HOUSE DEMOCRATIC POLICY COMMITTEE HEARING
Topic: Water and Sewer Infrastructure
Curtis Hall – Wyncote, PA
September 15, 2016

AGENDA

10:00 a.m. Welcome and Opening Remarks

10:10 a.m. Panel One:
   - Dr. Robert Traver, Civil and Environmental Engineering Professor, Villanova University
   - Doug Farquhar, Program Director, Environmental Health, National Conference of State Legislatures
   - Cosmo Servidio, Southeast Regional Director, Pennsylvania Department of Environmental Protection

11:00 a.m. Panel Two:
   - Bryan Havir, Township Manager, Cheltenham Township
   - David Katz, Deputy Water Commissioner, City of Philadelphia Water Department
   - William McFalls, Legislative Committee Chair, Pennsylvania Association of Realtors

11:40 a.m. Panel Three:
   - Rachel Reyna, Chief of Rural and Community Forestry in Bureau of Forestry, Pennsylvania Department of Conservation and Natural Resources
   - John Rogers, Principal, Keystone Conservation Trust

12:20 p.m. Closing Remarks
Public Hearing on Water and Sewer Infrastructure

Statement of

Robert G. Traver, Ph.D., PE, D.WRE, F. EWRI, F. ASCE
Edward A. Daylor Chair of Civil Engineering
Director, Villanova Urban Stormwater Partnership Villanova University
Director, Villanova Center for the Advancement of Sustainability in Engineering

Before the

House Democratic Policy Committee

Commonwealth of Pennsylvania

September 15th, 2016
Good morning, Rep. Stephen McCarter and committee members. My name is Robert Traver. I am the Daylor Chair of Civil Engineering at Villanova University, Director of the Villanova Urban Stormwater Partnership, and the Villanova Center for the Advancement of Sustainability in Engineering. As a long term member of the American Society of Civil Engineers, I have participated on their Energy, Environment and Water Policy Committee, led the task force that authored the 2014 report entitled *Flood Risk Management: Call for a National Strategy*, and was a member of the Hurricane Katrina External Review Panel. I was also a member of the National Research Council (NRC) committee that authored the 2008 report *Urban Stormwater Management in the United States*.

I appreciate being invited to discuss our water infrastructure with you. I am sure you aware that the ASCE Report Card for Pennsylvania graded Wastewater a “D-” and Stormwater as a “D+”. I applaud the civil engineer volunteers for their many hours of work on this document. This clearly shows the consequences of neglected maintenance, short term funding windows, and delaying solutions until sometime in the future. ASCE’s 2013 national estimate of needing $298 Billion over the next 20 years for water and wastewater is hard for me to fathom, and I am sure that figure is much larger now. It is much more expensive to replace infrastructure systems, then it is to maintain and update them with a long term vision toward resilience. Short term funding leads to short term solutions, and impacts us daily. Cracked sewer pipes send rainwater to treatment plants, reducing capacity and increasing the cost of treatment. River flows during droughts are sometimes higher with development, which is thought to be partially caused by leaking sewer pipes. Undersized stormwater culverts can flood roadways and homes, and the effect is worsened if the upstream stormwater management practices are not working. Resilient infrastructure requires a long term vision with long term resources to avoid wasteful emergency spending.
From the stormwater prospective there is a lot of good news for the Commonwealth. Our research at Villanova and that of others around the world on green storm water infrastructure (GSI) shows that they are effective and resilient when designed, built and maintained correctly. By GSI, I am referring to rain gardens, green roofs, pervious pavements and other stormwater designs that incorporate natural properties and can mitigate or through redevelopment improve the urbanization impacts on water quality and quantity. We are still learning about how to take full advantage of the potential of these practices. At Villanova we found that a green stormwater treatment train designed for one inch of runoff regularly exceeds its design expectations, even capturing most of the runoff from Superstorm Sandy. We see the same results in rain gardens and tree trenches built to reduce combined sewer overflows that we are studying as part of a USEPA grant in partnership with Philadelphia Water. These advances will directly impact the Commonwealth’s abilities to meet our regulatory requirements such as the Chesapeake Bay, NPDES, TMDL, Act 167 etc., and to protect our water courses and our people. However, on top of the funding issues, we do have some barriers we need to tear down.

The first barrier is the advances found over the last decade are not included in the “current” 2006 Pennsylvania Stormwater Best Management Practices Manual, and I don’t think the Commonwealth has any mechanism for creating an updatable design manual that can keep pace with the advances of the profession. I continue to hear from visitors to our research sites that it is great to learn more about our research and how to get more performance out of our GSI structures, but that they can’t implement these lessons as they are not in the commonwealth or township manuals or codes. It is not enough to simply revise the manual, we need to figure out how to keep pace with advancements. We can’t afford to build or promote inefficient structures.

The second is that GSI is an engineered system, and needs to be inspected and maintained. This is a historic challenge, and has been since I started as an engineer in Kennett Square in 1978. Around 2000, a student of mine visited most of the detention basins in Valley Creek and found that over 50% had problems that significantly
interfered with their function. This continues with GSI – every day I pass a rain garden where water can’t flow uphill to get in… so it is the driest rain garden ever, and this permitted regulatory structure hasn’t been corrected in a decade. So, we are wasting our investment if we don’t build them right and keep them working. Our past practice was to have these systems on private property making it difficult to inspect and enforce compliance, to the detriment of those who live downstream that they are designed to protect. A great example of how this should work is practiced by the Philadelphia Water Department. They inspect and maintain their Stormwater Management Practices, and thus they are learning and incorporating the lessons learned - making their operation effective, and holding the owners accountable. Of course this takes funding.

We do have new tools, the addition of stormwater to the list of permitted authorities in 2013, and now Act 62 that authorizes stormwater fees, and encourages GSI retrofits on private property. We need to take inspection and maintenance seriously to make sure all the investment in land costs and construction continue to protect our downstream neighbors and waterways. I suspect our work is not yet done on this subject.

Lastly, we need to encourage innovation in our stormwater design and permitting. Current design criteria or guidelines have progressed slowly from the detention basin days, but have not been rethought to allow us to take full advantage of what green stormwater infrastructure can give us. The challenge is to encourage a dynamic approach to design that incorporates climate patterns, soils & infiltration, plants & evapotranspiration, temperature cooling effects, and carbon sequestration to maximize the benefit received from our investment. We need to revisit the design criteria and tools we use to assess whether we are meeting our goals and to change our guidelines checklists to a performance based approach.

That concludes my statement. I applaud the Committee for their continued efforts and thank you for the opportunity to testify. I will be glad to answer any questions the Committee might have.
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 currently serves as the Director of both the Villanova Center for the Advancement of Sustainability in Engineering, and the Villanova Urban Stormwater Partnership. Dr. Traver earned his undergraduate degree in Civil Engineering from the Virginia Military Institute, his MS from Villanova University, and His Ph.D. from the Pennsylvania State University.

While at Villanova, Dr. Traver has conducted research on topics that include modeling of stream hydraulics, urban hydrology, water quality, and measures to mitigate stormwater effects of urbanization. He believes that research supports and enhances the undergraduate and graduate educational experience. Dr. Traver has been the main force in creating a Stormwater Green Infrastructure Demonstration and Research Park on the Villanova Campus, and founded the Villanova Urban Stormwater Partnership to enable continuing long term stormwater research. Many highly cited publications have resulted from the work of faculty and students through this initiative. He teaches graduate courses in hydrology, hydraulics, urban storm water management, and undergraduate courses in all facets of water resources.

Dr. Traver is a registered professional engineer, a fellow of the American Society of Civil Engineering (ASCE), and a Diplomate of the American Academy of Water Resource Engineers which he also served as president. In 2007, he received the Outstanding Civilian Service Medal from the Commanding General of the Unites States Corps of Engineers for his work on ASCE’s External Review Panel (ERP) of the Corps investigation of Hurricane Katrina. In 2014, he was honored with the ASCE William H. Wisley American Civil Engineer Award, “recognized for his leadership of ASCE’s Task Committee on Flood Safety Policies and Practices and editor of the Committee’s report, Flood Risk Management: Call for a National Strategy.” He was a committee member of the National Research Council Committee that authored “Urban Stormwater Management in the United States” (2009). He continues to serve the profession as an associate editor of the ASCE Journal of Sustainable Water in the Build Environment which he helped to create. Dr. Traver was a past member of ASCE’s Water Policy Committee, and is a member of Pennsylvania’s Department of Environmental Protection’s Water Resources Advisory Committee. He received Villanova’s outstanding research award in 2016.
State Drinking Water Revolving Funds
September 2016

Compiled by Doug Farquhar and Morgan Simpson

State Revolving Funds (SRF) are financial assistance programs set up by the state to help fund local water system projects. These funds are established to help the local water systems to achieve the health protection objectives under the Safe Water Drinking Act ("SWDA") and the Clean Water Act. (See 42 U.S.C. § 300f et seq; 33 U.S.C. § 1251 et seq.) These state-run programs initially receive 80 percent of their funding from federal grants. The two main laws permitting for the allocation of this federal money are the Drinking Water State Revolving Fund ("DWSRF") and the Clean Water State Revolving Funds ("CWSRF"). See 42 U.S.C. § 300j-12; 33 U.S.C. § 1383. The Water Infrastructure Finance and Innovation Act (WIFIA) establishes a new financing mechanism for water and wastewater infrastructure projects. WIFIA provides low interest rate financing for large dollar-value projects.

The US EPA estimates that $334 billion is needed to maintain existing water and wastewater infrastructure through 2026. Since 1996, a substantial amount of funding for such projects have come from the SRF programs, but Congressional support for these funds has been declining. Local water utilities have resorted to the bond market, which makes up to 65.1% of water project financing in states in 2009. Water and wastewater rate payers are likely to fund future costs of infrastructure (through debt service).

This memorandum will primarily focus on the DWSRF. It will discuss how the funds work, projects that can be funded, and states that have used the funds thus far.
<table>
<thead>
<tr>
<th>Sources of Financing</th>
<th>Covers Construction Cost</th>
<th>Covers Operation and Maintenance Cost</th>
<th>Dedicated, Equitable Cost (based on stormwater impacts)</th>
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<tbody>
<tr>
<td>Loans (i.e. CWSRF), Municipal Bonds</td>
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<tr>
<td>General Fund (Property taxes), Water/Sewer Budget, Grants</td>
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<tr>
<td>Stormwater Fee/Utility, Permit/Inspection Fees, Special Assessment/Benefit District</td>
<td>✓</td>
<td>✓</td>
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</table>

1. How the Funds Work


Once the general allocation is made, Congress grants each state a certain percent of the general allocation. Each state is guaranteed at least one percent of the general allocation. C.F.R. § 35.3515. The percentage that Congress grants to each state is based on a needs survey that is presented to congress every 4 years. See 42 U.S.C. § 300j-12(h). In this survey, the Administrator conducts an assessment of water system capital improvement needs of all eligible water systems in the U.S. The current survey was completed for FY 2014 and will be the percentages used for allotment through 2017. See EPA, STATE ALLOTMENT PERCENTAGES FOR THE DRINKING WATER STATE REVOLVING FUND PROGRAM, 78 Fed. Reg. 36183 (June 17, 2013) (containing the percentage allotment for all states).

In order for a state to receive the allotment, the state must submit an application to the EPA, create a state revolving fund, and must match the government grant with at least 20 percent. Any portion of the grant and state match that is not set aside must be placed in the state revolving fund. Any federal allotment that the state does not choose to use may be used by any other state that has used its entire allotment.

The state match must be cash or the electronic equivalent from state monies. This payment can be made in a lump sum or through installments. Any installments must be
combined with a letter of credit. The state monies must be deposited into the revolving fund prior to or proportionally with the federal disbursement of funds. A state may issue bonds to raise the revenue required to match the federal grant. The bonds may be retired from state monies or from interest derived from the state revolving fund. The bonds may not be retired from monies gathered from any principle payments made to the revolving fund.

Once a state has created the revolving fund and has received the appropriate funding, the state may begin loaning the funds to the local water supply projects. For the water projects to receive a loan, the project leaders must submit an application to use the money. In the application the leaders must state how the money will be used, how dire the project is, and how feasible the project is to complete with said funds. States rank applications based on which project addresses the most serious risk to human health, which project is necessary to ensure compliance with the SDWA, and which project is most in need according to state affordability criteria. The higher-ranking projects are granted first priority for the revolving fund.

The loans are granted as typical bank loans. The project is required to pay back the principle of the loan with interest. The loan period may be for 30 years or the useful life of the project. The interest rates range from 0 percent to market rate. For projects that are in extreme need, states may give grants, forgive the principle loan amount in part or in whole, or provide negative interest rates. Disadvantaged and extreme need communities are defined as the service area of a water system that meets affordability criteria established after public review and comment by the State in which the water system is located.

The repayment money along with the interest are to be placed back into the state revolving fund. The addition of interest to the repayment allows for the government grant to leveraged beyond a dollar for dollar ratio, thus creating a more efficient system of government funding.

2. Water Projects That May Receive Funding

The projects that can receive funding are statutorily defined. The DWSRF may be used to fund six categories of projects including: water treatment, transmission and distribution, source water, water storage, water consolidation, and creation of new systems. See 42 USC § 35.3520(b).

Treatment is defined as a project to install or upgrade facilities to improve drinking water quality to comply with SDWA regulations. Id. Transmission and distribution is defined as a project consisting of rehabilitation, replacement, or installation of pipes to improve water pressure to safe levels or to prevent contamination caused by leaky or broken pipes. Id. Source water is defined as a project consisting of rehabilitation of wells or development of eligible sources to replace contaminated sources. Id. Water storage is defined as a project to install or upgrade finished water storage tanks to prevent microbiological contamination from entering the distribution system. Id. Water consolidation is defined as a project interconnecting two or more water systems. Id. New systems are defined as projects constructing a new system to serve homes with contaminated individual wells or consolidating existing systems into one new regional water system. Id.
In addition to these stated uses, the funds may also be used to support the costs for planning and design associated with pre-project costs, the costs for acquisition of land, but only for locating eligible project components, and restructuring non-compliant systems.

The projects that cannot receive funding are also statutorily defined. In accordance with 42 U.S.C § 35.3520(d) the following systems cannot be funded:

- federally-owned public water systems and for-profit noncommunity water systems;
- systems that lack the technical, financial, and managerial capability to ensure compliance with the requirements of the Act, unless the assistance will ensure compliance and the owners or operators of the systems agree to undertake feasible and appropriate changes in operations to ensure compliance over the long-term; and
- systems that are in significant noncompliance with any national primary drinking water regulation or variance, unless:

  the purpose of the assistance is to address the cause of the significant noncompliance and will ensure that the systems return to compliance; or the purpose of the assistance is unrelated to the cause of the significant noncompliance and the systems are on enforcement schedules (for maximum contaminant level and treatment technique violations) or have compliance plans (for monitoring and reporting violations) to return to compliance.

3. States That Have Used the Funds

The funds have been used by all 50 states, Puerto Rico, DC, American Samoa, Guam, Northern Mariana Islands, Virgin Islands. California ($1,623,312,950), New York ($1,100,722,775), and Texas ($1,301,243,350) have received the greatest amount of federal funding.

Water Infrastructure Finance and Innovation Act (WIFIA)

The Water Resources Reform and Development Act (WRRDA) of 2014 establishes a new financing mechanism for water and wastewater infrastructure projects. Under Title V, the act creates the Water Infrastructure Finance and Innovation Act (WIFIA) to provide low interest rate financing for the construction of water and wastewater infrastructure.

WIFIA funds projects not eligible under current State Revolving Fund (SRF) programs, in particular large multi-state projects. This new program offers credit assistance in the form of loans or guarantees, enabling these project to leverage other financing. Funded projects must be nationally or regionally significant. Individual projects must be reasonably anticipated to cost no less than $20 million, or $5 million for small community projects. These projects may be either public or private or a combination of both.

WIFIA works separately from, but in coordination with, the SRF programs to provide subsidized financing for large dollar-value projects. Eligible assistance recipients include corporations, partnerships, municipal entities, and SRF programs.

Eligible projects include:
- **Clean Water SRF** eligible projects
- **Drinking Water SRF** eligible projects
- Projects for enhanced energy efficiency at drinking water and wastewater facilities
- Brackish or seawater desalination project, an aquifer recharge project, water recycling project
- Acquisition of property if it is integral to the project or will mitigate the environmental impact of a project
- Bundled SRF projects submitted under one application by an SRF program
- A combination of projects secured by a common security pledge

Specifics of the loan include:

- Maximum amount of the loan may not exceed 49% of eligible project costs;
- The remaining 51% may not come from tax-exempt financing;
- Up to 25% of the funds may be used to fund projects up to 49% of project costs;
- Projects must have a dedicated source of revenue.
- 15% is set-aside for small communities (populations of no greater than 25,000)
- Loan may be for 35 years of the useful life of the project, whichever is less;
- Total amount of federal assistance shall not exceed 80% of the total project costs;
- WIFIA loan may be used to meet the non-federal share requirements of the project costs.

**The Role of SRFs**

Both WIFIA and the SRF may jointly fund a project. The maximum WIFIA participation can be no more than 49%, and WIFIA funded projects cannot use tax-exempt debt. SRFs are eligible to borrow from WIFIA to finance a combination of project under a single application. This allows SRFs to reach borrowers and/or help finance project they might not otherwise be able to support.

**Language from WIFIA on Eligibility:**

SEC. 5026. PROJECTS ELIGIBLE FOR ASSISTANCE
The following projects may be carried out with amounts made available under this subtitle:
(1) Any project for flood damage reduction, hurricane and storm damage reduction, environmental restoration, coastal or inland harbor navigation improvement, or inland and intracoastal waterways navigation improvement that the Secretary determines is technically sound, economically justified, and environmentally acceptable, including—
   (A) a project to reduce flood damage;
   (B) a project to restore aquatic ecosystems;
   (C) a project to improve the inland and intracoastal waterways navigation system of the United States; and
   (D) a project to improve navigation of a coastal or inland harbor of the United States, including channel deepening and construction of associated general navigation features.
2016 State Stormwater Management Enacted Legislation

September 2016

Compiled by Doug Farquhar and Brian Gross

Summary: Bills were enacted in CA (3); CT (1); DE (1); HI (2); ME (2); NC (2); NJ (3); NM (1); TN (2); VA (2) and VT (2).

