



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

Harold D. Ward, Cabinet Secretary
www.dep.wv.gov

Monday, December 11, 2023
PERMIT MODIFICATION APPROVAL
Horizontal 6A / New Drill

EQT PRODUCTION COMPANY
400 WOODLIFF DR.

CANONSBURG, PA 15317

Re: Permit Modification Approval for HUDSON S-8HM
47-051-02379-00-00

Lateral Revision

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.

A blue ink signature of James A. Martin, written in a cursive style.

James A. Martin
Chief

Operator's Well Number: HUDSON S-8HM
Farm Name: CNX LAND LLC
U.S. WELL NUMBER: 47-051-02379-00-00
Horizontal 6A New Drill
Date Modification Issued: 12/11/2023

Promoting a healthy environment.

12/15/2023

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

1) Well Operator: EQT Production Company 306686 Marshall Meade Glen Easton
Operator ID County District Quadrangle

2) Operator's Well Number: S-8HM Well Pad Name: Hudson

3) Farm Name/Surface Owner: CNX Land, LLC Public Road Access: Roberts Ridge Road (CR 21)

4) Elevation, current ground: 1,346' Elevation, proposed post-construction: 1,346'

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, 6,782', 51', 3,800 psi

8) Proposed Total Vertical Depth: 6,782'

9) Formation at Total Vertical Depth: Marcellus

10) Proposed Total Measured Depth: 18,443'

11) Proposed Horizontal Leg Length: 10,442'

12) Approximate Fresh Water Strata Depths: 90', 585', 635', 779', 929', 1049'

13) Method to Determine Fresh Water Depths: Offset wells - 051-00554, 051-00568

14) Approximate Saltwater Depths: 1,749', 1,900', 2,089'

15) Approximate Coal Seam Depths: 901'-904', 983'-989'

16) Approximate Depth to Possible Void (coal mine, karst, other): N/A

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

(a) If Yes, provide Mine Info: Name: Marshall County Coal Company/Marshall County Mine

Depth: 983'-989'

Seam: Pittsburgh

Owner: Murray Energy/Consolidated Coal Company

CK # 00005991650
\$ 7500.00
9/14/2023

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Strader Gower
11/22/2023

WW-6B
(04/15)

API NO. 47- 051 - 02379
 OPERATOR WELL NO. S-8HM
 Well Pad Name: Hudson

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	30	New	BW	BW	120	120 ✓	415 ft ³ / CTS
Fresh Water	13 3/8	New	J-55	54.5	1300	1300 ✓	1460 ft ³ / CTS
Coal							
Intermediate	9 5/8	New	J-55	36	2425	2425 ✓	910 ft ³ / CTS
Production	6	New	P-110	24	18443	18443 ✓	500' above intermediate casing
Tubing							
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	30	36	1.0	2333	1866	Class A	1.2
Fresh Water	13 3/8	17 1/2	0.380	2730	2184	Class A	1.04 - 1.20
Coal							
Intermediate	9 5/8	12 3/8 - 12 1/4	0.352	3520	2816	Class A	1.04 - 1.20
Production	6	8 3/4 - 8 1/2	0.400	14580	11664	Class A/H/L	1.04 - 2.10
Tubing							
Liners							

PACKERS

Kind:				RECEIVED Office of Oil and Gas NOV 27 2023 WV Department of Environmental Protection
Sizes:				
Depths Set:				

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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, 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 0.1%) of chemicals (including 15% Hydrochloric acid, 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 10,000 psi, maximum anticipated treating rates are expected to average approximately 100 bpm. Stage lengths vary from 150 to 300 feet. Average approximately 350,000 gallons of water per stage. Sand sizes vary from 100 mesh to 20/40 mesh. Average approximately 200,000-600,000 pounds of proppant per stage.

21) Total Area to be disturbed, including roads, stockpile area, pits, etc., (acres): 22.94

22) Area to be disturbed for well pad only, less access road (acres): 6.18

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 other joint from production casing shoe to landing point. One solid body centralizer spaced every joint from landing point to planned top of cement.

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

Conductor: No additives
Surface: Calcium Chloride. Used to speed the setting of cement slurries
Intermediate: Calcium Chloride. Used to speed the setting of cement slurries.
Production: Calcium Carbonate, Fluid Loss, Extender, Dispersent, Viscosifier, Defoamer, POZ, Bonding Agent, Retarder
Anti-Settling/Suspension Agent

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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: Perform a cleanup cycle by pumping 3-8 bottoms up or until the shakers are clean. Check volume of cuttings coming across the shakers every 15 minutes.

