Protecting the Commonwealth's Water Resources

Testimony of
Scott Perry
Deputy Secretary
Department of Environmental Protection
Office of Oil and Gas Management

Members of the Committee, thank you for the opportunity to provide testimony on behalf of the Commonwealth of Pennsylvania, Department of Environmental Protection.

The potential of the Marcellus Shale play has captured the world's attention. Indeed, not since Edwin Drake drilled North America's first commercial oil well in 1859 have so many focused their attention on Pennsylvania as an opportunity for oil and gas development. Increased well drilling has also brought with it concern about Pennsylvania's ability to properly oversee the oil and gas industry.

This concern is misplaced. As my testimony will demonstrate, Pennsylvania has a comprehensive set of regulations that fully protect the Commonwealth's precious water resources. These regulations were based on Pennsylvania's extensive experience with oil and gas development and have been consistently reviewed and improved as technology and well development practices evolve. In keeping with this commitment to a process of continuous improvement, Act 13 of 2012 has added important new provisions that further enhance Pennsylvania's regulatory program.

Pennsylvania's Regulatory Program

Pennsylvania regulates oil and gas well operations under several statutes including the newly enacted Act 13 which comprehensively revised the 1984 Oil and Gas Act. Other significant statutes regulating the oil and gas industry include the Clean Streams Law, the Air Pollution Control Act, the Dam Safety and Encroachments Act and the Solid Waste Management Act. As described in more detail below, this network of laws and their associated regulations provides the Department of Environmental Protection (DEP) with the tools it needs to comprehensively regulate everything associated with oil and gas development and protect water resources.

Well Site Location

The newly enacted Chapter 32 of Act 13 comprehensively updated the Oil and Gas Act of 1984. Chapter 32 (2012 Oil and Gas Act) is the primary law governing well drilling in Pennsylvania. This new law prohibits operators from drilling shale gas wells within 1000 feet of public water supplies, within 500 of private water wells and buildings and within 300 feet of any stream, spring or body of water that is identified on a topo map (small intermittent or head water streams are not always identified). DEP may waive these restrictions if additional protective measures are included as conditions to the well permit.

Typical conditions include additional erosion and sediment control measures and measures to deal with the additional fresh water that will be encountered while drilling.

Finally, locating well sites within a floodplain has been significantly restricted by Act 13 which eliminated the ability to store waste materials in pits and restricts the use of tanks in floodways. Other support facilities are also heavily regulated when they are located in proximity to streams. 25 Pa. Code Chapter 105 (the Dam Safety and Encroachment regulations) requires well operators to obtain an encroachment permit if a support facility (such as an access road or water withdrawal pad) is located within a FEMA designated floodway. If FEMA has not designated a floodway (as can be the case for small streams), the operator must obtain a permit if the facility will be within 50 feet of a stream.

Site Development

Developing a well site outside the location restrictions of the 2012 Oil and Gas Act and the Dam Safety and Encroachments Act is regulated under the Clean Streams Law through the Department's erosion and sediment control program.

Stormwater runoff is the leading cause of stream impairment in Pennsylvania. To address this problem, DEP has developed a comprehensive stormwater management program. Pursuant to 25 Pa. Code Chapter 102, all earth disturbance activities must employ "best management practices" like silt fences and road side culverts to control erosion and manage stormwater.

If well site construction will disturb more than 5,000 square feet or has the potential to discharge sediment to High Quality or Exceptional Value waters (so classified pursuant to 25 Pa. Code Chapter 93), the operator must develop and implement an erosion and sediment control plan. This E&S plan must be kept on site for review by DEP. If development of the well site, access roads and other related facilities will disturb 5 or more acres, the operator must obtain an erosion and sediment control permit before the site can be developed.

Well Drilling

Drilling any well – even a water well – has the potential to impact fresh groundwater. While this potential may exist, such an impact is not acceptable. Protecting groundwater supplies is of utmost importance and the 2012 Oil and Gas Act is particularly strict in this regard. If a well operator impacts a water supply (by pollution or diminution), they *must* restore or replace it and pay for any increased costs of maintaining or operating the replacement supply.

In fact, if an unconventional well is drilled within 2,500 feet of a water supply and the water supply becomes polluted within 12 months of completing the well, the operator is *presumed* to have caused the pollution unless they took a water sample that demonstrates the pollution was present before the oil or gas well was drilled. Needless to say, taking a

pre-drilling water sample from all supplies within 2,500 feet of a gas well should be a standard business practice.

Of course, the goal is to avoid groundwater impacts in the first place. To that end, in 2010 DEP promulgated new regulations that significantly strengthen our well construction standards. These new regulations accomplish five things.

