

Gas Well Activity and Regulatory Requirements In the Susquehanna River Basin



July 15, 2008

Chenango, New York

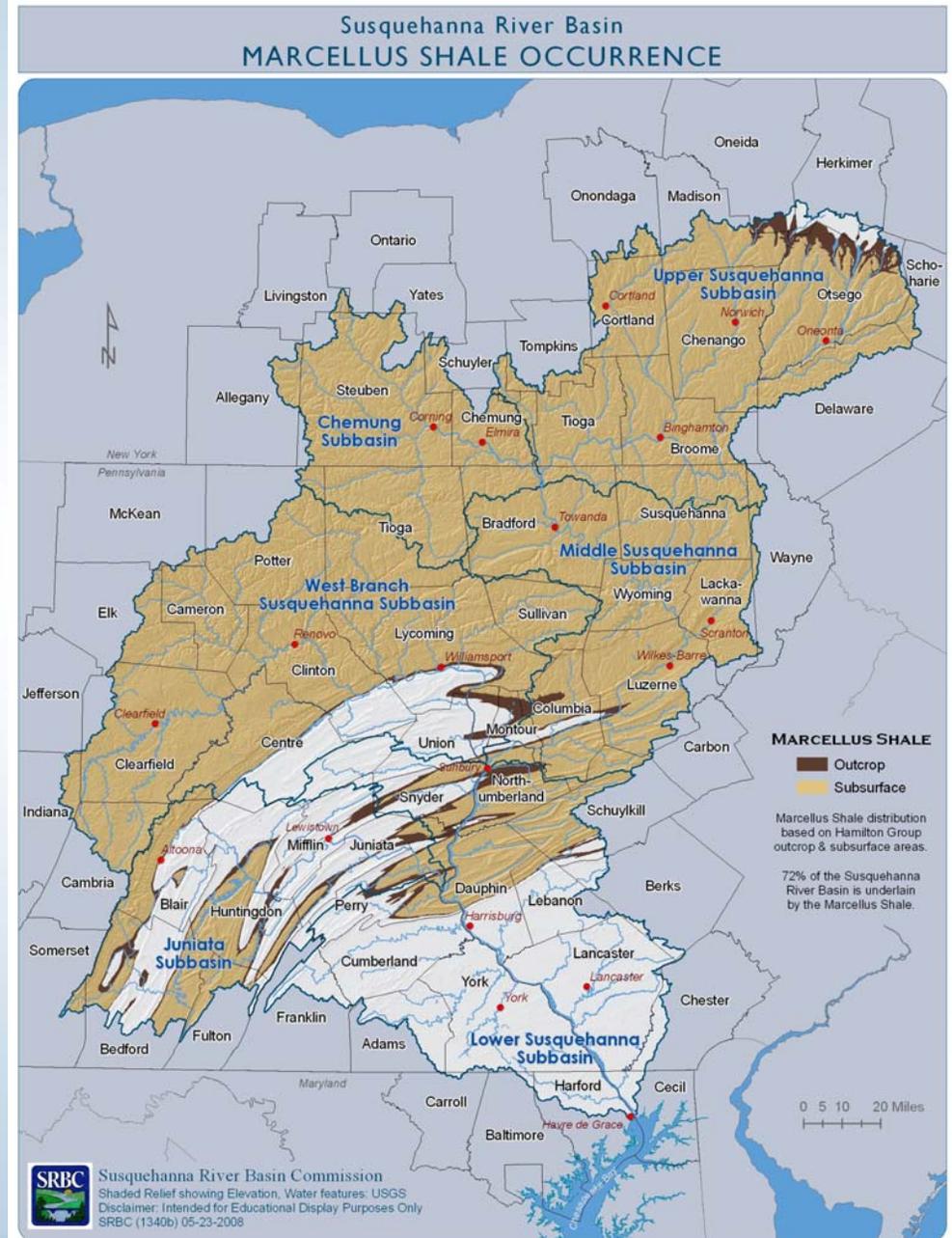


Susquehanna River Basin Commission (SRBC)

- SRBC is a federal-interstate compact commission established by the federal government and the states of New York, Pennsylvania, and Maryland.
- SRBC is responsible for managing the basin's water resources.
- The Susquehanna basin covers a 27,510-square-mile area that drains into the Chesapeake Bay.

