west virginia department of environmental protection

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

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

September 29, 2016
PERMIT MODIFICATION APPROVAL
Horizontal 6A / Horizontal 6A Well - 1

EQT PRODUCTION COMPANY
120 PROFESSIONAL PLACE
BUILDING II
BRIDGEPORT, WV 26330

Re: Permit Modification Approval for 514119
47-017-06774-00-00

Shorten 9 5/8" to 2960'

EQT PRODUCTION COMPANY

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.

If there are any questions, please feel free to contact me at (304) 926- 0450.

James A. Martin
Chief

Operator's Well Number: 514119
Farm Name: MEYER, ELEANOR
U.S. WELL NUMBER: 47-017-06774-00-00
Horizontal 6A / Horizontal 6A Well - 1
Date Issued: September 29, 2016

WW-6B
(04/15)

API NO. 47- 017 - 06774 MOD
OPERATOR WELL NO. 514119
Well Pad Name: WEU8

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

1) Well Operator: EQT Production Company | 306686 | Doddridge | West Uni | West Union
Operator ID | County | District | Quadrangle

2) Operator's Well Number: 514119 Well Pad Name: WEU8

3) Farm Name/Surface Owner: Eleanor Meyer Public Road Access: Rt 50

4) Elevation, current ground: 1071 Elevation, proposed post-construction: 1071

5) Well Type (a) Gas X Oil ____ Underground Storage ____
Other ____
(b)If Gas Shallow X Deep ____
Horizontal X

6) Existing Pad: Yes or No Yes

7) Proposed Target Formation(s), Depth(s), Anticipated Thickness and Expected Pressure(s):
Marcellus, 6730' TVD, 55', 2951 PSI

8) Proposed Total Vertical Depth: 6730

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 13906

11) Proposed Horizontal Leg Length: 4727

12) Approximate Fresh Water Strata Depths: 129, 273, 304, 652

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

14) Approximate Saltwater Depths: 1705, 1854

15) Approximate Coal Seam Depths: 223, 840

16) Approximate Depth to Possible Void (coal mine, karst, other): none

17) Does Proposed well location contain coal seams directly overlying or adjacent to an active mine? Yes ____ No X

(a) If Yes, provide Mine Info: Name: ____
Depth: ____
Seam: ____
Owner: ____

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WW-6B
(04/15)

API NO. 47- 017 - 06774 MOD
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18) **CASING AND TUBING PROGRAM**

TYPE	Size (in)	New or Used	Grade	Weight per ft. (lb/ft)	FOOTAGE: For Drilling (ft)	INTERVALS: Left in Well (ft)	CEMENT: Fill-up (Cu. Ft.)/CTS
Conductor	20	New	A-500	78.6	40	40	44.8 ft^3 / CTS
Fresh Water	13 3/8	New	J-55	54.5	937	937	1016 ft^3 / CTS
Coal							
Intermediate	9 5/8	New	A-500	40	2960	2960	1158 ft^3 / CTS
Production	5 1/2	New	P-110	20	13906	13906	500' above top producing zone
Tubing	2 3/8		J-55	4.7		May not be run, if run set 40' above top perf or 80° Inclination	
Liners							

TYPE	Size (in)	Wellbore Diameter (in)	Wall Thickness (in)	Burst Pressure (psi)	Anticipated Max. Internal Pressure (psi)	Cement Type	Cement Yield (cu. ft./k)
Conductor	20	26	.375	1378	1102	Class A	1.18
Fresh Water	13 3/8	17 1/2	.38	2700	2160	See Variance	1.19
Coal							
Intermediate	9 5/8	12 3/8	.395	3950	3160	See Variance	1.19
Production	5 1/2	8 1/2	.361	12640	10112	H	1.07/1.86
Tubing	2 3/8	NA	.19	7700			
Liners							

PACKERS

Kind:				
Sizes:				
Depths Set:				

Gas

9/20/16

Protection

WW-6B
(10/14)

API NO. 47- 017 - 06774 MOD
OPERATOR WELL NO. 514119
Well Pad Name: WEU8

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. Drill the vertical to an approximate depth of 4158'. Kick off and drill curve. Drill the lateral in the Marcellus. Cement casing.