California

**CA AJR 44**

- **AUTHOR:** Holden [D]
- **TITLE:** Municipal Separate Storm Sewer System Permits
- **INTRODUCED:** 06/09/2016
- **ENACTED:** 08/25/2016
- **DISPOSITION:** Adopted
- **LOCATION:** Chaptered
- **CHAPTER:** 145

Summary: Urges the federal government to provide greater financial support for local agencies implementing a federal mandate to improve stormwater quality, including by passing legislation strengthening the Clean Water State Revolving Fund and creating new grant programs to assist in funding stormwater projects.

**STATUS:**
- 08/25/2016 Chaptered by Secretary of State.
- 08/25/2016 Resolution Chapter No. 145
- Subject: EHManagement, stormwater_sewage

**CA S 485**

- **AUTHOR:** Hernandez [D]
- **TITLE:** County of Los Angeles: Sanitation Districts
- **INTRODUCED:** 02/26/2015
- **ENACTED:** 10/09/2015
- **DISPOSITION:** Enacted
- **LOCATION:** Chaptered
- **CHAPTER:** 678

Summary: Authorizes specified sanitation districts in the County of Los Angeles, to acquire,
construct, operate, maintain, and furnish facilities for the diversion, management, and treatment of stormwater and dry weather runoff, the discharge of the water to the stormwater drainage system, and the beneficial use of the water. Requires a district to consult with the specified entities prior to initiating a stormwater or dry weather runoff program within the boundaries of specified areas.

STATUS:
10/09/2015   Signed by GOVERNOR.
10/09/2015   Chaptered by Secretary of State. Chapter No. 678
Subject: Drinking_Water, EHMangement, Water-WasteWater, stormwater_sewage

CA S 1328

CA S 1328

AUTHOR: Lara [D]
TITLE: Water Delivery: Greenhouse Gas Emissions: Funding
INTRODUCED: 02/19/2016
LAST AMEND: 08/18/2016
DISPOSITION: To Governor
LOCATION: To Governor
SUMMARY:

Authorizes the State Water Resources Control Board to expend moneys from the Greenhouse Gas Reduction Fund to provide grants to public agencies, nonprofit organizations, public utilities, and mutual water companies to implement stormwater and dry weather runoff collection and treatment, wastewater, water recycling, and drinking water projects that are intended to reduce greenhouse gas emission by decreasing the demand for fossil fuel needed to pump, transport, and delivery water to serve water customers.

STATUS:
09/09/2016   *****To GOVERNOR.
Subject: Drinking_Water, Water-WasteWater, stormwater_sewage

Connecticut

CT H 5540

INTRODUCER: Joint Public Health
TITLE: State Water Plan
INTRODUCED: 03/02/2016
ENACTED: 06/09/2016
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER #: 16-137
SUMMARY:

Concerns the State Water Plan; amends legislative processes relating to the development of a plan; prepares a State Water Plan for the management of water resources of the State; designs a unified planning program and budget; considers regional water and sewer facilities plans; identifies the appropriate regions of the State for comprehensive water planning; identifies the data needed and develops a consistent format for submission to the Water Planning Council and applicable State agencies.

STATUS:
06/09/2016   Signed by GOVERNOR.
06/09/2016   Public Act No. 16-137
Subject: Drinking_Water, EHMangement, Water-WasteWater, stormwater_sewage
Delaware

DE S 253

**PRIMARY SPONSOR:** Hocker [R]

**TITLE:** Sediment and Stormwater Management Plan

**INTRODUCED:** 05/05/2016

**ENACTED:** 06/24/2016

**DISPOSITION:** Enacted

**LOCATION:** Chaptered

**CHAPTER:** 274

**SUMMARY:**
Excludes from the requirement for a sediment and stormwater management plan the construction of an agricultural structure construction project of one acre or less subject to a standard plan for minor land disturbing activities; prohibits a regulation that relies on a stormwater runoff volume reduction approach; requires a regulatory impact statement and a regulatory flexibility statement.

**STATUS:**
06/24/2016 Signed by GOVERNOR.
06/24/2016 Chapter Number 274
Subject: EHManagement, Water-WasteWater, stormwater_sewage

Hawaii

HI H 1325

**STATE ID:** SD1

**COMPANION:** HI S 1310

**AUTHOR:** Souki [D]

**TITLE:** Stormwater Management

**INTRODUCED:** 01/29/2015

**ENACTED:** 05/06/2015

**DISPOSITION:** Enacted

**LOCATION:** Chaptered

**ACT:** 2015-42

**SUMMARY:**
Authorizes the counties to establish and charge user fees to create and maintain stormwater management systems or infrastructure.

**STATUS:**
05/06/2015 Signed by GOVERNOR.
05/06/2015 Act No. 2015-42
Subject: EHManagement, Water-WasteWater, stormwater_sewage

HI H 1852

**STATE ID:** CD1

**AUTHOR:** Evans [D]

**TITLE:** Wastewater Treatment Works

**INTRODUCED:** 01/22/2016

**ENACTED:** 07/12/2016

**DISPOSITION:** Enacted

**LOCATION:** Chaptered

**ACT:** 240

**SUMMARY:**
Relates to waste water treatment works; makes nonprofit organizations eligible to receive loans from the clean water state revolving fund loan program to construct, repair, or replace a privately owned decentralized wastewater treatment system and an individual wastewater system that treats municipal
wastewater or domestic sewage; clarifies that entities eligible to receive loans from the water pollution control revolving fund includes nonprofit organizations; relates to water conservation.

**STATUS:**
07/12/2016 Signed by GOVERNOR.
07/12/2016 Act No. 240
Subject: EHManagement, Water-WasteWater, stormwater_sewage

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**ME H 105**

**LD:** 147
**AUTHOR:** Welsh [D]
**TITLE:** Stormwater Management
**INTRODUCED:** 01/23/2015
**ENACTED:** 04/29/2015
**DISPOSITION:** Enacted
**LOCATION:** Chaptered
**CHAPTER:** 12
**SUMMARY:**
(Resolve)Provides for legislative review of portions of Chapter 500, Stormwater Management, a major substantive rule of the Department of Environmental Protection; provides that when monitoring demonstrates that when a stressor in the watershed, a pollutant or failure to meet a water quality standard, is contributing to the impairment of the urban impaired stream, the department may require the applicant to use alternative or additional stormwater treatment measures.

**STATUS:**
04/29/2015 Signed by GOVERNOR.
04/29/2015 Resolve No. 12
Subject: EHManagement, Water-WasteWater, stormwater_sewage

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**ME S 535**

**LD:** 1427
**AUTHOR:** Saviello [R]
**TITLE:** Stormwater Management
**INTRODUCED:** 05/19/2015
**ENACTED:** 06/09/2015
**DISPOSITION:** Enacted
**LOCATION:** Chaptered
**CHAPTER:** 22
**SUMMARY:**
(Resolve)Provides for final adoption by the Department of Environmental Protection of portions of Rule Chapter 500, Stormwater Management, a major substantive rule of the department that was submitted for legislative review on January 8, 2015 and approved for final adoption by the Legislature; relates to the urban impaired stream standard, where a stressor in the watershed, a pollutant or a failure to meet a water quality standard, is contributing to the impairment of the urban impaired stream.

**STATUS:**
06/09/2015 Became law without GOVERNOR'S signature.
06/09/2015 Resolve No. 22
Subject: EHManagement, Water-WasteWater, stormwater_sewage

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North Carolina

NATIONAL CONFERENCE OF STATE LEGISLATURES
NC H 538

AUTHOR: Mills [R]
TITLE: Water and Sewer Authorities
INTRODUCED: 04/06/2015
ENACTED: 08/11/2015
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER #: 2015-207
SUMMARY:
Relates to water and sewer authorities; includes storm water management programs; authorizes counties and cities to pledge a security interest in an escrow account; authorizes a maturity date for financing water system projects; authorizes installment contract financing agreements; requires public or community wastewater systems to accept liquid condensate from residential heating and cooling systems; relates to reimbursement agreements to be paid to a private developer or property owner for infrastructure.
STATUS:
08/11/2015 Signed by GOVERNOR.
08/11/2015 Session Law Number 2015-207
Subject: EHManagement, Water-WasteWater, stormwater_sewage

NC H 634

AUTHOR: Torbett [R]
TITLE: Stormwater Programs
INTRODUCED: 04/14/2015
ENACTED: 07/16/2015
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER #: 2015-149
SUMMARY:
Clarifies the definition of a built-upon area for purposes of stormwater programs; excludes swimming pools.
STATUS:
07/16/2015 Signed by GOVERNOR.
07/16/2015 Session Law Number 2015-149
Subject: EHManagement, Swimming_Pools, Water-WasteWater, stormwater_sewage

New Hampshire

NH S 97

AUTHOR: Birdsell [R]
TITLE: Stormwater Regulation Ordinances
INTRODUCED: 01/08/2015
ENACTED: 07/13/2015
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER: 2015-247
SUMMARY:
Authorizes municipalities to regulate stormwater in order to comply with federal and state laws and regulations; authorizes planning boards to advise governing bodies as to whether proposed ordinances and bylaws regarding the maintenance and operation of stormwater systems comply with the master plan.
STATUS:
07/13/2015 Signed by GOVERNOR.
### New Jersey

<table>
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<tr>
<th>Bill Number</th>
<th>Title</th>
<th>Sponsor</th>
<th>Introduced</th>
<th>Enacted</th>
<th>Disposition</th>
<th>Location</th>
<th>Chapter</th>
<th>Summary</th>
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<tr>
<td><strong>NJ A 3882</strong></td>
<td>Environmental Infrastructure Project Financing</td>
<td>Spencer [D]</td>
<td>06/20/2016</td>
<td>08/18/2016</td>
<td>Enacted</td>
<td>Chaptered</td>
<td>2016-30</td>
<td>Changes submission and notice requirements for short-term and long-term financing for environmental infrastructure projects.</td>
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<td><strong>NJ A 3883</strong></td>
<td>State Environmental Infrastructure Trust Expansion</td>
<td>Zwicker [D]</td>
<td>06/20/2016</td>
<td>08/18/2016</td>
<td>Enacted</td>
<td>Chaptered</td>
<td>2016-31</td>
<td>Authorizes the State Environmental Infrastructure Trust to expend certain sums to make loans for environmental infrastructure projects for FY2017.</td>
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<td><strong>NJ A 3884</strong></td>
<td>Environmental Infrastructure Appropriations</td>
<td>Chiaravalloti [D]</td>
<td>06/20/2016</td>
<td>08/18/2016</td>
<td>Enacted</td>
<td>Chaptered</td>
<td>2016-32</td>
<td>Appropriates funds to Department of Environmental Protection for specified environmental infrastructure projects for FY2017.</td>
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**Status:**
- 08/18/2016 Signed by GOVERNOR.
- 08/18/2016 Chapter No. 2016-30

**Subject:**
- EHManagement, Water-WasteWater, stormwater_sewage
NM S 106

AUTHOR: Cervantes [D]
TITLE: New Mexico Finance Authority Water Project Fund Project
INTRODUCED: 01/19/2016
ENACTED: 03/04/2016
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER #: 52
SUMMARY: Authorizes the New Mexico Finance Authority to make loans or grants from the water project fund to cities, towns, villages, districts and counties for water projects; includes water conservation, water treatment, watersheds and flood control.
STATUS: 03/04/2016 Signed by GOVERNOR.
03/04/2016 Chaptered. Chapter No. 52
Subject: EHManagement, stormwater_sewage

Tennessee

TN S 1830

SAME AS: TN H 1892
AUTHOR: Sotherland [R]
TITLE: Municipal Separate Storm Sewer Systems
INTRODUCED: 01/19/2016
ENACTED: 04/22/2016
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER #: 1007
SUMMARY: Relates to post construction storm water requirements for municipal separate storm sewer systems; provides that any national pollutant discharge elimination system permit issued to a local governmental entity administering a municipal separate storm sewer system shall not impose post-construction stormwater requirements, except to the extent necessary to comply with the minimum requirements of federal law.
STATUS: 04/28/2016 Public Chaptered. Chapter No. 1007
Subject: EHManagement, Water-WasteWater, stormwater_sewage

TN S 2417

SAME AS: TN H 1850
AUTHOR: Yarbro [D]
TITLE: Green Infrastructure Practices and Sewage
INTRODUCED: 01/21/2016
ENACTED: 04/12/2016
DISPOSITION: Enacted
LOCATION: Chaptered
CHAPTER #: 792
SUMMARY: Authorizes the use of green infrastructure practices within areas that have combined sanitary sewage and storm water systems; relates to trees, tree boxes, vegetated roofs, infiltration strips, rain gardens, cisterns, dry wells,
permeable pavement, soil amendments, pocket wetlands, and vegetated swales; provides that green infrastructure practices may be implemented on both public and private property at the discretion of the incorporated city or town.

**STATUS:**
04/25/2016 Public Chaptered. Chapter No. 792
Drinking_Water, EHManagement, Water-WasteWater, stormwater_sewage

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**Virginia**

**VA H 919**

**AUTHOR:** Mason [D]
**TITLE:** Water and Sewer Service Provided by Locality
**INTRODUCED:** 01/13/2016
**ENACTED:** 03/11/2016
**DISPOSITION:** Enacted
**LOCATION:** Chaptered
**CHAPTER:** 415
**SUMMARY:**
Relates to water and sewer service provided by locality; relates to canceling service for nonpayment of charges; shortens the period after which a locality providing water or sewer service may shut off service for unpaid charges; provides the time period prior to ceasing service that the locality shall provide the owner, lessee, or tenant with written notice of such cessation.

**STATUS:**
03/11/2016 Acts of Assembly. Chapter No. 415

**VA S 542**

**AUTHOR:** Obenshain [R]
**TITLE:** Delinquent Sewer Charges
**INTRODUCED:** 01/13/2016
**ENACTED:** 03/29/2016
**DISPOSITION:** Enacted
**LOCATION:** Chaptered
**CHAPTER:** 528
**SUMMARY:**
Relates to delinquent sewer charges; relates to lien; relates to unlimited time; allows a sewer authority that provides only sewer service to place a lien on the property receiving the service in the amount of any number of months of delinquent charges when the water and sewer is, supplied to a lessee or tenant, when the water or sewer is, or both are, provided to the property owner.

**STATUS:**
03/29/2016 Acts of Assembly. Chapter No. 528

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**Vermont**

**VT H 610**

**AUTHOR:** Emmons [D]
**TITLE:** Clean Water State Revolving Fund
**INTRODUCED:** 01/20/2016
**ENACTED:** 05/12/2016
**DISPOSITION:** Enacted
**LOCATION:** Chaptered
**ACT:** 103
SUMMARY:
Clarifies the current law relating to the procedure and implementation of the 
Agency of Natural Resource's Water Pollution Control Grant Program and the 
Clean Water State Revolving Fund.

STATUS:
05/12/2016            Signed by GOVERNOR.
05/19/2016            Act No. 103
Subject:              Drinking_Water, EHManagement, Water-WasteWater, 
                       stormwater_sewage

VT H 674

AUTHOR:              Lanpher [D]
TITLE:               Public Notice of Wastewater Discharges
INTRODUCED:          01/26/2016
ENACTED:             05/04/2016
DISPOSITION:         Enacted
LOCATION:            Chaptered
ACT:                 86
SUMMARY:
Requires wastewater treatment facility notify the Secretary of Natural Resources 
and local health officers of overflows, upsets or bypasses around or within the 
wastewater treatment facility during dry or wet weather conditions; requires 
notification of discharges of domestic, commercial, or industrial wastewater 
from the facility to separate storm sewer systems; requires daily press release 
regarding whether cyanobacteria have been identified in any water that could 
constitute a public health hazard.

STATUS:
05/10/2016            Act No. 86
Subject:              Drinking_Water, EHManagement, Water-WasteWater, 
                       stormwater_sewage

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Testimony of
Cosmo Servidio, Regional Director
Southeast Regional Office
Pennsylvania Department of Environmental Protection
House Democratic Policy Committee
Thursday, September 15, 2016

Mr. Chairman, Distinguished Members of the Committee, Ladies and Gentlemen:

My name is Cosmo Servidio and I am the Southeast Regional Director for the Pennsylvania Department of Environmental Protection. I truly appreciate the opportunity to join you today and provide testimony on this very important regional, statewide, and, frankly, national issue.

For DEP’s purposes, the southeast region covers the counties of Bucks, Montgomery, Chester, Delaware, and Philadelphia. We are the most populous region and probably the oldest region when it comes to our existing infrastructure. As you are well aware, infrastructure issues are always a challenge for all levels of government, whether it is roads and bridges, or the sanitary and storm sewer issues we are here to discuss today.

I would like to talk about two programs that I feel have the most impact on today’s subject: Our Chapter 94 Wastewater Management Program as it relates to our sanitary sewer systems, and The Municipal Separate Storm Sewer Systems, better known as MS4, and the evolving expectations of municipal governments to manage and remediate their stormwater discharges to our waterways.

Chapter 94 is intended to prevent unpermitted and insufficiently treated wastewater from entering waters of this Commonwealth by requiring the owners and operators of sewage facilities to project, plan and manage future hydraulic, organic and industrial waste loadings to their sewage facilities. When these systems stumble or fail, they cause hydraulic and organic sanitary sewer overflows – or SSO’s – which naturally jeopardize the waters of the commonwealth Chapter 94 is designed to protect. Most times, these overflows are caused by a combination of factors, including storm and groundwater infiltration into the sanitary sewer system through damaged mains or laterals, and inflow to the sanitary storm system caused by things like sump pumps and roof drains being directed to the sanitary system. Aging and inadequately maintained infrastructure is the primary culprit of these SSO’s. As you can see, part of the problem lies with the publicly owned infrastructure, but a key contributor to all of these problems is the maintenance and operation of the privately owned laterals as well.

In 2015, the southeast region had 177 sewer systems operating in southeastern Pennsylvania. This includes all whole municipal systems as well as those with multiple municipalities included in a regional authority. Of those 177 systems, 82 or 46% have some evidence of loading problems. This number includes existing and projected hydraulic and organic overloads. Many of these systems have been classified as overloaded and they are working to address these problems through a corrective action
program. Some, however, are not yet classified, but rather have been identified through the analysis of recent data.