Geographic Location

- Appalachian Basin Province
 - NY to PA, OH, MD, WV and VA
 - Trending northeast, spans a distance of approximately 600 linear miles, and 54,000 square miles
 - 72 percent of the Susquehanna River Basin is underlain by the Marcellus Shale



Marcellus Shale Gas

- Large volume of entrapped natural gas approximately 5,000 - 8,000 feet below ground surface
- Regional stratigraphic (blanket-like) accumulations stored in a tight formation
- Requires “unconventional” means for extraction
 - Horizontal Drilling
 - Fracture Stimulation (Hydrofrac)



Horizontal Gas Well Drilling

- Drill vertically to desired depth in the formation
- Drill rods are then turned (horizontal) in order to drill perpendicular to naturally occurring vertical fractures

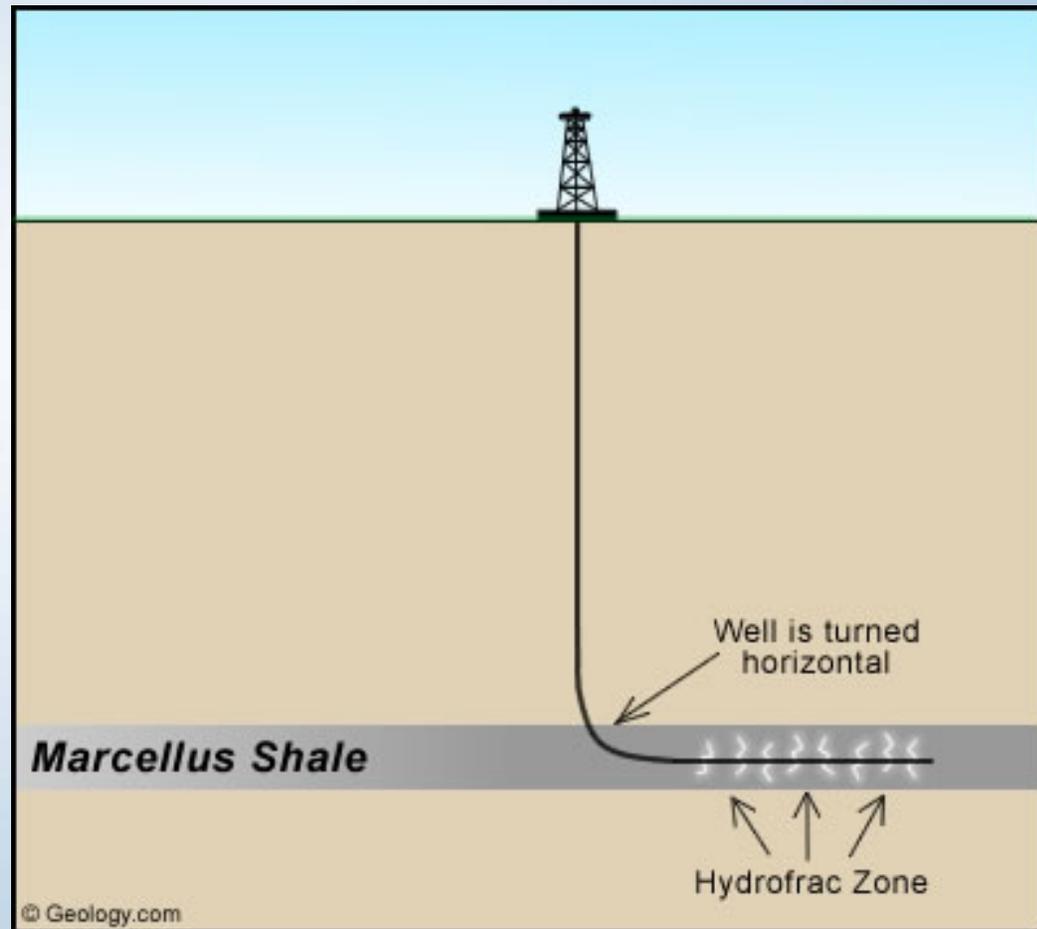


Illustration retrieved from: geology.com/articles/marcellus-shale.

