Green City, Clean Waters

Implementation and Adaptive Management Plan

Consent Order & Agreement

Deliverable I

City of Philadelphia Combined Sewer Overflow Long Term Control Plan Update

Submitted to

The Commonwealth of Pennsylvania

Department of Environmental Protection

By The Philadelphia Water Department

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Glossary of Acronyms

ASCE	American Society of Civil Engineers
BIA	Building Industry Association of Philadelphia
BID	Business Improvement District
BOD	Biological Oxygen Demand
BUC	Business United for Conservation
BWWF	Base Wastewater Flow
CAC	Citizens Advisory Council
CAPA	Creative and Performing Arts School (New Kensington)
CAPIT	Capital Program Integrated Tracking System
CBOD	Carbonaceous Biochemical Oxygen Demand
CDC	Community Development Corporations
COA	Consent Order and Agreement
CSO	Combined Sewer Overflow
CSS	Combined Sewer System
DCIA	Directly Connected Impervious Area
DCNR	Department of Conservation and Natural Resources
DO	Dissolved Oxygen
DRBC	Delaware River Basin Commission
DRWC	Delaware River Waterfront Corporation
DVGBC	Delaware Valley Green Building Council
DVRPC	Delaware Valley Regional Planning Commission
DWF	Dry-Weather Flow
EAP	Evaluation and Adaptation Plan
ECA	Energy Coordination Agency
ERSA	Existing Resources and Site Analysis
E&S	Erosion and Sediment Control
FWWIC	Fairmount Water Works Interpretive Center
GA	Greened Acres
GSI	Green Stormwater Infrastructure
GWI	Groundwater and Stream Inflow and Infiltration
IAMP	Implementation and Adaptive Management Plan
ICG	Interagency Coordination Group
L&I	Department of Licenses and Inspections
LEED	Leadership in Energy and Environmental Design
LTCPU	Long Term Control Plan Update
MOS	Mayor's Office of Sustainability
MOTU	Mayor's Office of Transportation and Utilities
NBOD	Nitrogenous Biochemical Oxygen Demand
NGO	Non-Governmental Organization
NKCDC	New Kensington Community Development Corporation
NMC	Nine Minimum Controls
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTI	Neighborhood Transformation Initiative
NWS	National Weather Service

O&M	Operations and Maintenance Agreement
OIT	Office of Innovation and Technology
PADEP	Pennsylvania Department of Environmental Protection
PCPC	Philadelphia City Planning Commission
PEC	Pennsylvania Environmental Council
PennDOT	Pennsylvania Department of Transportation
PHA	Philadelphia Housing Authority
PHS	Pennsylvania Horticultural Society
PIA	Philadelphia International Airport
PIDC	Philadelphia Industrial Development Corporation
PPR	Philadelphia Department of Parks & Recreation
PSD	Philadelphia School Department
QAQC	Quality Assurance and Quality Control
RDA	Redevelopment Authority
RDII	Rainfall Derived Inflow and Infiltration
ROW	Right-Of-Way
SBN	Sustainable Business Network
SCSSD	Sports Complex Special Service District
SEPTA	Southeastern Pennsylvania Transportation Authority
SGSG	Spring Garden Street Greenway
SMED	Stormwater Management Enhancement District
SMIP	Stormwater Management Incentives Program
SMP	Stormwater Management Practices
SOD	Sediment Oxygen Demand
SOP	Standard Operating Procedures
SRDC	Schuylkill River Development Corporation
SSDs	Special Service Districts
SSES	Sewer System Evaluation Survey
SSOAP	Sanitary Sewer Overflow Analysis and Planning
TEPS	Transportation Engineering and Planning Section
TPL	Trust for Public Land
TSS	Total Suspended Solids
TTF	Tookany/Tacony-Frankford Watershed Partnership
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WD	Depth of Water
WEF	Water Environment Federation
WPCP	Water Pollution Control Plants
WQBEL	Water Quality Based Effluent Limit
WRT	Waterways Restoration Team
ZCC	Philadelphia Zoning Code Commission

1.0 Introduction

On June 1, 2011, the Commonwealth of Pennsylvania approved the City of Philadelphia's Combined Sewer Overflow (CSO) Long Term Control Plan Update (LTCPU) and its supplements, as amended through negotiations with the Pennsylvania Department of Environmental Protection (PA DEP). The approved LTCPU and its supplements, called the *Green City, Clean Waters* program, represents the City of Philadelphia's commitment towards meeting regulatory obligations while helping to revitalize the City. This Implementation and Adaptive Management Plan (IAMP) describes how the Philadelphia Water Department (Water Department) will implement the *Green City, Clean Waters* program. The framework for the IAMP was established during negotiations and is included in Appendix G of the Consent Order and Agreement (COA), and includes the components listed in Table 1-1.

Table 1-1 IAMP Components Outlined in Appendix G of COA

Topic	Section of IAMP
Adaptive Implementation	2.2
Capital Projects	3 (Entire Section)
Green Stormwater Infrastructure Data System(s)	2.1.1
Operation and Maintenance	5 (Entire Section)
Streamlining	4 (Entire Section)
Sewer System Evaluation Survey (SSES)	6.9.1
Outlying Communities Report	6.9.2
Early Action Area project	3.1.1.1 and 6.8

The first five years of the program implementation is the proof-of-concept phase of the program, a period of growth, evolution and experimentation. The proof-of-concept phase will provide time necessary to develop, expand, and establish the main components of the program described herein.

1.1 Regulatory Framework

The COA provides the regulatory structure for the *Green City, Clean Waters* program to ensure compliance of the City's CSOs with the Federal Clean Water Act (33 U.S.C. §1251 et seq.), the Pennsylvania Clean Streams Law (P.L 1987, Act 394 of 1937, as amended (35 P.S. 691.1 et seq.)), and the Water Department's National Pollutant Discharge Elimination System (NPDES) permits. This regulatory approach includes water quality based effluent limits that detail the Performance Standards associated with each program metric and the products that the City will deliver during the first five years of the program.

1.1.1 Water Quality Based Effluent Limit Performance Standards

The City of Philadelphia's LTCPU and its supplements are based on the National Combined Sewer Overflow Control Policy for a presumption approach to meeting the water quality requirements of the Federal Clean Water Act. The City will construct and place into operation, the controls described as the selected alternative in the LTCPU and its supplements, to achieve the elimination of the mass of pollutants that would otherwise be removed by the capture of 85% by volume of the combined sewage collected in the Combined Sewer System (CSS) during precipitation events on a system-wide annual average basis.

The Water Quality Based Effluent Limit (WQBEL) in the COA includes quantitative Performance Standards, which will be achieved by specific interim dates, or by the end of the Program (Table 1-2).

The following metrics are included in the WQBEL Performance Standards:

NE / SW / SE Water Pollution Control Plant Upgrades: Design
The Water Department operates three Water Pollution Control Plants (WPCPs): the Northeast, Southwest and Southeast WPCP. Upgrades to increase wet weather treatment capacity at each of the City's WPCPs are cost-effective traditional improvements to reduce the effect of CSOs. The milestones associated with these metrics will be established by June 1, 2013 when the Facility Concept Plan for each of the WPCPs is submitted to the PA DEP. Approval by the PA DEP will establish the compliance schedule for the design phase of the plant upgrades.

NE / SW / SE Water Pollution Control Plant Upgrades: Construction
The milestone values associated with construction metrics will be established by June 1, 2013 when the Facility Concept Plan for each WPCP is submitted to the PA DEP. Approval by the PA DEP will establish the compliance schedule for the construction of the plant upgrades.

Interceptor Rehabilitation
The Cobbs Creek and Tacony Creek interceptors will be rehabilitated, as necessary, during the course of the COA. The length of interceptor rehabilitated will be tracked to report progress annually.

Overflow Reduction Volume
Overflow volume is a traditional CSO performance metric. The Reduction Volume is the difference between the volume of overflow in million gallons per year for the condition prevailing at the time of the report and the volume of overflow in million gallons per year for the baseline year. The baseline year is considered the state of Philadelphia's sewerage system as configured on January 1, 2006. These volumes will be estimated for the typical year using the validated hydrologic and hydraulic models described in the LTCPU and its supplements.

Equivalent Mass Capture (TSS, BOD, *Fecal Coliform*)
Equivalent Mass Captures of Total Suspended Solids (TSS), Biological Oxygen Demand (BOD), and *fecal coliform* bacteria, are measures of the reduction of these constituents equivalent to what would be removed otherwise by the capture of 85% by volume of the combined sewage collected in the Combined Sewer System (CSS). Conformance with these metrics will be documented through simulations performed using the hydrologic and hydraulic models described in the LTCPU and its supplements.

Total Greened Acres
A Greened Acre is an acre of impervious cover that is retrofitted to utilize Green Stormwater Infrastructure (GSI) which manages stormwater using source controls such as infiltration, evaporation, transpiration, decentralized storage, alternative stormwater routing, reuse and others.

GA = IC * Wd

IC is the impervious cover utilizing GSI (acres). This quantity can include the area of the stormwater management feature itself, as well as the area that drains to it.

Wd is the depth of water over the impervious surface that can be physically stored in the facility (inches). GSI designs will be aimed at controlling at least 1.0 inch of runoff, and up to 1.5 inches of runoff, unless otherwise deemed feasible by engineering design.

One Greened Acre is equivalent to one inch of managed stormwater from one acre of drainage area or 27,158 gallons of managed stormwater.

The *Green City, Clean Waters* program is based on an adaptive approach. The program allows the Water Department to select projects to test new types of GSI, while continually working towards the water quality targets.

1.1.2 First Five-Years of Deliverables to PA DEP

Paragraph 3a of the COA requires the submission of 12 deliverables, each further described in Appendix G of the COA and included for reference in call-out boxes throughout the IAMP. This IAMP addresses the approach that the Water Department will take to ensure timely delivery of these products. Table 1-3 lists each deliverable, the date by which it will be submitted to the PA DEP and the section of this IAMP where the development of the deliverable is described.

Table 1-2 WQBEL Performance Standards

Metric	Units	Base line value	Cumulative amount as of Year 5 (2016)	Cumulative amount as of Year 10 (2021)	Cumulative amount as of Year 15 (2026)	Cumulative amount as of Year 20 (2031)	Cumulative amount as of Year 25 (2036)
NE / SW / SE WPCP upgrade: Design	percent complete	0	TBD June 2013	TBD June 2013	TBD June 2013	100%	100%
NE / SW / SE WPCP upgrade: Construction	percent complete	0	TBD June 2013	TBD June 2013	TBD June 2013	100%	100%
Miles of interceptor lined	miles	0	2	6	14.5	14.5	14.5
Overflow Reduction Volume	million gallons per year	0	600	2,044	3,619	5,985	7,960
Equivalent Mass Capture (TSS)	percent	62%	Report value	Report value	Report value	Report value	85%
Equivalent Mass Capture (BOD)	percent	62%	Report value	Report value	Report value	Report value	85%
Equivalent Mass Capture (*Fecal Coliform*)	percent	62%	Report value	Report value	Report value	Report value	85%
Total Greened Acres	Greened Acres	0	744	2,148	3,812	6,424	9,564

Table 1-3: COA Deliverables

Deliverable Name	Deliverable Date	IAMP Reference Section
Implementation and Adaptive Management Plan	December 1, 2011	Entire Plan
Green Stormwater Infrastructure Maintenance Manual Development Process Plan	June 1, 2012	5.1
Comprehensive Monitoring Plan	December 1, 2012	6.0
Facility Concept Plan for NE WPCP	June 1, 2013	3.4
Facility Concept Plan for SE WPCP	June 1, 2013	3.4
Facility Concept Plan for SW WPCP	June 1, 2013	3.4
Updated Nine Minimum Controls Report	June 1, 2013	3.5
Tributary Water Quality Model – Bacteria	June 1, 2013	6.4
Tributary Water Quality Model - Dissolved Oxygen	June 1, 2014	6.4
Green Stormwater Infrastructure Maintenance Manual - First Edition	June 1, 2014	5.1
Tidal Waters Water Quality Model - Bacteria	June 1, 2015	6.4
Tidal Waters Water Quality Model - Dissolved Oxygen	June 1, 2015	6.4

1.2 Preparing for Implementation

The Water Department is a large City agency with over 1800 employees, made up of 7 divisions, 32 units, and many working groups to support its various compliance and customer service obligations. Implementing the *Green City, Clean Waters* plan requires significant realignment for the Water Department, including reorganization of existing staff structures and expansion of other resources. The Water Department is conducting an internal assessment of its organizational structures to evaluate Departmental capacity and needs. This process has led to the development of strategic plans for each Division.