What do these overloads mean to a municipality? As the problems almost always involve failing infrastructure, it usually signals that the municipality or authority has a less-than-adequate preventative maintenance program in place and needs to dedicate more resources – both human and financial – towards a solution. It also creates the need for additional funding for maintenance and, at times, even capital improvements to resolve the overload. And finally, it can hinder new development or redevelopment efforts because sewer connections may be restricted until adequate measures are taken to address the overload problems.

I understand that in times of austere budgets, there is no easy answer to these very old and prevalent problems that our municipalities and authorities face. It is important to note that some have had reasonable success implementing programs geared toward asset management, water and energy efficiency, creating infrastructure-specific capital improvement funds, utilizing more consistent and comprehensive standards for system assessment and repair, and even exploring creative solutions to assist in private sewer lateral repair. All of these successes point toward strained systems potentially recovering their sewer infrastructure and moving toward self-sustainment of these critical systems. Some best practices that authorities and municipalities should consider include: collection system mapping, more regular flow monitoring and data analysis, collection system rehabilitation, structural integrity assessments like televising and pressure testing pipes and mains, and, of course, ongoing monitoring and maintenance. Naturally, many of these require additional investment by the local governments and authorities to achieve.

The other program that we implement on behalf of the US EPA that has a direct connection to today's topic involves the Municipal Separate Storm Sewer System or MS4 program. Everyone here, by now, is familiar with MS4 and the requirement for many municipalities across the nation to meet standards in managing their stormwater so as to lessen its impact on our nation’s waterways. For decades, people viewed storm drains like any other drains and routinely dumped paint, car wash runoff, and regular trash into those systems. MS4 has tasked our municipalities with taking a comprehensive approach toward managing those stormwater discharges through public education and other best management practices.

The program requires all MS4 eligible communities to file a permit with our office and submit reports demonstrating their compliance with the program's requirements. In 2016, new regulations were adopted that require even more diligence and action on the part of the municipalities in the MS4 program. Based on where they are and the kinds of waterways their systems discharge to, many will now be required to implement best management practices and remediation activities to actively reduce certain contaminants and nutrients from their discharges.

In the southeast region, we have 224 MS4 communities. Of those, 127 or 56% will need to submit such a remediation plan by September of 2017. As you can imagine, protecting our impaired and exceptional
value waterways will also come at a cost. Additional MS4 compliance may come at a cost not already accounted for in municipal budgets, and may compete for already tight resources with sanitary sewer infrastructure needs. The main difference, until recently, has been that sanitary sewer systems were funded through customer ratepayers where storm sewers were general fund expenditures.

Recent legislation has enabled the creation of stormwater authorities and also provided municipalities with the ability to create a system ratepayer base for its residents so that dedicated resources can flow right to the area of need. So while many municipalities wrestle with the rate structure required to fund their sanitary systems, as I discussed earlier, they are now looking at the issue of creating a new stormwater-only rate structure to account for the cost of that infrastructure network. Having both a healthy sanitary and storm sewer infrastructure is critical to protecting our precious natural water resources in Pennsylvania and that is why we must work so hard with all of our partners to ensure everyone is doing their part to protect our environment.

It is no secret to your committee, Mr. Chairman, that funding issues are at the root of most of what you will hear today. I do want you to understand that all of us at DEP are aware of the burdens municipalities face and we take that into consideration as we try to assist them toward compliance on these issues.

In conclusion, all of us at DEP are committed to working with every municipality and authority to assist them in any way possible in maintaining their systems and restoring the ones that are failing. We certainly understand the regulatory and financial pressures that our municipalities and authorities face, and we take that into full consideration while working hard to fulfill our mission of protecting the commonwealth’s invaluable natural resources.

Thank you very much for your time and consideration.
Hello and good morning members of the Committee, my name is Bryan T. Havir and I am the Township Manager of Cheltenham Township, Montgomery County. I have been the Manager in Cheltenham for four (4) years, prior to that, Assistant Township Manager for fourteen (14) years. Over my career, I have thirty (30) years of experience in urban and community planning.

AGING INFRASTRUCTURE

Cheltenham Township is located in southeastern Montgomery County with a population of 37,024 people according to the 2014 Special U. S. Census. The Township is a first-generation suburb adjacent to the City of Philadelphia which experienced the peak of its growth, between 1910-1960. Today the Township is 98% developed. The Township has approximately 120 miles of sanitary sewer lines and four interceptors ranging in size from 8 to 33 inch diameter pipes. The main interceptor, known as Interceptor “A”, which runs for the most part, parallel to Tookany Creek between Route 309 and Cheltenham Avenue for almost 9 miles, is over 90 years old and consists of vitrified clay pipes and brick manholes. It is noted that the life span of sanitary sewers is typically 85-100 years. Consequently, due to its age and material, there is a lot of leaking from cracks in the system. The leaks are worsened by wet weather and a high water table, which causes infiltration and inflow of groundwater and stormwater into the lines. This is known as “I&I”. When there is a lot of I & I in the system, surcharging of the raw sewage out of the sewer lines can occur, potentially allowing raw sewage to enter the Tookany Creek and causing contamination. This is known as a Sanitary Sewer overflow or SSO.
Cheltenham’s sanitary sewer system is not unique for an older community. However, it can be difficult to determine where there is a problem since the physical infrastructure is underground and problems often cannot be seen or detected.

Cheltenham does not have a treatment plant, nor does it have a pumping station. 100% of Cheltenham’s flow is gravity and leaves the Township and treated at the Philadelphia Northeast Treatment Plant.

In Cheltenham’s case, its sewer infrastructure is truly ‘out of sight, out of mind’.

**MAINTENANCE HISTORY**

From 2000 to 2009, extensive televising and grouting of the entire system took place in five (5) phases totaling close to $5,643,811.37. During these nine (9) years, the Township’s program focused mainly on general maintenance, identification of deteriorated sewers, and basic, short-term grouting repairs to address I&I.

In early spring 2010, Southeastern Pennsylvania had a catastrophic weather event consistent of severe snow storms followed by warm weather and rain. The rain and melting snow contributed to the highest water table in the region’s history. On April 2, 2010, Cheltenham’s system experienced significant surcharging, which led to the Pennsylvania Department of Environmental Protection (DEP) issuing a Township-wide building moratorium and directing the Township through a consent order to correct its system by reducing flows and making repairs.
From 2010 to the present, the Township has refocused its program to remediation, reconstruction, and rebuilding of its system through a concentrated inflow and infiltration reduction effort system-wide.

PAST, PRESENT AND FUTURE ACTIONS

The Township hired consulting engineers who specialize in addressing problems of aging sanitary sewers. The Township also adopted a Sanitary Sewer Corrective Action Plan in 2010, from which a Consent Order was placed on the Township by DEP. This Consent Order set forth timetables and milestones that the Township must meet to correct its system.

In 2009 and into 2010, the Township spent nearly $1,326,000 for the installation of a temporary Bypass Pumping System to absorb the overflows during severe wet weather and high flow conditions along the main interceptor in order to prevent discharges of sewage onto the ground or into the creek. Between 2010-2016, an additional $16,469,839.39 plus $7,000,000 borrowed, has since been spent and/or encumbered to cover engineering design services for fixing the system, to reline and reconstruct portions of the collection system and the main interceptor, and to install sewer meters to monitor flow and collect data to be reported on a quarterly basis.

In 2013, the Cheltenham Township Board of Commissioners completed a draft Act 537 Sewage Facilities Plan to regulate and assess current and future needs for wastewater collection, conveyance, and treatment facilities, and to evaluate alternatives to meet future growth projections. The Township to date has spent over $325,000 in engineering costs for the development of the Plan. This is an eight (8) year plan with primary recommendations to replace portions of the main interceptor within the sewer-shed. A companion I&I remediation study is being
finalized as we speak, which places an estimated value of $50 Million additional for replacement, relining and partially rebuilding other portions of the system. Private building lateral assessment and repairs will also be included in the comprehensive study. It is important that all of the municipalities in the sewershed share in the problem solving since portions of the sewage flows from Abington and Springfield Townships and Jenkintown Borough traverse Cheltenham before entering Philadelphia. Additionally, it is extremely advantageous to the City of Philadelphia since it reduces the amount of I&I going to the Northeast Philadelphia Treatment Plant. However, the repairs of the aging laterals create an unexpected expense for property owners. A public meeting to help educate property owners will be held on September 28, 2016 at Cheltenham High School. Greater flexibility to help the property owners about this plan with these unexpected expenses is needed. The Township requests the State’s assistance to support legislation to allow for municipalities to collect a set amount from all property owners (including tax exempt properties) and include funds for capital improvements such as sewer infrastructure work. Legislation also needs to be given municipalities to allow unspent monies to roll over into the next fiscal year to be used for ongoing capital infrastructure work. This would give great flexibilities to municipalities.

The Township has been and will continue to make capital improvements to its sanitary sewer system with the use of incurring debt from the sale and issuance of General Obligation Bonds and will continue to file applications for state and federal grants to help offset capital expenses.

One of the most important grant programs Pennsylvania had to offer several years ago to municipalities was co-administered by the Department of Community and Economic Development and the Commonwealth Finance Agency, was previously known as the H2O. We encourage this committee to explore ways to perhaps
reinvigorate funding for that program or consider reprioritizing the way other grant funds, such as PennVest, are actually distributed and disbursed.

Under the last two grant rounds of the former H20 program, Cheltenham submitted three (3) applications totaling over $2 Million and secured a little over $550,000. We actually thought our grant allocation was somewhat on the low side; especially since Cheltenham was under a Consent Order by DEP to fix its aging infrastructure. Our Township is an older first generation inner suburban community with a sanitary sewer system nearing its life cycle as compared to some other municipalities that received larger State grant awards, having newer built sewer systems.

Cheltenham Township wholeheartedly supports the State Grant Programs like the former H20 Program, as well as other grant programs, which offer funding assistance to municipalities with aging infrastructure. We just ask that the Committee consider adopting policies and guidelines on how the money is distributed to make it more favorable to the cities and first generation suburban townships and older boroughs where the sanitary sewer systems, public water facilities, transportation networks, including roads, bridges, transit and rail lines are already in place. It is these communities that are struggling financially to keep their populations intact and have the greatest need to address the maintenance, repairs and rebuilding of the aging infrastructure to keep their communities livable, walkable and viable. Because of the fiscal constraints and impacts on their operating and capital budgets that older municipalities are faced with, there is a greater need for help from higher levels of government to reduce the tax burden on the local citizenry. Investing in older communities takes advantage of the efficiencies of their existing sewer, water and transportation facilities and encourages physical improvements of the inner suburban communities, and would be preferable to the inefficiencies and expense of suburban sprawl.
A greater amount of investment by higher levels of government into the older communities will help to revitalize older communities and cause residents to want to stay where the infrastructure and amenities already exist. Otherwise, what you end up with is a continued push toward urban sprawl; that is populations exiting the built areas and relocating to the “exurbia” or the next generation communities because it is cheaper for them to live in those newer communities further out. However, 75 to 100 years from now, those communities will be experiencing aging infrastructure issues and land use decisions leading to sprawl and populations will continue to leap frog outward to even farther underdeveloped areas because again, it is cheaper to live.

In essence, Cheltenham Township is asking the Committee to consider adopting favorable policies of the “First Suburbs Project”, which encourage stabilization and revitalization through investment in existing infrastructure of older communities; and maintain the built environment in our region. These policies should be used as a guideline and basis for distributing future funding to help with the aging sewer water and transportation infrastructure needs of the older first generation townships and boroughs, which are so vital to older communities like Cheltenham Township and others within Bucks, Montgomery, Chester, Delaware, and Philadelphia counties.

Thank you for your time and consideration.

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Good morning. Thank you for allowing me to testify.

My name is David A. Katz, Deputy Water Commissioner, Philadelphia Water Department (PWD). I have been involved in Clean Water Act issues for almost three decades on both a local and national level. I originally served as General Counsel to PWD for 13 years before becoming the Deputy Commissioner for Compliance. I have been involved extensively with utility ratemaking and management issues.

In my brief testimony, I would like to make three points.

First, clean streams and rivers are a shared responsibility. Shared between the federal, state and local governments. We knew this once, but apparently have forgotten.

In 1972 the Federal government passed what we now refer to as the Clean Water Act. The very first section of that Act, Section 101, made it clear that it was our national policy to provide federal financial assistance to treatment plants to clean our rivers.

That 70 billion dollars which we spent nationwide in the 1970s and 1980s was the best environmental investment this country has ever made. It created the greatest improvement in water quality this nation has ever seen. This program no longer exists.

The Commonwealth also had a grant program—Act 339—which provided operational grants equal to 2% of the capital investment in your plants. This helped ensure that plants were properly operated and maintained. This Program no longer exists.

Yes there are still a few programs remaining—Pennvest and EPA’s revolving loan programs—but they are wholly inadequate to address the needs of cities and towns throughout the state.

It is particularly sad and somewhat ironic that this disinvestment is occurring during a period of ever growing environmental demands on cities and towns throughout the Commonwealth.

It’s my sincere hope that we soon remember what we have forgotten.
Second, I’ll address how the City helps its citizens pay for defective water and sewer laterals and how the City addresses its larger environmental challenges as well.

For traditional failing water and sewer services we offer HELP (Homeowners Emergency Loan Program). HELP offers 5 year interest free loans to pay for failing private infrastructure. So, for example, instead of a homeowner having to pay a plumber three thousand dollars for a repair the City will pay this amount and bill the homeowner 50 dollars a month for the next 60 months.

For the more complicated environmental challenges we face---CSO Long Term Control Program, Sanitary Sewer Overflows, MS4 compliance, etc. we work hard to accomplish two things:

First, we have the costs absorbed for these programs into our general rate base rather than pushing the cost further down onto individual homeowners. Sometimes this takes a little creativity but we believe it is critical if we are to meet our environmental mandates.

The City of Philadelphia has 26% of its citizens living below the federal poverty level and perhaps another 20-30% classified as food insecure. The reality in the City, as well as in many of our suburbs and towns throughout the Commonwealth, is that after families pay their mortgage or rent, food, child care, health care, and try to save for college there simply is very little left. Asking homeowners to pay 3, 5, or 10 thousand dollars to address a problem is simply not a realistic or viable solution.

Second, the City attempts to meet its environmental challenges in creative and innovative ways that maximizes the value of every dollar spent and produces the greatest environmental impact. Whether its utilizing green infrastructure, creating grant programs, incentivizing private property owners, creating new rate structures, negotiating flexibility into all our agreements, etc. it’s critical in meeting our challenges in a cost effective manner.

Lastly, I would like to just briefly touch on DEP’s role. DEP can often be portrayed as the “heavy” or “bad guys” forcing folks to spend money they don’t have. But nothing could be further from the truth.

I have worked with the folks from the SE region for almost three decades and have consistently found them not only smart and dedicated but always willing to work with the City to find sensible solutions and always sensitive to both the financial challenges and practical challenges we face in trying to build solutions in the real world.

I believe DEP can be an extremely value asset in helping folks meet their obligations. They offer solid practical ideas, common sense, flexibility and a real willingness to partner with you to find workable and affordable solutions.

And finally, no, Cosmo did not slip me 20 bucks to say this.

Thank you again for the opportunity to testify today.
The Philadelphia Water Department administers an emergency repair program for defective water and sewer service lines.

In the City of Philadelphia, water service and sewer drainage pipes are the responsibility of the homeowner. If you received a Notice of Defect from the Water Department indicating that your water and sewer lines are broken or leaking, you may qualify for the Homeowner’s Emergency Loan Program (HELP). The money loaned for the repairs will be at a zero (0) interest rate and payable over a sixty (60) month period.

The program eligibility guidelines are:

- The property must be a residential dwelling and not listed as a commercial property.
- The homeowner must have received a Notice of Defect issued by the Water Department.
- The property’s water bill must be current. Money owed cannot exceed two (2) billing cycles. If there is an arrearage, the payment agreement with the Water Revenue Bureau must be current for at least six (6) months, prior to receiving the Notice of Defect.
- The property must be owner-occupied at the time the Notice of Defect was issued and the services requested and cannot have any more than four units.
- The property must have an operable AMR water meter.
- To be considered, call 215-685-4901. Applications will only be completed over the telephone.

For more information visit phila.gov/water.
Chairman Sturla, Representative McCarter and fellow members of the House Democratic Policy Committee, I’d like to thank you for the opportunity to speak to you today.

I’m Bill McFalls, chair of the Legislative Committee for the Pennsylvania Association of Realtors. I have more than 25 years of experience as a Realtor®, and I’m currently an associate broker with RE/MAX Preferred in West Chester. I’m here today representing PAR’s 30,000 members.

The Pennsylvania Association of Realtors® understands the difficulties that aging sewer infrastructures are causing in communities throughout the commonwealth. Senate Bill 289 proposes an effective solution for overwhelming problem for many of our municipalities.

As you’re aware, the Pennsylvania Department of Environmental Protection and the US Environmental Protection Agency have become very aggressive in their enforcement of the federal Clean Water Act. These efforts have included, among other things, intense pressure on boroughs and townships to repair/and or replace aging sewer infrastructure. This aging infrastructure, including main lines and the private lateral lines that feed into them, is allowing far too much clean storm water to infiltrate, and sometimes overwhelm municipal sewer facilities.

The implications of excessive inflow and infiltration are significant to municipalities. The unnecessary treatment of clean storm water by municipal sewer systems is costing taxpayers millions of dollars each year. In addition, during particularly heavy rainfall conditions, inflow and infiltration can create overcapacity at sewer facilities, ultimately resulting in system failures. These events can lead to sewage backing up into homes or finding its way into ground water, nearby lakes and streams. This is obviously a serious environmental and public health issue.

In an effort to meet clean water standards and better protect their communities, many municipalities have implemented inspections of their own sewer infrastructure, as well as the private lateral lines that feed into their systems. In regard to the inspection of private sewer lateral lines, the most common practice has been to inspect only during the time of a real estate transaction. To be candid, these point-of-sale inspections have often been put in place as an attempt to appease state and federal regulators, while avoiding the wrath of local home owners who don’t want to pay thousands of dollars to repair infrastructure that they can’t even see. While Realtors® understand the need for inspecting private sewer laterals to insure they are not allowing inflow and infiltration into the system, we are very concerned that the potential “return” on this type of point-of-sale inspection is far too limited to justify the serious issues they can create.