Vertical vs. Horizontal Drilling

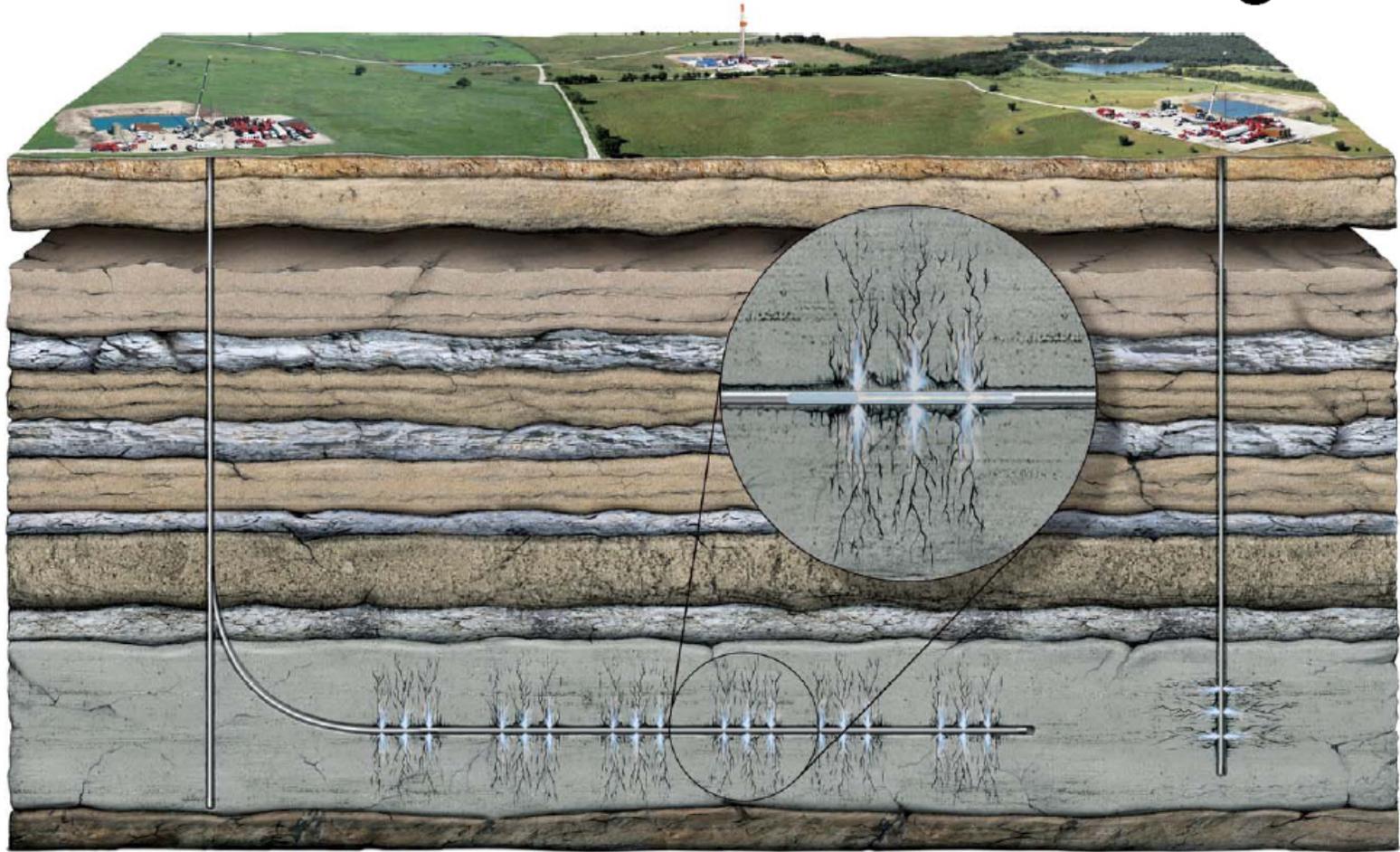


Illustration retrieved from: Independent Oil and Gas Association of Pennsylvania's *Drilling & Developing the Marcellus Shale*

Horizontal Drilling

- Can provide greater access with a smaller footprint
- Multiple horizontal wells from a single drilling pad could drain 200 - 400 acres

