STORMWATER

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# STORMWATER

## EXECUTIVE SUMMARY

While generally performing adequately for higher-frequency lower-intensity rainfall events, the age of much of Pennsylvania's stormwater infrastructure exceeds 100-years, and needs on-going repairs, replacement, and capacity upgrades. There is also a lack of easily accessible critical information relating to the size, condition, capacity, and capital needs of all public and privately-owned stormwater assets. Sources of funding for these much-needed improvements are not consistently available for municipalities across the Commonwealth. The Pennsylvania Municipal Authorities Act was amended in 2013 by Act 68 to permit the creation of stormwater authorities, and Act 62 was signed into law in June 2016 authorizing second class townships to create stormwater utilities. Several other legislative bills are currently in the Pennsylvania Senate, and if enacted, will further empower local governments to apply a stormwater use-based revenue system to fund the operation, maintenance and upgrades of stormwater assets.

## BACKGROUND

Stormwater management looks at how much and how quickly runoff enters our streams, rivers, wetlands and lakes, as well as the quality of said runoff water. Stormwater management involves the planning, design, construction, and maintenance of stormwater conveyance infrastructure and control facilities. It is comprised of Best Management Practices (BMPs) such as roadside swales, stormwater culverts and inlets, detention basins, and green infrastructure practices. Historically, stormwater infrastructure has been constructed to mitigate the additional stormwater runoff that occurs when land cover conditions are altered due to development. Stormwater management is an integral aspect of construction projects including roads, rail, and aviation infrastructure, and stormwater management affects dams, levees and inland waterways. Municipalities, government agencies, private businesses and homeowner associations own and maintain stormwater management facilities within the Commonwealth. For this report, the evaluation of combined sewer overflows (CSO) are covered in the Wastewater category.

The National Pollution Discharge Elimination System (NPDES) Phase II Program is a national program that sets procedures that must be followed for stormwater. In Pennsylvania under the NPDES program, most construction projects that disturb more than 1.00 acre of soil, require a separate permit that reviews the approach to handle stormwater. Typically, county conservation districts or the Pennsylvania Department of Environmental Protection (PADEP) perform these reviews and issue NPDES permit approval. Another program under NPDES is the municipal sperate stormwater systems (MS4s). This program is intended to look at municipal stormwater systems that are not combined with sanitary sewers. In Pennsylvania there are 955 municipalities with MS4 regulations. According to the Pennsylvania Department of Environmental Protection (PADEP), MS4s must apply for NPDES permit coverage or a waiver if they are in an urbanized area as determined by the latest Decennial Census by the U.S. Census Bureau, or if they are designated as needing a permit by the PADEP. Additionally, MS4s that discharge to impaired surface waters or within the Chesapeake Bay Watershed must prepare a Pollution Reduction Plan (PRP).

## CONDITION & CAPACITY

Although public and private entities within Pennsylvania have been designing and building stormwater management assets for over 160 years, there is currently no statewide assessment of existing conditions and capacity. While agencies such as the Philadelphia Water Department and PennDOT have begun to create inventories and assess their stormwater management assets, more should be done on a statewide level to complete an assessment of conditions and capacity for all public and private-owned assets. Such an inventory, conducted in a similar fashion as the above-referenced agencies, could be used to help prioritize areas that are in the biggest need of maintenance or replacement.

Beginning to create an assessment of stormwater will have its challenges. One challenge is establishing a baseline performance of capacity. Much of the stormwater infrastructure within the Commonwealth was designed and constructed under very different design criteria than that what is used today. Stormwater conveyance systems installed pre-1950 were designed to convey stormwater as quickly as possible away from a site, with no focus on controls or regulatory compliance. Stormwater regulations began to take shape during the 1950's, with an emphasis on floodplain management, and evolved during the 1980's with rate control. Much of these systems, while modern at the time, are not capable of providing the level of service required in the modern day regarding rate control, volume management, and water quality. Without a statewide system assessment of desired and actual performance, many of these systems may continue to underperform, or perform in a manner that does not achieve the desired level of service within the Commonwealth.

The evaluation of the stormwater infrastructure systems within the Commonwealth is complicated by the multitude of agencies and jurisdictions that take ownership of and are responsible for maintenance of the assets. There are 2,560 municipalities in Pennsylvania with 955 communities that comply with the MS4 program and 152 that comply with combined sewer outfall (CSOs) long term control plans. The remaining municipalities are less than 10,000 persons and are currently exempted from MS4 requirements.

The condition of stormwater since the late 1990s has been expanded to further consider water quality with the advent of low-impact development (LID) strategies. Requirements for sediment and nutrient removal are built into the requirements of the NPDES permitting process, as well as local stormwater ordinances. However, systems that pre-date the LID movement provide very little, if any, water quality treatment of stormwater, and they can contribute to the degradation of Pennsylvania receiving waterways. Retrofits to these older systems, with the goal of improving the quality of discharge to receiving waterways, must become a priority within the Commonwealth.

The PADEP designated approximately 19,000 miles of rivers and streams impaired for water supply, aquatic life, recreation or fish consumption in 2016, with stormwater runoff pollution estimated to be one of the major contributors for this impairment. Large investments in green infrastructure and aging infrastructure in major cities like Pittsburgh and Philadelphia, as well as updates to state regulations, such as the PAG-13 General Permit, are expected to increase the quality of stormwater discharge from MS4s. The 2018 PAG-13 update includes increased regulations that should enhance stormwater quality.