During the first two years of program implementation, most of the organizational repositioning will focus on the Planning and Environmental Services Division. The Planning and Environmental Services Division has primary responsibility for planning the implementation of *Green City, Clean Waters* and tracking compliance with CSO regulations and the COA. The Division already has begun to reorganize staff roles and define needs for additional support to implement the *Green City, Clean Waters* program. Examples of newly created functional programs and groups, each with a role in implementing *Green City, Clean Waters,* are described as follows:

Strategic Policy and Coordination Program

Green City, Clean Waters relies on collaboration, understanding and acceptance by policy-makers at all levels of government. It will require inter-agency policy coordination, private sector investment, not-for-profit implementation, and citizen education, cooperation and support. The newly created Strategic Policy and Coordination program is charged with driving policy and code changes necessary for realizing CSO and Stormwater permit compliance and fostering cooperation with other City agencies, City Council, and the Mayor's Office.

Planning and Regulatory Compliance Program

The primary mission of this program is to achieve compliance with stormwater and CSO regulations. This entails planning, design, and project implementation across a wide spectrum of projects associated with CSO reduction. Within this program, the Green Stormwater Infrastructure Planning and Design Coordination groups are responsible for piloting green stormwater infrastructure across the full spectrum of opportunities (*e.g*. schools, parks, streets), site conditions (*e.g*. steep slopes, various soil conditions), and land use patterns during the first five years of the program. This program will be responsible for developing design guidelines, standards and specifications. As the program expands, the responsibilities will grow to include selection and management of design consultants, bidding oversight, and consultant training. This program also includes monitoring and inspection of green stormwater infrastructure, critical to support the Water Department's wet weather compliance responsibilities.

Private Development Services Program

The implementation of *Green City, Clean Waters* will rely on changes in the way stormwater is managed in the private and public sectors. Implementation of the 2006 stormwater regulations

required the creation of the Private Development Services group with significant staff increases to provide for timely stormwater plan review. The primary mission of this program is to continue to manage the stormwater plan review process to ensure that compliance with the Philadelphia Stormwater Regulations is upheld.

Parcel Based Billing, Stormwater Credits and Appeals Program

The stormwater rate structure resulted in an increase in stormwater rates for properties with a high percentage of impervious cover. This program is working on potential methods to mitigate the impact on customers, including the creation of stormwater credits and incentives programs.

Environmental Restoration and Monitoring

The mission of this program is to perform field activities to monitor water quality and environmental indicators, to model water quality in streams and estuaries, and to actively restore streams, wetlands, and riparian habitats. It also includes monitoring and inspection of living resource restoration.

It is expected that additional changes to the Water Department's organization will occur in the coming years as the strategic planning process advances to meet the challenge of moving the *Green City, Clean Waters* program from demonstration into implementation.

1.3 Contents of the Plan

The contents of the IAMP are organized into 7 sections as follows:

Section 1 provides the regulatory context and describes how the Water Department is organizing its staff to implement the plan.

Section 2 describes the development of an implementation tracking system and the reporting of implementation progress. This Section provides the framework for program adaptation to meet required long-term water quality endpoints and Performance Standards during the first five years of implementation (June 1, 2011-June 1, 2016) and at each 5-year decision point thereafter.

Section 3 describes the capital program components that make up the *Green City, Clean Waters* program, including projects already completed, those underway at present, and the framework for identifying projects in the four and a half years leading up to the delivery of the first Evaluation and Adaptation Plan in 2016. The projects described are those associated with green stormwater infrastructure including strategic frameworks and processes, waterfront disconnection, and interceptor rehabilitation. Also described are the facility concept plans currently in development for the water pollution control plants.

Section 4 identifies actions underway or completed by the Water Department to address identified policy obstacles and needs. It describes the framework for the Water Department to address policy and coordination needs as they emerge during implementation. Actions are organized into three categories. The first category includes activities that streamline the Water Department's structure, protocols, and communication pathways. The second includes actions that facilitate the identification, prioritization and resolution of policy obstacles to ensure effective *Green City, Clean Waters* implementation. The third category defines steps that streamline coordination with organizations outside of the Water Department to maintain compliance with the COA.

Section 5 describes the current GSI maintenance program, the anticipated changes as the program grows, and the steps required for developing the Green Stormwater Infrastructure Maintenance Manual Process Plan and the Maintenance Manual First Edition.

Section 6 describes the framework for developing the Comprehensive Monitoring Plan, due December 1, 2013. This includes monitoring to be conducted over the coming years, the development and field testing of monitoring protocols, improving design procedures for GSI, and assessing sewer system, receiving waterways, meteorological and groundwater conditions. This section includes descriptions of the processes proposed for developing hydrologic, hydraulic and hydrodynamic models for characterizing improvements in receiving water quality resulting from the implementation of the *Green City, Clean Waters* program. This section also describes the methods the Water Department will undertake to evaluate sanitary sewer flows and determine if wet weather inflow and infiltration reduction can result in significant reductions to CSO volumes.

Section 7 describes the Water Department's plans for continuing their public outreach efforts, including notification to impacted communities, soliciting feedback, raising awareness, and creating educational opportunities related to the *Green City, Clean Waters* program.

2.0 Implementation Tracking, Reporting, and Adaptive Management

The *Green City, Clean Waters* program has been designed to allow for continual evaluation to ensure efficient investment of public funds and to maximize water quality and other public benefits. The Long Term Control Plan Update (LTCPU) and its supplements describe the need for adaptive management to implement this decentralized approach to stormwater management. This Section provides the framework within which the program may be adapted to meet the required long-term water quality endpoints and Performance Standards during the first five years of implementation (June 1, 2011-June 1, 2016) and at each 5-year decision point thereafter.

2.1 Reporting Implementation Progress

The WQBEL requires that the City develop the capability to track the ownership and maintenance responsibilities of green stormwater infrastructure (GSI). The Water Department is developing a project tracking system that will integrate existing and newly developed Water Department databases to calculate and report metrics such as Greened Acres (GAs). The program's mechanisms for the delegation of required operation and maintenance of GSI are explained in Section 5. This section describes the development of this tracking system and how progress will be reported annually.

2.1.1 Tracking System Development

As the City of Philadelphia implements the *Green City, Clean Water* program, the tracking of GSI projects from the planning stages through the lifetime of the program is essential for efficient program management and compliance reporting. Data for individual SMPs will be tracked from design through construction phases, with the anticipated future development of maintenance and inspection tracking components. This will help provide a streamlined and cohesive location for data on private, public and partner-implemented projects. These details ultimately will provide the metrics for annual reporting of GSI progress towards meeting the goals set forth in the *Green City, Clean Waters* program and the COA.

Development of the project tracking system is underway, including:

1. Developing a list of asset types (GSI) to be tracked
2. Developing tracking details (tracking fields)
3. Standardizing SMP definitions
4. Database programming

5. Integration of existing Water Departmental databases (GIS, CAPIT, Stormwater Plan Review, Stormwater Billing and Credits Program)

6. Data entry of project details

7. Review of output data for accurate reporting metrics

Integrated Tracking

The Water Department has a number of robust tracking systems in place and is working on the creation of an integrated *Green City, Clean Waters* Program Tracking System to be used to compile information from these systems that track other projects and details. Illustrated in Figure 2-1 is the proposed framework for linking information for the purposes of project tracking and reporting.

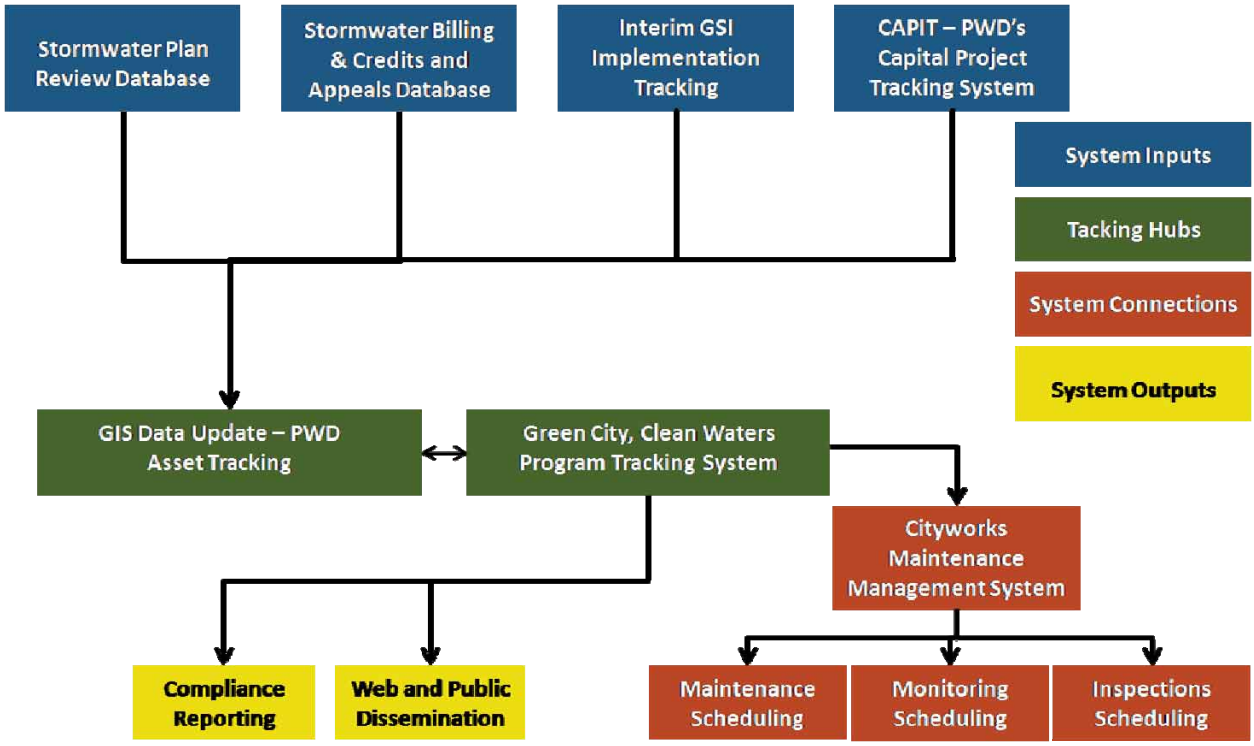


Figure 2-1 *Green City, Clean Waters* integrated project tracking system

Data Inputs

Stormwater Plan Review Database

The Stormwater Plan Review Group within the Water Department uses a database to track the review status of development projects in Philadelphia for compliance with the Philadelphia Stormwater Regulations. The main purpose of the database is to track stormwater plan submissions and relevant information on development projects in Philadelphia. The database also tracks length of project review time, the project order for review, and project contact information. A key function of the database is its interaction with the website *http://www.phillyriverinfo.org/PWDDevelopmentReview/home.aspx*. The website has an online application where applicants can submit project details, initial project plan sheets and

contact information. Project review status is exported to the website giving applicants the ability to check on the review progress of their project online (see section 3.1.5.1 for details regarding data tracked within this system). Over the years the database has evolved to produce Conceptual Approval documentation, track meetings and inspections, and collect detailed information on the stormwater management practices (SMPs) being approved. Data tracked by this system will directly feed annual reporting metrics.

Stormwater Billing, Credits & Appeals Database

The Stormwater Billing, Credits & Appeals Group within the Water Department utilizes a database to track the review status of applications for stormwater billing credits. This system also tracks maintenance and inspections performed on SMPs for credits purposes. Data tracked by this system will directly feed annual reporting metrics.

The Water Department's Interim Green Stormwater Infrastructure Implementation Tracking

For projects identified, designed and constructed by the Water Department, an internal database is updated manually with data for each project. This system tracks projects from conceptualization through construction. Input data is limited while more detailed data remains in hard-copy format to be retrieved as needed. This data system serves as an interim compliance tracking system for WQBEL and reporting metrics. Based on data housed within this system, definitions have been compiled for each SMP type implemented throughout the City to help inform the larger data structure development. The SMP types tracked in the database and their definitions are located in Tables 2-1 and 2-2. Data associated with each SMP within a project will be tracked throughout the life cycle of the infrastructure.