First, the regulations will establish more stringent well construction standards for all new wells drilled in Pennsylvania. Second, the regulations impose new requirements on operators to inspect existing wells and report their findings to the Department. Third, the regulations codify existing caselaw on water supply replacement requirements and clearly describe an operator's responsibilities if they contaminate or diminish a water supply. Fourth, the regulations impose a duty on operators to investigate complaints of gas migration and to mitigate any hazards found in the course of the investigation. Finally, the regulations require reporting of chemicals used to hydraulically fracture wells.

Below is a brief description of the significant new requirements in 25 Pa. Code Chapter 78.

I. New Well Drilling

Properly cementing and casing a well is critical to preventing gas migration. Prior to drilling a well, operators will now be required to develop a casing and cementing plan that shows how the well will be drilled and completed. Use of centralizers (which keep the casing centered in the well bore) must be used at prescribed locations to insure that cement is evenly distributed between the casing and the well bore. Cement meeting ASTM criteria for oil and gas wells must be used. Documentation of the cement quality and cementing practices used at the well must be available for Department inspection.

When cementing a well, if cement is not returned to the surface the operator must install a second string of casing for an added layer of protection. If cement is returned to the surface and the operator intends to only use surface casing (Marcellus operators typically use surface, intermediate and production casing), the operator must demonstrate that any gas, oil and produced fluids cannot leave the well bore.

Used or welded casing must be pressure tested. Casing strings attached to heavy duty blow-out preventers (such as Marcellus intermediate casing) must also be pressure tested.

II. Existing Wells

Operators must inspect all of their wells quarterly and report the findings of the inspections to the Department annually. If defective casing, evidence of leaks, or if excessive pressure within the well bore is discovered, the operator must immediately notify the Department and take corrective action.

III. Water Supply Replacement

The 2012 Oil and Gas Act requires any operator who contaminates or diminishes a water supply to restore or replace the supply with one that is adequate in quantity and quality for the purposes served. Case law on these requirements has defined when an operator must provide compensation for increased operation and maintenance costs (when costs are more than a deminimus amount) and for what duration (in perpetuity). The regulations codify these and other relevant holdings to clearly describe the operator's responsibility.

IV. Gas Migration Response

The new regulations impose a duty on operators to immediately investigate a gas migration complaint and to notify the Department if they receive such a complaint. If natural gas is found at elevated levels (10% of the lower explosive limit) the operator must immediately notify emergency responders and initiate mitigation measures (including advisories and controlling access to the area).

V. Reporting Requirements

The practice of hydraulic fracturing has drawn considerable attention recently. One of the primary concerns involves the chemicals used during the process. While the Chapter 78 revisions required disclosure of the hazardous constituents of those additives on a well by well basis, the 2012 Oil and Gas Act further enhanced these disclosure requirements. Now, shale gas drillers must disclose the complete list of chemicals to DEP – regardless of their confidential nature. In addition, chemical disclosure must also be made to the public website FracFocus.

While DEP has never observed any evidence that hydraulic fracturing has directly contaminated fresh groundwater despite tens of thousands of wells being "fraced" over the past several decades, mandating public disclosure of the chemicals used in the process should end much of the controversy surrounding the subject.

Water Withdrawal

While the volume of water to frac a Marcellus well is greater than the amount required to frac traditional wells in Pennsylvania, the Marcellus industry's use of water is miniscule in comparison with other energy sources and other sources in general. Marcellus fracing is the smallest major user in Pennsylvania using only 0.2% of the daily water withdrawn which ranks it ninth of the top nine water users in the state. Marcellus drilling uses only 1.9 million gallons per day (MGD). This is in stark contrast to power plants which use 6.43 *billion* gallons per day (BGD). Other major uses include public water suppliers (1.42 BGD); industrial users (770 MGD); aquaculture (524 MGD); private water wells (152 MGD); mining (95.7 MGD); livestock (61.8 MGD); and irrigation (24.3 MGD). Thus, shale gas drilling is a very efficient energy production source measured as a function of water usage.

There are three entities charged with protecting water quality by managing water withdrawals in Pennsylvania - DEP, the Susquehanna River Basin Commission and the Delaware River Basin Commission. DEP is on the forefront of protecting headwaters of the Commonwealth's streams in areas outside the Basin Commission jurisdiction by requiring operators to adhere to water management plans which governs their water withdrawal practices. The Basin Commissions were formed by a compact between the federal government, Pennsylvania and neighboring states within the respective watersheds. If a Marcellus well is drilled within the Susquehanna or Delaware River watershed, DEP and Commission approval of the operator's water management plan must be obtained before construction of the well site can begin. If the well is located outside those two river basins, only DEP approval is necessary.

The water management plan is based on low flow conditions and describes where water will be withdrawn how much water will be needed and the amount of water that will be taken at any one time. Evaluation of the plan involves looking both upstream and downstream to assess cumulative impacts, taking into account all other withdrawals and discharges and their impact on the resource, particularly during low flow periods.

