

Flood Mitigation and Stormwater Management

Statement of

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Senate Environmental Resources and Energy Committee

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Good morning, Senator Erickson and Senator White, and members. My name is Robert Traver. I am a Professor of Civil and Environmental Engineering at Villanova University, Director of the Villanova Urban Stormwater Partnership, and the Villanova Center for the Advancement of Sustainability in Engineering. While at Villanova, I have been very active in research on stormwater control measures and flooding, and was a member of the National Research Council (NRC) committee that authored the report *Urban Stormwater Management in the United States* (2008).

I appreciate the opportunity to discuss both flood control and stormwater management with you. At Villanova we had over 20 inches of rain in August, which is an incredible volume, and I know many parts of the state were much worse off than us. Whenever these events occur, the public's concern mount and then unfortunately dissipate, so I am very glad to see the committee's continued interest in this topic.

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Let us start with stormwater management. The purpose of stormwater management is to prevent increased flooding and degradation of our rivers and water bodies from changes in land use. I consider Pennsylvania's current stormwater management regulations (Chapter 102) to be well thought out. The combination of volume control for smaller storms and peak flow rate reductions for the localized stream channels paired with stream bank buffers is well balanced. I am working with other engineers to recommend an alternative approach, more friendly to Low Impact Development, but it falls within this same structure. The watershed volume reduction of these devices is significant. On the screen are few pictures of green infrastructure Stormwater Control Measures at Villanova that we are studying. These range from green roofs and rain gardens, to pervious pavements and a stormwater wetlands. These are simple, work within the landscape, and can be more cost effective than past practices when designed within the site infrastructure. While we still have much to learn about these structures, they are no longer considered landscape features but engineered mitigation strategies that when designed and built correctly are expected to work, and when maintained they are expected to continue to fulfill their design function.

What is not working well, and has not worked since I started as an engineer in a small firm in Kennett Square in 1978, are our inspection and maintenance practices. A former student Clay Emerson, now of Princeton Hydro took these pictures in the Valley Creek watershed. He found that 50% of the detention basins he inspected had problems that interfered with their function. The picture on the left is that of a pipe that used to go through a berm as part of a detention basin that failed. The owner decided that instead of fixing it to plant trees hiding the failure. The picture on the right is that of a riser designed to hold back water that has rusted out. Note however that the bushes are well manicured.

We have the same problem with Green Infrastructure. This picture shows a raingarden designed to capture runoff from the parking lot through a curb cut. This type of structure is similar to one I showed you from Villanova that we have studied for over 10 years. It should work well. Except, the water bypasses the curb cut as it is parallel

to the flow path, and enters into a storm drain, missing the rain garden. This design would have been much better with the inlet relocated in the rain garden itself, and no curb. Here is another. A beautiful rain garden / swale combination. You can see plantings that use a lot of water, and an outlet structure designed to pond the water. But there is almost no contributing area nor water getting to the site. Why have these structures not been fixed? Many studies from Australia to Maryland all have found that unless we are able to inspect and maintain our structures, they will not work as designed.

As part of the NRC stormwater committee I visited and talked with local stormwater professionals around the country. Municipalities that had established utilities or authorities were the only places with sustainable programs. In locations such as Austin, a fee based on impervious surface area was levied that was used for inspection, and to insure maintenance or replacement occurred as needed. Property owners can reduce their fee through retrofits, such as storm drain disconnection or simple rain garden or pervious pavements for larger sites. This is part of what Philadelphia is now doing to meet their combined sewer overflow requirements. In most of Pennsylvania we instead are going to have to address retrofits within our current municipal budgets to correct degraded streams and rivers as required by the Clean Water Act. Unfortunately with the lack of funds available in Growing Greener, I don't see any other vehicle. I applaud your efforts in aiding the creation of authorities in Pennsylvania.

What then remains is flood control. If an area has been flooded frequently, we should expect it to continue to flood. If this is not acceptable, our choices are unfortunately limited to either major conveyance works such as levees, or land use decisions to include moving structures or raising first floor elevations. We all accept some risk from our choice of location. The 100 year storm has a 1% chance of happening every year, which has more of a chance of happening then for me to win the powerball. And when we design to that standard the site is vulnerable to the 200 year storm (0.5% chance of happening every year). If levees become the solution, I urge the committee to look at

the real cost to include maintenance, and to incorporate land use activities as part of the solution. I have seen what happens first hand when this is not considered during my work for the American Society of Civil Engineers in New Orleans after Hurricane Katrina.

Note: I have heard some talk of dredging, but even if this would increase conveyance and not destroy the stream, we should remember that the shape and character of the river is based upon the slope, water volumes and geomorphology. The river will try to return to what it was prior to the dredging, and besides the potential of shifting problems elsewhere, the dredging would need to occur over and over and over.

That concludes my statement. I applaud the Committee for their continued efforts and thank you for the opportunity to testify. I understand that the committee is interested in public – private partnerships and I will be glad to answer any questions on the Villanova Urban Stormwater Partnership or any other questions the Committee might have.



The mission of the Villanova Urban Stormwater Partnership is to advance the evolving field of sustainable stormwater management and to foster the development of public and private partnerships through research on innovative stormwater Best Management Practices, directed studies, technology transfer and education.

Biographical Sketch

Robert G. Traver

Dr. Robert G. Traver has been a member of the Water Resources and Environmental Engineering Program at Villanova since 1988. He is a registered professional engineer, and a Diplomat of the American Academy of Water Resource Engineers. He teaches graduate courses in hydrology, hydraulics, urban storm water management, and undergraduate courses in all facets of water resources. He is a retired LTC of the US Army Reserves, and a veteran of Desert Storm.

While at Villanova Dr. Traver has conducted research on topics that include modeling of stream hydraulics, urban hydrology, water quality, and measures to mitigate adverse stormwater effects. He constructed the Stormwater Best Management Practice Demonstration and Research Park on the Villanova Campus, and founded the *Villanova Urban Stormwater Partnership* to enable continuing long term stormwater research. Dr Traver believes that research supports and enhances the undergraduate and graduate educational experience.

Dr Traver was a member of the National Academies Committee entitled Reducing Stormwater Discharge Contributions to Water Pollution, and served on ASCE's External Review Panel (ERP) of the Corps investigation of Hurricane Katrina. He was awarded the Outstanding Civilian Service Medal for his commitment and contribution by the Commanding General of the Corps of Engineers.

Recognizing the link between policy and engineering, Dr. Traver continues to be involved with the implementation of stormwater policy. He participated with a team study to review the effects of Pennsylvania's water regulation on watershed sustainability (1994), and was appointed by the Secretary of PaDep to the oversight committee for Pennsylvania's 2006 Stormwater BMP manual. Dr Traver has served as Chair for the 1998, - 2011 Pennsylvania Stormwater Management Symposium's held at Villanova. He currently serves as chair to the Pennsylvania Department of Environmental Protection Water Resources Advisory Committee, and was named the inaugural director for the Villanova Center for the Advancement of Sustainability in Engineering.