Statement of
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Chairman Miller, Chairman Vitali 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 343 on Water Well Construction Standards. For the past 25 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 started in the early 1980's by my predecessor, Dr. William Sharpe 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 would like to first acknowledge both the Center for Rural Pennsylvania and the Pennsylvania Water Resources Research Center. These two sponsors have graciously provided the support necessary to complete the research on private water wells which I will refer to today. Other funders such as the Pennsylvania Ground Water Association and the Pennsylvania Department of Environmental Protection along with colleagues at many other agencies and institutions across the state have also 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. Our statewide team of water resources extension educators, specialists and trained Master Well Owner volunteers interact with thousands of private well owners each year with questions related to water well construction, water testing, and solving water problems.

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 was a two-year study of over 700 private water wells throughout the state which was published earlier this year in the *Journal of Environmental Health*. We also recently concluded a study of over 200 water wells near Marcellus gas drilling sites with funding from the Center for Rural Pennsylvania.

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 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. The prevalence of bacterial contamination in water wells with sanitary construction was about one-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. Hundreds of 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 proper 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 recent 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.

Our recent study of over 200 water wells near Marcellus gas drilling sites 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 this 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 of 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.

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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

Swistock, B.R., S. Clemens, W.E. Sharpe & S. Rummel. (2013). Water quality and management of private drinking water wells in Pennsylvania. *Journal of Environmental Health. 75(6):60-66.*