

Susquehanna River Basin Commission Information Sheet



Natural Gas Well Development in the Susquehanna River Basin

Natural Gas Shales in the Susquehanna River Basin and Hydraulic Fracturing

Eighty-five (85) percent of the Susquehanna River Basin is underlain by black gas-bearing shales that run deep underground – much of these rocks are more than a mile beneath the surface. The natural gas shales found in the Susquehanna basin include the Marcellus Shale, a sedimentary rock formation that holds one of the richest deposits of natural gas in the lower 48 states. Other tight shale formations in the Susquehanna basin include Utica, Antes, Burket, Geneseo, Mandata, Middlesex, Needmore and Rhinestreet.

Extracting gas from these shales is technically and economically feasible due to advances in horizontal drilling and high volume “hydraulic fracturing” (commonly called “fracing”). The fracing process creates millions of artificial fractures that allow the collection of trapped gas. Large volumes of water are mixed with sand and chemicals and pumped into the shale under high pressure to shatter the formation facilitating release of the gas.

SRBC’s Management of Water for Natural Gas Development

Because of the large volumes of water used in the fracing process, the Susquehanna River Basin Commission (SRBC) plays an important role as it regulates water withdrawals and consumptive water uses in the Susquehanna River Basin. The drilling and development of each production well uses, on average, between 4 and 5 million gallons of water. Approval of the use of water by SRBC is necessary before drilling is undertaken. (SRBC’s “approvals” are similar to the term “permits” used by other agencies.)

SRBC’s review of proposed water withdrawals includes an evaluation of whether that activity would cause adverse impacts to the water resources of the basin. Withdrawals may impact other water uses, fish, wildlife or other living resources or their habitat, recreation and flows in streams.



SRBC DOES NOT REGULATE....

Construction of drilling pads, access roads and drilling wells; Production and monitoring of natural gas; Transmission of natural gas; Handling and disposal of flowback fluids and other water quality issues.

Impact Issues Associated with Gas Drilling

There are local impacts associated with natural gas drilling occurring in the Susquehanna River Basin. The issues under debate and scrutiny in local communities include: road development and wear; heavy truck traffic; excess noise and night-light; forest fragmentation; and potential contamination of aquifers.

SRBC is committed to working with agencies of its member states to balance the needs for economic development and environmental protection.

Key Water Issues

The concentration of drilling activities in Pennsylvania is cause for concern over how drilling will impact public water supplies and the integrity of surface waters. Although the Susquehanna basin is relatively wet compared to other areas of the country experiencing natural gas development activities (e.g. Arkansas and Texas), there are serious challenges that focus on the cumulative impact of gas drilling, both from a water quantity and water quality perspective.

The key water-related issues include:

- impact of water withdrawals on small, remote forested streams, often home to wild trout and other sensitive species;
- impact on local public water supplies;
- potential for water contamination from poor casing of well bores or from flooded or leaking waste fluid holding pits;
- runoff from well pad sites, pipelines and unpaved roads;
- natural gas migration into streams and nearby water wells;
- the handling and disposal of fluids that return to the surface after hydraulic fracturing (flowback);
- disturbance of sensitive lands adjacent to water bodies; and
- spills.



Eastern Hellbender

In the Susquehanna basin, many of these issues fall under the authority of Pennsylvania's Department of Environmental Protection.

Sound Science in Regulatory Process

SRBC, in its important but limited role in regulating water withdrawals and uses, relies on sound science to guide its regulatory decisions. For each proposed water withdrawal, SRBC staff conducts a desktop environmental review to examine the stream classification, wild trout status, attainment/nonattainment status, presence of rare, threatened or endangered species, surrounding wetlands and scenic waterways. SRBC staff also performs an on-site evaluation to assess the project location for additional or varying site conditions. For certain streams, SRBC conducts an aquatic resource survey to assess the condition of the aquatic community within the stream ecosystem.

WATER FACTS....

1. SRBC considers all fresh water used in fracing to be consumptive (lost to the system).
2. A typical fracing stimulation uses 4-5 million gallons of water over a 2- to 5-day period.
3. About 8-10% of the water flows back to the surface within 30 days after the pressure is released.
4. Fluid used in fracing is typically comprised of 98% water and 2% sand with chemical additives.
Companies drilling in PA must disclose additives used in fracing as part of the state permit process.
5. Potable water is about 850 ft below ground surface. Shale gas formations are vertically separated from freshwater aquifers by at least 2,000 ft of sandstones and shales of moderate to low permeability.
6. Recent estimates indicate that actual water use from the entire natural gas industry at full build-out for fracing is expected to be about 30 million gallons per day (gpd). To put that into perspective, water use for recreation is about 50 million gpd, water use for power production is about 150 million gpd and water use for public water supplies is about 325 million gpd.

To address potential impacts, SRBC places protective conditions in its withdrawal approvals – known as passby flows – a prescribed quantity of stream flow that must be allowed to pass a specific point downstream from a water withdrawal intake at any time a withdrawal is occurring. The intent of the passby flow requirement is to protect streams during low flow conditions. Project sponsors may be required to stop or decrease withdrawals during low streamflow periods. Passby flows are site specific and vary according to state designated use classifications, available habitat information and consultations with state fishery management agencies.