## FUNDING

Historically, costs for the upkeep, repair and replacement of stormwater systems have fallen to municipalities to fund using property tax-generated general funds. Tax exempt properties and large low valued impervious paved areas are examples of how this model does not equitably generate funds needed to maintain these systems. Other sources of funding include limited bonds and low-interest loans that are available through the Pennsylvania Infrastructure Investment Authority's (PENNVEST), Clean Water State Revolving Fund program.

The idea of implementing user-based stormwater fees is gaining interest across the Commonwealth as a revenue to be used to invest in aging infrastructure and create cost incentives for the deployment of green stormwater infrastructure (GSI). The Pennsylvania Municipal Authorities Act was amended in 2013 by Act 68 to permit the creation of stormwater authorities. Act 62 was signed into law in June 2016 authorizing second class townships to create stormwater utilities. At the time of this writing, legislation empowering local governments to apply a use-based revenue system to fund stormwater systems operation, maintenance and upgrade, if they so desire, are under consideration in the Pennsylvania legislature.

## FUTURE NEED

Stormwater carries with it pollutants such as sediment, fertilizers, pesticides and automotive fluids. According to the Environmental Protection Agency (EPA), urban and suburban stormwater is the source of 15% of the total nitrogen entering the Chesapeake Bay, and is the only source that is still increasing. The Pennsylvania region in the Chesapeake Bay's watershed is leading the effort in the Commonwealth to control stormwater pollution. Some MS4 systems that discharge to the Chesapeake Bay watershed are required to develop a PRP that will reduce that load by 10% within five years. These efforts are good examples of blueprints for the rest of Pennsylvania to address stormwater pollution.

Pennsylvania retains its title as having the most combined sewer overflows (CSO) of any state in the country. CSOs convey both storm and sanitary sewer flows, resulting in the release of untreated human and industrial waste and other pollutants into the environment. The 1,608 CSOs systems across 39 counties also account for some of the highest occurrences of overflows in the country. Such occurrences can significantly impair water quality and impact public health and wildlife. The Philadelphia Water Department Office of Watersheds' hydraulic and hydrologic models estimate annual CSO discharge at about 16 billion gallons from 164 CSO point sources within the City of Philadelphia alone.

## PUBLIC SAFETY AND RESILIENCE

While water quality degradations from inadequate stormwater management have a long-term effect on public health and safety, flooding can have immediate impacts on the safety and property of residents in the Commonwealth. Flash flooding is one of the greatest losses of property and has caused an estimated $91.6 million per year in losses from 1996 to 2014, according to National Oceanic and Atmospheric Association (NOAA). Torrential rains have contributed to the flooding of roadways, causing road closures and trapping motorists. These events require water rescues of residents from the rising floodwaters, though rescues are not always successful. Heavy flooding in Pittsburgh resulted in the death of one person in 2018 in the town of Bridgeville.

As improvements to stormwater modelling methodologies and software continue to develop, more regional models that rely on the EPA's Stormwater Management Model should be developed to model the quality and quantity of runoff within the watershed, while considering changes in rainfall intensity. Doing so may increase the resiliency of stormwater management to changing climate conditions.

## INNOVATION

The Commonwealth has made little headway in the update of its 2006 Stormwater Best Management Practices (BMP) Manual. The development of this manual, which should incorporate changes in science and technology, is vital to advancing stormwater management in the Commonwealth. Preliminary developments of the revised manual are currently underway at Villanova University, but no timeline for public comment has been released as of the date of this report.

There have been technological and research advancements in stormwater management. Real-time control of stormwater assets such as outlet structures can allow for more efficient use of available storage during wet-weather events. Implementation of these systems through new installations or the retrofit of existing assets can be used to control wet-weather flows and reduce CSOs and downstream flooding through peak shaving strategies.

Besides renewing and expanding sewer capacities, communities with CSO systems are also beginning to deploy green infrastructure to reduce the impact of stormwater on these systems. In 2018, the City of Philadelphia met it's 5-year goal of "greening" 774 acres and removing 600 million gallons CSO discharges and has a goal of achieving 10,000 greened acres by 2036. The EPA has highlighted The City of Lancaster's Green Infrastructure Plan as a national model. The 25-year $140 million plan is expected to save the city $5 million annually and prevent over 1 billion gallons of CSO discharges from polluting the Conestoga River.


# RECOMMENDATIONS TO RAISE THE GRADE

- Create a statewide system that inventories the size, condition, capacity, and capital needs of all public and privately-owned stormwater assets that is easily accessible.
- The Commonwealth must strive to improve the quality of stormwater runoff through the retrofit of older assets that provide little or no water quality benefit.
- The Commonwealth must strive to explore options to address the maintenance and monitoring aspect of assets within the public right-of-way, and those assets located on privately-owned land.
- Evaluate revising the MS4 program to be a watershed-based system, rather than the current municipality approach, to gain economy of scale efficiencies and the ability for smaller municipalities to benefit from sharing staff across a larger region.
- Provide additional funding to PENNVEST for stormwater and green infrastructure projects.
- Release an update to the 2006 Stormwater BMP manual incorporating advances in technology and stormwater research.
- Embrace innovative stormwater controls in future designs, as well as retrofits of older designs.
- The Commonwealth must strive to pass legislation empowering municipalities to charge user-based fees if they desire.
- Create a state-wide recommendation for water quality requirements.


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