First and foremost, at the rate properties are sold in most municipalities, it could take 40 to 50 years to inspect every private lateral connection. If correcting inflow and infiltration is a serious problem, waiting decades to address the issue is certainly not a credible response. Second, when these inspections occur at point-of-sale, they often create financial hardships for sellers. Replacement of sewer laterals can range anywhere between several thousand to well over $10,000, which is beyond
affordable for many families. In instances where homeowners can’t afford the repair, a home can become virtually unsellable. This problem becomes even more serious when a family facing a short-sale or foreclosure is involved. As a result, communities could see an increase in blighted properties when those facing these financial hardships are unable to afford the repairs.

The association believes a more holistic approach of addressing these issues is to create a uniform system of sewer lateral inspections and repairs. As an example, Cheltenham Township is considering an ordinance that would implement a sewer main and lateral inspection and repair program stretched over eight years. It is exactly the type of remedy that should be a model for all southeastern PA municipalities facing similar infrastructure issues. We commend the township for the comprehensive thought that went into the ordinance, and for the effort to make any potential repairs required by the inspection system it would implement as affordable as possible for affected residents.

That’s why the Pennsylvania Association of Realtors® supports Senate Bill 289. This bill could work hand-in-hand with the type of ordinance Cheltenham is considering by providing a financial solution for both municipalities and homeowners. This legislation would create a public funding mechanism to reduce an individual homeowner’s responsibility for costly and unaffordable repairs. The use of public funding to repair private sewer lateral infrastructure is an innovative approach that could benefit individual property owners, potential homebuyers and entire communities. We thank the committee for the opportunity to provide testimony and I’d be happy to answer any questions.
The Impact of Trees on Stormwater Management

Thank you Chairman Sturla, Representative McCarter and members of the House Democratic Policy Committee for allowing me to speak to you today about the impact of trees on stormwater management.

Trees have a positive impact on stormwater runoff through multiple means: Interception of raindrops, slower infiltration of water into the soil, intake of water, soil stabilization, and interception of pollution and particulate matter. I will briefly cover each of these benefits:

Trees reduce runoff through the interception of raindrops. As raindrops fall, tree leaves intercept those drops. This means that the leaves are taking on some of the erosive energy of the raindrops before they reach the ground. This aspect keeps more soil intact, as the impact of the raindrops contributes to soil erosion.

Trees also assist with slower infiltration of water in the soil. Some of the water that lands on the leaves will fall to the ground, but it will fall at a slower rate as evidenced by anyone who has taken refuge under a tree in the rain. Some of the water in the canopy from the storm will slowly make its way down the bark to the ground, also slowing the amount of water reaching the ground at one time. The remaining raindrops in the canopy evaporate back into the atmosphere without ever reaching the ground. Tree roots and the beneficial fungi associated with them create additional pores within the soil that can hold water.

Where ground surfaces are pervious and water is able to infiltrate, such as leaf litter, organic matter, soil macro pores and tree roots, trees help soak up water and allow more water to infiltrate the soil. The water that tree roots don’t soak up gets filtered into the water table through the root system keeping water from flowing quickly offsite. More water can be stored within soils that have healthy root systems than in soil barren of trees. Tree roots help stabilize soil, working to keep it in place during rain events, instead of being washed downstream or into the sewer systems.

The tree canopy intercepts pollution and particulate matter. Raindrops often carry air pollution such as nitrogen dioxide and particulate matter. Trees, through the interception of raindrops, the slowing of water in its journey to the soil, and their ability to keep water in the soil, help reduce the amount of pollution that would otherwise run off into waterways and sewers.

I would be happy to answer any questions you might have for me.
Testimony Presented to the House Democratic Policy Committee

John Rogers
President, Keystone Conservation Trust
September 15, 2016

Thank you for the opportunity to testify before this esteemed Policy Committee of the House Democrats.

A major issue facing state and local decision makers is how to manage environmental assets in a way that ensures the highest quality of life at the lowest possible cost.

My testimony will focus on two concepts:

First, the financial value of nature is real, significant, impacts many stakeholders and should play a major role in public and private decision making; and

Second, it is not enough for communities to just protect existing open space in order to sustain nature’s financial benefits. We need to identify ways to expand the services that nature provides to ensure sustainable, low-cost infrastructure, quality of life, good health and a strong local economy.

Section § 27
(The Pennsylvania Constitution

Natural resources and the public estate.
The people have a right to clean air, pure water, and to the preservation of the natural, scenic, historic and esthetic values of the environment. Pennsylvania's public natural resources are the common property of all the people, including generations yet to come. As trustee of these resources, the Commonwealth shall conserve and maintain them for the benefit of all the people.

If the goal of our political system is to maximize health, safety and social welfare, and conserve and maintain public natural resources, every policy process should begin with a comprehensive understanding of the value of nature to the local economy and its residents. The question is "Are nature’s contributions to our welfare being adequately and accurately reflected in political, business and personal decisions?"

Nature’s benefits are real.
Beyond their intrinsic value, open space and nature (i.e., forests, wetlands, riparian buffers, meadows and farmland) provide essential cost-free, natural system services such as water supply

Keystone Conservation Trust
and treatment, stormwater management, flood control, pollination and biological control and habitat.

Natural systems work 24 hours a day, 365 days a year without cost to taxpayers. Even though natural system services are inherently renewable, they require natural system productivity and biological diversity to remain intact. Once lost, these services can take 50-100 years to replace nature’s full capacity. In the meantime, these services must be replaced at the taxpayers’ expense.

The U.S. Environmental Protection Agency’s (EPA) Healthy Watersheds Program explains that nature may create green infrastructure solutions that are less expensive and more reliable than engineered solutions. Losing valuable assets year after year is poor asset management. As policy makers want the best financial choice without losing assets they already control, understanding the value of nature is a good business strategy.¹

While residential, commercial and industrial areas require public investment for services, intact natural areas require little more than protection. In this way, nature provides a form of insurance or risk management. Natural systems also increase the resilience of an area to the effects of climate change, decreasing the risk of flooding and allowing more rapid recovery after severe weather events.²

**Nature’s benefits are significant.**

Just as financial analysts express return on investments, new methods are being developed to express a return on the environment (ROE). As a result, policy makers, businesses and residents can begin to see natural systems as a portfolio of financial assets rather than a commodity or extra expense.

Over the last five years, county-wide ROE studies were completed in Berks, Lehigh, Northampton, Cumberland and Monroe Counties. Natural system services and open space per county provided average avoided cost and revenues as shown below.

$543.6 million per county, per year in natural system services (stormwater management, flood mitigation, nutrient uptake, water supply, pollination, habitat, soil erosion prevention, aquatic habitat, habitat regeneration).

$140.65 million per county, per year in air quality pollution control (CO2 and air pollutants).

$409 million per county per year in revenues from outdoor recreation. Activities included hunting, fishing, wildlife watching, bird watching, walking, hiking, running, bicycling, kayaking and canoeing, camping and nature study.

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² Ibid.
5,181 jobs were created related to outdoor recreation activities per county, and these activities realized an average of $32.9 million per county each year in state and local taxes.

The data from the Lehigh Valley ROE study was so compelling that the Northampton County Commissioners put $2.2 million back in their 2015 open space budget.

Nature’s benefits impact a wide range of stakeholders.

Nature’s benefits impact environmental, social and economic concerns. Understanding the value of nature’s benefits helps policy makers, land planners, tourism agencies and economic development groups. Nature’s benefits also affect agriculture and businesses that support recreation, rely on clean water for products (beverages, technology and pharmaceuticals) or require point source outflows. Residents are also impacted by nature’s benefits.

Benefits of estimating nature’s financial value.

Money talks. The benefits of a Return on Environment valuation are as follows:

1. Nature’s complex system is conveyed in a simple bottom line, understandable to a broad audience.
2. Dollars, as a financial measure, underscore nature’s connection to quality of life, health, cost of living, economy and sense of place.
3. Dollars also convey a level of significance or priority to allow for better trade-off analysis.
4. Monetary estimates of the value of natural system services can be applied within decision frameworks related to land use, tourism and economic development.

While any numeric model will engender healthy skeptics, the discussion about nature’s value finally puts this issue on the table in full view so policy makers and citizens are aware of its relative importance.

If planning processes at all levels begin with a clearer understanding of natural system services and values, costly mistakes and losses can be avoided. By doing so, townships can protect valuable natural assets and services at the lowest possible cost. This also helps ensure that a community’s quality of life, healthy environment, cost of living and economy do not deteriorate over time.

Having Return on Environment values mapped encourages better investment choices and helps future investors develop better development plans to protect township financial resources and resident quality of life. Applying Return on Environment estimates in political, business and personal decisions ensures that nature’s contributions are being adequately and accurately reflected.

Keystone Conservation Trust
Measuring nature's financial value.

Because Mother Nature doesn't write receipts, it is difficult to measure the value of natural system services to quality of life, health and cost of living. Like a return on investment analysis, Return on Environment studies place a dollar value on avoided costs provided by natural system services, revenues from recreational activities related to residents' quality of life and health, and taxes gained from premiums people are willing to pay to live close to parks and designated open space. Actual values are based on peer-reviewed articles, fines, replacement costs and investments made.

In the ROE studies that were completed in Pennsylvania, eleven natural system services including water supply, nutrient uptake stormwater management, flood mitigation, pollination, air quality, habitat, aquatic habitat, habitat regeneration, beneficial insects, and soil erosion prevention were valued.

Twelve cover types that reflected current land use were evaluated and an annual avoided cost was determined by summing the natural system service values associated with each cover type. Cover types included: headwaters, wetlands, riparian buffers, floodplains, large forests over 500 acres, forests less than 100 acres, working forests, cultivated fields, pasture and open water.

The dollar value provided by the natural system services and cover types were quantified and mapped to show which resource areas provided the highest financial return each year. These financial values helped explain how loss of habitat and open space can negatively impact local economies and taxes. This information can help decision makers make more informed decisions.

Planning for the Highest Return on Environment

The cover types with the highest financial values are:

- Headwaters
- Wetlands
- Riparian Forests

Each of these cover types provides an annual savings to tax payers of $4,400 of to more than $5,200 per acre, per year, if left in their natural state. Developing tools to protect and restore these areas will provide the highest return on the environment. For example:

1. Informing land use policy and decisions about the financial loss of disrupting natural areas.

2. Providing information on the value of riparian buffer ordinances, open space easement, land purchase investment and Official Map decisions.

3. Creating strategies to reduce flooding, stormwater, restore natural system services and protect air and water quality.

4. Creating incentives to help encourage riparian habitat restoration.
5. Educating residents on nature’s value and inspire good stewardship.


**How to expand the financial benefits of Natural System Services.**

Strategic conservation and restoration goals cannot just focus on protecting what habitat is left, but must identify creative ways to expand and connect existing resource capacity.

If properties along the boundaries of open spaces use native plants and good stewardship principles, the value of existing natural systems are significantly increased—even doubled.

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**Backyard Conservation Design can help communities and homeowners save money**

<table>
<thead>
<tr>
<th>Homeowners</th>
<th>Annual Savings</th>
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<tr>
<td>Design with climate</td>
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</tr>
<tr>
<td>Lawn care</td>
<td>$225</td>
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<tr>
<td>Plant purchase</td>
<td>$200</td>
</tr>
<tr>
<td>Energy conservation</td>
<td>$602</td>
</tr>
<tr>
<td>Water conservation in home</td>
<td>$164</td>
</tr>
<tr>
<td><strong>Homeowner Total</strong></td>
<td><strong>$1,852</strong></td>
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</table>

**Community**

| Stormwater                               | $870           |
| Water treatment                          | $152           |
| Pest control                             | $9             |
| Pollination                              | $7             |
| Flood mitigation                         | $336           |
| Habitat                                  | $1,111         |
| **Community Total**                      | **$2,485**     |

**Total financial impact per year** = **$4,337**

---

**Every House Counts**

An average home on a one-third acre lot can infiltrate 400,000 gallons of rainwater every year. Good backyard design reduces or eliminates runoff, stormwater, flooding and water pollution created by the landscape. This infiltration contributes 88,000 gallons annually to base flow in streams at 55 degrees Fahrenheit which is the temperature where aquatic organisms do best. A similar amount goes to deep groundwater recharge. Good habitat is made up of native trees, shrubs, wildflowers, ferns and grasses and supports a wide variety of resident and migrating birds and butterflies. Other wildlife thrives as well.

Expanding natural system services saves money for communities and homeowners by managing environmental assets in a way that ensures the highest quality of life at the lowest possible cost.
Testimony presented to House Democratic Policy Committee’s Public Hearing on Water and Sewer Infrastructure by Anna Shipp, Project Manager, GSI Partners Thursday, September 15, 2016

Thank you to State Representative Stephen McCarter and the House Democratic Policy Committee for hosting this hearing and for the opportunity to share testimony on the issues surrounding aging infrastructures. We are pleased to remark on the growth of green stormwater management solutions in the greater Philadelphia region.

About the Sustainable Business Network of Greater Philadelphia (SBN)
The Sustainable Business Network of Greater Philadelphia (SBN) is a non-profit membership organization whose mission is to build a just, green, and thriving economy in the Greater Philadelphia region. Our hundreds of members are locally-owned businesses that practice the triple bottom line (TBL), which is a way of thinking and doing that integrates financial success with environmental and social responsibility.

About the Green Stormwater Infrastructure (GSI) Partners
SBN’s signature initiative, the Green Stormwater Infrastructure (GSI) Partners, demonstrates the degree to which investments in green solutions to aging water infrastructure can catalyze strong economic growth. The GSI Partners is a robust and active subset of SBN’s larger membership and currently represents over 60 locally-owned engineering, landscape architecture, architecture, landscape contractors, and material suppliers whose services and products pertain to green stormwater infrastructure. Many of our members are recognized as experts locally, regionally, and nationally. The goal of the GSI Partners is to grow the local GSI industry; to advance innovation, and to amplify the environmental, economic, and social (TBL) benefits of GSI -- all in response to, and in support of, Philadelphia’s innovative, comprehensive stormwater management plan, Green City Clean Waters. We are accomplishing this by advocating for the support and promotion of the greenest approaches and for the significant public and private investment to go to local firms whenever possible.

About Green City Clean Waters
Green City Clean Waters is the City of Philadelphia’s 25-year innovative, comprehensive stormwater management plan to meet EPA Clean Water Act regulations. Philadelphia, like many older cities, has combined sewer systems and separate sewer systems. The combined sewer system connects the wastewater pipes (everything that goes down a drain) with stormwater pipes (everything that hits gutters and street storm drains). On a dry day, all waste water goes to the water treatment facilities and gets treated; on a wet day, wastewater (raw sewage) and stormwater overflow untreated into our rivers and streams, violating Clean Water Act regulations. The separate sewer system keeps the wastewater and stormwater pipes separate, meaning that on dry or wet days, waste water always makes it to the treatment facilities; stormwater, however, is never given the opportunity and always overflows untreated into our rivers and streams, also violating aspects of the Clean Water Act.

Traditionally, stormwater has been managed with large underground networks of pipes and tunnels. However, due to the cost of maintaining and upgrading Philadelphia’s existing water infrastructure, increasingly tighter wastewater discharge regulations, and a number of other considerations, the Philadelphia Water Department proposed a far more cost-effective, decentralized approach: green stormwater infrastructure (GSI). GSI are engineered soil-water-plant systems (e.g., rain gardens, green roofs, tree trenches, curb bump outs, stormwater planters, treatment meadows and wetlands) that manage rain where it falls, allowing the water
to be filtered and to infiltrate into the ground. Comprehensively managing rain where it falls prevents the combined sewer system from getting overwhelmed and overflowing, and prevents untreated stormwater from entering our waterways in the separate sewer system. Additionally, as demonstrated in Philadelphia, these vegetated practices are beautifying neighborhoods and catalyzing significant economic growth.

Philadelphia’s Green City Clean Waters, a triple-bottom-line plan, establishes a national model for a cost-effective, yet economically-stimulating, environmentally and socially beneficial approaches to urban stormwater management.

The Local Economic Impact of Green City Clean Waters: The First Five Years
In February 2016, SBN published a report assessing the local economic impact of the first five years of Green City Clean Waters, and made projections for the economic impact of the next 20 years of the plan. A few of the high-level results are: (Attached to this testimony is the Executive Summary of our report for your review, as well as the full version.)

- Using SBN’s GSI Partners as a proxy, the local GSI industry is believed to be experiencing double-digit annual growth and conservatively represents the annual economic impact of almost $60 million within the city of Philadelphia alone, currently supporting 430 local jobs and generating nearly $1 million in local tax revenues.

- Conservatively, public and private investments over the lifetime of Green City Clean Waters, will produce a $3.1 billion impact on the Philadelphia economy, supporting about 1,000 jobs per year and generating $2 million per year in local tax revenues for the entire 25-year period.

- GSI has already proven itself superior to traditional gray infrastructure solutions in generating more accessible on-ramps for individuals to find employment opportunities and for more local businesses to find contract opportunities.

- GSI represents a neighborhood-level amenity that provides a wide range of quality of life benefits, stabilizing home values, growing the city’s property tax base, and making possible more private investment throughout the city. One study showed 18-27% reductions in narcotics possession and distribution near public GSI features.

Summary
In sum, cities and municipalities in Pennsylvania and across the country have aging water and sewer infrastructure. Increasing development in these areas overwhelms this infrastructure and causes Clean Water Act violations. Philadelphia is leading the nation with its approach to combat these Clean Water Act violations in a cost-effective way for rate payers that simultaneously catalyzes a vibrant green economy, and beautifies every neighborhood.

Philadelphia’s approach demonstrates the degree to which thoughtful environmental policy can save ratepayers money, strengthen local businesses, create jobs, and equitably improve communities.

Just imagine if Green City Clean Waters, and SBN’s complimentary initiative, were replicated in other parts of the state and country.
The ECONOMIC IMPACT of Green City, Clean Waters: The FIRST FIVE YEARS
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Appendix A: Impact of GSI Partner Calculations

Appendix B: Input Output Modeling Methodology

Appendix C: Additional Information on Green City, Clean Waters, and the Regulations, Billing Structure, and Incentives that are Driving Private Investment
The purpose of this report is to articulate the local economic impact of Green City, Clean Waters (GCCW), an ambitious initiative of the Philadelphia Water Department that seeks to invest in green stormwater infrastructure (GSI) projects throughout the City of Philadelphia. GCCW fulfills federally established water quality requirements in ways that are simultaneously environmentally sustainable, positive for the local economy, and beneficial to neighborhoods throughout the City (see Table ES.1).