Tracking at the SMP level

The Water Department will track GAs at the SMP level to provide annual reporting metrics. For example, a project such as a green street may be designed at the segment level consisting of interconnected SMPs including tree pits, bump-outs, porous pavement, etc. These SMPs may function together as a system, but will be tracked in the data system as individual SMPs and will be used for calculating GA values.

Based on a review of existing systems assessing how each of them has defined SMPs, the Water Department has synthesized a comprehensive list of SMP definitions (Table 2-1). While the Water Department believes this to be a comprehensive list and associated set of definitions, staff will evaluate these on a regular basis to add, update and refine as necessary.

Table 2-1 SMP Definitions Developed for the LTCPU Tracking System

LTCPU SMP Definitions	
Field/Metric	**Definition/Purpose**
Stormwater Tree Trench	A stormwater tree trench is a system of trees connected by a subsurface infiltration / storage trench. It is designed to infiltrate and/or detain and release stormwater runoff where necessary.
Rain Garden	A rain garden is a vegetated area designed to infiltrate and/or detain and release stormwater runoff where necessary. Rain gardens are also commonly referred to as bio-infiltration basins and bio-retention basins. They are typically integrated into landscape features (*e.g.* median strips) and are non-mowed areas.
Stormwater Planter	A stormwater planter is a structure filled with soil media and planted with vegetation or trees. It is designed to infiltrate and/or detain and release stormwater runoff where necessary. Planters can be designed below street grade or above grade and often contain curb edging as the structure surrounding the planter.
Stormwater Bumpout	A stormwater bumpout is a vegetated curb extension that intercepts street and sidewalk flow along the curb-line. It is designed to infiltrate and/or detain and release stormwater runoff where necessary.
Infiltration/Storage Trench	An infiltration/storage trench is a subsurface structure designed to infiltrate and/or detain and release stormwater runoff where necessary.
Pervious Paving	Pervious paving is a hard permeable surface commonly composed of concrete, asphalt or pavers. It is designed to infiltrate and/or detain and release stormwater runoff where necessary.
Stormwater Wetland	A stormwater wetland is a vegetated basin designed principally for pollutant removal. It typically holds runoff for periods longer than 72 hours. Wetlands can also detain and release stormwater runoff.
Cistern/Rain Barrel	A cistern/rain barrel is a tank or storage receptacle that captures and stores runoff for up to 72 hours and can thereby reduce runoff volume. The stored water may be used to serve a variety of non-potable water needs (*e.g.*, irrigation).
Green Roof	A green roof is a vegetated surface installed over a roof surface. Green roofs are effective in reducing the volume and rates of stormwater runoff.
Swale	A swale is a channel designed to convey stormwater. It can be designed to attenuate and/or infiltrate runoff where feasible.
Stormwater Basin	A stormwater basin is a basin or depression that is vegetated with mowed grass. It is designed to infiltrate and/or detain and release stormwater runoff where necessary.
Disconnection (impervious to pervious)	Disconnection is when runoff from an impervious area is directed to available adjacent pervious area.
Stormwater Tree	A stormwater tree is a tree that has stormwater runoff directed to its pit. It is designed to infiltrate and/or detain and release stormwater runoff where necessary.
Non-Credit Tree	A non-credit tree is a tree planted in a pervious area.

During the first year, the Water Department will continue to enhance the interim database to track GAs and progress toward Performance Standards.

The Water Department's Capital Projects (CAPIT) System

CAPIT is the Water Department's information system for identifying, tracking, procuring and delivering projects funded through the Water Department's capital budgets and grant programs. All budgets are tracked by infrastructure type (water, sewer, GSI, water and wastewater plants, and miscellaneous) at the project level. The ability to track GSI was added in 2011.

The system tracks planning (identification of potential work), design (engineering specifications, site investigation/testing, professional service contracts, preparation of engineer's probable estimates of costs, bid forms, utility reviews, etc.), projects control (bidding and contract administration), construction (inspections and payment estimates), and close out (monitoring of project during testing period). CAPIT connects with other City information systems for procurement (ADPICS) and finance (FAMIS) to procure bids, and tracks contractor payments.

Data Tracking

Green City, Clean Waters Program Tracking System

This system is intended to serve as the information hub tracking all implementation related to GSI planning, design and construction, as well as post-construction inspections, maintenance and monitoring. This system will be fed by content housed within numerous sub-systems.

During the second through the fifth years of the program, a sophisticated data tracking system, like the one described in Figure 2-2, will be developed to retrieve and integrate data from existing Water Departmental databases.

The following process will enhance the development of the *Green City, Clean Waters* project tracking system over the coming years:

- Finalize asset/SMP definitions
- Finalize metrics and fields for tracking
- Create the interface for multiple data systems
- Migrate data
- Implement data quality control techniques
- Implement data input management techniques

Geographic Information Systems (GIS) – Asset Tracking

Water Department assets are tracked through the City's GIS data. The Water Department's GIS data will reciprocally feed and be fed by the *Green City, Clean Waters* Program Tracking System as new GSI assets are constructed.

System Connections

Cityworks Maintenance Management System

The Philadelphia Streets Department uses the Cityworks work order management system to track various maintenance functions. The Water Department is in the process of implementing this tool for some of its own maintenance functions. The system will be linked to the City's GIS and may be used for tracking customer complaints, repairs, and maintenance of the Water Department's assets such as fire hydrants, inlets, water mains, sewers and SMPs. Over the coming years as the Water Department develops maintenance, monitoring and inspections protocols and scheduling, it is the goal to include in this system the capability to schedule and track these processes. The Water Department envisions linking Cityworks with the *Green City, Clean Waters* Program Tracking System.

Data Outputs

Compliance Reporting

The *Green City, Clean Waters* project tracking system will be designed to produce compliance reporting outputs for submission to the PA DEP on an annual basis. The tracking system will produce up-to-date values for metrics such as GAs for accurate and timely reporting.

The tracking system reporting format will provide details as illustrated in Table 2-2.

Table 2-2 Project Tracking Metrics and Sample Reporting Format

Project Tracking Metrics						
Project Name	Watershed	SMP Type	Greened Acres	Storage Volume (cf)	Impervious Area Managed (sf)	New Trees
Project 1		SMP				
		SMP				
Project 2		SMP				
Project 3		SMP				
		SMP				
…		…				

Annual reporting field definitions:

Project Name
The name of the project which can include the location and also the main SMP type(s) utilized.

Watershed
Project location within one of the seven watersheds located within the City of Philadelphia.

SMP Type
The SMP associated with the project as defined inT 2-1

Greened Acres
The number of GAs associated with an SMP in the tracking system. See GA definition in Section 1.1.1.

Storage Volume
The volume of stormwater runoff temporarily stored by the SMP

Impervious Area Managed
This represents the total directly connected impervious area (DCIA) managed by the SMP

New trees
The number of new trees will be tracked by type as follows:

1. New Trees planted in association with a system SMP
2. A Stormwater Tree SMP
3. Non-credit tree SMP, that would be planted associated with a project

Potential Future Outputs

Web and Public Information Dissemination

This data structure also will be used to update the Water Department's web interface with project related information and statistics to support public outreach and information dissemination goals.

Green City, Clean Waters Program Tracking System development progress will be provided to PA DEP in the Water Department's annual reports.

2.1.2 Annual Reporting

The City's CSO and Stormwater NPDES Annual Reports documenting permit compliance are submitted by the Water Department to the PA DEP by September 30 of each year. Future Annual Reports will contain program updates describing progress towards the five-year WQBEL Performance Standards, deliverables and updates on the programmatic development and policy streamlining components described in this IAMP.

In accordance with Paragraph 3d of the COA, written progress on the implementation of CSO Controls are to be provided in the Annual Reports. The Annual Reports will include:

- Information regarding the City's implementation of the Nine Minimum Controls from the National CSO Policy
- Progress on capital projects described in the 1997 Long Term Control Plan
- CSO program elements discussed in the approved LTCPU and its supplements

The WQBEL metrics will be reported annually in a new section of the Water Department's CSO and Stormwater NPDES Annual Reports.

2.2 Adaptive Management Process

Implementation of the requirements within the approved COA will rely upon an adaptive management process throughout the 25 years. An adaptive management approach requires flexibility and periodic program assessments throughout the 25-year implementation period. Adaptations in the management approaches are expected throughout this period to ensure that WQBEL goals are met, to optimize and enhance the program, to maximize benefits and minimize the costs of implementation. Major decisions on management approaches will be made every five years based on progress toward the WQBEL Performance Standards (Table 1-2) and will be described in Evaluation and Adaptive Management Plans.

Adaptive Management Triggers

The LTCPU and its supplements outline an adaptive management process with "decision points" every five years. These decision points are used to evaluate progress towards the final water quality Performance Standards. The WQBEL Performance Standards (Table 1-2) constitute the five-year targets for the adaptive management decision points. These quantitative targets require the development of a number of policy and infrastructure tools in the first five years, and in subsequent years, in particular to support the increasing GSI implementation rate necessary to meet those targets. As stated in Appendix I of the COA, "the GSI component of the LTCPU is intended to provide for the gradual, continual conversion of the hydrologic characteristics of the Philadelphia combined sewer area that will consequently reduce the frequency and volume of overflows from the combined sewer system." The more traditional infrastructure elements of the LTCPU implementation program, including implementation of water pollution control plant upgrades, also should be evaluated on a five-year schedule to assess their progress toward the process components outlined in the facility concept plans.

To illustrate potential program modifications adopted at 5-year intervals with approved Evaluation and Adaptation Plans, the Water Department developed a flow chart (Figure 2-2). This figure is intended to illustrate that a program modification could be made once, at year 5, 10, 15 or 20 and then not needed again for the life of the program, or a program modification might be incorporated at each 5-year decision point, or may never be needed at all.