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 internal casing pressure is expected to be approximately 10000 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): +/- 15.1

22) Area to be disturbed for well pad only, less access road (acres): +/- 3.1

23) Describe centralizer placement for each casing string:

- Surface: Bow spring centralizers – One centralizer at the shoe and one spaced every 500'.
- Intermediate: Bow spring centralizers– One centralizer at the shoe and one spaced every 500'.
- Production: One solid body centralizer spaced every joint from production casing shoe to KOP

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

Conductor: Class A no additives
Surface (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries, .25% Flake. Loss Circulation Material (LCM)
Intermediate (Type 1 Cement): 0-3% Calcium Chloride. Used to speed the setting of cement slurries. 0.25% flake. Loss Circulation Material (LCM)
Production:
Lead (Class H Cement): 0.2% CD-20 (dispersant makes cement easier to mix). .15% SuperFL-300 (fluid loss/lengthens thickening time) .15% SEC-10 (fluid loss) 50:50 POZ (extender)
Tail (Class H Cement): 0.2% Super CR-1 (Retarder). Lengthens thickening time. .3% Super FL-200 (fluid loss) .2% SEC-10 (Fluid loss). .2% SuperFL-350 (fluid loss) Reduces amount of water lost to formation. 60 % Calcium Carbonate. Acid solubility.

25) Proposed borehole conditioning procedures:

Surface: Circulate hole clean while rotating & reciprocating the drill string until cuttings diminish at surface.
Intermediate: Circulate hole clean while rotating & reciprocating the drill string until cuttings diminish at surface.
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.

9/20/16

$7-0674
new

Well 514119(WEU8H7)

