

**Statement of
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Before the
House Consumer Affairs Committee
Hearing on House Bill 1855 (Water Well Construction Standards)**

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Chairman Godshall, Chairman Preston and members of the Committee, I am Bryan Swistock, a senior water resources extension associate in the College of Agricultural Sciences at Penn State University. Thank you for the opportunity to provide comments related to House Bill 1855 on Water Well Construction Standards. For the past 23 years, I have been actively involved in both research and outreach programs related to private water wells in Pennsylvania. Our current efforts in this area were largely founded in research and extension work began in the early 1980's by my predecessor, Dr. William Sharpe in the School of Forest Resources at Penn State. He and his colleagues at that time recognized that private water wells are a critical part of the water infrastructure in Pennsylvania, providing drinking water to millions of residents in rural homes, farms and businesses.

I first want to recognize both the Center for Rural Pennsylvania and the Pennsylvania Water Resources Research Center. These two sponsors have provided the majority of the funding necessary to complete the research on private water wells which I will refer to today. Other funders such as the Pennsylvania Ground Water Association, Pennsylvania Department of Environmental Protection and Pennsylvania Rural Water Association along with colleagues at many other agencies and institutions across the state have been very supportive of our private water supply programs.

Pennsylvania is currently one of the few states that do not have statewide requirements for the construction of private water wells. In the absence of both regulatory protections and unbiased assistance, Penn State has devoted considerable research and extension efforts to meet the demands of private well owners interested in properly constructing and managing their drinking water supply. Over the past three decades we have conducted numerous research projects on various aspects of water quality that have included thousands of private water wells. The largest were a two-year project in 2006 which studied over 700 private water wells throughout the state and a project just completed in 2011 that studied over 200 water wells near Marcellus gas drilling sites.

Our research has consistently found that approximately 40% of private water wells in Pennsylvania fail to meet at least one safe drinking water standard. The most frequently detected pollutant with a potential health effect is coliform bacteria, which occurred in about one third of the water wells tested in our research. The presence of these bacteria indicates

the potential for disease-causing bacteria to occur in drinking water. *E. coli* bacteria, which originate from either animal or human wastes and thus represent a more serious health risk, were found in 14% of the water wells in our recent study.

While these bacteria can be related to various land-uses near water wells, they can also occur from surface water, insects, or small mammals entering poorly constructed wells. This surface contamination can be prevented by extending a properly sized well casing above the ground surface, installing a cement-like grout seal around the casing, and fitting the top of the casing with a vermin-proof or "sanitary" well cap. Our recent study found that 12 percent of water wells did not have a casing above ground, 84% lacked a sanitary well cap and 82% had no obvious evidence of a grout seal around the well casing. More importantly, this same research showed a statistical correlation between water well construction and the occurrence of both coliform bacteria and *E. coli* bacteria in the well water. Bacterial contamination rates in water wells with sanitary construction were about half of the rates found in water wells which lacked any sanitary construction components. While proper water well construction did not completely eliminate water quality problems, it clearly played a role in the occurrence of surface contaminants like coliform bacteria in water wells.

An earlier, small-scale study that we conducted in conjunction with the U. S. Geological Survey found that some bacterial contamination in water wells could be removed simply by having a water well professional disinfect the well and replace loosely-fitted well caps with a sealed, sanitary well cap. I can personally attest to the value of a sealed, sanitary well cap from experience with my own home water well. Nearly 15 years ago our family purchased a rural home with a deep water well that lacked a sanitary well cap. The well was tested and found to be bacterially contaminated. Several hundred dollars were spent during the real estate transaction to install an ultraviolet light disinfection system to treat the water to acceptable bacteria standards. Not long after moving into the home, we discovered that the bacteria were originating from mice which were entering the well through a loose well cap and nesting on the pit-less adapter about three feet below the ground surface. We were able to permanently solve our bacteria problem by removing the mice and no longer need the ultraviolet light water treatment system.