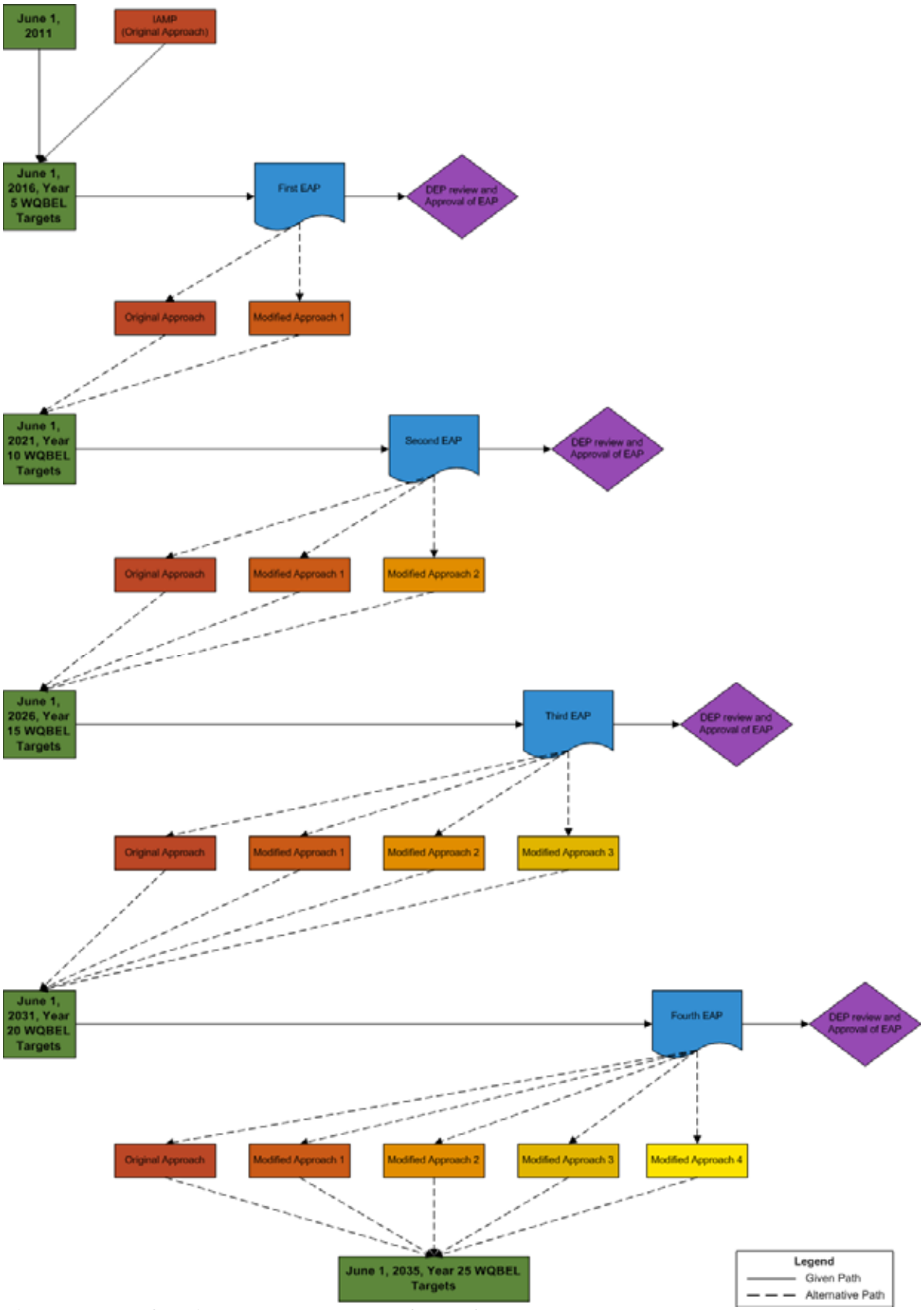


Figure 2-2 Adaptive Management Flow Chart

Evaluation and Adaptive Plans

According to paragraph 3e of the COA, an Evaluation and Adaptation Plan will be submitted "every five years, starting October 30, 2016." Each Evaluation and Adaptation Plan will be a comprehensive assessment of the City's progress towards full implementation of the approved LTCPU and its supplements with descriptions of program elements expected to be implemented in the next five-year period. Each Evaluation and Adaptation Plan also should include the following components:

1. Performance tracking of the *Green City, Clean Waters* Program using hydrologic and hydraulic models that have been validated with monitoring data, as described in Section 10 of the LTCPU and its supplements

2. Up-to-date values for each of the metrics that appear in Table 1 of the Water Quality Requirements section of the NPDES permits, with detailed descriptions of how the reported values are estimated

3. An assessment of how each metric's reported value compares to the Performance Standards provided in Table 1 in the Water Quality section of the NPDES permits

4. If any reported metric value does not equal or exceed the corresponding Performance Standard in Table 1 in the Water Quality section of the NPDES Permits, the City shall include in that Evaluation and Adaptation Plan an adaptive strategy for altering appropriate elements of program implementation. This strategy shall describe how the City proposes to ensure that the metric will meet the appropriate Performance Standard by the date of the next Evaluation and Adaptation Plan

5. Up-to-date values for the following additional metrics:
    - Number of GSI projects used to calculate the total number of GA created
    - Volume of stormwater (in million gallons per year) managed by new infrastructure, not including GSI
    - Volume Percent Capture for the combined sewer system as a whole.

The Evaluation and Adaptation Plan will include a description of the outcome of adaptive management decisions and changes in implementation for the following five years. Any proposed change in priorities or approach for meeting the milestones in the following five years will be described in this section, including altering approaches to implementing GSI and, if necessary, targeted traditional infrastructure investments or changes in design approaches. The modified approach would provide details on a project or series of projects that would compensate for missed metrics associated with the WQBEL Performance Standards.

Financial Capability

Financial capability will help determine what programmatic changes will be feasible, necessary, and achievable. Local economic conditions, including changes in household income, revenue, capital spending in response to new regulations or requirements, construction and operating costs, and the Water Department's financial position and cost of capital, will be assessed.

Adjustments to the program that either increase the rate of progress toward goals or decrease spending to avoid economic hardship will be considered.

2.2.1 Continuous Reporting of Adaptive Management

Through the Water Department's annual reporting process, continuous updates on the adaptation of the implementation program will be provided to the PADEP. Per paragraph 3d of the COA, if the City fails to achieve one or more of the Performance Standards from Table 1 in the Water Quality Requirements section of its NPDES Permits, as documented in an Evaluation and Adaptation Plan, the subsequent Annual Reports shall include an update describing the City's progress towards meeting those standards. Such updates must be provided in subsequent Annual Reports until all the applicable standards have been achieved. When the standards are achieved, the City shall provide a declaration of the date that the City achieved the standard, and documentation to support this declaration in the form of a demonstration of compliance.

3.0 Capital Projects

The Philadelphia Water Department will spend $1.2 billion over the next 25 years to implement the *Green City, Clean Waters* program. This includes an $800 million commitment for constructing GSI, $200 million for upgrading the City's water pollution control plants, and $200 million that will be spent on additional GSI and, or, on traditional CSO controls. These improvements will allow the City to achieve the WQBEL Performance Standards included in its National Pollutant Discharge Elimination System Permits.

This section of the IAMP describes the capital programs that make up each of the components of the *Green City, Clean Waters* program, including projects already completed, those underway and those proposed for implementation in the four and a half years leading up to the delivery of the first Evaluation and Adaptation Plan in 2016. The projects described include those associated with GSI including strategic frameworks and processes, waterfront disconnection, and interceptor rehabilitation. Also described are the facility concept plans for upgrades to the water pollution control plants, which are in development.

3.1 Green Stormwater Infrastructure

The Water Department's *Green City, Clean Waters* program includes a 25-year commitment to convert more than one-third of the impervious cover within the sections of the City served by combined sewers to GAs, or 9,564 acres of directly connected impervious cover. Of that total, at least 744 GAs will be achieved within the coming five years.

The LTCPU submitted in September 2009 described a number of programmatic themes that the Water Department would evaluate for implementation potential including:

- Green Streets,
- Green Schools,
- Green Public Facilities,
- Green Parking,
- Green Open Space,
- Green Industry, Business,
- Green Commerce and Institutions,
- Green Alleys, Driveways and Walkways, and
- Green Homes

These programmatic themes were established based on land use and ownership characteristics. In developing this IAMP, the Water Department has refined these themes and evolved some of them into strategic initiatives described in section 3.1.1.1 while others will be further evaluated for potential implementation tools through a pilot implementation program described in Section 3.1.1.2.

The *Green City, Clean Waters* program has three components through which GAs will be accrued:

1. Water Department-initiated GSI projects (Section 3.1.1)
2. GSI following "public works" projects (Section 3.1.2); and
3. Private investment (described in Section 3.1.5).

Each of these program components will be described herein.

3.1.1 Water Department initiated Green Stormwater Infrastructure

Prior to the submission of the LTCPU and its supplements in 2009, the Water Department had initiated a significant commitment to demonstrating land-based stormwater management projects in the City. The Water Department implemented a number of pilot projects aimed at demonstrating the utility of various green stormwater control technologies in highly urbanized areas. These demonstration projects helped to raise awareness of GSI among City residents and the regulatory community.

In 2009, the Water Department entered into a $30M loan agreement with the Commonwealth's PENNVEST program, much of which was targeted for the design and construction of green stormwater infrastructure. To date, the Water Department has constructed 4 projects using the loan funds, has completed designs on another 4 projects, and has 19 projects in various phases of design, which will accrue approximately 75 greened acres. In total, during the demonstration phase of the *Green City, Clean Waters* program, beginning in January 2006 through May 2011, the Water Department implemented 23 projects and secured approximately 14 GAs to apply toward the first 5-year WQBEL Performance Standard (Table 3-1).

Table 3-1 Green Stormwater Infrastructure Demonstration Projects (January 2006 through May 2011)

Project Name	SMP(s) Utilized	# of Trees	Completed Date	Drainage Area (sq. ft)	Storage Volume (CF)	Greened Acre (acre-inch)
Awbury Arboretum Bioswale	swale	0	Apr-06	9000	2522	0.69
West Mill Creek Farm Swales	Rain Garden, Swale	4	May-06	34517	360	0.10
Mill Creek Playground Porous Basketball Court	Pervious Paving	0	Jun-06	9350	1870	0.52
West Mill Creek Tree Trench	Stormwater Tree Trench	6	Jul-06	17000	755	0.21
47th & Grays Ferry Rain Garden	Rain Garden	7	Apr-07	19200	1260	0.35
Cliveden Park Stormwater Project	Rain Garden	0	Sep-07	52355	4378	1.21
Clark Park Basketball Court Project	Infiltration/Storage Trench	0	Nov-07	25458	3080	0.85
Jefferson Square Raingarden	Rain Garden	3	Jun-08	3782	305	0.08

Project Name	SMP(s) Utilized	# of Trees	Completed Date	Drainage Area (sq. ft)	Storage Volume (CF)	Greened Acre (acre-inch)
Waterview Recreation Center	Stormwater Tree Trench, Stormwater Planter, Pervious Paving	8	Jul-08	14773	2021	0.56
Herron Playground Porous Basketball Court	Pervious Paving	0	Apr-09	14480	551	0.15
Liberty Lands Stormwater Project	Rain Garden	24	Jun-09	8000	849	0.23
Greenfield Elementary School	Rain Garden, Pervious Paving	52	Jul-09	24640	2326	0.64
Independence Charter School	Rain Garden, Pervious Paving	5	Dec-09	7862	1783	0.49
Columbus Square Stormwater Planters	Stormwater Planter	0	Jan-10	7754	670	0.18
Sepviva St from Susquehanna Ave to Dauphin St	Other (Infiltration/Storage Trench?)	12	Jan-10	29675	1417	0.39
Shissler Playground	Stormwater Tree Trench	6	Jun-10	17600	3384	0.94
Lancaster Ave from N 58th St to N 63rd St	Stormwater Bumpout, Infiltration/ Storage Trench, Swale	219	Nov-10	76689	11281	3.11
16th St between Passyunk Ave and Jackson St	Stormwater Tree Trench	5	Nov-10	14735	571	0.16
Hartranft School	Stormwater Tree Trench	6	Nov-10	44524	3587	0.99
Palmer St from Frankford Ave to Blair St	Stormwater Tree Trench	5	Nov-10	9250	1250	0.34
Percy St from Catharine St to Christian St	Pervious Paving	0	Apr-11	4740	657	0.18
Eadom Parking Lot Depaving	Rain Garden	4	May-11	35278	3973	1.09
Bureau of Laboratory Services	Stormwater Tree Trench, Stormwater Bumpout	13	May-11	13408	1290	0.36
Total Greened Acres:						**13.8**

Evolution from Demonstration to Implementation

With the signing of the COA in June 2011, the Water Department's GSI demonstration phase came to a close and the *Green City, Clean Waters* program entered the implementation phase. As described in Section 1 of this IAMP, the Water Department recently reorganized the GSI implementation process to enhance productivity. Part of the reorganization involved the creation of two new working groups: the GSI Planning group and the Design Coordination group. At the present time, these two new groups essentially operate as one, with a 3-fold mission:

1. Identification of projects for queuing GSI capital projects;
2. Piloting a variety of project types; and,
3. Coordinate the design and construction oversight of active projects.

In the coming years, as additional staff positions are added and the number of projects and contracts managed by the team increases, the groups will separate and begin to operate in their individual roles as described herein.

Green Stormwater Infrastructure Planning Group

The Planning Group is charged with identifying, prioritizing and developing conceptual designs for projects that will manage runoff from public property or the public right-of-way. The Group's responsibilities include building an ample list of potential GSI projects and developing conceptual designs for feasible projects. A greater number of projects will be identified and conceptualized than required to meet interim WQBEL Performance Standards because it is not uncommon for projects that may seem feasible in their development phase to be delayed or canceled due to constraints found in the preliminary design phase. In order to meet the aggressive targets to supply viable projects, the Water Department's engineering resources will be increased as needed (further described in section 3.1.4).

Another responsibility of the Planning Group is to coordinate with City agencies in the development and management of programs associated with the Water Department GSI projects on streets and parks. This includes coordination with Philadelphia Parks & Recreation (PPR) and the Streets Department to develop design manuals to coordinate implementation to meet multi-agency objectives and leverage funding, and to review and approve project designs.