EQT Production

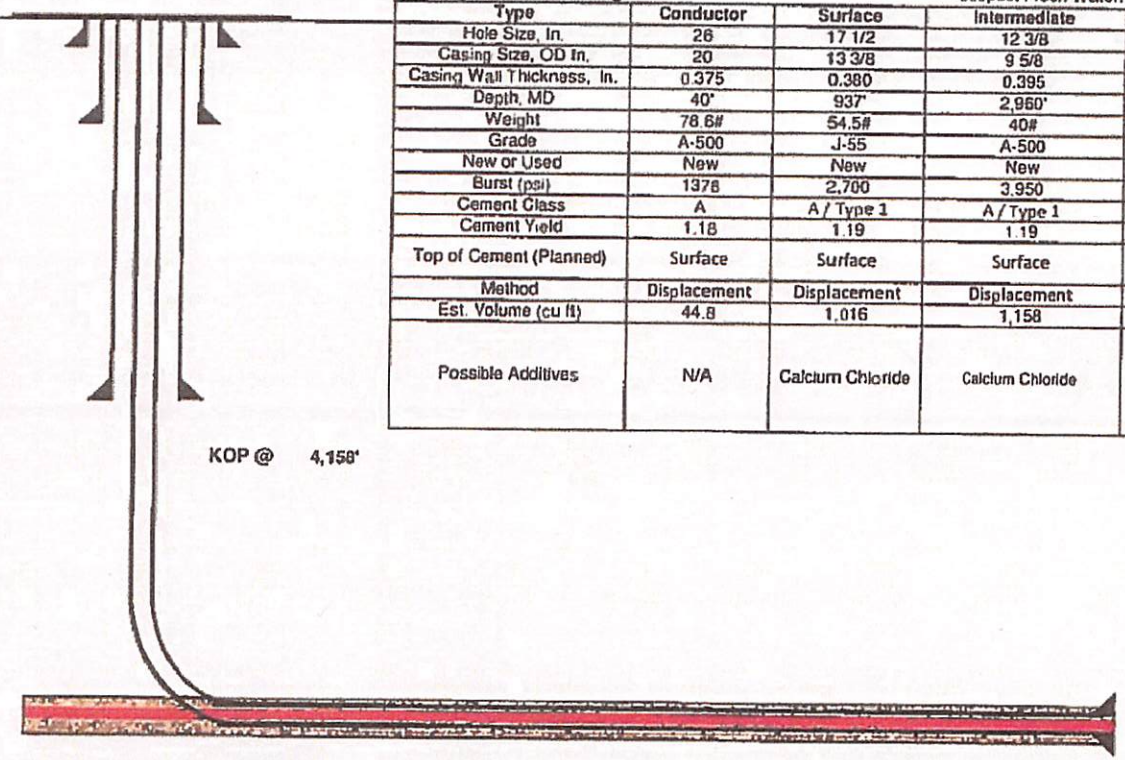
West Union Quad

Doddridge County, WV

Azimuth 328
Vertical Section 7402

Note: Diagram is not to scale

Formations	Top TVD	Base TVD
Conductor	40	
Base Fresh Water	652	
Surface Casing	937	
Base Red Rock	1149	
Maxton	1583	1750
Big Lime	1997	2104
Big Injun	2111	2135
Weir	2235	2404
Gantz	2487	2500
Fifty foot	2614	2648
Thirty foot	2687	2705
Gordon	2769	2779
Forth Sand	2818	2825
Bayard	2900	2910
Intermediate Casing	2960	
Warren	3336	3411
Speechley	3427	3533
Balltown A	4019	4196
Riley	4557	4584
Benson	4978	5004
Alexander	5230	5309
Sonyea	6294	6434
Middlesex	6434	6486
Genesee	6486	6551
Geneseo	6551	6590
Tully	6590	6611
Hamilton	6611	6629
Marcellus	6629	6684
Production Casing	13906	MD
Onondaga	6684	



KOP @ 4,158'

Land curve @ 6,730' TVD
9,179' MD

Est. TD @ 6,730' TVD
13,906' MD

4,727' Lateral

Casing and Cementing Deepest Fresh Water: 652'

Type	Conductor	Surface	Intermediate	Production
Hole Size, In.	26	17 1/2	12 3/8	8 1/2
Casing Size, OD In.	20	13 3/8	9 5/8	5 1/2
Casing Wall Thickness, In.	0.375	0.380	0.395	0.361
Depth, MD	40'	937'	2,960'	13,906'
Weight	78.6#	54.5#	40#	20#
Grade	A-500	J-55	A-500	P-110
New or Used	New	New	New	New
Burst (psi)	1378	2,700	3,950	12,640
Cement Class	A	A / Type 1	A / Type 1	H
Cement Yield	1.18	1.19	1.19	1.07/1.86
Top of Cement (Planned)	Surface	Surface	Surface	500' above top Producing Zone
Method	Displacement	Displacement	Displacement	Displacement
Est. Volume (cu ft)	44.8	1,016	1,158	2,796
Possible Additives	N/A	Calcium Chloride	Calcium Chloride	Calcium Carbonate, Fluid Loss, Extender, Dispersant, Viscosifier, Defoamer, POZ, Bonding Agent, Retarder, Anti-Settling/Suspension Agent

Proposed Well Work:
Drill and complete a new horizontal well in the Marcellus formation.
Drill the vertical to an approximate depth of 4158'.
Kick off and drill curve. Drill lateral in the Marcellus. Cement casing.

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17-06774 MED

September 20, 2016

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

Re: Modification of 47-017-06774 (WEU8)

Dear Mr. Smith,

Enclosed is an updated WW-6B and schematic for the API number above on the WEU8 pad. While drilling the intermediate hole section, EQT encountered difficulties with red rock and needed to quickly make a decision on the 9 5/8" casing. Dan Doebereiner spoke with Joe McCourt and Dan Flack on Sunday and discussed shortening the 9 5/8" intermediate casing. Joe McCourt gave Dan a verbal approval, as did Dan Flack. Dan Flack has since signed off on the modification, which is attached.

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

Sincerely,

Vicki Roark
Permitting Supervisor-WV

Enc.

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