Provisions of SRBC’s Regulation of Natural Gas Development

As the natural gas industry expands drilling efforts in the Susquehanna River Basin, SRBC continues to amend its regulations and add clarity to address concerns regarding adverse impacts to water resources. SRBC also has the authority to take enforcement action against companies that fail to gain SRBC approval or violate the terms and conditions of approvals.

Regulatory Threshold

Most importantly, SRBC requires gas companies to seek approval from the commission before withdrawing or using any amount of water to develop wells in certain tight shale formations in the Susquehanna basin. SRBC adopted the threshold for natural gas projects in October 2008. (For project sponsors other than natural gas companies, the regulatory thresholds as 30-day averages are 100,000 or more gallons per day for water withdrawals and 20,000 or more gallons per day for consumptive uses.)

SRBC evaluates the gas industry’s individual and cumulative impacts on water resources. On each drilling pad, natural gas companies must monitor their water use daily and provide reports of water used quarterly.



Withdrawing water from a stream

Approval By Rule

SRBC regulates consumptive water use on a drilling pad basis through an administrative Approval by Rule (ABR) process. This allows SRBC to track all water activity associated with a drilling pad – the sources of water transported to and from a site, quantities consumptively used and the fate of flowback and produced fluids – while issuing approvals more efficiently (SRBC Regulations §806.22(f)(i) and (ii)).

The ABR process also is used for interbasin transfer of flowback for pad-to-pad use and also for companies interested in using a source of water that has already been approved for use (e.g., a public water supply (**photo**)) or a source that is of lesser quality (e.g., wastewater discharge, mine drainage water). Withdrawal application for surface or groundwater sources receive more scrutiny than ABRs and undergo complete technical reviews.



Getting water from public water supply source

NATURAL GAS COMPANY RESPONSIBILITIES....

As conditions of an approval to use water, SRBC requires natural gas companies to demonstrate that:

1. All flowback and produced fluids are treated and disposed of in accordance with state and federal laws.
2. Any unused (surplus) water is not to be discharged back to the waters of the basin without controls or treatment to prevent the spread of invasive aquatic species.
3. All necessary permits or approvals required by local, state or federal agencies are obtained.
4. All water withdrawn from surface waters is transported, stored, injected into a well or discharged so as to not spread invasive species.
5. There are accurate meters to monitor daily withdrawals and consumptive use of water.

Approved Source Sharing

A rule change adopted by SRBC in 2009 allows for flexibility in directing water from approved sources to drilling pads and source sharing by the natural gas industry. Natural gas companies may use withdrawal locations previously approved for use by another company as long as access and use agreements are registered with SRBC and proper tracking requirements are followed. Allowing water sharing limits the number of withdrawal locations across the basin and potentially reduces tanker truck traffic by allowing project sponsors to use the closest approved water source site.

Diversion of Water (not related to transfer of flowback for pad-to-pad use)

Gas companies also must receive approval to divert water into the Susquehanna basin from other basins and to divert flowback out of the Susquehanna basin. Applications to drill water wells as additional sources of water are also being submitted. These activities are also regulated by SRBC and are evaluated for the long term impacts on the water resources of the basin.

How Natural Gas Is Produced

Drilling for natural gas in the mid-Atlantic states is not a new activity. There are tens of thousands of conventional natural gas wells in New York State and Pennsylvania. The key difference in the recent development in shales involves the horizontal drilling and the use of high volume hydraulic fracturing to stimulate the gas release (**diagram**).

Multiple horizontal wells located at a single pad site can provide greater access to the natural gas with a smaller footprint. Wells on a single drilling pad could potentially produce gas from 200-400 or more acres.

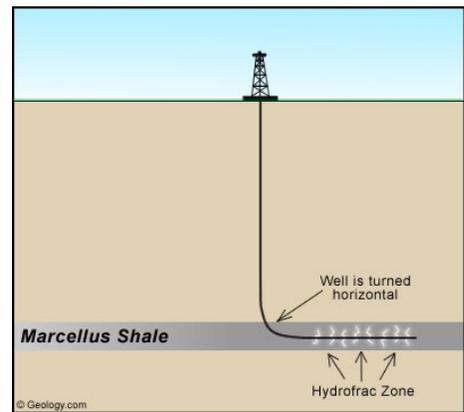
Getting water to drilling pads involves delivery by trucks (**left photo**) or pipeline either directly from the source or from centralized water storage



impoundments. At the drilling pad, water is typically stored in large, steel tanks called frac cans (**right photo**) or in open impoundments.

After the stimulation process, about 8-10 percent of the water flows

back to the surface in the first 30 days after the pressure is released. The flowback water is either temporarily stored on site or reused in another well before final disposal according to state regulations.



After turning the well bore at depth to align with the shale formation, the hydraulic stimulation creates a “cluster” of multiple fractures maximizing gas production.



Reuse of Flowback

The natural gas industry reuses flowback water for drilling activities, a practice that reduces the demand for fresh water and may reduce production costs. However, safe handling of the flowback fluid that is transferred to another pad is a concern that will be monitored.

RELATED WEB SITE RESOURCES....

Water Resources Portal (approved projects and pending applications): <http://www.srbc.net/wrp/Default.aspx>

Natural Gas Development: <http://www.srbc.net/programs/projreviewnaturalgas.htm>

Frequently Asked Questions: http://www.srbc.net/programs/natural_gas_development_faq.htm