In the coming year, a key focus will be on developing strategic initiatives, identifying and priorotizing public works projects described in Section 3.1.2 and identifying project opportunities on public property. The Planning Group also will assess large-scale, concentrated or more centralized projects (described in section 3.1.1.1, Stormwater Management Enhancement Districts). The responsibility of this group is to identify projects, work with partners to assess feasibility, and to manage development of conceptual designs before turning projects over to the Design Coordination group for site design.

Design Coordination Group

The Design Coordination group has the primary responsibility to implement GSI projects by coordinating the design and construction process for projects from the GSI capital project queue and to develop operational procedures, tools, and templates to streamline implementation. Specific responsibilities include developing design guidelines, standard details and specifications, design process streamlining, and selection, training and management of design consultants. In addition to these procedural tasks, the Design Coordination group will oversee the implementation of projects funded through the current PENNVEST loan program.

3.1.1.1 Strategic Initiatives for Green Stormwater Infrastructure Conceptualized Project List

An important component of the strategy for identifying candidate GSI project sites is to target publicly owned facilities. These include City-owned properties, streets and rights-of-way, which constitute more than 45% of the impervious cover within the City. Stormwater capture associated with public property is enhanced by routing runoff from areas adjacent to public land

and managing that stormwater on the public land. Initial efforts to identify projects for the GSI conceptualized project list will focus on publicly owned impervious cover and schools. As implementation progresses, additional programmatic elements will be explored and developed.

Projects developed during the demonstration phase were primarily focused on building the relationships and partnerships needed to support a larger GSI program, and were often located on recreation facilities or other properties managed by the Water Department's partners. Though this process, the Water Department developed a number of tools for building the project list of conceptualized projects based on lessons learned in the GSI demonstration phase, and refined while developing a list of potential projects for the PENNVEST loan program. Project identification was based partially on following opportunities, existing partnerships, and ease of implementation.

While the Water Department will continue to follow opportunities and collaborative efforts with partners, the Water Department now will proactively embark on a number of strategic planning processes for queuing projects. An initial set of strategies for Water Department-sponsored projects is described below, including:

- GSI on Water Department-owned facilities,
- development of Stormwater Management Enhancement Districts (SMEDs),
- green campus initiatives,
- green schools and schoolyards,
- greening of publicly owned parking facilities,
- evaluation of vacant lands, and
- Other strategic initiatives.

Green Stormwater Infrastructure on Water Department-owned Facilities

The Water Department manages a wide range of facilities, including wastewater plants, water treatment plants, a biosolids recycling center, a laboratory, and various other large operation and maintenance sites. The diversity of these facilities lends itself to a wide range of GSI implementation strategies that enable the piloting of new techniques. By undertaking efforts to green its own facilities first, the Water Department will showcase its vision for environmental sustainability. In the coming years, the Water Department will continue to lead by example and convert its underutilized, impervious areas and provide a multi-faceted model for GSI implementation.

Examples of completed demonstration projects at Water Department Facilities include:

Bureau of Laboratory Services

The Bureau of Laboratory Services is a Water Department facility located in northern Philadelphia within the Tookany/Tacony Frankford watershed. Construction was recently completed and the project consists of a stormwater tree trench on Castor Avenue, a stormwater tree trench on Lycoming Street and a series of 7 stormwater planters along Hunting Park Avenue. The GSI at the Bureau of Laboratory Services

utilizes subsurface storage and vegetation to manage stormwater in both the combined and separate sewer systems.

Queen Lane Water Treatment Plant

The Queen Lane Water Treatment Plant is located in the East Falls neighborhood of Philadelphia within the Schuylkill Watershed. In partnership with the East Falls Development Corporation, 6 stormwater bumpouts were recently constructed along West Queen Lane adjacent to the treatment plant. Although the infrastructure manages stormwater in the separate storm system, this premiere application of an example of the Water Department's commitment to leading by example implementation GSI its current facilities.

Table 3-2 Philadelphia Water Department Facilities Which May Have Opportunity for Greening

Water Department Facility		TOTAL SITE	
Address	Sewer Type	GA (sq ft)	IA (sq ft)
Northeast WPCP	Both	6,175,962	2,582,112
Southwest WPCP	Both	3,067,170	1,801,692
Southeast WPCP	Both	2,244,211	1,005,648
Belmont Water Treatment Plant	Both	1,264,413	498,140
Queen Lane Water Treatment Plant	Separate	2,695,606	1,019,994
Baxter Water Treatment Plant	Separate	6,528,162	1,344,670
29th Street Facility	Combined	694,314	316,983
Collectors Systems Administration	Separate	430,421	341,726
Oak Lane Reservoir	Both	788,250	5,885
West Oak Lane Pumping Station	Combined	5,499	2,818
Bureau of Laboratory Sciences	Both	248,624	101,020
Fairhill High Pressure Pumping Station	Combined	171,370	35,586
49th and Paschall Sewer Maintenance Yard	Combined	33,959	31,022
Lardner's Point Sewer Maintenance Yard and Pump Station	Combined	414,405	135,744

Stormwater Management Enhancement Districts

The Water Department is developing a program to support coordinated investment in GSI and other stormwater management improvements. Stormwater Management Enhancement Districts (SMEDs) are areas where the potential exists for concentrated contiguous and interconnected use of GSI controls that may offer greater efficiencies than if those same controls were implemented in a non-coordinated manner.

The Water Department currently is identifying and prioritizing potential SMEDs project areas.

A Stormwater Management Enhancement District may be identified by the Water Department based on several criteria including:

1. Feasibility/Cost-Benefit of GSI implementation including analysis of:
    - Impervious Cover
    - Topography/surface drainage, some form of hydrologic uniformity
    - Land Use Type

2. Visibility, Community Gateways:
    - Areas where early success can be showcased to the public, rate payers, policy makers, developers, and other industry representatives
    - high visibility areas with uniform land ownership (*i.e.* campus scale)
3. Potential for substantial stakeholder interest, favorable partnership opportunities, and/or existence of community master plans
4. Community needs and equitable distribution of public investment throughout the combined sewer system area including urban and underserved neighborhoods
5. Planned Investments:
    - areas where other planned water and sewer or GSI investments are made
    - areas where concentrated development or redevelopment investments are made
6. Concentration of properties impacted by parcel based stormwater charges, and, or, areas of common land use such as business or industrial districts
7. Interagency Collaboration and Synergies: collaborating with other potential implementation initiatives such as Green Campus Initiatives, Green2015 schools and Philadelphia2035 and its forthcoming District Plans
8. Other criteria yet to be identified

Once a SMED has been identified by the Water Department, a consultant may be tasked with completing a comprehensive evaluation and Stormwater Improvements Plan (SIP) for the project area. Each SMED may be evaluated for potential to meet the following objectives:

1. Stakeholder Involvement: Success in implementing stormwater improvements in a SMED will be partly and, in particular cases, largely dependent on effective involvement and participation of key stakeholders. An effective strategy for identifying and coordinating with key stakeholders in a SMED is required.
2. Coordination with Other Planning Initiatives: SMED evaluations should investigate and identify cohesion and potential synergy with planning initiatives within a SMED as well as with citywide initiatives such as Greenworks, Philadelphia 2035, GreenPlan Philadelphia, Zoning Code updates, Philadelphia Pedestrian and Bicycle Plan, Philadelphia Complete Streets Initiative, Green 2015, and other relevant initiatives.
3. Coordination with Land Development: SMED evaluations should investigate and identify cohesion and potential synergy with near and long-term development within a SMED.
4. Effective Visual Presentation: All graphics from a SMED evaluation including maps, renderings, schematics, and other items that require visual representation must be prepared in a highly professional and effective illustrative format.

5. Creativity: Incorporating creativity such as artistic and/or historic elements into stormwater improvements is important.

6. Feasibility: In addition to physical considerations, benefits, and costs, other feasibility issues to be considered should include, at a minimum, financing issues, public/private ownership relationships and interaction, operation and maintenance, and area specific sensitivities.

7. Comparison and Rating Methodology: Both for the comparison of different stormwater management improvements in the same physical space and for the combination of stormwater management improvements area wide, an effective comparison and rating methodology must be developed to prioritize and recommend stormwater management improvements for a SMED. The ability to compare multiple stormwater improvements and various combinations of those improvements to arrive at a selected set is absolutely imperative. Comparison and rating methodology can be flexible but sustainability, multi-use benefits, and triple bottom line benefits are important considerations and should be included.

8. Implementation Strategy: To make the SMED Stormwater Improvement Plan more practical, a phasing and implementation strategy should be prepared for the combination of stormwater improvements.

Each Stormwater Improvement Plan will be a combination of text and supporting graphics that demonstrates how the evaluation objectives were addressed and resulting outcomes including the recommended type of stormwater management facilities; approximate sizing, layouts, and placement based upon drainage patterns; the impervious area managed; and the runoff volume managed and cost estimates for implementation. Cost estimates will include estimated project costs as defined by the Association for the Advancement of Cost Engineering Practice No. 18R-97 and present worth costs for operation and maintenance.

The Water Department currently is in the process of seeking professional services contracts to complete evaluations and Stormwater Improvements Plans for identified SMED project areas. Once these tasks are completed the consultant may be asked to develop detailed concept designs for one or more of the SIP proposed solutions. Detailed concept designs would include a higher level of detail, and would be completed as a next phase. The Water Department hopes to begin evaluations of four (4) SMEDs in the next year.

Green Campus Initiative

Often functioning as their own small-scale communities, college campuses present unique opportunities for efficient approaches to stormwater management. Philadelphia's concentration of college campuses may provide prime opportunities for concentrated GSI implementation. Implementing GSI on college campuses not only will have immediate environmental and aesthetic benefits but could also advance GSI research and monitoring by forming partnerships with university researchers.

The Water Department has initiated contact with several local colleges and universities to explore the development of collaborative relationships with the goal of developing campus-wide stormwater management plans. In some cases, green campus initiatives may evolve into SMEDs. In these cases, the scope of the planning may expand to include the surrounding neighborhoods.

At present, the Water Department's Green Campus strategy includes the following elements and proposed actions:

1. Gather campus data including: whether within the combined sewer system area, land use breakdown, gross area, DCIA, topography, existing campus facility plans, etc. Table 3-3 includes a list of campuses within the City of Philadelphia.

2. Prioritize the list of campuses according to baseline data (*i.e.* land area, % impervious cover, potential GA) and other leveraging criteria. Leveraging criteria may include: existing sustainability mission or green values, potential research and partnership opportunities, level of visibility, etc.

3. Build on strong existing relationships with university professors and researchers, with the intent of aligning *Green City, Clean Waters* principles with the goals of the university administration for future physical and strategic planning.

4. Work with the university administration to establish a partnership between the Water Department and university facility managers and administrators to open lines of communication and coordinate project development.

5. Proactively evaluate opportunities for implementation identified during the planning process, in anticipation of available funding and upcoming projects.

6. Develop a stormwater master plan that is based on green principles to maximize stormwater management, in some places above and beyond the required level, to compensate for areas that may be more challenging for GSI.

7. Evaluate the potential to streamline the Water Department's project review process to increase the likelihood for participation in time-sensitive university development initiatives.

The sixteen campuses located within the combined sewer system area represent a total land area of 1,030 acres. In total, 67.8%, or 698 acres of the area is impervious, which provides considerable potential for GSI implementation. Although the Water Department has crafted a citywide vision for green institutions, the Water Department initially will target campuses within the combined sewer system area.