Unfortunately, our bacteria problem and similar problems with many health-related pollutants in water wells are often only discovered after proper testing by a state-accredited laboratory and interpretation of these water test records. Several of our research projects have shown that homeowners with water wells that fail at least one health-based drinking water standard are typically unaware that their water is unsafe. Just as one example, of the 203 water wells that contained unsafe levels of coliform bacteria in our 2006 study, only 11% were aware of this problem before our study. We have found that about one-third of water well owners have never had their water tested properly by a state accredited laboratory, especially before the increased testing in response to Marcellus Shale gas drilling. Clearly, the lack of voluntary water testing is one impediment to the recognition of existing water quality problems.

An additional study that we just completed in 2011 studied over 200 water wells near Marcellus gas drilling sites and found that even water well owners who had extensive water testing done before gas drilling were often unaware of existing water quality issues in their water well. In this case, it appeared that water supply owners were having difficulty understanding complex water test reports. In addition to the obvious health risks associated with unknowingly drinking contaminated water, uninformed homeowners may also fall victim to unscrupulous businesses practices. Given the low awareness of existing water quality issues among water well owners, practices such as proper water well construction which can prevent water contamination are critical to protect the health of rural residents utilizing these water supplies.

Private water wells are pervasive across the landscape of Pennsylvania serving as important sources of water for rural and suburban homes and farms. The groundwater aquifers that they access are a shared resource that does not recognize political or property boundaries. Our research has shown that inadequate water well construction is a contributing factor to the failure of some private water wells to meet safe drinking water standards in this state. This, along with the fact that many health-related pollutants have no obvious symptoms in water, water well owners often do not adequately test their water supply, and those that do may not understand the water test results, leads to a significant potential health risk among the millions of rural residents, farmers and businesses that access the shared groundwater resource. Our research also found that about two-thirds of water well owners who were made aware of these issues were supportive of statewide regulations for water well construction, even if it added more than \$500 to the cost to a new water well.

Thank you for the opportunity to discuss our research experiences relevant to private water wells. I will be happy to answer any questions.

Relevant Penn State Research Reports

Boyer, E. W., B.R. Swistock, J. Clark, M. Madden and D.E Rizzo. (2011). The impact of Marcellus gas drilling on rural drinking water supplies. Final report to The Center for Rural Pennsylvania, Harrisburg, PA. 29 pp.
http://www.rural.palegislature.us/documents/reports/Marcellus_and_drinking_water_2011_rev.pdf

Pennsylvania State University (2011). Summary of Drinking Water Samples Tested by the Penn State Agricultural Analytical Services Laboratory, 2007-2011.
<http://www.aasl.psu.edu/Water%20Summaries/Pennsylvania%20water%20sum.pdf>,

Sharpe, W.E., D.W. Mooney, & R.S. Adams. (1985). An analysis of ground water quality data obtained from private individual water systems in Pennsylvania. *Northeastern Environmental Science*, 4(3-4), 155-159.

- Swistock, B.R., W.E. Sharpe, & P.D. Robillard. (1993). A survey of lead, nitrate and radon contamination of private individual water systems in Pennsylvania. *Journal of Environmental Health*, 55(5), 6-12.
- Swistock, B.R., Sharpe, W.E. & Dickison, J. (2001). Educating rural private water system owners in Pennsylvania using satellite vs traditional programs. *Journal of Extension*. 39(3).
- Swistock, B.R. & W.E. Sharpe. (2005). The influence of well construction on bacterial contamination of private water wells in Pennsylvania. *Journal of Environmental Health*, 68(2):17-23.
- Swistock, B.R., S. Clemens & W.E. Sharpe. (2009). Drinking water quality in rural Pennsylvania and the effect of management practices. Final report The Center for Rural Pennsylvania, Harrisburg, PA. 24 pp.
http://www.rural.palegislature.us/documents/reports/drinking_water_quality.pdf