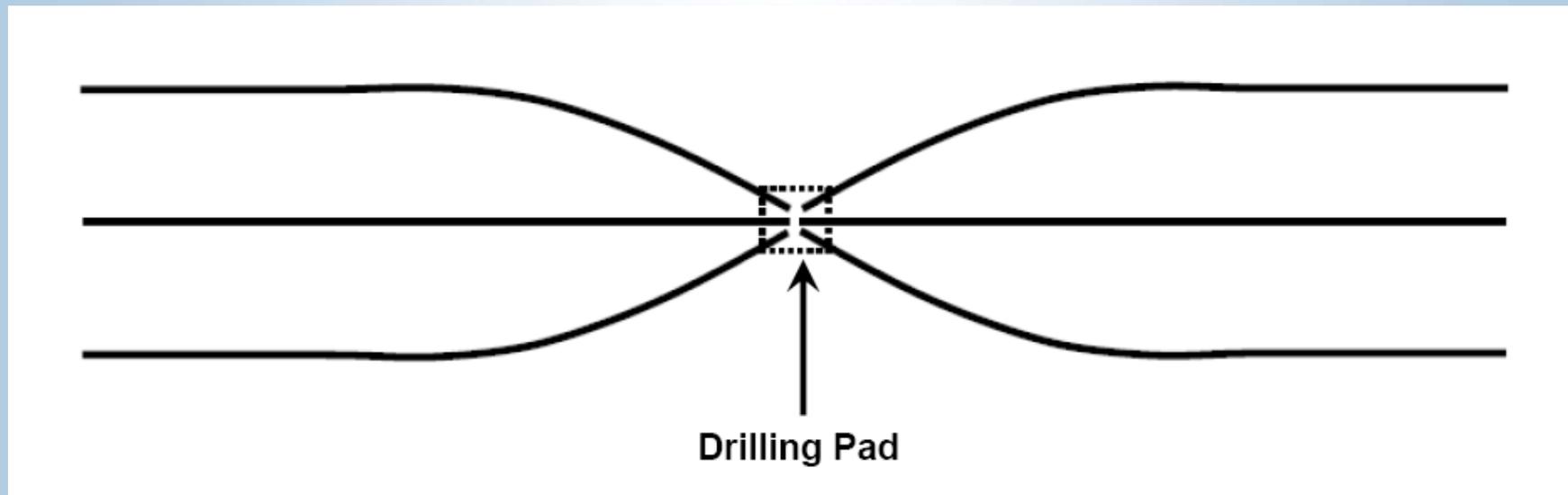


Illustration retrieved from: Independent Oil and Gas Association of Pennsylvania's *Drilling & Developing the Marcellus Shale*

Hydraulic Fracturing (Hydrofracing)

- Force a fracturing fluid (primarily water) into a sealed off portion of the borehole under high pressure
- The applied pressure causes the formation to fracture, allowing the fracturing fluid to enter further into the formation and extending the cracks
- Solid proppant (usually sand) is added to the fracture fluid to keep fractures open after the injection stops



Typical Gas Well Frac Site



Typical Gas Well Frac Site



Hydrofracing (cont'd)

- Hydrofracing typically requires millions of gallons of water for horizontal wells
- Flowback water requires off-site treatment
 - Brine
 - Hydrocarbons
 - Metals
 - May be slightly radioactive



Commission Regulation

- Consumptive water use definition (§806.3)
 - The loss of water transferred through a manmade conveyance system or any integral part thereof (including such water that is purveyed through a public water supply system), due to transpiration by vegetation, incorporation into products during their manufacture, evaporation, *injection of water or wastewater into a subsurface formation from which it would not reasonably be available for future use in the basin*, diversion from the basin, or other process by which the water is not returned to the waters of the basin undiminished in quantity.

Commission Regulation (cont'd)

- Projects requiring review and approval
 - Consumptive water use §806.4(a)(1)
 - 20,000 gpd/30-day average (600,000 gallons)
 - Water withdrawals §806.4(a)(2)(iii)
 - 100,000 gpd/30-day average (3,000,000 gallons)
 - Any project which involves a withdrawal from a groundwater or surface water source and which is subject to the requirements of §806.4(a)(1) regarding consumptive use.

Potential Impacts/Approval Challenges

- Consumptive Use/Surface Water Withdrawal
 - Sites are located in headwater areas
 - Streams are typically high quality
 - Operations continue during low flow periods
 - Passby considerations/streams encroachment
 - Cumulative impacts of multiple projects
- Potential Local Infrastructure Issues
 - Increased heavy truck traffic
 - Dust control

Recent Commission Actions

May 30, 2008 - Cease and desist Orders were issued to two gas well drilling companies

June 6, 2008 - Letters to 23 gas well companies operating within the Susquehanna River Basin clarifying that water used for developing natural gas wells in the Susquehanna River Basin needs Commission approval

June 18, 2008 - Letters to an additional 29 gas well companies operating within the Susquehanna River Basin clarifying that water used for developing natural gas wells in the Susquehanna River Basin needs Commission approval

June-July 2008 - Commission staff has met with 28 gas well companies operating within the Susquehanna River Basin

Current Status

- Gas well site inspections are currently ongoing
- Notice of Intent for Approval by Rule
 - 63 APPLICATIONS HAVE BEEN RECEIVED
 - 11 HAVE BEEN ISSUED
- Surface water withdrawal applications
 - 47 APPLICATIONS HAVE BEEN RECEIVED
 - 5 HAVE BEEN ISSUED (JULY 12, 2008)
- Consumptive water use applications
 - 9 APPLICATIONS HAVE BEEN RECEIVED
 - 3 HAVE BEEN ISSUED (JULY 12, 2008)

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Presented July 15, 2008 in Chenango, New York