Table 3-3 Campuses located within the combined sewer system area

University/College Name	Watershed	Impervious (Acres)	Total Area (Acres)	Percent Impervious
Art Institute of Philadelphia	Schuylkill	0.18	0.18	98.9%
Community College Main Campus	Schuylkill	16.43	21.01	78.2%
Curtis Institute of Music	Schuylkill	0.36	0.36	99.8%
Drexel University	Schuylkill	41.01	52.81	77.7%
LaSalle University	TTF	63.02	154.54	40.8%
Lutheran Theological Seminary of Philadelphia	TTF, Wissahickon	5.07	11.57	43.8%
Moore College of Art & Design	Schuylkill	1.16	1.23	94.1%
Pierce College	Schuylkill	0.29	0.30	94.6%
Pennsylvania Academy of the Fine Arts	Schuylkill	0.25	0.25	100.0%
Philadelphia College of Osteopathic Medicine	Schuylkill	0.02	0.03	93.5%
St. Josephs University	Schuylkill	54.55	112.07	48.7%
Temple Medical	Delaware	47.79	56.05	85.2%
Temple University	Delaware	183.67	254.17	72.3%
Thomas Jefferson University	Delaware	22.01	24.68	89.2%
University of Arts	Delaware/Schuylkill	15.60	16.92	92.2%
University of Pennsylvania	Schuylkill	242.41	312.75	77.5%
University of Sciences	Schuylkill	3.20	9.82	32.6%
Walnut Hill College	Schuylkill	0.88	1.10	80.7%
TOTAL		697.90	1029.83	67.8%

Green Schools Initiative

Schools in Philadelphia encompass about 2% of all impervious cover in the combined sewer system area of the City, but because they are highly visible and are educational institutions, they have been afforded a high priority in the Water Department's GSI program. School improvements are envisioned to utilize an array of stormwater measures such as rain gardens, green roofs, rain barrels and cisterns. These sites offer significant potential for the incorporation of pervious pavement and tree plantings both on school parking and recreational facilities, transforming heat-trapping asphalt zones into more welcoming, cooler, green areas.

A Green Schools Initiative will provide educational opportunities for students and instructors, enhanced recreational amenities for students, aesthetic improvements to campuses, and potential reductions to stormwater bills for the School District of Philadelphia.

The Green 2015 partnership (further described in Section 4) provides a launching point for an ongoing partnership among the Water Department, PPR, the School District of Philadelphia, and the Trust for Public Land. The Water Department has an interest in undertaking this venture to examine systematically options to transform school yards and maximize stormwater management benefits for adjacent communities. In support of this Plan, the Water Department has committed to greening 5-7 schoolyards in the coming years. The Water Department sees the Green2015 initiative as a first step in a long-term relationship with the Philadelphia School District to support a citywide green schools initiative.

Green School Implementation Strategy

The short-term Green School Implementation Strategy is based on the Green 2015 Action Plan and the Water Department plans to support the retrofitting of many of Philadelphia's schools. At present, the Water Department has developed a cooperative implementation approach through an Interagency Coordination Group (ICG). Some of the functions of the ICG include:

1. The ICG is working with the School District of Philadelphia to review and finalize the list of Green 2015 schools.
2. With the finalized list, the GSI Planning group will begin to evaluate and prioritize sites based on the following factors: potential GA, provision of additional amenities, maintenance requirements, etc.
3. ICG will collaborate with project partners to develop a coordinated implementation process that addresses gaps/inefficiencies in design, outreach and construction schedules.
4. Using community feedback, the GSI Planning group will begin design of stormwater management features on selected school sites, coordinating with project partners at predetermined intervals of the design process.
5. ICG will work with the Philadelphia Law Department to obtain proper easements and/ or, deed restrictions required for maintenance obligations.

Table 3-4 shows a preliminary inventory of all school sites within the Combined Sewer Area. Out of the 313 potential sites, the Water Department has evaluated more than 30 for green stormwater infrastructure opportunities.

Table 3-4 Potential Sites for Green School Implementation

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
1300 E Palmer St*	Delaware Direct	1.712	1.725	99%
4134 N 06th St	Delaware Direct	1.020	1.020	100%
1130-48 Federal St*	Delaware Direct	0.781	0.799	98%
5401 Warrington Ave*	Cobbs Creek	2.500	2.909	86%
5901 Malvern Ave*	Lower Schuylkill River	2.351	2.863	82%
2850 Jenks St*	Delaware Direct	0.768	0.773	99%
2834 Jenks St*	Delaware Direct	0.055	0.064	85%
2838 Jenks St*	Delaware Direct	0.055	0.065	84%
2836 Jenks St*	Delaware Direct	0.055	0.067	82%
2832 Jenks St*	Delaware Direct	0.059	0.070	85%
1620 Christian St*	Delaware Direct	0.664	0.664	100%
3001 Robbins St*	Delaware Direct	4.789	5.621	85%
201 E Olney Ave*	Tacony-Frankford Creek	4.552	5.026	91%
4701-11 Spruce St*	Lower Schuylkill River	0.537	0.551	97%
4713-21 Spruce St*	Lower Schuylkill River	0.455	0.467	97%
242 S 47Th St*	Lower Schuylkill River	0.952	0.952	100%
5304-46 Lancaster Ave*	Lower Schuylkill River	2.842	3.226	88%
2400 N Front St*	Delaware Direct	2.446	2.790	88%

*Preliminary reviews for stormwater management potential have been completed for these sites. This includes desktop and site analyses to determine project feasibility.

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
6600 Chester Ave*	Cobbs Creek	1.820	1.942	94%
1400-24 N 06Th St*	Delaware Direct	0.960	0.966	99%
3302-64 N 03Rd St*	Delaware Direct	1.787	1.841	97%
3300 N 03Rd St*	Delaware Direct	0.727	0.743	98%
412-30 W Susquehanna Ave*	Delaware Direct	2.578	2.819	91%
120 E Tabor Rd*	Tacony-Frankford Creek	1.286	1.286	100%
1720-58 N 12Th St*	Delaware Direct	0.942	1.022	92%
5800 Walnut St*	Cobbs Creek	6.721	8.241	82%
2100 S 18Th St*	Lower Schuylkill River	1.717	1.869	92%
243-57 E Allegheny Ave*	Delaware Direct	1.607	1.615	100%
3133 Ridge Ave*	Lower Schuylkill River	4.462	4.482	100%
2501 S 05Th St*	Delaware Direct	1.951	1.969	99%
2000 Wakeling St	Tacony-Frankford Creek	2.475	8.619	29%
3400 N Howard St*	Delaware Direct	2.357	2.475	95%
2400-56 Diamond St*	Delaware Direct	3.117	3.117	100%
4300 Bleigh Ave	Delaware Direct	2.360	3.132	75%
2814-28 N 12Th St	Delaware Direct	1.035	1.099	94%
1301-37 N Broad St	Delaware Direct	3.527	5.092	69%
427-33 Monroe St	Delaware Direct	0.131	0.136	96%
701-41 N 48Th St	Lower Schuylkill River	1.901	2.263	84%
800 S 53Rd St	Cobbs Creek	0.251	0.307	82%
101-25 E Rittenhouse St	Tacony-Frankford Creek	0.196	0.605	32%
2200-24 Chestnut St	Lower Schuylkill River	1.241	1.424	87%
5900 Baltimore Ave	Cobbs Creek	6.116	6.902	89%
4700 Walnut St	Lower Schuylkill River	4.082	4.082	100%
1630-42 Green St	Lower Schuylkill River	0.533	0.540	99%
6801 Cottage St	Delaware Direct	1.233	1.553	79%
151 W Luzerne St	Tacony-Frankford Creek	10.676	23.453	46%
1700 Bigler St	Lower Schuylkill River	1.834	2.630	70%
1800 Cottman Ave	Delaware Direct	2.850	3.373	85%
2301-15 N 03Rd St	Delaware Direct	0.211	0.316	67%
2601-31 N 28Th St	Delaware Direct	1.416	1.431	99%
4612-72 W Girard Ave	Lower Schuylkill River	2.545	3.222	79%
2734 E Cambria St	Delaware Direct	0.012	0.014	85%
728-62 N 44Th St	Lower Schuylkill River	3.041	3.178	96%
4420 Haverford Ave	Lower Schuylkill River	3.082	4.136	75%
1501 Sellers St	Tacony-Frankford Creek	0.787	0.811	97%
1012-20 W Thompson St	Delaware Direct	2.554	2.636	97%
2101 S 24Th St	Lower Schuylkill River	2.139	2.380	90%
2601-31 W Cumberland St	Delaware Direct	2.480	2.480	100%
2853 Salmon St	Delaware Direct	0.039	0.045	86%
2701-17 W Oxford St	Lower Schuylkill River	0.473	0.478	99%
6226 Elmwood Ave	Lower Schuylkill River	1.068	1.154	93%
1301-31 E Luzerne St	Tacony-Frankford Creek	2.118	2.208	96%
900-14 Lindley Ave	Tacony-Frankford Creek	1.808	1.828	99%
1000 Bigler St	Delaware Direct	4.994	14.571	34%
700 N 35Th St	Lower Schuylkill River	2.842	2.889	98%
2901 Princeton Ave	Delaware Direct	5.808	11.212	52%
2226-50 S 08Th St	Delaware Direct	0.743	0.743	100%
5199 Mulberry St	Delaware Direct	1.458	1.726	84%
2400 N 57Th St	Lower Schuylkill River	2.651	4.692	56%
2210-20 Sansom St	Lower Schuylkill River	0.152	0.157	97%

*Preliminary reviews for stormwater management potential have been completed for these sites. This includes desktop and site analyses to determine project feasibility.

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
3001-65 N 06Th St	Delaware Direct	3.287	3.750	88%
300 W Duncannon Ave	Tacony-Frankford Creek	1.105	1.404	79%
4735 Old York Rd	Tacony-Frankford Creek	1.674	1.867	90%
4901-57 Parrish St	Lower Schuylkill River	1.456	1.468	99%
3921-61 N 05Th St	Tacony-Frankford Creek	1.690	1.701	99%
1321 S 26Th St	Lower Schuylkill River	0.888	0.943	94%
528-44 N 13Th St	Delaware Direct	1.294	1.307	99%
428 Monroe St	Delaware Direct	0.208	0.208	100%
2331-57 N 04Th St	Delaware Direct	0.827	0.829	100%
1101-25 N 04Th St	Delaware Direct	1.042	1.080	96%
1821 S 09Th St	Delaware Direct	1.756	1.774	99%
1619 E Moyamensing Ave	Delaware Direct	0.952	0.952	100%
1601 W Hunting Park Ave	Tacony-Frankford Creek	3.128	6.432	49%
330 E Wyoming Ave	Tacony-Frankford Creek	2.823	3.161	89%
800 S 20Th St	Lower Schuylkill River	1.115	1.135	98%
435-37 Monroe St	Delaware Direct	0.035	0.042	83%
1901 S 23Rd St	Lower Schuylkill River	0.594	0.594	100%
626 Dickinson St	Delaware Direct	0.650	0.650	100%
1801-09 W Oxford St	Delaware Direct	1.370	1.520	90%
1245 W Moyamensing Ave	Delaware Direct	0.691	0.724	95%
4030-60 Brown St	Lower Schuylkill River	2.844	3.086	92%
6801 N 19Th St	Tacony-Frankford Creek	2.270	2.762	82%
1435-45 N 26Th St	Lower Schuylkill River	0.870	0.877	99%
1001 Devereaux Ave	Delaware Direct	6.057	6.176	98%
5111-17 N 04Th St	Tacony-Frankford Creek	0.207	0.246	84%
5720-38 Media St	Lower Schuylkill River	1.895	1.901	100%
620-34 N 15Th St	Delaware Direct	1.794	1.814	99%
1721-35 W Sedgley Ave	Delaware Direct	0.000	1.707	0%
3701 Frankford Ave	Tacony-Frankford Creek	0.863	0.864	100%
131-35 E Rittenhouse St	Tacony-Frankford Creek	0.510	0.510	100%
1301-35 W Girard Ave	Delaware Direct	0.479	2.119	23%
6101-67 N Gratz St	Tacony-Frankford Creek	3.129	3.390	92%
1642 Comly St	Delaware Direct	0.663	0.915	72%
1464-88 N 53Rd St	Lower Schuylkill River	1.285	1.435	90%
11-19 S 42Nd St	Lower Schuylkill River	0.895	0.915	98%
1325-49 S 33Rd St	Lower Schuylkill River	0.328	0.336	97%
4301-19 Ogden St	Lower Schuylkill River	1.640	1.711	96%
5400 N Broad St	Tacony-Frankford Creek	12.033	29.538	41%
1601 Levick St	Delaware Direct	4.855	6.335	77%
3112-14 W Lehigh Ave	Lower Schuylkill River	0.119	0.119	100%
1920 E Orleans St	Delaware Direct	0.759	0.794	96%
1301-59 Belmont Ave	Lower Schuylkill River	2.675	2.753	97%
100 E Duncannon Ave	Tacony-Frankford Creek	1.219	7.644	16%
2600-24 W Thompson St	Lower Schuylkill River	0.888	0.893	99%
5601 Christian St	Cobbs Creek	1.636	1.655	99%
1901 Tyson Ave	Delaware Direct	6.344	12.369	51%
3900-58 N 18Th St	Delaware Direct	1.125	1.317	85%
1100 Tyson Ave	Delaware Direct	4.037	5.653	71%
2136 Ritner St	Lower Schuylkill River	1.683	1.687	100%
2600 W Clearfield St	Lower Schuylkill River	1.645	1.645	100%
1801-27 Green St	Lower Schuylkill River	1.465	1.467	100%
2100-50 W Lehigh Ave	Delaware Direct	3.242	4.249	76%
122-50 W Erie Ave	Delaware Direct	4.325	6.318	68%
3600 N 11Th St	Delaware Direct	0.814	0.816	100%
3250 Amber St	Delaware Direct	0.390	0.394	99%
3001-29 W Berks St	Lower Schuylkill River	2.502	2.700	93%