Table ES.1 GREEN CITY, CLEAN WATERS’ TRIPLE BOTTOM LINE BENEFITS

<table>
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<tr>
<th>ECONOMICS</th>
<th>ENVIRONMENT</th>
<th>EQUITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Green infrastructure provides a more affordable approach for Philadelphia and rate payers, circulates more dollars with the local business community, and improves property values.</td>
<td>Green infrastructure is less energy intensive than gray infrastructure, provides water and air quality improvements, enhances habitats, reduces the carbon footprint, provides an aggregate cooling effect, and enhances adaptability and resiliency.</td>
<td>Green infrastructure creates more neighborhood benefits and more accessible employment/business opportunities than gray infrastructure. Green infrastructure is being leveraged to make improvements to recreation centers, play grounds, and school yards. Green infrastructure enhances aesthetics and reduces blight.</td>
</tr>
</tbody>
</table>
GCCW is currently in Year 5 of a 25-year program, so it is useful to both account for its successes to date and point to even greater impacts upon further implementation of efforts. This report reaches the following key findings:

**Stormwater Management Regulations for Development have helped catalyze a best-in-class GSI industry cluster, with meaningful consequences for the local economy.** The local GSI industry is believed to be experiencing double-digit annual growth, and conservatively represents annual economic impact of almost $60 million within the city of Philadelphia, currently supporting 430 local jobs and generating nearly $1 million in local tax revenues. Innovative solutions birthed by local vendors in response to GCCW have produced export opportunities for the benefit of the local economy and have established Philadelphia’s status as a leader in stormwater management; positive media coverage, national awards, and emulation from such cities as New York City and Washington have followed.

**Public investment in GSI boosts the local economy.** Philadelphia Water has projected that it will invest approximately $1.2 billion in stormwater infrastructure projects over the life of GCCW, and is inducing additional private GSI projects through regulation and incentives. Conservatively, these investments will produce a $3.1 billion impact in the Philadelphia economy, supporting about 1,000 jobs per year and generating $2 million per year in local tax revenues for the entire 25-year period.

**GSI projects advance social equity.** GSI has proven superior to traditional gray infrastructure solutions in generating more accessible on-ramps for individuals to find employment opportunities and for businesses to find contract opportunities. Also, both GSI investments by Philadelphia Water and private GSI investments induced by regulation and incentives can be found in neighborhoods throughout Philadelphia (see Figure ES.1), and hence the benefits they confer at a very local level are enjoyed by a wide range of household income levels. Indeed, the majority of GSI projects (public and private) are located in relatively low-income neighborhoods (with very few in relatively high-income neighborhoods), with some becoming beloved amenities for communities even as they perform an important ecological function.
GSI represents a neighborhood-level amenity that provides a wide range of quality of life benefits, stabilizing home values, growing the city’s property tax base, and making possible more private investment throughout the city.

1. For more information on the distinction between green and gray stormwater mitigation features, please see section 3.2.

---

**GSI Projects as of January 2016**

<table>
<thead>
<tr>
<th>Private Projects</th>
<th>Public Projects</th>
</tr>
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<tbody>
<tr>
<td>All Green Features</td>
<td>All Green Features</td>
</tr>
<tr>
<td>All Gray Features</td>
<td>All Gray Features</td>
</tr>
<tr>
<td>Mix of Green and Gray Features</td>
<td>Mix of Green and Gray Features</td>
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</tbody>
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1. For more information on the distinction between green and gray stormwater mitigation features, please see section 3.2.

---

**Figure ES.1 GREEN AND GRAY STORMWATER INFRASTRUCTURE PROJECTS COMPLETED AS OF JANUARY 2016 UNDER GREEN CITY, CLEAN WATERS**

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The Economic Impact of Green City, Clean Waters: The First Five Years  
February 2016
GSI represents a neighborhood-level amenity that provides a wide range of quality of life benefits, stabilizing home values, growing the city’s property tax base, and making possible more private investment throughout the city. GSI projects beautify areas, create passive and active recreation opportunities in neighborhoods previously lacking such resources, reduce the negative effects of urban blight, and perform valuable ecological services, including cleaner air and less flooding. These gains are enjoyed in neighborhoods throughout Philadelphia, and have resulted in increases in property values relative to houses not near GSI projects. It is estimated that proximity to a GSI feature produces a 10+ percent increase in house value, which means that the 496 GSI projects that have been completed in the first five years have yielded an aggregate $1.3 billion increase in citywide property value, producing an annual increase of $18 million in property taxes for City government and for the School District of Philadelphia.

Table ES.2 ESTIMATED AGGREGATE PROPERTY VALUE INCREASE AND PROPERTY TAX GAIN FROM PROPERTIES WITHIN A QUARTER-MILE OF GREEN STORMWATER INFRASTRUCTURE INVESTMENT

<table>
<thead>
<tr>
<th>Aggregate Property Value</th>
<th>Estimated Property Value Gain from Proximity to GSI Investment</th>
<th>Aggregate Property Value Gain from Proximity to GSI Investment</th>
<th>Aggregate Annual Property Tax Increase from Proximity to GSI Investment</th>
</tr>
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<tbody>
<tr>
<td>$13.8B</td>
<td>10.3%</td>
<td>$1.3B</td>
<td>$18.0M ($8.1M to City and $9.9M to School District)</td>
</tr>
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Five years into an ambitious, daring, and innovative 25-year plan to address federal water quality requirements, GCCW has demonstrated present results and future potential. Its premise is to deal with stormwater on site and in a distributed fashion, using green infrastructure solutions, rather than move it to centralized locations and treating it in traditional gray infrastructure ways. But its promise is grander: to simultaneously pursue economic gain, environmental sustainability, and community benefit, and to not only orient public sector action in this way but to impel private sector participation to the same end. It appears that GCCW’s greatest legacy is to encourage a triple bottom line approach to water quality requirements that saves municipal government billions of dollars and in turn invests in desirable neighborhood amenities, creates local employment and economic opportunities, positively impacts the Philadelphia economy, and generates tax revenue gains for the Philadelphia government.
1.1 INTRODUCTION

The purpose of this report is to articulate the local economic impact of Green City, Clean Waters, which is an ambitious initiative of the Philadelphia Water Department that seeks to invest in green stormwater infrastructure projects throughout the City of Philadelphia. In doing so, Green City, Clean Waters will fulfill federally established water quality requirements in ways that are simultaneously environmentally sustainable, positive for the local economy, and beneficial to neighborhoods throughout the City. Green City, Clean Waters is currently in Year 5 of a 25-year program, so it is useful to both account for its successes to date and point to even greater impacts upon further implementation of efforts. Specifically, this report will speak to the benefit to Philadelphia from cultivating a local green stormwater infrastructure industry cluster, the impact of the work on the local economy and on local real estate markets, and the quality of life gains that will be accrued to Philadelphia’s neighborhoods.

1.2 ABOUT GREEN CITY, CLEAN WATERS

Green City, Clean Waters (GCCW) is the name given to the Combined Sewer Overflow Long Term Control Plan Update (CSO LTCPU), an initiative of the Philadelphia Water Department (Philadelphia Water) that responds to water quality goals set for Philadelphia as part of its consent decree with the United States Environmental Protection Agency and the Pennsylvania Department of Environmental Protection. GCCW will include $1.2 billion in green stormwater infrastructure (GSI) and other investments, including an additional $260 million for stream restoration and wetland creation yielding 9,600 "greened" acres.
The objective of GCCW is to reduce combined sewer overflow (CSO) events in innovative ways that are more cost-effective, environmentally sustainable, and neighborhood-friendly than traditional methods. For more information about the regulations, billing structure, incentives, and goals of GCCW, please see Appendix D.

1.3 THE IMPETUS

Historically, older cities like Philadelphia have managed stormwater runoff by using a combined sewer system that uses vast underground networks of pipes and pumps that carry both sewage and rainwater, treat it at a centralized treatment plant and release it back into bodies of water. However, due to development and increased density, the capacity of the system is regularly overwhelmed during wet weather events. This causes a combination of untreated sewage and stormwater to overflow into rivers and streams, a phenomenon called a combined sewer overflow (CSO).

Specifically, increasingly stringent water quality regulations at the federal (US EPA) and state (PA DEP) levels have necessitated that Philadelphia take action to reduce the number of CSO events.¹

Federal and state regulatory bodies are setting increasingly stringent water quality requirements. These requirements are typically met through traditional “gray infrastructure” methods that would be prohibitively expensive, energy-intensive, and disruptive to neighborhoods. Below-ground solutions are complex, involving vast networks of pipes and devices to capture, store, and treat stormwater. Furthermore, much of Philadelphia’s existing gray infrastructure is over 100 years old, making repair and expansion efforts even more costly. All told, it is estimated that $8 billion to $10 billion in gray infrastructure investment would be needed to comply.²

This is cost-prohibitive for the City: federal policies concerning affordability constrain Philadelphia Water from raising water rates and therefore place a ceiling on capital spending in any given year. Therefore, any response to federal and state requirements involving traditional gray infrastructure methods will not only be extremely expensive but would have to be implemented over a period of several decades, delaying the City’s ability to be compliant.

Increasingly stringent water quality regulations at the federal and state levels have necessitated that Philadelphia take action to reduce the number of combined sewer overflow events.

2. $1.2 billion in 2011 dollars / $2.4 billion in total 2036 dollars
3. Per GCCW: A greened acre manages at least the first inch of rainfall over that acre.
4. The Environmental Protection Agency’s Combined Sewer Overflow (CSO) Control Policy establishes a national approach for controlling discharges from CSOs to bodies of waters through the National Pollutant Discharge Elimination System (NPDES) permit program. The CSO Control Policy mandates that CSO permittees should develop long term CSO control plans which evaluate alternatives for attaining compliance with the Clean Water Act. The Pennsylvania Department of Environmental Protection developed a policy in response to “improve and preserve the purity of the waters of the Commonwealth through the adequate permitting and control of CSOs.” This policy describes the actions that will be taken if permit conditions are violated.
1.4 THE ALTERNATIVE

Philadelphia Water proposes instead to approach stormwater management in a distributed manner, using a variety of “green stormwater infrastructure” (GSI) techniques installed throughout the city. Also known as low impact development (LID), GSI represents water-soil-plant systems that intercept stormwater, infiltrate a portion of it into the ground, evaporate a portion of it into the air, and in some cases release a portion of it slowly back into the sewer system recreating the natural water cycle in a dense urban area.

According to this report and other research conducted, this approach promises greater local benefits in the form of desired amenities, positive health outcomes, energy savings, and economic opportunities.

In 2011, Philadelphia Water signed a consent agreement with the US EPA to implement GCCW over the next 25 years as an alternative approach to satisfying water quality requirements. Philadelphia Water is currently 5 years into the 25-year plan to meet water quality requirements through green stormwater infrastructure principles and investments. This paradigm shift – from traditional stormwater infrastructure systems to innovative GSI solutions – will begin to contribute to water quality improvements immediately, while a large tunnel project would not reduce CSOs until it was completed. Alternatively, above-ground investments using GSI serve to not only support incremental improvements to water quality over time, but also create additional environmental, economic, and social benefits. This above ground investment will enhance the urban environment and add value to properties throughout the city.

1.5 A PARADIGM SHIFT IN WATER QUALITY CONTROL

Fundamentally, GCCW represents a paradigm shift in water quality control, from utilizing complex, expensive, and energy-intensive gray infrastructure methods below ground to dealing with stormwater to treating stormwater above ground and on site and thereby reducing (or in some cases eliminating entirely) the amount of stormwater that enters into the City's sewer collection system. As such, it is governed by the following guiding principles:

1. Thinking of stormwater as a resource to be used for good where it falls, rather than a problem to be dealt with by moving it away and treating it elsewhere.

2. Being strategic and cost-effective in the maintenance and upgrading of one of the nation’s oldest water infrastructure systems.

3. Activating regulatory partners, the public sector, and business community, as well as advocacy groups and local citizenry to come together on strategies that simultaneously achieve economic, environmental, and equity objectives.

If successful, GCCW will fundamentally shift the way urban stormwater is managed throughout the country.

Figure 1.1: AN EXAMPLE OF A STORMWATER TUNNEL BEING CONSTRUCTED IN PORTLAND, MAINE & THE PHILADELPHIA FREE LIBRARY’S GREEN ROOF

© LRSLA Studio, Inc.

1.6 IN PURSUIT OF TRIPLE BOTTOM LINE ACTIVITIES

GCCW is reflective of a broader movement, at both the national and local levels, towards “triple bottom line” activities that simultaneously achieve multiple objectives (see Table 1.1). This innovative approach to stormwater management is being followed carefully by other municipalities and serves as a blueprint for similar work in New York City, Washington D.C., Buffalo, and Kansas City. If successful in fulfilling its aims, GCCW will serve as the gold standard for cities across the country, fundamentally shifting the way urban stormwater is managed throughout the country, and build on Philadelphia’s long-standing leadership position in municipal water management.

Table 1.1 GREEN CITY, CLEAN WATERS’ TRIPLE BOTTOM LINE BENEFITS

<table>
<thead>
<tr>
<th>ECONOMICS</th>
<th>ENVIRONMENT</th>
<th>EQUITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GREEN INFRASTRUCTURE...</td>
<td>GREEN INFRASTRUCTURE...</td>
<td>GREEN INFRASTRUCTURE...</td>
</tr>
<tr>
<td>• Provides a more affordable approach for Philadelphia and rate-payers,</td>
<td>• Is less energy intensive than grey infrastructure,</td>
<td>• Creates easier on-ramps for employment and business opportunities,</td>
</tr>
<tr>
<td>• Has the potential to be more cost effective than gray infrastructure,</td>
<td>• Provides water and air quality improvements,</td>
<td>• Represents desirable amenities in residential neighborhoods,</td>
</tr>
<tr>
<td>• Circulates more dollars with the local business community,</td>
<td>• Enhances habitats,</td>
<td>• Is less disruptive to residential neighborhoods and commercial corridors,</td>
</tr>
<tr>
<td>• Supports local jobs and generates local tax revenues,</td>
<td>• Reduces the carbon footprint,</td>
<td>• Is being leveraged to make improvements to recreation centers, playgrounds, and schoolyards, and</td>
</tr>
<tr>
<td>• Has led to a best-in-class GSI industry cluster, and</td>
<td>• Provides an aggregate cooling effect,</td>
<td>• Enhances aesthetics and reduces blight.</td>
</tr>
<tr>
<td>• Improves property values.</td>
<td>• And enhances adaptability and resiliency.</td>
<td></td>
</tr>
</tbody>
</table>
1.7 NATIONAL INTEREST IN GREEN CITY, CLEAN WATERS

The City of Philadelphia has long been a leader in municipal water management, and the implementation of GCCW has reaffirmed this status, drawn national attention and accolades (see Table 1.2), and afforded Philadelphia influence as an innovator and convener on stormwater management. This is hugely important for Philadelphia, both from a reputational standpoint (Philadelphia is seen as a leader and trend-setter on vital municipal issues) and for producing intellectual capital that can be exported to other cities (Philadelphia firms are seen as go-to vendors for a variety of products and services needed in other parts of the country).

Table 1.3 SELECTED LIST OF HONORS AND ACTIVITIES CATALYZED BY GREEN CITY, CLEAN WATERS

<table>
<thead>
<tr>
<th>HONOR/ACTIVITY (YEAR)</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>US Water Prize (2012)</td>
<td>Presented by the U.S Water Alliance</td>
</tr>
<tr>
<td>Sustainability Award (2012)</td>
<td>Presented by the Pennsylvania Horticultural Society</td>
</tr>
<tr>
<td>Environmental Communications Award (2014)</td>
<td>Presented by the American Academy of Environmental Engineers and Scientists</td>
</tr>
<tr>
<td>Emerald City Rating (2011)</td>
<td>The only city profiled by the Natural Resources Defense Council undertaking all six recommended actions related to GSI investment</td>
</tr>
</tbody>
</table>

“Smart communities will build green infrastructure. At the municipal level, the pioneer operating on a grand scale is the city of Philadelphia.”

--- Forbes

AWARD: FROM THE NATURAL RESOURCES DEFENSE COUNCIL

In November 2011, the Natural Resources Defense Council ranked cities working to employ green stormwater infrastructure to reduce combined sewer overflows. Philadelphia was the only city to meet all six of the review criteria. In order to meet the criteria, cities were required to have a vision linked with a long-term green infrastructure plan, prioritization of infrastructure investments, a strong retention standard for stormwater reduction or management of runoff from impervious surfaces, incentives for residential and commercial property owners to install green infrastructure, and lastly a long-term, dedicated funding source to support green infrastructure investment.

Source: Natural Resources Defense Council
1.8 REPORT OVERVIEW

Given the import of what GCCW represents for Philadelphia and as a national model, it is appropriate to take stock, five years into a 25-year effort, of its performance and benefits. The purpose of this report is to express the local economic impact of GCCW during its first five years of operation, and to discuss where it has been successful in achieving its intended economic, environmental, and equity aims. The report begins with a description of the local GSI business cluster that GCCW has helped grow (Section 2). The report then describes three sets of gains produced by GCCW: impacts to the local economy and tax base from the economic activity catalyzed by GCCW (Section 3), impacts to neighborhood residential real estate markets from the addition of GSI features (Section 4) and quality of life benefits to households throughout Philadelphia (Section 5). The report concludes with a summary of these early gains and their implications for highlighting the success of GCCW (Section 6).