*Note: Attach additional sheets as needed.

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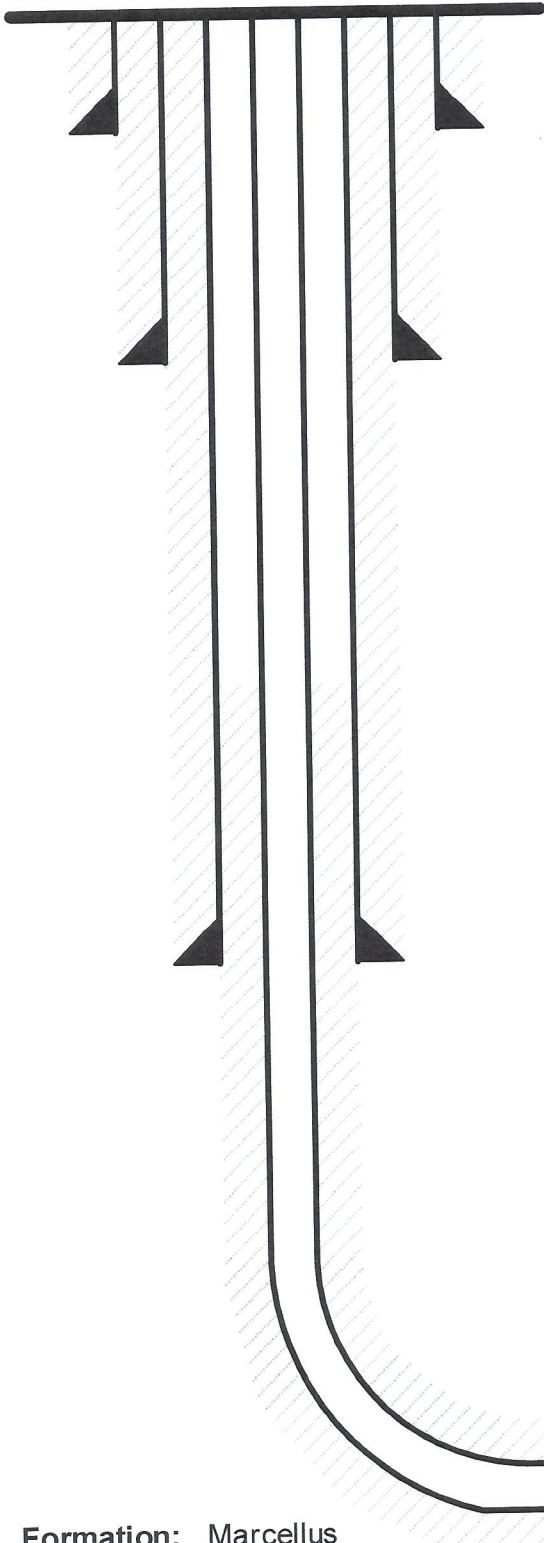
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EQT Production (Tug Hill)

Wellbore Diagram

Well: Hudson S-8HM
Pad: Hudson
Elevation: 1346' GL 1359' KB

County: Marshall
State: West Virginia



Conductor @ 120'

30", BW, BW, cement to surface w/ Class A

Surface @ 1,300'

13-3/8", 54.5#, J-55, cement to surface w/ Class A

Intermediate @ 2,425'

9-5/8", 36#, J-55, cement to surface w/ Class A

Production @ 18,443' MD / 6,782' TVD

6", 24#, P-110, cement to 500' inside 9-5/8" w/ Class A/H/L

Formation: Marcellus

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12/15/2023 NOT TO SCALE

WEST VIRGINIA GEOLOGICAL PROGNOSIS

HUDSON
API
S-002892

Drilling Objectives: Marcellus
County: Marshall
Quad: 0
Elevation: 1359 KB
Recommended Azimuth: 149 Degrees