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
5200 Media St	Lower Schuylkill River	0.355	1.694	21%
777-87 Schuylkill Ave	Lower Schuylkill River	1.290	1.331	97%
1511-19 W Huntingdon St	Delaware Direct	0.297	0.439	68%
2942 Belgrade St	Delaware Direct	1.071	1.118	96%
3400 N 15Th St	Delaware Direct	1.584	1.584	100%
5748 Willows Ave	Cobbs Creek	1.989	2.047	97%
2528-34 W Sedgley Ave	Delaware Direct	0.531	0.817	65%
5101 Mascher St	Tacony-Frankford Creek	4.843	6.522	74%
1034-42 S 60Th St	Cobbs Creek	2.139	2.210	97%
2829-59 N 23Rd St	Delaware Direct	1.040	1.040	100%
4901-31 Chestnut St	Lower Schuylkill River	2.229	4.604	48%
440 N Broad St	Lower Schuylkill River	4.635	4.804	96%
434 Monroe St	Delaware Direct	0.029	0.033	87%
4501 Benner St	Delaware Direct	1.958	2.084	94%
1205-11 E Tulpehocken St	Tacony-Frankford Creek	1.671	3.390	49%
6421 W Passyunk Ave	Lower Schuylkill River	6.387	6.590	97%
1835-69 N 54Th St	Lower Schuylkill River	1.263	1.448	87%
3630 N Randolph St	Delaware Direct	1.748	1.757	99%
600 E Thompson St	Delaware Direct	1.211	1.349	90%
3200 W Lehigh Ave	Lower Schuylkill River	2.963	5.384	55%
601-19 Fairmount Ave	Delaware Direct	1.219	1.219	100%
436 Monroe St	Delaware Direct	0.029	0.035	83%
5801-51 N 05Th St	Tacony-Frankford Creek	2.462	2.462	100%
5000 Oxford Ave	Tacony-Frankford Creek	3.515	4.612	76%
2201 Brown St	Lower Schuylkill River	1.791	1.920	93%
5001-35 Greenway Ave	Lower Schuylkill River	2.143	2.096	102%
2400 Christian St	Lower Schuylkill River	0.737	0.800	92%
3715-33 N 19Th St	Delaware Direct	0.657	0.664	99%
1601 S 33Rd St	Lower Schuylkill River	3.927	4.463	88%
926-76 E Chelten Ave	Tacony-Frankford Creek	2.571	2.618	98%
2000-46 N 07Th St	Delaware Direct	1.483	1.511	98%
5801 Elmwood Ave	Lower Schuylkill River	1.305	6.690	20%
1197 Haworth St	Delaware Direct	1.939	2.724	71%
6501 Chew Ave	Tacony-Frankford Creek	2.033	2.226	91%
416 Monroe St	Delaware Direct	0.015	0.017	85%
1100 E Mount Pleasant Ave	Tacony-Frankford Creek	5.801	6.435	90%
2732 E Cambria St	Delaware Direct	0.011	0.013	85%
6501-33 Limekiln Pk	Tacony-Frankford Creek	2.654	2.654	100%
2724-28 E Cambria St	Delaware Direct	0.041	0.049	83%
1601-49 N 28Th St	Lower Schuylkill River	1.664	1.664	100%
5700 Lancaster Ave	Lower Schuylkill River	3.721	4.627	80%
414 Monroe St	Delaware Direct	0.014	0.016	85%
2400-14 S 62Nd St	Lower Schuylkill River	0.236	0.236	100%
2118-34 W Norris St	Delaware Direct	1.964	2.014	98%
1501 S 17Th St	Lower Schuylkill River	1.091	1.129	97%
2922 Memphis St	Delaware Direct	2.358	2.520	94%
4800 Fairmount Ave	Lower Schuylkill River	0.396	0.434	91%
4344-58 N 05Th St	Tacony-Frankford Creek	0.854	0.864	99%
1101-51 E Gorgas La	Tacony-Frankford Creek	3.297	6.897	48%
3070-74 Frankford Ave	Delaware Direct	0.234	0.262	89%
6404 Elmwood Ave	Lower Schuylkill River	0.480	0.520	92%
2143-75 E York St	Delaware Direct	2.025	2.287	89%
1500 S 32Nd St	Lower Schuylkill River	1.945	2.033	96%
4601 Haverford Ave	Lower Schuylkill River	0.604	1.890	32%
1300 S 19Th St	Lower Schuylkill River	1.146	1.165	98%
5600-54 Vine St	Cobbs Creek	3.522	4.356	81%

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
7501 Woodbine Ave	Cobbs Creek	4.472	5.474	82%
1660 Comly St	Delaware Direct	0.490	0.566	87%
3148 Ridge Ave	Lower Schuylkill River	0.025	0.102	25%
5300 Ditman St	Delaware Direct	2.208	2.429	91%
7001 Buist Ave	Lower Schuylkill River	1.496	1.527	98%
1301-31 W Grange Ave	Tacony-Frankford Creek	1.144	1.197	96%
6714-28 Lansdowne Ave	Cobbs Creek	0.154	0.321	48%
2201-51 N 28Th St	Delaware Direct	3.768	4.312	87%
432 Monroe St	Delaware Direct	0.029	0.035	83%
2826 Salmon St	Delaware Direct	1.054	1.199	88%
1701-47 Chelten Ave	Tacony-Frankford Creek	1.676	2.473	68%
2411-15 Sepviva St	Delaware Direct	0.233	0.234	100%
1901-51 N 17Th St	Delaware Direct	2.330	4.590	51%
308-32 S 06Th St	Delaware Direct	1.929	2.093	92%
15 S 50Th St	Lower Schuylkill River	0.012	0.049	25%
801-39 E Hunting Park Ave	Tacony-Frankford Creek	3.577	5.033	71%
2300-52 Jefferson St	Lower Schuylkill River	0.789	0.873	90%
6523-43 Lansdowne Ave	Cobbs Creek	1.629	1.928	84%
430 E Washington La	Tacony-Frankford Creek	3.743	5.161	73%
1102-96 E Tulpehocken St	Tacony-Frankford Creek	4.842	7.516	64%
67 E Bringhurst St	Tacony-Frankford Creek	3.431	3.596	95%
1700 Chelten Ave	Tacony-Frankford Creek	0.378	2.691	14%
1829 E Clearfield St	Delaware Direct	1.004	1.018	99%
1537 W Cayuga St	Tacony-Frankford Creek	0.570	0.642	89%
1323-45 N 06Th St	Delaware Direct	0.872	0.880	99%
800 E Ontario St	Delaware Direct	0.968	0.976	99%
3150 Germantown Ave	Delaware Direct	0.726	0.726	100%
1930 E Elkhart St	Delaware Direct	1.548	4.974	31%
4401 Paul St	Tacony-Frankford Creek	1.672	1.758	95%
2300-44 Master St	Lower Schuylkill River	1.833	2.193	84%
3501-15 Powelton Ave	Lower Schuylkill River	1.028	1.225	84%
2200-26 N 22Nd St	Delaware Direct	2.925	3.214	91%
5624 Spruce St	Cobbs Creek	2.008	2.196	91%
2101 S Broad St	Delaware Direct	3.975	4.610	86%
2700 E Huntingdon St	Delaware Direct	0.742	0.817	91%
3400-42 Frankford Ave	Delaware Direct	2.820	2.932	96%
548 N Broad St	Delaware Direct	1.683	1.731	97%
5025 Rutland St	Delaware Direct	0.006	3.711	0%
430 Monroe St	Delaware Direct	0.029	0.034	84%
1523-49 W Cumberland St	Delaware Direct	1.140	1.170	97%
1040 E Mount Pleasant Ave	Tacony-Frankford Creek	0.000	2.803	0%
400-16 S 52Nd St	Cobbs Creek	1.549	1.614	96%
1114-50 S 05Th St	Delaware Direct	0.999	1.110	90%
5021 Rutland St	Tacony-Frankford Creek	1.445	3.565	41%
601 Carpenter St	Delaware Direct	1.061	1.092	97%
111-25 W Oxford St	Delaware Direct	0.282	0.289	98%
2611-35 N 05Th St	Delaware Direct	0.158	0.165	96%
4514-22 Woodland Ave	Lower Schuylkill River	0.963	0.968	99%
3261 B St	Delaware Direct	0.386	0.388	99%
500 E Allegheny Ave	Delaware Direct	1.441	1.622	89%
5300-34 Baltimore Ave	Cobbs Creek	1.609	1.673	96%
1900 S 03Rd St	Delaware Direct	2.184	2.213	99%
221-41 Hanson St	Lower Schuylkill River	0.351	0.354	99%
1901 S 09Th St	Delaware Direct	2.007	2.263	89%
2834-44 N Hutchinson St	Delaware Direct	0.247	0.282	87%
2075 E Cumberland St	Delaware Direct	1.975	1.994	99%

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
4002-10 Germantown Ave	Delaware Direct	0.480	0.480	100%
11-83 N 38Th St	Lower Schuylkill River	9.392	14.028	67%
1100 Catharine St	Delaware Direct	0.950	0.950	100%
4000 Germantown Ave	Delaware Direct	0.012	0.047	25%
713 S 05Th St	Delaware Direct	0.716	0.752	95%
2851 Salmon St	Delaware Direct	0.039	0.045	86%
800 W Cumberland St	Delaware Direct	1.547	1.962	79%
1818 N 53Rd St	Lower Schuylkill River	0.584	0.960	61%
6101 Summerdale Ave	Delaware Direct	2.717	3.693	74%
1850 E Washington La	Tacony-Frankford Creek	1.731	2.607	66%
6001 Cedar Ave	Cobbs Creek	1.938	2.554	76%
2429-65 N 08Th St	Delaware Direct	2.161	2.329	93%
6000 Stenton Ave	Tacony-Frankford Creek	10.347	41.844	25%
1146 Melon St	Delaware Direct	1.083	1.083	100%
56-58 E Haines St	Tacony-Frankford Creek	0.396	0.404	98%
2445-63 Emerald St	Delaware Direct	0.948	0.964	98%
5500 Kingsessing Ave	Lower Schuylkill River	2.617	2.697	97%
1501-43 Diamond St	Delaware Direct	4.448	4.588	97%
2834-66 N Howard St	Delaware Direct	0.543	0.552	98%
1645 Spring Garden St	Lower Schuylkill River	0.726	0.773	94%
3901-61 N 18Th St	Delaware Direct	4.355	5.668	77%
801 N 22Nd St	Lower Schuylkill River	0.552	0.554	100%
2630-44 Wharton St	Lower Schuylkill River	0.542	0.549	99%
1800-56 W Nedro Ave	Tacony-Frankford Creek	1.832	2.067	89%
6601 Elmwood Ave	Lower Schuylkill River	6.604	7.369	90%
1801 S 22Nd St	Lower Schuylkill River	1.028	1.064	97%
2500 Tasker St	Lower Schuylkill River	2.610	2.986	87%
2800-62 N 06Th St	Delaware Direct	2.643	2.704	98%
5401 Tabor Ave	Tacony-Frankford Creek	1.975	2.246	88%
4515 A St	Tacony-Frankford Creek	0.008	0.032	24%
401-21 W Lehigh Ave	Delaware Direct	2.407	2.427	99%
901-33 S Broad St	Delaware Direct	2.134	2.774	77%
1202R-06 E Washington La	Tacony-Frankford Creek	0.065	0.129	51%
2600-20 N Broad St	Delaware Direct	1.817	1.830	99%
3116 Frankford Ave	Delaware Direct	1.994	2.016	99%
4933 Chestnut St	Lower Schuylkill River	0.031	0.050	63%
2400-54 S 58Th St	Lower Schuylkill River	0.048	0.542	9%
5873 Lancaster Ave	Lower Schuylkill River	0.716	1.043	69%
5685 Lancaster Ave	Lower Schuylkill River	0.052	0.925	6%
608-20 W Erie Ave	Delaware Direct	0.233	0.233	100%
4001L Parkside Ave	Lower Schuylkill River	7.254	11.957	61%
238 E Wyoming Ave	Tacony-Frankford Creek	1.483	1.695	88%
206-10 E Courtland St	Tacony-Frankford Creek	1.711	2.069	83%
1301-17 Spring Garden St	Delaware Direct	0.608	0.611	99%
1900-20 N Newkirk St	Lower Schuylkill River	0.170	0.172	99%
2100-16 N 13Th St	Delaware Direct	0.186	0.188	99%
2118-60 N 13Th St	Delaware Direct	1.584	1.671	95%
2101-51 N Park Ave	Delaware Direct	0.627	0.629	100%
1417-27 N Marshall St	Delaware Direct	0.174	0.174	100%
1411-13 N Marshall St	Delaware Direct	0.016	0.066	25%
4224-50 N Front St	Tacony-Frankford Creek	4.419	4.582	96%
4220 N Front St	Tacony-Frankford Creek	0.416	0.514	81%
624 Schuylkill Ave	Lower Schuylkill River	0.093	0.641	15%
2801-37 W Glenwood Ave	Lower Schuylkill River	1.096	1.348	81%
2731-49 W Glenwood Ave	Lower Schuylkill River	0.515	0.515	100%
2824-26 Jenks St	Delaware Direct	0.160	0.160	100%