Source: Inside D.C.'s Massive Tunnel Project, Brian Clark Howard, National Geographic, July 5th, 2014

Source: Rooftmeadow
GCCW continues to draw national attention and accolades, and affords Philadelphia influence as an innovator and convener on sustainable stormwater management.
IMPLICATIONS ON THE LOCAL ECONOMY OF GROWING A BEST-IN-CLASS GREEN STORMWATER INFRASTRUCTURE INDUSTRY CLUSTER

2.1 SECTION OVERVIEW

This is the first of four sections articulating anticipated benefits from *Green City, Clean Waters* and evaluating the extent to which these benefits have materialized or will materialize. Through regulation, investment, and incentives, Philadelphia Water has created an economic landscape that encourages the development of a local industry cluster of green stormwater infrastructure firms that provide best-in-class products, services, solutions, and developments. This has the effect of actualizing the triple bottom line potential of GCCW in Philadelphia, of providing accessible on-ramps for employment and business opportunities, including for traditionally disadvantaged communities, and of creating opportunities for local firms to gain business in other parts of the country. This section will endeavor to describe the composition and growth of this industry cluster, quantify its economic footprint within Philadelphia, and evaluate the extent to which the promises of export and of economic inclusion have been fulfilled.
2.2 MAINTAINING A DIVERSE ECONOMY THAT FOSTERS INNOVATION

Manufacturing jobs have provided Philadelphia residents with family-supporting wages for the last century. However, like other metropolitan areas, the City has shifted away from goods-producing industries and has become more dependent on service-providing sectors. Unfortunately, the manufacturing industry in Philadelphia no longer supports the jobs or revenue for the City that it once did. Between 2007 and 2012, the industry has seen a 12.8 percent decline in total firms, a 20.4 percent decline in total employees, and a 12 percent decline in annual sales within the Philadelphia region. However, in order to keep up with global economic forces, Philadelphia has cultivated new industries to compensate for sectors like manufacturing that are experiencing stagnation or becoming obsolete. In fact, the Bureau of Labor Statistics’ Quarterly Census of Employment and Wages shows that the combined job growth in health services and professional and business services has helped offset the losses in the manufacturing industry over the last ten years. The growth of annual revenues of the GSI Partners’ firms from 2013 to 2014 represents the City’s dedication and new dependence on GSI as a growing industry.

While there is growing consensus on what constitutes GSI, the work transcends traditional industry classifications, making it difficult to calculate the size of the GSI industry in Philadelphia. One useful proxy of the size – and rapid growth – of the GSI industry in Philadelphia is SBN’s GSI Partners. Through the GSI Partners, SBN is working to grow the local GSI industry and advance innovation by ensuring processes and incentives encourage GSI and that public and private investment benefits local firms. Members include locally-based architecture, engineering, and landscape architecture firms; landscape design, build, maintenance firms; and material suppliers whose services and products pertain to GSI.

GSI Partners is growing in membership, and the partner firms are growing as well. These firms revenues totaled more than $146.8 million 2014, an increase of 14 percent from 2013 (see Table 2.1).

A useful proxy for the size and growth of Philadelphia’s GSI industry is the Sustainable Business Network’s GSI Partners, whose members experienced an increase of 14% in annual revenue from 2013 to 2014.

10. Please see Appendix A for details on the Impact of GSI Partners.
GSI Partners firm operations’ growth has a significant impact across the City. By supporting jobs and other businesses in the area, GSI Partners firm operations have a significant economic impact on the City of Philadelphia in three ways:

1. The direct footprint of GSI Partners firms. Revenue growth and the percent increase in growth are shown in Table 2.1.

2. GSI Partners firm operations require direct procurement of various goods and services, a portion of which take place within the city. These local expenditures have a ripple effect on the economy. Expenditures on goods and services cause suppliers of those goods and services to increase production to meet the demand as well as acquire additional goods and services from their suppliers, who themselves will do the same. The additional output, employment, and earnings beyond the activity at GSI Partners firms is known as the **indirect impact**.

3. GSI Partners firms directly employ hundreds of full- and part-time workers, a portion of whom live within the City. The wages and salaries provide employees with additional spending power. Some of that spending power is exercised within the region, supporting local providers of various goods and services (e.g., food, entertainment, housing, retail, and transportation). This additional output, employment, and earnings beyond the activity at GSI Partners firms is known as the **induced impact**.

ESI constructed an economic impact model using multiplier data provided by IMPLAN, an industry standard input-output modeling software program, to estimate the scale and composition of spillover impacts generated by activity associated with GSI-related activities in Philadelphia. The results indicate that operations associated with just the Philadelphia-based GSI Partners (n=31) on green stormwater infrastructure projects in the City of Philadelphia account for $35 million in total annual revenues. This in turn generates an annual economic impact of $57 million within the City of Philadelphia alone; supports 430 direct, indirect, and induced jobs annually; and generates $27 million in annual labor income for the City. More details on the methodology can be found in Appendix A.

### Table 2.1 Revenue Growth of GSI Partners Firms Within the City of Philadelphia

<table>
<thead>
<tr>
<th>2013 Revenue</th>
<th>2014 Revenue</th>
<th>Revenue Increase</th>
<th>% Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>$128,959,000</td>
<td>$146,796,900</td>
<td>$17,837,900</td>
<td>13.8%</td>
</tr>
</tbody>
</table>

Source: Econsult Solutions (2016), GSI Partners (2016)
The ongoing operations these of GSI Partners firms, coupled with spending from local residents and employees, generate annual tax revenues to the City of Philadelphia government. The associated tax revenues come from personal income and wages, sales, and business taxes. In total, the City of Philadelphia currently gains nearly $860,000 in tax revenue each year as a result of GSI Partners firm operations (see Table 2.3).

It is important to note that these results are simply the impact of the operations of these 60 GSI Partners firms, rather than the overall impact of the GSI industry within Philadelphia, which is much greater. Additionally, these impacts are projected to grow significantly over the next several years as local GSI firms grow in tandem with the demand for GSI work within the City.

### Table 2.2 ESTIMATED CURRENT ANNUAL ECONOMIC IMPACT OF GSI PARTNERS FIRMS PERFORMING GSI WORK WITHIN THE CITY OF PHILADELPHIA

<table>
<thead>
<tr>
<th>Impact Type</th>
<th>City of Philadelphia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Output</td>
<td>$35 M</td>
</tr>
<tr>
<td>Indirect &amp; Induced Output</td>
<td>$22 M</td>
</tr>
<tr>
<td>Total Output</td>
<td>$57 M</td>
</tr>
<tr>
<td>Employment Supported</td>
<td>430 jobs</td>
</tr>
<tr>
<td>Labor Income Supported</td>
<td>$27 M</td>
</tr>
</tbody>
</table>


### Table 2.3 ESTIMATED CURRENT ANNUAL FISCAL IMPACT OF GSI PARTNERS FIRMS PERFORMING GSI WORK WITHIN THE CITY OF PHILADELPHIA

<table>
<thead>
<tr>
<th>Tax Type</th>
<th>City of Philadelphia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>$580,000</td>
</tr>
<tr>
<td>Sales</td>
<td>$109,000</td>
</tr>
<tr>
<td>Business</td>
<td>$170,600</td>
</tr>
<tr>
<td>Total</td>
<td>$859,000</td>
</tr>
</tbody>
</table>

2.3 THE BENEFITS OF BEING FIRST

In addition to regulation, investment, and incentives generating GSI work in Philadelphia, Green City, Clean Waters is also creating a best-in-class GSI industry cluster whose early work and innovations is producing vendors primed for work within as well as outside of Philadelphia. As other cities look to the City of Philadelphia government as a national model for municipal stormwater management, they are also taking note of the innovative solutions being implemented by a growing sector of manufacturers of GSI products and providers of GSI services.

There are two pivotal aspects of the perception gain for Philadelphia in being first and foremost in green stormwater infrastructure. First is the reputational enhancement to the city itself, as a place of innovation and triple bottom line solutions. Second are the export opportunities for Philadelphia vendors and service providers who are sought out because of their experience and work in the city of Philadelphia and thus support additional employment and tax base in the city. Both of these gains can be seen in vivid ways in the recent successes of three local companies providing innovative solutions in the GSI space (see insets). In all three cases, the private sector has responded to regulation-driven opportunities. There is now an economic incentive to deal with stormwater through green stormwater infrastructure methods - with innovative solutions given the new rules of the marketplace.

Green City, Clean Waters is creating a best-in-class GSI industry cluster of local vendors and service providers prepared for work in Philadelphia and beyond.
2.4 A DIVERSITY OF OPPORTUNITIES

Another hugely important consequence of GCCW is that it is superior to the traditional gray infrastructure approach in generating on-ramps for individuals to find employment opportunities and businesses to find contract opportunities. Gray stormwater projects are typically bid on by multinational engineering firms. Submitting a bid on a large government contract requires significant investments in time and labor and it can be difficult for small, local firms to win projects like these. Green infrastructure projects are typically smaller in size and the bidding process is less capital intensive. It has also led to a vibrant support network of advocacy groups, technical assistance providers, and non-profits.

The traditional gray infrastructure solution to meeting Philadelphia’s CSO goals would potentially result in a sewage tunnel under the City costing billions of dollars. This type of large infrastructure project would likely go to a large, international construction firm. The employment impact would not necessarily be as localized and the gains from the contract would also circulate largely outside the city.\(^\text{11}\)

In contrast, GSI work creates more, smaller opportunities that can represent contract and employment opportunities for local firms and residents. The City’s procurement process requires compliance with City policies concerning the use of minority and women-owned businesses. Labor input for GSI work presents entry level (e.g. landscaping and restoration activities) with advancement opportunities for living wage levels and beyond. Additionally, GCCW creates opportunities for intersection with the aims and actions of the City’s current programming around youth violence reduction, truancy prevention, and ex-offender re-entry.

\(^\text{11}\) Stratus Consulting, A Triple Bottom Line Assessment of Traditional and Green Infrastructure Options for Controlling CSO Events in Philadelphia’s Watersheds.
In 2015, the Overbrook Environmental Education Center facilitated a 15-week Green Stormwater Infrastructure and Aesthetic Maintenance course to Philadelphia High School students. This course emphasized stormwater best management practices as directed in GCCW.

Eligible program participants are students enrolled in Career Technical Education schools and have an expressed interest in science, technology, engineering and/or math. After successfully completing the program’s Green Streets Design and GSI Maintenance coursework, students participate in a 6-week paid in-field training, of which, thirty percent of last year’s cohorts are now making a livable wage, employed as Green Stormwater Maintenance Apprentices with PWD.

The GCCW program is supported by a growing network of advocacy groups, technical assistance providers, and other non-profits promoting GSI education and training. These groups include the Overbrook Environmental Education Center, Jastech and PowerCorpsPHL. It is also supported by Soak it Up!, an innovative grant program managed by the Pennsylvania Environmental Council in partnership with the Philadelphia Industrial Development Corporation. Grants are provided to civic groups to help maintain the beauty and functionality of green stormwater infrastructure.

GSI PARTNER QUOTES:

“We have a GSI contract with an engineering firm as part of a SMIP grant that will double our revenues this year.”
POWERCORPSPHL is an AmeriCorps program designed to support the City of Philadelphia’s youth violence prevention and workforce development initiatives. They annually enroll 100 individuals, ages 18-26 in a 9 month program that includes 6 months of full-time service as AmeriCorps membership and 3 months of intensive job placement support. The program encourages environmental stewardship, while building career opportunities for Philadelphia’s youth.

Their goal is to strengthen communities by maintaining and enhancing public spaces and breaking down barriers to employment for Philadelphia’s young adults. Power Corps provides training and service. Corps members gain technical and transferable skills, work experience, and support transitioning to the demands of the 21st century economy. Their service work helps to maintain city’s green infrastructure, making Philadelphia healthier, safer, and stronger.

“Team “Blue Magic” supports the Green Stormwater Infrastructure Maintenance Team. This group of young men and women has done an outstanding job of maintaining the green in Philadelphia. In just over 10 weeks on the job, they have collected over 9,385 lbs. of trash and street litter (over 4 tons), 3,124 lbs. of leaves and organic debris and 2,138 lbs. of construction materials from green stormwater infrastructure (GSI) across the city. These achievements are the result of over 430 hours of hard work, completing over 326 work orders for PWD.”

3.1 SECTION OVERVIEW

Another important characteristic of Green City, Clean Waters is that it has represented, and will continue to represent, significant investment all throughout Philadelphia. There are 125 constructed public projects and 172 constructed private projects. These projects can be found in practically every major neighborhood in Philadelphia’s combined sewer area. This section shows where those investments have taken place and what their overall impact has been on the Philadelphia economy and on Philadelphia tax bases.

These public investments, and the overall framework of regulations and incentives created by Philadelphia Water, have many spillover benefits to the city as a whole. Private expenditures tend to cluster in Center City and major commercial corridors, because those are locations where the lot sizes and the underlying economics warrant major infrastructure investment; however, even these dollars have been distributed all throughout Philadelphia.

Figure 3.1 PUBLIC AND PRIVATE STORMWATER INFRASTRUCTURE PROJECTS COMPLETED AS OF JANUARY 2016 UNDER GCCW
The median annual household income of Philadelphia is $35k

Figure 3.2 DISTRIBUTION OF CENSUS BLOCK GROUPS WITH A GSI PROJECT BY MEDIAN INCOME LEVEL

Note: The median income of a census block group is defined as follows: low if less than 80% of the citywide median; moderate if between 80% and 120% of the citywide median; medium if between 120% and 200% of the citywide median; and high if over 200% of the citywide median.

GSI PARTNER QUOTES:

"My company has been greatly affected by Green City, Clean Waters. About 40% of our projects have been because of public or private investment in GSI, and about 25% have benefited from grant funding for GSI."
3.2 PUBLIC GSI PROJECTS

As noted above, public GSI projects are part of a $1.2 billion investment commitment in Philadelphia by Philadelphia Water. As this section demonstrates, these investments span a large geographic footprint reaching into neighborhoods through Philadelphia and therefore providing ecological as well as economic and social benefits to residents of every walk of life.

The location of public projects is chosen in large part to achieve the most and best water quality solutions at the lowest financial cost and civic disturbance. Philadelphia Water aims to distribute GSI throughout the portion of the city that contains combined sewer system, which is about 65 percent of the city and covers the densest urban areas. There are 125 public GSI projects built and these projects include 474 features to mitigate stormwater. There are 238 public projects that are in the planning phase but have not been constructed. Table 3.1 lists the most common features.

These projects can be found throughout the city.
In fact, some have become beloved amenities for communities, even as they perform an important ecological function. Figure 3.4 shows the distribution of public GSI projects by the median household income of the Census block group in which they are located. It is notable that the majority of public GSI projects are located in relatively low-income neighborhoods, and very few are located in relatively high-income neighborhoods.

Controlling stormwater can be done with a combination of green and gray features. Green features include pervious paving, green roofs, rain gardens, stormwater bumpouts, stormwater planters, stormwater tree trenches, stormwater wetlands and swales. Gray features are subsurface features including subsurface basins, cisterns, rain barrels, and underground holding tanks. Tables 3.1 and 3.2 include the count of the various green and gray features in planned and constructed projects.

Table 3.1  **ALL FEATURES OF PUBLIC PROJECTS** *(Multiple Features per Project)*

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Planned</th>
<th>Constructed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stormwater Bumpout</td>
<td>140</td>
<td>17</td>
<td>157</td>
</tr>
<tr>
<td>Depaving</td>
<td>5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Green Gutter</td>
<td>1</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Green Roof</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pervious Paving</td>
<td>47</td>
<td>10</td>
<td>57</td>
</tr>
<tr>
<td>Stormwater Planter</td>
<td>143</td>
<td>49</td>
<td>192</td>
</tr>
<tr>
<td>Rain Garden</td>
<td>117</td>
<td>54</td>
<td>171</td>
</tr>
<tr>
<td>Stormwater Tree</td>
<td>10</td>
<td>86</td>
<td>96</td>
</tr>
<tr>
<td>Swale</td>
<td>35</td>
<td>6</td>
<td>41</td>
</tr>
<tr>
<td>Stormwater Tree Trench</td>
<td>491</td>
<td>194</td>
<td>685</td>
</tr>
<tr>
<td>Gray Feature</td>
<td>221</td>
<td>57</td>
<td>278</td>
</tr>
<tr>
<td><strong>Total Features</strong></td>
<td>1,210</td>
<td>474</td>
<td>1,684</td>
</tr>
<tr>
<td><strong>Total Public Projects</strong></td>
<td>238</td>
<td>125</td>
<td>363</td>
</tr>
</tbody>
</table>

To date, the majority of the 363 completed and planned public GSI projects are located in relatively low income communities.
The stormwater regulations create opportunities for builders to incorporate green features into their projects, which the marketplace is beginning to value more.

### 3.3 PRIVATE GSI PROJECTS

In addition to public GSI projects, Philadelphia Water’s stormwater regulations create a responsibility for the private sector to make its own investments in stormwater management. Specifically, earth disturbances of greater than 15,000 square feet require on-site stormwater management solutions to manage stormwater at a minimum of 1.5 inches. As is articulated more in Section 4, this creates an opportunity for builders to incorporate green features into their product, something that the marketplace is beginning to value in ways that can produce profit opportunities for developers.
There are 172 private projects comprised of 409 features to mitigate stormwater. There are 502 additional private projects that are in the planning phase but have not been constructed. Private GSI projects occur where development is happening, which results in a concentration of private investment in Center City and popular commercial corridors, as well as other areas that are just starting to see development interest. Figure 3.5 reflects these clusters of private GSI investment. These rapidly growing areas are being made more environmentally sustainable as a result of the stormwater regulations. These areas tend to include a wide range of household income levels, all of which are then benefitting from the presence of these investments.

Importantly, private GSI projects occur wherever development is happening, and while there are concentrations of development in Center City and edge areas, development is in fact occurring all throughout the city and therefore private GSI projects are similarly spread out. This means some are located in areas outside of the city’s combined sewer area and so they are further distributing the spillover economic and quality of life benefits throughout the city. Despite the fact that private GSI projects by definition are located where new development is subject to regulations requiring such investments, it is important to note that, as with public GSI projects, many private GSI projects are located in relatively low-income neighborhoods, and very few are located in relatively high-income neighborhoods. The average income level of the Census block groups where private GSI projects are located is $35,000, which is about the median household income in Philadelphia. Please see Figure 3.6 for a distribution of census block groups with a private GSI project by median income level.