1346 GL

Recommended LP to TD: **TBD**

ESTIMATED FORMATION TOPS

from Crawford 1V 4705101166

Formation	Top (TVD)	Base (TVD)	Lithology	Comments	Top RR	Base RR
Fresh Water Zone	1	1049		FW @ 1049,929,779,635,585,90	1335	1335
Sewickley Coal	901	904	Coal		979	979
Pittsburgh Coal	983	989	Coal	Mining?		#VALUE!
Big Lime	2065	2319	Limestone	SW @ 2089,1900,1749,		#VALUE!
Big Injun	2319	2375	Sandstone			#VALUE!
Int. csg pt	2425			Storage?		#VALUE!
Berea	2649	3086	Sandstone			#VALUE!
Gordon	3144	3213	Silty Sand			
Bayard	3354	3634	Silty Sand	Base of Offset Well Perforations at 3055' TVD		
Alexander	5476	5924	Silty Sand			
Elks	5924	6452	Gray Shales and Silts			
Sonyea	6452	6558	Gray shale			
Middlesex	6558	6584	Shale			
Genesee	6584	6627	Gray shale interbedded			
Genesee	6627	6655	Black Shale			
Tully	6655	6682	Limestone			
Hamilton	6682	6768	Gray shale with some			
Marcellus	6768	6819	Black Shale	Start Lateral at 6782'		
-Lateral Zone	6782					
Cherry Valley	6809	6811	Limestone			
Onondaga	6819		Limestone			

Target Thickness	51 feet
Max Anticipated Rock Pressure	3800 PSI

Comments:
 Note that this is a TVD prog for a horizontal well (azimuth of 149 degrees; target formation = Marcellus). All measurements taken from estimated KB elevation. Water and coal information estimated from surrounding well data.
 Intermediate casing point is recommended beneath the Big Injun to shut off any water production from the Upper Devonian sands. Intermediate casing should be cemented into the surface string, per WV regulations.
 The estimated landing point TVD is 6782'; rig geologist may adjust landing point. After the well is landed, drill to reported bed dips/ geologists' recommendation. The geologic structure is unknown at this time.

LATERAL DRILLING TOLERANCES

Mapview - Lateral: Deviate as little as possible to the left or right of the planned wellbore.
Mapview - TD: DO NOT EXTEND beyond recommended wellbore to avoid lease line.

RECOMMENDED CASING POINTS

Fresh Water/Coal: CSG OD 13 3/8
Intermediate 1: CSG OD 9 5/8
Production: CSG OD 5 1/2

Planned Depth TVD
 1300'
 CSG DEPTH: 2425
 EQT proposed depth due to unconformity 50' Beneath the Big Injun formation
 CSG DEPTH: @ TD

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EQT Production
Hydraulic Fracturing Monitoring Plan
Pad ID: Hudson
County: Marshall

November 21, 2023

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Purpose

The purpose of this pad-specific Hydraulic Fracturing Monitoring Plan is to identify and notify conventional well operators near EQT hydraulic fracturing in Marshall County, WV prior to hydraulic fracturing at the following EQT wells on the Hudson pad: S-2HM, S-3HM, S-4HM, S-6HM, S-7HM, S-8HM, 9HM & S-10HM.

Due to the requirements under 35CSR8 5.11, the permittee is required to review the area surrounding the proposed well pad so as to identify and evaluate potential conduits for unintended fracture propagation.

A report is required to be submitted along with a well work permit application.

The plan is being implemented as an additional safety measure to be utilized in conjunction with existing best management practices and emergency action plans for the site. These additional measures include coordination with well operators of the timing and location of the hydraulic fracturing, establishment of measures well operators should implement, and assurance that the OOG is notified of the timeline, as well as any issues that may arise during fracturing.

1. Communications with Well Operators

EQT, using available data (WV Geological Survey, WVDEP website, and IHS data service), has identified all known wells and well operators within 500 feet of this pad and the lateral sections that are known or could reasonably be expected to be within range of the fracture propagation. A map showing these wells along with a list of the wells and operators is included in **Attachment A**.

EQT will notify these operators of the hydraulic fracturing schedule for these wells, and coordinate with them throughout the fracturing process.

