More than 72 percent of the Susquehanna River Basin is underlain by the Marcellus Shale, a sedimentary rock formation that holds one of the richest deposits of natural gas in the lower 48 states. This black shale and other gas-bearing shales like the Utica Shale run deep underground – much of these rocks are more than a mile beneath the surface.

Extracting gas from these shales is technically and economically feasible using a process known as “hydraulic fracturing,” which creates millions of artificial fractures that allow the collection of trapped gas. The process requires large volumes of water to be mixed with sand and chemicals that are pumped into the shale under high pressure to shatter the formation facilitating release of the gas.

Because of the large volumes of water used in the 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. While SRBC does not regulate or monitor the production and transmission of natural gas, the drilling and development of each production well uses, on average, between 4 and 7 million gallons of water. Approval of the use of this water by SRBC is necessary before drilling is undertaken. (SRBC’s “approvals” are equivalent to the term “permits” used by other agencies.)

SRBC’s review of proposed water withdrawals includes an evaluation of whether a project 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.

Challenges focus on the cumulative impact of gas drilling, both from a water quantity and water quality perspective.

These impacts are among the many issues associated with the gas drilling occurring in the Susquehanna River Basin. Road development and wear, heavy truck traffic, excessive noise and light, forest fragmentation and potential contamination of aquifers are issues under debate and scrutiny in local communities. 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 the southern tier of New York and northern tier of Pennsylvania is cause for concern over how drilling will impact public water supplies and the integrity of surface waters. Although this region is relatively wet compared to other areas of the country experiencing natural gas development activity (e.g., Texas), there are serious challenges that focus on the cumulative impact of gas drilling, both from a water quantity and water quality perspective.

Key water-related issues include:

- impact of withdrawals from 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 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.

SRBC relies on sound science to guide its regulatory decisions to address these concerns. For each proposed water withdrawal, SRBC staff conduct an environmental screening that examines the designated use of the stream, wild trout status, impairment, presence of rare, threatened or endangered species, surrounding wetlands and scenic waterways. For certain streams, SRBC oversees an aquatic resource survey to assess the condition of the aquatic community within the stream ecosystem.

Water Facts...

SRBC considers all fresh water used in hydraulic fracturing to be consumptively lost to the system.

A typical Marcellus Shale hydraulic fracturing stimulation uses 4-7 million gallons of water over a 2- to 5-day period. About 15 percent of the water flows back to the surface within 2 to 8 weeks.

Fluid used in hydraulic fracturing is typically comprised of more than 98 percent water and sand with chemical additives comprising less than 2 percent or less of the fluid. Since October 2008, companies drilling in Pennsylvania are required to disclose additives used in hydraulic fracturing as part of the state permit process.

Generally, the maximum depth of potable water is 850 feet below the ground surface. Shale gas formations are vertically separated from freshwater aquifers by at least 1,000 feet of sandstones and shales of moderate to low permeability.

With regard to 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 supply intake at any time a withdrawal is occurring. The intent of passby flow requirements is to protect streams during low flow conditions. Project sponsors may be required to stop or decrease withdrawals during low stream flow periods. Passby flows vary according to state designated use classifications, available habitat information, and consultations with state fishery management agencies.
Rules & Oversight Evolve with Changing Industry

As the natural gas industry expands drilling efforts in the Susquehanna River Basin, SRBC continues to amend its regulations to add clarity and to address concerns regarding adverse impacts to water resources.

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 the Marcellus or Utica shale formations in the river basin. This represents a change from its standard regulatory threshold. SRBC adopted the threshold-change in October 2008 and successfully applied it to the natural gas industry. This requires the Commission to evaluate 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.

Approval by Rule
SRBC has adapted its process to regulate consumptive water use on a drilling pad basis through an administrative Approval by Rule process, rather than by a conventional approval on a company lease-area basis. 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 Regulation §806.22(f)(i) and (ii)).

The expedited Approval by Rule process is used by companies interested in using a source of water that has already been approved for use (e.g., a public water supply) or a source that is of lesser quality (e.g., wastewater discharge, mine water). This administrative approval process allows SRBC to focus its efforts on the more time-consuming technical review of withdrawal applications for surface or groundwater sources where the potential for impacts demands more scrutiny.

Approved Source Sharing
A subsequent rule change adopted by SRBC in 2009 is designed to facilitate flexibility 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 withdrawal location 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.

SRBC also has the authority to take enforcement action against companies that fail to gain Commission approval or violate the terms and conditions of approvals.
Looking Ahead

In January 2010, SRBC launched a remote water quality monitoring initiative to track water quality conditions within smaller streams and rivers in selected areas of the Susquehanna River Basin where water demands are increasing. A network of 30 stations will be established in New York and Pennsylvania with state-of-the-art monitoring and communication equipment that will collect and transmit real-time water quality data. These data will allow a timely response in the case of pollution incidents and may assist in identifying the source of impairment.

As for trends in its water use in 2009, the natural gas industry reported increased “reuse” of flowback water for drilling activities, a practice that may reduce production costs by using less fresh water. However, safe handling of the flowback fluid that is transferred to another pad is a concern that will be monitored.

Gas companies have also indicated a desire to divert water into the Susquehanna River 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.

For detailed information on SRBC’s role in managing water used in natural gas drilling, go to SRBC’s website at www.srbc.net.

SRBC estimates that, at full development, the natural gas industry could be using 28 million gallons of water a day on an annual basis.

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 large volumes of water to stimulate the gas release. During 2009, more than 1,300 natural gas wells were permitted in Pennsylvania and over 400 were drilled; the majority of new wells is expected to employ these new methods of extraction.

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 acres.

Getting water to drilling pads involves delivery by trucks 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 or in open impoundments. After the stimulation process, approximately 15 percent of the water flows back to the surface, and the flowback water is either temporarily stored on site or reused in another well before final disposal according to state regulations.