Figure 3.5 PRIVATE STORMWATER INFRASTRUCTURE PROJECTS COMPLETED AND PLANNED AS OF JANUARY 2016 UNDER GCCW
The cost of installing GSI on private projects depends on a number of factors, including the size of the feature, the type of GSI feature, and the features of the site. The cost of installing GSI on private projects is not currently tracked. As such, it is impossible to estimate the aggregate investment in Philadelphia represented by these projects. However, their size and geographic distribution suggest a magnitude that could rival that which is being projected for public GSI. To be conservative, it is assumed that aggregate private investment will be equivalent to half the total value of public investment, or $600 million. Hence, public and private GSI investment will total at least $1.8 billion in today’s dollars over the 25-year period starting in 2011. This is a conservative estimate.
Table 3.2 **ALL FEATURES OF PRIVATE PROJECTS**

(Multiple Features per Project)

<table>
<thead>
<tr>
<th>Feature Type</th>
<th>Planned</th>
<th>Constructed</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bio-infiltration</td>
<td>119</td>
<td>39</td>
<td>158</td>
</tr>
<tr>
<td>Bio-retention</td>
<td>286</td>
<td>56</td>
<td>342</td>
</tr>
<tr>
<td>Green Roof</td>
<td>189</td>
<td>31</td>
<td>220</td>
</tr>
<tr>
<td>Porous Pavement</td>
<td>24</td>
<td>10</td>
<td>34</td>
</tr>
<tr>
<td>Surface Detention Basin</td>
<td>68</td>
<td>21</td>
<td>89</td>
</tr>
<tr>
<td>Surface Infiltration Basin</td>
<td>155</td>
<td>10</td>
<td>165</td>
</tr>
<tr>
<td>Gray Feature</td>
<td>850</td>
<td>242</td>
<td>1092</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,691</strong></td>
<td><strong>409</strong></td>
<td><strong>2,100</strong></td>
</tr>
<tr>
<td><strong>Total Private Projects</strong></td>
<td><strong>502</strong></td>
<td><strong>172</strong></td>
<td><strong>674</strong></td>
</tr>
</tbody>
</table>

3.4 **PROJECTED ECONOMIC IMPACT**

The overall economic impact of these future private and public investments is quantifiable.

The estimated $1.8 billion in spending over the next twenty-five years was entered into the IMPLAN input-output model to estimate the total economic impact. The investments will lead to a total expenditure impact of $3.0 billion within the City, supporting about 1000 jobs each year and approximately $1.5 billion in total labor income (see Table 3.3).

The cost of installing GSI on private projects is not currently tracked, however, project size and geographic distribution suggest a magnitude that could rival that which is being projected for public GSI.

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15. The annual employment impact represents an average per year over the estimated 25-year period rather than a precise yearly impact. Construction spending and job demand is likely to fluctuate during varying phases of the project and thus will likely not stay constant over the three year period.
The direct, indirect, and induced economic impacts generate tax revenues to the City of Philadelphia. The associated tax revenues come from the personal income or wages, sales, and business taxes directly and indirectly associated with the new developments. In aggregate, the City of Philadelphia will gain an additional $48 million of additional tax revenue over the next 25 years, or about $2 million per year during that time (see Table 3.4).

### Table 3.3 TOTAL ECONOMIC IMPACT OF GREEN CITY CLEAN WATERS STORMWATER INFRASTRUCTURE INVESTMENTS WITHIN THE CITY OF PHILADELPHIA OVER THE NEXT 25 YEARS

<table>
<thead>
<tr>
<th>Impact Type</th>
<th>Public Investment</th>
<th>Private Investment</th>
<th>Total Investment</th>
<th>Annualized Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Output</td>
<td>$1,200 M</td>
<td>$600 M</td>
<td>$1,800 M</td>
<td>$72 M</td>
</tr>
<tr>
<td>Indirect &amp; Induced Output</td>
<td>$840 M</td>
<td>$418 M</td>
<td>$1,254 M</td>
<td>$50 M</td>
</tr>
<tr>
<td>Total Output</td>
<td>$2,036 M</td>
<td>$1,018 M</td>
<td>$3,054 M</td>
<td>$122 M</td>
</tr>
<tr>
<td>Employment Supported (Job-Years)</td>
<td>15,656</td>
<td>7,828</td>
<td>23,484</td>
<td>940</td>
</tr>
<tr>
<td>Labor Income Supported</td>
<td>$1,020 M</td>
<td>$510 M</td>
<td>$1,530 M</td>
<td>$60 M</td>
</tr>
</tbody>
</table>


Conservatively, over the life of GCCW, public and private investments in GSI are projected to produce a $3.1 billion impact in the Philadelphia economy, supporting roughly 1,000 jobs per year and generating $2 million per year in local tax revenues.
**2.0 UNIVERSITY PLACE**

2.0 UNIVERSITY PLACE is the forefront of green building design in Philadelphia. The over 90,000 square foot, Class A structure is completely eco-friendly, earning a Platinum Pre-Certification rating from the U.S. Green Building Council’s L.E.E.D. (Leadership in Energy and Environmental Design) program – the highest standard for environmentally sustainable construction. Stormwater is managed through an extensive modular green roof system composed of soil media and drought-tolerant vegetation.

Source: 2.0 University Place

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### Table 3.4 TOTAL FISCAL IMPACT OF GREEN CITY CLEAN WATERS STORMWATER INFRASTRUCTURE CAPITAL INVESTMENTS WITHIN THE CITY OF PHILADELPHIA OVER THE NEXT 25 YEARS

<table>
<thead>
<tr>
<th>Tax Type</th>
<th>Public Investment</th>
<th>Private Investment</th>
<th>Total Investment</th>
<th>Annualized Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Income</td>
<td>$23 M</td>
<td>$11 M</td>
<td>$34 M</td>
<td>$1.3 M</td>
</tr>
<tr>
<td>Sales</td>
<td>$4 M</td>
<td>$2 M</td>
<td>$6 M</td>
<td>$0.2 M</td>
</tr>
<tr>
<td>Business</td>
<td>$6 M</td>
<td>$3 M</td>
<td>$9 M</td>
<td>$0.4 M</td>
</tr>
<tr>
<td>Total</td>
<td>$32 M</td>
<td>$16 M</td>
<td>$48 M</td>
<td>$1.9 M</td>
</tr>
</tbody>
</table>

4.1 SECTION OVERVIEW

An important benefit of green stormwater infrastructure, as opposed to traditional gray infrastructure, is that it produces tangible quality of life benefits to households. GSI projects beautify areas, create recreation opportunities in neighborhoods previously lacking such resources, and perform invaluable ecological services that result in cleaner air and less flooding.

Basic real estate economics states that when positive features are added to a place, demand for that place as a residential location increases, which produces one or both of the following outcomes: an increase in housing values and/or an increase in housing supply. Both of these outcomes are essential for the health of individual neighborhoods and the vitality of the city as a whole: an increase in housing values means more wealth for homeowners and more tax revenues for the City and the School District of Philadelphia; and an increase in housing supply means more investment in Philadelphia neighborhoods and more choices for prospective residents. To be sure, the specter of displacement of long-time low-income residents through higher property tax bills is ever present, but it should not necessarily prevent public policies that result in the introduction of attractive amenities that improve quality of life and render important ecological services in otherwise disinvested neighborhoods.

The purpose of this section is to summarize analytical work currently being performed by Econsult Solutions, Inc. as part of a US Environmental Protection Agency grant to explore the property value impact of GSI projects in neighborhoods throughout Philadelphia. In other words, one of the important benefits of Green City, Clean Waters is that it has produced household wealth for private property owners as well as an increase in the property tax base from which both the City and School District derive a significant proportion of their operating revenues.
4.2 RESIDENTIAL PROPERTY VALUE IMPACT

The impact of the spillover benefits of green stormwater infrastructure on property values can be estimated using an economic technique known as a hedonic regression model. Hedonic regression models have been used to estimate the positive impacts of improved water quality, open space, neighborhood greening as well as the negative impacts of being located in close proximity to landfills, toxic waste sites, and power plants.\(^\text{16}\)

This analysis only uses GSI projects that had been built by March 2014. The full dataset that has been used previously in this report includes projects completed in 2015, however, the home sales data used to measure the impact the GSI features have on home value, is from early 2014.

The impact of stormwater infrastructure likely differs based on who installed the infrastructure (public vs private) and the distance to the investments. The analysis controlled for being located close to a green stormwater investment by including a dummy variable that indicates whether the property is within a quarter mile of green public project and a variable that indicates whether the project is within an eighth mile of green private investment. The analysis also controlled for whether the public project occurred at a park, school, or recreation center. In these ways, the different ways in which stormwater infrastructure investments can be seen as beneficial to an immediate area could be teased out.

Our results indicate that green stormwater infrastructure investments have had a positive impact on local communities. The variables that describe the impact of stormwater infrastructure are statistically significant and have the expected sign (positive). Being located within a quarter mile of public project that did not occur at park, school or recreation center has a positive impact on nearby residential property values of 12.7 percent, while being located near a public project that occurred at a park, school or rec center is 11.5 percent. The larger impact from being located near a public project that did not occur at park, school or recreation center is likely due to the fact that these projects are adding green features to a neighborhood that otherwise did not have much in the way of green. Nevertheless, it is notable that public projects have such a significant impact in neighborhoods that already have some green amenities.

16 The basic premise of a hedonic pricing model is that the price of good is related to the characteristics of the good. For example, the price of a house is related to the size of the house, the number of bedrooms, the size of the lot, the distance of the house to downtown, etc. The hedonic regression model allows us to estimate the price that an individual is willing to pay for various characteristics. In this case, we can include variables that indicate whether or not a house is located in close proximity to stormwater infrastructure investments. The hedonic regression is as follows:

\[
\ln(\text{price}) = \beta X + \alpha \text{Census} + \gamma \text{Neighborhood} + \delta \text{private} + \eta \text{public} + \zeta \text{time}
\]

Where:

- \(\ln(\text{price})\) is the price of the house
- \(X\) are variables that describe the characteristics of the house
- \(\text{Census}\) describe the Census tract that the house is located in
- \(\text{Neighborhood}\) describes the Neighborhood that the house is located in
- \(\text{Private}\) describes the private stormwater investments located nearby the property
- \(\text{Public}\) describes the public stormwater investments located nearby the property
- \(\text{Time}\) controls for the year the property was sold.
Residential properties within a 1/4 mile of a public GSI project where there was no prior green or open space, saw a 12.7% increase in value.

Being located near a private investment increases nearby residential property values by 1.7 percent. The smaller impact of private investment is likely due to the fact that these investments occur on private property and may not be visible to nearby properties, so they are still rendering an ecological function but their outward visibility is limited. Overall, it is estimated that the average residential property value impact of being located close to a green stormwater infrastructure investment is 10.3 percent. In other words, all else being equal, an identical house is worth 10.3 percent more if it is located near a green stormwater infrastructure investment, compared to not being located near the investment. To state this finding at an individual homeowner’s level, an otherwise $100,000 house is worth over $110,000 if it is proximate to a green stormwater infrastructure investment.

Table 4.1 ESTIMATED PROPERTY VALUE IMPACT ON PROPERTIES WITHIN A QUARTER-MILE OF GREEN STORMWATER INFRASTRUCTURE INVESTMENT

<table>
<thead>
<tr>
<th></th>
<th>Public GSI Project in a Park/Rec/School Facility</th>
<th>Public GSI Project (Not in a Park/Rec/School Facility)</th>
<th>Private GSI Project</th>
<th>All GSI Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>11.5%</td>
<td>12.7%</td>
<td>1.7%</td>
<td>10.3%</td>
</tr>
</tbody>
</table>

The results of the regression analysis can be used to estimate the aggregate impact that the stormwater infrastructure investments have had on the property values. The market values of properties that are located within a quarter mile of public infrastructure investment is $13.8 billion and $1.3 billion of that value can be attributable to being located near a green stormwater investment. In other, words, those properties would be worth $1.3 billion less if it was not for the green stormwater investments. Assuming accurate and annually updated property value assessments (which is now true, on account of the City’s recently implemented Actual Value Initiative), increased property values generate $8.1 million in additional tax revenue for the City each year and another $9.9 million per year for the School District of Philadelphia. These tax revenue gains will accrue annually, and the amounts will increase over time as additional projects are completed.
4.3 COMMERCIAL PROPERTY VALUE IMPACT

Green infrastructure has impacts beyond residential neighborhoods. It can help commercial property owners in a multitude of ways, including higher rents and property values, increased retail sales, energy savings, reduced maintenance costs, reduced utility bills, and improved safety, health, and job satisfaction for office employees. A study by the Natural Resources Defense Council found that the cumulative value of the benefits can total in the millions of dollars for an individual property over 40 years.\(^\text{17}\)

A number of other studies have found that green infrastructure related landscaping can increase commercial office rents by 7 percent\(^\text{18}\) and apartment rents by approximately 5 percent.\(^\text{19}\) A study in New York City found that apartment buildings with a green roof enjoyed a rental premium of 16 percent compared to apartment buildings without a green roof, after controlling for other factors that impact rental rates.\(^\text{20}\) To the extent that green infrastructure contributes to LEED certification, the green infrastructure investment can lead to increased property value, rents, and occupancy rates. After controlling for building age and other characteristics, LEED certification can increase occupancy rates by 8 percent.\(^\text{21}\)

Retailers can also benefit from green infrastructure investments. Research has found that people are willing to spend more, visit more frequently, or travel farther to shop in areas with attractive landscaping, tree cover, or green streets.\(^\text{22}\)

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**Table 4.2 ESTIMATED AGGREGATE PROPERTY VALUE INCREASE AND PROPERTY TAX GAIN FROM PROPERTIES WITHIN A QUARTER-MILE OF GREEN STORMWATER INFRASTRUCTURE INVESTMENT**

<table>
<thead>
<tr>
<th>Aggregate Property Value</th>
<th>Estimated Property Value Gain from Proximity to GSI Investment</th>
<th>Aggregate Property Value Gain from Proximity to GSI Investment</th>
<th>Aggregate Annual Property Tax Increase from Proximity to GSI Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>$13.8B</td>
<td>10.3%</td>
<td>$1.3B</td>
<td>$18.0M ($8.1M to City and $9.9M to School District)</td>
</tr>
</tbody>
</table>

Commercial property owners can also benefit from stormwater fee credits and other incentives. Property owners that install green infrastructure that manages runoff from the first inch of a storm event can achieve up to an 80 percent reduction on the property’s stormwater bill. Grants from PWD, such as SMIP, can help offset the cost of installing green stormwater infrastructure on commercial properties. Philadelphia also offers a green roof tax credit. The credit covers 50 percent of the green roof installation costs, up to $100,000, and is applied against the applicant’s Business Income and Receipts Tax obligation for the year the roof is installed.

4.4 A PARADIGM SHIFT IN DEVELOPMENT IN PHILADELPHIA

Philadelphia Water’s innovative approach to stormwater management is beginning to produce a paradigm shift within the development community in Philadelphia. Regulations designed to require or incentivize positive environmental solutions had typically been seen as an added cost burden for developers, affecting their returns and in some cases rendering a project infeasible. In other words, when viewed solely as an increase in project costs, environmental regulations were thought of as producing a lower return on investment on a project that in some cases caused an otherwise attractive project to not be pursued.

Developers understand that if a product can be made more attractive to end users, it can be marketed and priced accordingly, increasing developer returns and in some cases making a previously infeasible project feasible (see Figures 4.1 and 4.2 on the right). In other words, if the presence of environmental regulations encourages the construction of features that enable higher revenues to be derived from a project, instead of reducing the number of projects that are feasible, they could make otherwise infeasible projects attractive to pursue.

Consumers have not fully shifted to a new way of thinking about development. Developers therefore currently work hard to keep the cost of including green features to a minimum, as they do with all costs, because consumers do not always recognize the value that green building adds. Green City, Clean Waters is helping consumers recognize this value. And, over time the market place is adjusting: more and more consumers are valuing and demanding green features, and more and more developers are featuring them in their projects. This shift in the development community—from seeing stormwater regulations requirements as a cost burden that drags down proj-
ect feasibility to an opportunity to create an enhancement that can improve project feasibility and create amenity space for tenants or owners—may prove to be one of the lasting contributions of GCCW. This shift encourages a marketplace that is already heading in this direction and produces a development environment in which triple bottom line thinking is pursued more regularly, with positive implications for the local economy, the environment, and livable communities.

**GCCW is helping to create a shift in the development community towards seeing GSI as an enhancement that can improve project feasibility and create an amenity for tenants or owners.**

**E-BUILT**

E-BUILT was contracted to build a 14,000 square foot green roof / inset roof deck and a storm water management system by Alterra Properties for their Wharton Street Lofts project.

This project manages an impressive 100% of stormwater on site. The 100% absorption is achieved through several features. E-BUILT has incorporated a large green roof, a rain garden in the center of the parking lot, two subsurface infiltration beds at the entry and exit of the parking lot, additional landscaping and street trees.

This combination of features enhances infiltration on site but the GSI feature that catches the greatest attention of existing and prospective residents is the green roof. The green roof enhances the aesthetic of the property and the marketability of the project. Residents are willing to pay slightly more because of the dramatic increase in usable outdoor space and greenery.

A chef who lives in the building has developed a roof top vegetable garden on the roof. The roof is routinely used for social functions and fund raisers for local schools like Jackson Elementary. The green roof helps to keep the roof area cool so that these functions can be held on mid-summer days when a typical urban rooftop would be sweltering. The green roof surrounding the inset roof deck also provides an aesthetic that a roof deck alone could never provide.

Source: E-Built
The Economic Impact of Green City, Clean Waters: The First Five Years
February 2016

5.0 NEIGHBORHOOD-LEVEL QUALITY OF LIFE BENEFITS FROM GREEN STORM-WATER INFRASTRUCTURE PROJECTS

5.1 SECTION OVERVIEW

Beyond the economic impacts quantified in the previous three sections are a number of important quality of life benefits that accrue to households throughout Philadelphia from Green City, Clean Waters, including the following categories tracked by Philadelphia Water: Heat Stress Related Premature Fatalities Avoided, Water Quality and Aquatic Habitat Enhancement, Wetlands Enhancement and Creation, Energy Use and Related Changes in Carbon and other emissions, Air Quality Pollutant Removal from Added Vegetation and Construction and Maintenance Related Disruption Impacts. In many ways, it is these benefits that are most clearly evident and are of most importance to Philadelphia residents, and indeed these benefits were on the forefront of Philadelphia Water’s consideration as it envisioned and then implemented GCCW.

5.2 GAINS FROM ACTIVE RECREATION

As noted in Section 3, both public and private GSI projects can be found in neighborhoods throughout Philadelphia. Many of these GSI projects include an active recreation component. A 2010 study by Econsult Corporation for PennFuture found that 44,000 households representing 98,000 people are not within close walking distance of an active recreation site in Philadelphia.