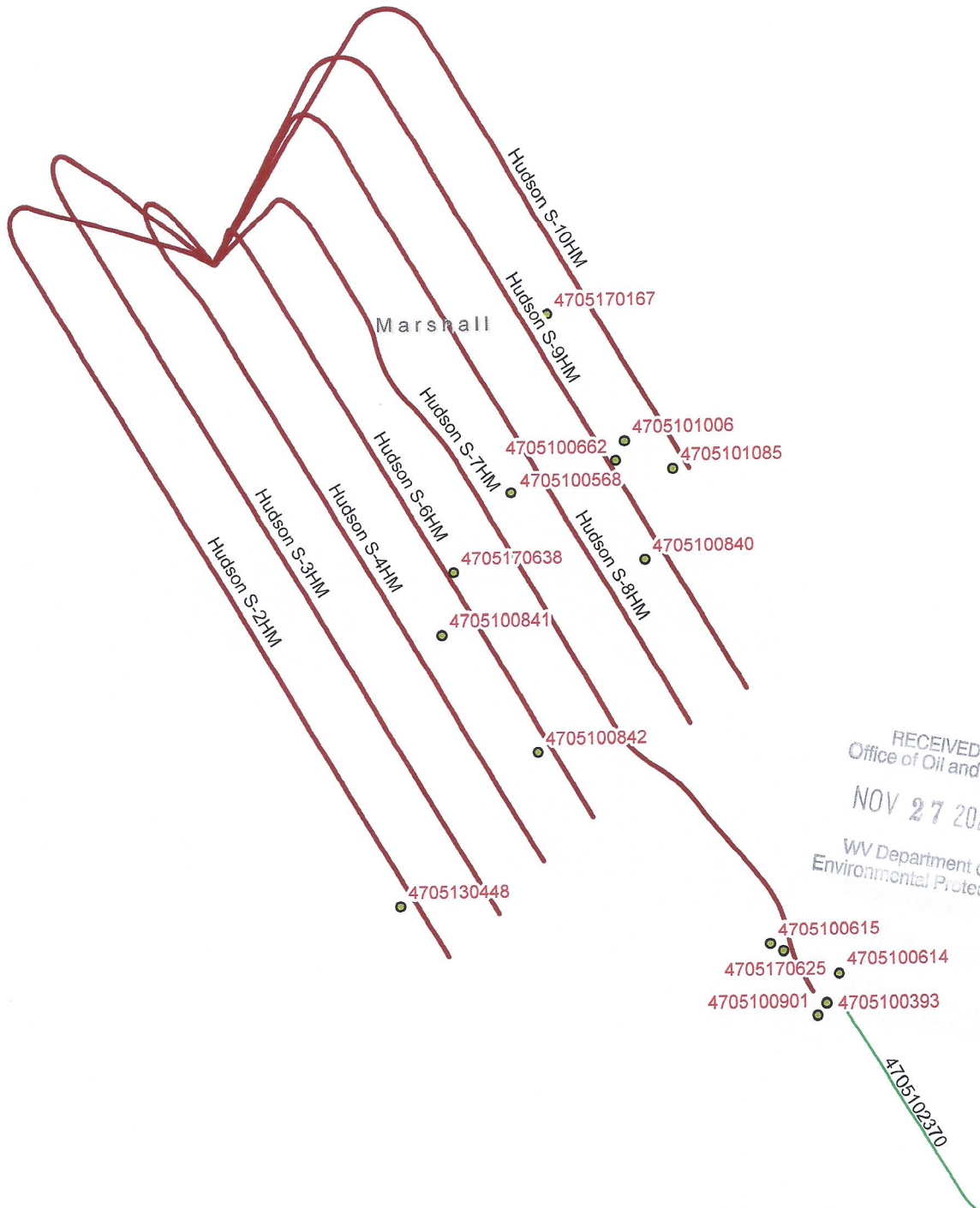
EQT will recommend to these operators at a minimum to:

1. Inspect their surface equipment prior to fracturing to establish integrity and establish pre-frac well conditions
2. Observe wells closely during and after fracturing and monitor for abnormal increases in water, gas or pressure
3. Inspect or install master valves or other necessary equipment for wellhead integrity capable of a pressure recommended by EQT
4. Notify the OOG and EQT if any changes in water, gas production, pressure, or other anomalies are identified

2. Reporting

EQT will provide information relating to the hydraulic fracturing schedule, communication with other operators, and ongoing monitoring of the work upon request of OOG or immediately in the event of any noted abnormalities.

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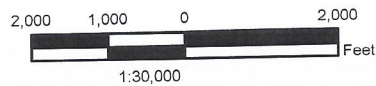
EQT Corporation
625 Liberty Avenue
Pittsburgh, PA 15222

Hudson

Vertical Offsets and Foreign Laterals within 500'

Legend

- Well Lateral_FM
- Formation
 - Genesee
 - Marcellus
 - Utica
- Hudson_Offset_Wells
- Hudson_Offset_Laterals



Disclaimer:

This map is confidential and is to be used only for the express informational purposes for which it was created. Unauthorized use, copying, or dissemination is strictly prohibited. EQT does not warrant the accuracy of the location of any items shown on this map, including, but not limited to, any structures, well or pipeline facilities, property boundaries, topography, roadways, or waterways. The items shown on the map may not have been placed on the map using survey lines or GPS coordinates. The specific location of any of the map items should be determined by a field survey performed by a licensed surveyor upon consultation with EQT.