Generally speaking, if the water withdrawal is less than 10 percent of the natural or continuously augmented 7-day, 10-year low flow (Q7-10) of the stream or river, a passby (a restriction on the ability to take water during low flow conditions) will not be required. Q7-10 is the lowest average, consecutive 7-day flow that would occur with a frequency or recurrence interval of one in ten years. A 10-year low flow event has a 10 percent chance of occurring in any one year. Accepted hydrologic practices must be used to determine the Q7-10 flow.[1]

Once approved, the plan is valid for each location for five years. Although the Commonwealth has ample water resources, operators will need to cooperate to make sure that access to water is available as more and more plans are submitted for headwater streams.

Water and Wastewater Storage

Once an operator gets the water needed to frac a well, the question becomes where to put it? Even more important, where to put the wastewater that is returned to the surface (called flowback)? A new development with Marcellus wells is the advent of centralized impoundments. Unlike pits located immediately adjacent to the well, centralized impoundments use dam like structures to hold enough water to service multiple wells over an extended period of time. These impoundments can store freshwater, and more increasingly, flowback from a frac job.

[1] Policy No. 2003-01 Guidelines For Using and Determining Passby Flows and Conservation Releases For Surface-Water and Ground-Water Withdrawal Approvals, November 8, 2002.

Under DEP's dam safety regulations, small freshwater impoundments – similar to a farmer's pond - do not need a permit. However, Marcellus impoundments can hold over 15 million gallons and if they store wastewater, must be permitted and constructed according to DEP standards. Key standards include two impervious 40 mil liners with a leak detection zone and groundwater monitoring wells around the impoundment. Impoundments located where a breach could threaten public safety must undergo a much more stringent engineering review.

Wastewater Management

The most significant issue facing Marcellus operators today is wastewater treatment and disposal. Operators report that approximately 15% of the water used to frac a well is returned to the surface during the initial flowback period. The Department has seen an increase in reuse of this wastewater – industry wide approximately 80% of the flowback is used on another frac job. Thus, the total volume of wastewater that must be disposed is a small fraction of the volume needed to frac the well.

Still, flowback from Marcellus frac jobs contain pollutants of concern – particularly high levels of dissolved salts. Indeed, flowback water is several times saltier than sea water. Thus, Total Dissolved Solids (TDS) represent a growing concern for the Commonwealth's waterways and the Department has developed a proactive strategy to address this concern before widespread impacts are felt.

The best solution for disposing of high TDS wastewater is deep well injection. Unfortunately, the best geology in Pennsylvania for this method of waste disposal is being used for gas storage. Exploration for new injection sites is ongoing but not widely available yet.

Therefore, the current preference for flowback water disposal is through existing DEP approved wastewater treatment plants. These plants typically do not have the technology necessary to remove TDS from the effluent and instead rely on dilution. The DEP's recently promulgated Chapter 95 regulations completely address the cumulative impacts of oil and gas wastewater discharges.

This new rule is the first of its kind in the country and limits the discharge of TDS to drinking water standards from new or expanded facilities that take oil and gas wastewater. This means that new discharges cannot exceed 250 mg/l for chlorides and that drinking water supplies will never be impaired because of oil and gas drilling. The process of eliminating the TDS will also remove radium – which has been the subject of recent articles. Thus, in addition to reducing the contaminants discharged to our streams, the new Chapter 95 rule will increase the use or recycled water, promote the development of alternative forms of disposal and perhaps promote the use of alternative sources of fracing fluid.

While this new rule took a very significant step in protecting our streams and rivers, it was still not enough. Therefore, on April 19, 2011, at the direction of Governor Tom Corbett, Secretary Michael Krancer called on all Marcellus Shale natural gas drilling operators to cease by May 19 delivering wastewater from shale gas extraction to 15 facilities that then accepted it under an exemption from being covered by last year's Total Dissolved Solids (TDS) regulations. The next day the industry publically stated its commitment to compliance. From what we can see today a dramatic sea change has occurred in Pennsylvania on this as we have virtually overnight gone from millions of gallons being delivered to those facilities and discharged to virtually none.

Enforcement

The best regulatory program in the world is meaningless if the rules are not strictly enforced. DEP has been very strong on enforcement of rules and regulations in this industry. By way of example, in May 2011 DEP announced more than $1 million in penalties against an operator to address violations in Bradford and Washington Counties. Through two Consent Orders and Agreement (COA) with Chesapeake, DEP collected $900,000 for contaminating private water supplies in Bradford County, $200,000 of which must be donated to the department's well plugging fund; and another $188,000 for the February 23, 2011, tank fire at a drilling site in Avella, Washington County. The Bradford matter was the highest single penalty ever assessed against any oil and gas operator in the history of the program. In the Washington County matter the fines assessed were the highest allowed by the Oil and Gas Act.

Conclusion

The Marcellus Shale play along with other domestic unconventional resources can transform world energy markets. This potential will only be realized by avoiding the mistakes of the past. I believe that Pennsylvania will prove that the balance between environmental protection and the development of this world class resource is possible.