Given the growing obesity problem in Philadelphia, and the increasing cost it is imposing on City government and on the local health, social services, and insurance sectors, this aspect of GCCW is of utmost importance. Indeed, the City has set goals to meet the demand associated with active recreation sites, so GCCW helps accomplish those goals.

5.3 POSITIVE HEALTH OUTCOMES FROM GREENING INITIATIVES

In addition to encouraging active recreation, the mere presence of greened sites can have a meaningful effect on people's physical, emotional, and mental health.

Many psychologists and doctors have published numerous research papers that have made the connection between access to green space and positive health outcomes. Michigan psychologist Stephen Kaplan theorizes that nature, much like sleep, can refurbish and rejuvenate our brains. A 2009 study, conducted by a group of professors from Oberlin and University of Illinois at Urbana-Champaign, found that people who took a 15-minute stroll through the woods had a more positive mood than those who walked through the urban streets. Similar results were found in a 2012 study written by a group of researchers, which showed positive health results after a 90-minute walk through the woods. The study indicated that people had less rumination and showed fewer neural activities in the portion of the brain that is associated with sadness. Bratman theorizes that reasonable investment in green space could improve the overall mental state of a city.

Charles C. Branas, PhD, Professor of Epidemiology at the University of Pennsylvania, has published numerous research papers making the connection between access to green space and positive health outcomes. These studies suggest that, irrespective of the positive gains accrued from active recreation, green space reduces cognitive fatigue, promotes emotional recovery, and mitigates against the negative influence of stressors in urban environments on one's mood and anxiety levels.

The presence of GSI projects in neighborhoods therefore represents a hugely important asset for Philadelphia households, and the distribution of these projects all throughout Philadelphia is a fulfillment of the desired outcome of GCCW to reach otherwise underserved populations with desired quality of life amenities.
The presence of green sites can also increase physical activity levels, ultimately impacting one’s psychological health. In a study conducted by Dr. Jules Pretty it was found that pleasant scenery while exercising produced a significantly greater positive effect on self-esteem and psychological well-being. This was tested by having individuals workout facing screens that exhibited different features such as pleasant rural and urban scenes as well as rural and urban unpleasant scenes. From these findings, Dr. Pretty and his colleagues were able to conclude that green exercise has important public and environmental health consequences. There is a positive effect on blood pressure and overall cardiovascular health and mental health. Such improvements in health can then lead to economic benefits due to decreased health care treatment costs.

5.4 AESTHETIC ENHANCEMENTS, BLIGHT REMOVAL, AND CRIME REDUCTION

Dr. Branas’ research also explores the role of greening projects in minimizing the negative effects of urban blight. His work has preliminarily found statistically significant improvements in crime levels upon the introduction of green space in urban settings. This research supports the “broken windows” theory of urban decay, which posits that vacancy, abandonment, and blight not only provide refuge for criminal activity but also visually symbolize the absence of care and supervision in ways that encourage additional criminal activity. Greened sites such as those produced by GCCW, on the other hand, can be a powerful counter-symbol of aesthetic beauty and active maintenance. Indeed, another study involving random introductions of green vegetation at public housing sites demonstrated meaningful reductions in violence and criminal activity.

Dr. Michelle Kondo, a researcher with the US Forest Service, is researching the link between GSI and Public Safety. Her research suggests that GSI installation may be a deterrent to the possession and manufacture of illegal drugs in public spaces.
5.5 ECOLOGICAL SERVICES RENDERED BY GREENED SITES

Of course, an important function of GCCW is water treatment. And, as noted, dealing with stormwater above ground and on site, as opposed to below ground and away from sites, is significantly more cost-effective. The more vegetated types of GSI investments render additional ecological services, particularly as it relates to air quality, soil erosion, the cost avoidance of sick days, and health care costs associated with asthma and heat attacks. Literature assembled by Econsult Corporation for a study on the ecological benefits of riverfront greenways in Philadelphia suggests that on a per acre basis, introductions of green space render the equivalent of $10.5 million/year in environmental benefit, whether measured by the replacement cost of purchasing those services in the marketplace or the value assigned by affected households.  

There are many other benefits of the Green City, Clean Waters Program that are manifesting but are not considered in this report, including the following categories tracked by Philadelphia Water: Heat Stress Related Premature Fatalities Avoided, Water Quality and Aquatic Habitat Enhancement, Wetlands Enhancement and Creation, Energy Use and Related Changes in Carbon and other emissions, Air Quality Pollutant Removal from Added Vegetation, and Construction and Maintenance Related Disruption Impacts.

On a per acre basis, introductions of green space render the equivalent of $10.5 M/year in environmental benefits.

Source: Meliora Design

CONCLUSION

GSI has proven successful in generating more accessible on-ramps for individuals to find employment opportunities and for local businesses to find contract opportunities.

Five years into an ambitious, daring, and innovative 25-year plan to address federal water quality requirements, Green City, Clean Waters has demonstrated present results and future potential. Its premise, as captured in its consent order with EPA and PA DEP, is to deal with stormwater on site and in a distributed fashion, using green infrastructure solutions, rather than move it to centralized locations and treating it in traditional gray infrastructure ways. But its promise is grander: to pursue a triple bottom line of economic gain, environmental sustainability, and community benefit, and even greater than that to influence the entire marketplace of public and private participants towards triple bottom line solutions.

By the numbers, GCCW has already proven to be an economic success, as articulated in this report. To begin with, GCCW is potentially saving the City billions of dollars over the 25-year period by dealing with stormwater on-site using green infrastructure solutions that invest in neighborhoods throughout the city, rather than through traditional gray infrastructure projects that are highly disruptive for residential communities and commercial corridors.

Conservatively, the current GSI industry in Philadelphia (as proxied by the member firms of SBN’s GSI Partners) represents at least $146.8 million in annual revenues, and in turn has an annual economic impact of $57 million, supporting 430 additional jobs and generating $860,000 in tax revenues for the City of Philadelphia. It is also an industry that is growing in size (GSI Partners’ firms have in the aggregate seen double-digit annual growth) and importance (GSI firms are providing innovative products and services that serve GSI needs here in Philadelphia and also create export opportunities to other localities around the country).

These economic gains are shared across individuals and firms throughout the city. Traditional gray infrastructure solutions tend to be large-scale engineering projects that can be fulfilled only by large and often non-local multinational firms. In contrast, green infrastructure solutions create accessible employment on-ramps for all levels of experience in multiple sectors, and economic participation, by local, small and woman and minority-owned firms. GCCW has also supported and in turn been
supported by a growing ecosystem of training and advocacy groups such as Power-CorpsPHL and the Overbrook Environmental Center.

Public GSI investments made because of GCCW, and accompanying private GSI investments catalyzed by local regulations and incentives, represent an additional boost to the local economy.

Public and private GSI investments are projected to have a $3 billion impact on the Philadelphia economy, supporting about 940 jobs per year and generating an aggregate $48 million in tax revenues annually for Philadelphia government.

These investments have proven to not only produce economic gains for the city as a whole but also ecological, aesthetic, recreational, and social gains in neighborhoods throughout the city. A spatial analysis recently conducted by Econsult Solutions, Inc. found that homes within a quarter-mile of a public GSI project saw a 10.3 percent increase in value as a result of proximity to the amenity, supporting the argument that these projects are beneficial to neighborhoods’ property values. Public GSI investments are therefore creating household wealth for homeowners throughout the city, which in turn stabilizes and expands the City’s property tax base, resulting in $18.0 million more per year in property tax revenues to support municipal services and public education.

Furthermore, and importantly for a city as large and diverse as Philadelphia, GSI investments can be found throughout the city, meaning that the benefits accrue at a very localized level – blight remediation, the aesthetic and recreational benefits of green space, and the ecological services they render – are being enjoyed by Philadelphians from all walks of life. With greater convergence of public and private investment in neighborhoods throughout Philadelphia around high quality of life offerings that respect community and environment, this may be Green City, Clean Waters’ greatest legacy, which is to encourage a triple bottom line approach to water quality requirements that saves municipal government billions of dollars and in turn invests in desirable neighborhood amenities, creates local employment and economic opportunities, and generates economic impact for the Philadelphia economy and tax revenue gains for Philadelphia government.
APPENDIX A: IMPACT OF GSI PARTNER CALCULATIONS

The survey results of GSI Partners firms in Philadelphia were used to quantify these direct, indirect, and induced impacts. Based on a review of those firms which did and did not complete the survey, it can be reasonably assumed that the 16 GSI Partners firms that did not report revenue amounts can have revenue amounts extrapolated for them based on those 44 GSI Partners firms that did report revenue amounts. Three adjustments were made to the revenue totals provided by the survey respondents.

1. First, the six firms who filled out the survey but did not provide revenue amounts were accounted for. By categorizing each of these firms into specific industries, ESI was able to estimate annual revenues and employment using industry standards of the other 44 firms.

2. Next, the ten firms who did not fill out the survey were accounted for by adjusting the aggregate revenue and employment upwards by 120 percent, non-specific to industry. This suggests aggregate annual revenues of $189 million and 1,600 employees in total among all 60 GSI Partners firms.

3. Lastly, the aggregate annual revenue for 2014 was adjusted downward based on the portion of revenue that is estimated to come from green stormwater infrastructure projects. This percentage was provided by all of the survey respondents and was 33.3% on average. However, these figures varied by firm. In general, larger firms generated less of their overall revenue from GSI projects while smaller firms estimated that over 80% of their revenues in 2014 came from GSI projects. In total, revenues associated with Philadelphia’s green stormwater infrastructure projects account for $35 million, approximately 20%, of the total annual revenues for the 60 GSI Partners firms.

32. Firms who did not provide employment totals were also accounted for in this process.
33. 60/50 = 120 percent.
ESI then constructed an economic impact model using multiplier data provided by IMPLAN, an industry standard input-output modeling software program, to estimate the scale and composition of spillover impacts generated by activity associated with GSI related industries in Philadelphia. Operations associated with Philadelphia’s green stormwater infrastructure projects account for $35 million of total annual revenues for the 60 GSI Partners firms. The estimated local operations of GSI Partners firms generate an annual economic impact of $57 million, supporting 430 direct, indirect, and induced jobs and $27 million in annual labor income within the City of Philadelphia.

APPENDIX B: INPUT OUTPUT MODELING METHODOLOGY

OVERVIEW

Economic impact estimates are generated by utilizing input-output models to translate an initial amount of direct economic activity into the total amount of economic activity that it supports, which includes multiple waves of spillover impacts generated by spending on goods and services and by spending of labor income by employees. This section summarizes the methodologies and tools used to construct, use, and interpret the input-output models needed to estimate this project’s economic impact.
INPUT-OUTPUT MODEL THEORY

In an inter-connected economy, every dollar spent generates two spillover impacts:

- First, some amount of the proportion of that expenditure that goes to the purchase of goods and services gets circulated back into an economy when those goods and services are purchased from local vendors. This represents what is called the "indirect effect," and reflects the fact that local purchases of goods and services support local vendors, who in turn require additional purchasing with their own set of vendors.

- Second, some amount of the proportion of that expenditure that goes to labor income gets circulated back into an economy when those employees spend some of their earnings on various goods and services. This represents what is called the "induced effect," and reflects the fact that some of those goods and services will be purchased from local vendors, further stimulating a local economy.

The role of input-output models is to determine the linkages across industries in order to model out the magnitude and composition of spillover impact to all industries of a dollar spent in any one industry. Thus, the total economic impact is the sum of its own direct economic footprint plus the indirect and induced effects generated by that direct footprint.

INPUT-OUTPUT MODEL MECHANICS

To model the impacts resulting from the direct expenditures Econsult Solutions, Inc. developed a customized economic impact model using the IMPLAN input/output modeling system. IMPLAN represents an industry standard approach to assess the economic and job creation impacts of economic development projects, the creation of new businesses, and public policy changes.

IMPLAN is one of several popular choices for regional input-output modeling. Each system has its own nuances in establishing proper location coefficients. IMPLAN uses a location quotient to determine its regional purchase coefficient (RPC). This represents the proportion of demand for a good that is filled locally; this assessment helps determine the multiplier for the localized region. Additionally, IMPLAN also accounts for inter-institutional transfers (e.g. firms to households, households to the
government) through its Social Account Matrix (SAM) multipliers. IMPLAN takes the multipliers and divides them into 440 industry categories in accordance to the North American Industrial Classification System (NAICS) codes.

These economic impacts in turn produce one-time or ongoing increases in various tax bases, which yield temporary or permanent increases in various tax revenues. To estimate these increases, Econsult Solutions, Inc. created a fiscal impact model to translate total economic impacts into their commensurate tax revenue gains.

**EMPLOYMENT AND WAGES SUPPORTED**

IMPLAN estimates the direct jobs employed by the project or activity being modeled. These estimated direct jobs will be displayed in the report unless the number of jobs is known beforehand by the project’s owner, and if provided, will be noted in the body of the report. The project/activity expenditures also support induced and indirect jobs. These are jobs not directly employed by the project, but instead are employees who work for the project’s vendors and employees who work at businesses frequented by those employees directly employed by the project. We report the total jobs supported by the project, therefore all direct, indirect, and induced jobs. These jobs are a mix of full-time and part-time jobs.

IMPLAN generates job estimates based on the term job-years, or how many jobs will be supported each year. For instance, if a construction project takes two years, and IMPLAN estimates there are 100 employees, or more correctly “job-years” supported, over two years, that represents 50 jobs each year. The 50 jobs represent the annualized number of jobs supported by the construction project. The job can be the same each year such as the coffee barista serving the directly employed construction workers or different if in the first year of the project a welder is needed and in the second year of the project an electrician is required.

The total income is for all direct, indirect and induced jobs. It includes proprietor income, wages, and all benefits. Since many projects/events require the employment sourced from multiple industries, the average wages paid will be different per industry. Therefore, it is not correct to divide the total labor income and divide it by the total job-years to derive an average employee compensation estimate.

GSI represents a neighborhood-level amenity that provides a wide range of quality of life benefits, stabilizing home values, growing the city’s property tax base, and making possible more private investment throughout the city.
APPENDIX C: ADDITIONAL INFORMATION ON GREEN CITY, CLEAN WATERS, AND THE REGULATIONS, BILLING STRUCTURE, AND INCENTIVES THAT ARE DRIVING PRIVATE INVESTMENT

GCCW is the broad effort to encourage public and private triple bottom line solutions for stormwater management through capital investment, regulation, and incentives. Through these mechanisms, private entities are compelled, guided, and resourced towards actions that simultaneously produce positive economic outcomes, pursue environmental sustainability, and advance social equity aims. This is a momentous paradigm shift, for the public sector to not only practice a triple bottom line to stormwater management but to encourage private investment in stormwater management through regulation, with incentives encouraging the greenest approaches.

As part of GCCW, Philadelphia Water is working with other City agencies in order to help reduce the costs associated with green infrastructure. This includes working with the Parks and Recreation department to install green stormwater infrastructure during renovations and working with the Streets Department to install green stormwater infrastructure during road construction projects.
Philadelphia Water has also worked with non-City agencies, such as SEPTA, to encourage the installation of green stormwater infrastructure on SEPTA property. These partnerships have helped Philadelphia Water reduce the cost of installing green stormwater infrastructure and has allowed for the leveraging of additional funding.

Table 1.2 PHILADELPHIA WATER DEPARTMENT GREENED ACRE GOALS

<table>
<thead>
<tr>
<th>YEAR</th>
<th>GREENED ACRES</th>
<th>SQUARE MILES</th>
<th>% IMPERVIOUS COVER MANAGED</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>750</td>
<td>1</td>
<td>3%</td>
</tr>
<tr>
<td>10</td>
<td>2,100</td>
<td>3</td>
<td>8%</td>
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<tr>
<td>15</td>
<td>3,800</td>
<td>6</td>
<td>14%</td>
</tr>
<tr>
<td>20</td>
<td>6,400</td>
<td>10</td>
<td>23%</td>
</tr>
<tr>
<td>25</td>
<td>9,600</td>
<td>15</td>
<td>34%</td>
</tr>
</tbody>
</table>

The City is working to manage the stormwater from 9,600 impervious acres by transforming them into greened acres. Vacant land presents a unique opportunity for stormwater management. There are over 40,000 vacant parcels of land in the City. An estimated 5,000 to 6,000 acres within the combined sewer system drainage will become greened during the 25 year program, given the rate of redevelopment. The City’s updated stormwater regulations adopted in July 2015, require every development/redevelopment project initiated within the City limits with an area of disturbance greater than 15,000 square feet to manage the first inch and a half of runoff from the site. As new development over 15,000 square feet takes place, there will be an increase in the number of greened acres.

Another policy-related tool that is resulting in Greened Acres is the Parcel Based Billing Initiative. Rather than charging properties based on their water meter(s), Philadelphia Water charges all properties a stormwater fee proportional to their lot size and impervious surface; single family residential is a flat rate based on the average Philadelphia home, whereas non-single-family-residential fees vary from property to property based on the ratio of impervious surface area to gross property area.
Properties with a higher ratio will be charged more, and properties that reduce the amount of impervious surface will be credited. There are two rates that apply to a property: the gross area fee and the impervious area fee. This gross area fee applies to the entire site and cannot be adjusted. The gross area rate is $0.59 per 500 square feet. The impervious area fee can be adjusted if impervious area is reduced. The impervious area rate is $4.746 per 500 square feet.

To support property owners to reduce their impervious surface, and therefore their stormwater fees, PWD offers two grant programs: SMIP and GARP. The Stormwater Management Incentives Program Grant (SMIP) program provides grants directly to non-residential property owners who want to construct Stormwater retrofit projects. The Greened Acre Retrofit Program (GARP) provides grants to contractors, companies or project aggregators who can build large-scale stormwater retrofit projects across multiple properties. In addition to the grant programs, the City has made a green roof tax credit available to business owners retrofitting their roof. The applicant may claim a credit against the Business Privilege Tax of fifty percent of all costs incurred to construct the Green Roof not to exceed $100,000.

"Increasing our involvement with GSI is both a personally rewarding direction I would like to continue to foster, and one that I feel is leading to growth opportunities for my company."

—Member, SBN's GSI Partners


Source: Philadelphia Green Roofs
ACKNOWLEDGEMENTS

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