Address	Watershed	Impervious Area (Acres)	Total Area (Acres)	Percent Impervious
1700 W Olney Ave	Tacony-Frankford Creek	7.280	16.776	43%
5118-50 N 06Th St	Tacony-Frankford Creek	2.184	2.353	93%
630R-50 W Fisher Ave	Tacony-Frankford Creek	0.019	0.076	25%
61-71 E Haines St	Tacony-Frankford Creek	0.282	0.287	98%
73 E Haines St	Tacony-Frankford Creek	0.225	0.230	98%
2603-09 N 05Th St	Delaware Direct	0.185	0.185	100%
1900 E Sergeant St	Delaware Direct	0.960	0.960	100%
2711 W Cabot St	Lower Schuylkill River	0.011	0.013	83%
5000 N 17Th St	Tacony-Frankford Creek	2.925	3.666	80%
5900 Race St	Cobbs Creek	1.009	1.009	100%
6900 Greenway Ave	Cobbs Creek	0.934	1.148	81%
3080 Emerald St	Delaware Direct	0.178	0.192	93%
5915-41 Germantown Ave	Tacony-Frankford Creek	4.711	6.227	76%
3303-61 Old York Rd	Delaware Direct	3.114	3.855	81%
1901 N Front St	Delaware Direct	2.617	7.842	33%
4301 Wayne Ave	Tacony-Frankford Creek	2.272	3.312	69%
3350 Richmond St	Delaware Direct	1.428	1.451	98%
8118 Frankford Ave	Pennypack Creek	2.130	2.230	96%
5500 Langdon St	Delaware Direct	8.166	23.048	35%
Sum		562.46	778.50	

Green Parking Lots Initiative

Parking lots constitute approximately 5% of the impervious cover in the combined sewer system area of the City and greening them offers significant opportunities to reduce stormwater runoff. The greening of parking lots can improve the appearance of the City's commercial and business districts. Additionally, the incentives provided by the Water Department's Parcel Based Billing initiative, which resulted in a reallocation of stormwater fees, may make retrofits aimed at reducing stormwater fees more feasible for private parking lots. A variety of stormwater measures can be used to remediate the effects of parking lot runoff, including vegetative strips, infiltration beds, tree plantings, porous pavement, and the development of green roof areas on parking garages.

Benefits to the City of greening parking facilities may include:

- Improved community aesthetics and urban design
- Potential low cost solutions
- Potential community engagement opportunities
- Reductions to stormwater bills for the parking lot owners

City-owned parking facilities will be targeted as a demonstration of the City's commitment to using GSI in the role of CSO control. The City also will consider Zoning Code and/or additional ordinance enhancements to require green buffers around parking facilities to include the function of a stormwater management measure.

Green Parking Lots Implementation Strategy

The Water Department developed two strategies to implement the Green Parking program, depaving and prioritizing public parking lots for incorporating GSI. Some projects may utilize both strategies.

Depaving Projects

Depaving projects would involve the removal of large sections of asphalt, replacing it with GSI such as rain gardens to manage stormwater runoff from the remaining impervious areas. The Water Department is following a nationwide movement to remove unnecessary impervious surfaces to create urban green space (see www.depave.org). The Water Department believes depaving projects offer a high benefit-to-cost ratio. These projects may be eligible for grant funding and are of relatively low cost due to little if any design necessary and the potential for volunteer labor to break apart the paving materials.

In addition to acquiring GAs, one of the goals of the depaving projects is to educate local volunteers and community members about watershed health, by involving them in the design and construction of a collaborative project.

The Water Department is currently looking into several approaches to administer depaving projects, such as the use of a citywide on-call services contract. These demonstration projects serve as models for private parking lots owners seeking stormwater credits on their stormwater bills.

Prioritized Public Parking Lots

Priority parking lots for green stormwater retrofits will be selected from an inventory of over 200 public parking lots. The Water Department is developing a prioritized list of public parking lots from baseline data (*i.e.* land area, % impervious cover, potential GAs and other leveraging criteria). An initial desktop screening was conducted, and the following criteria were used to identify and prioritize potential sites for this analysis:

- Entire parcel is owned by the City of Philadelphia or other public entity
- Large drainage areas, including the ability to manage street or adjacent streets
- Parking lots with existing vegetated buffers or landscaped islands that could manage stormwater
- Under-utilized parking lots, where GSI features can be above ground in existing parking spaces without loss of parking revenue
- Need for capital improvement or re-paving to improve the benefit-cost ratio

The City of Philadelphia owns 104 parking lots that an initial screening indicates could provide up to 99 GAs through greening (Table 3-5). The Water Department will evaluate the feasibility for greening these sites including field verification of the existing, physical conditions and use of the parking lots and then an analysis of the feasibility for installing GSI before any of these potential projects can be entered into a project planning queue.

Table 3-5 Public Parking Lots by Ownership

Parking Lot Owner	Potential Greened Acres	Number of Sites
City of Philadelphia	99	104
U.S of America (Federal Property)	9.8	2
Philadelphia School District	5.0	10
Philadelphia Industrial Development Corporation	3.0	3
Redevelopment Authority	2.5	9
Total	**119.3**	**128**

Vacant Land Initiative

Vacant land, while not all publicly owned, presents an opportunity for stormwater management. There are over 40,000 vacant parcels of land in the City, providing opportunities both for permanent green redevelopment and for more temporary measures such as the creative use of vacant parcels for management of stormwater from surrounding areas. The challenge however is that vacant lands by nature may be vacant only temporarily, and it is often difficult to assess the future potential use of a vacant site. A high percentage of vacant properties are less than one tenth of an acre. Due to the large number of small dispersed sites and the difficulty of evaluating each of them for the ability to manage stormwater, the Water Department has prioritized larger sites for the first five years, but plans to continue to consider the opportunities that may exist on smaller sites.

Vacant parcels within the combined sewer area of Philadelphia were reviewed to identify sites that could manage runoff from both impervious areas within the site and from adjacent streets and sidewalks. Sites were assigned low priorities if they had unfavorable site characteristics, such as small drainage area, poorly suited topography, structures, severe dumping activity, a long distance to a Water Department stormwater inlet, mature trees on site, or potential soil contamination. Sites were eliminated during this initial analysis if they are scheduled for future development. Site visits were conducted to verify data or adjust information as needed.

Vacant Land Screening Process undertaken to date:

1. Complete a GIS analysis to identify vacant land groupings (adjacent parcels)
2. Exclude parcels that are potential pollutant hotspots (those that have known histories of industrial land use)
3. Search for sites within 15 feet of a Water Department inlet – these are sites that are most likely to be able to collect runoff from the right-of-way (ROW)
4. Categorize groupings by ownership as public, private or multiple owners
   a) Public: minimum total site area: 2,000 square feet
   b) Private: minimum total site area: ¼ acre
   c) Multiple: minimum total site area: ¼ acre
5. Phase 1: Desktop Analysis
   a) Primary consideration: determining the amount of runoff that could be collected from the ROW

b) Adjacent drainage areas were calculated including streets and sidewalks along the site
c) Potential drainage areas were calculated including areas across the street where appropriate
d) Minimum adjacent drainage area: 9,000 square feet – sites not meeting this criterion were eliminated
e) The list of potential sites was further refined to exclude sites currently in use, sites with impeding structures or sites with development initiatives underway
f) Additional impervious area on site for which runoff could be managed was included in the final potential greened acres amount.

6. Phase 2: Perform Site Visits
   a) Site visits were conducted to verify data or adjust information as needed
   b) Constraints and opportunities were observed and documented related to topography, on-site structures, dumping and adjacent land uses

Table 3-6 Potential Sites by Ownership and Watershed Location

Watershed and Ownership	Number of Sites	Preliminarily Identified Potential Greened Acres
Cobbs Creek		
Private	1 site	1.2 acres
Delaware Direct		
Public	25 sites	17.0 acres
Private	14 sites	27.7 acres
Multiple	7 sites	4.3 acres
Lower Schuylkill		
Public	11 sites	7.4 acres
Private	5 sites	5.3 acres
Tacony-Frankford		
Public	4 sites	1.5 acres
Private	5 sites	3.8 acres
Total	72 sites	68.2 acres

At the conclusion of the study, 72 sites totaling 68.2 potential GAs (Table 3-6), and were classified as public, private or multiple ownership types. These sites will be evaluated further for policy obstacles, further prioritization and feasibility studies will be conducted during the first five years of implementation of the *Green City, Clean Waters* program.

Additional Strategic Initiatives Aimed at Building the Potential Conceptual Project List

Other strategic initiatives have been identified by the Water Department during the demonstration phase and will continue to be developed as opportunities emerge, such as the following:

Green Stormwater Infrastructure near Stream Restoration Projects

The Water Department is leveraging planned stream restoration projects by coordinating GSI implementation projects with large scale restoration along the mainstem sections of the Cobbs and Tookany/Tacony-Frankford streams. These restored streams will become renewed assets to their surrounding communities, if residents have the ability to access them. The construction associated with stream restoration projects requires the creation of new access routes to the stream. Wherever possible, the Water Department plans to restore these routes as new park gateway and trail assets and to couple GSI projects with this restoration. This provides the opportunity to manage stormwater from areas surrounding the park while creating a system to allow access for residents to these restored stream segments.

Neighborhood Gateway and Signature Projects

The Water Department will seek to locate GSI at gateways or key prominent areas where early successes can be showcased to the public, rate payers, policy makers, developers, and other industry representatives. Gateway projects at main intersections leading into a neighborhood or at the City boundary can help raise awareness of the *Green City, Clean Waters* program while managing the stormwater runoff from the surrounding streets and other impervious areas. Gateways and other signature projects present unique opportunities for collaboration with other partners due to the ability to meet multiple community design objectives, including stormwater management, neighborhood greening, pedestrian improvements, and a welcoming landscape for entering a neighborhood. When evaluating program priorities and project selection criteria, the Water Department will consider project visibility and, where possible, synergies with community-based partners.

Examples of potential Neighborhood Gateway Signature Projects include:

Madison Memorial Park

Madison Memorial Park is a small park located at the entrance of the Northern Liberties Neighborhood. It is located at south end of the Northern Liberties 2nd Street commercial corridor and is adjacent to several transit stops including both bus and subway stations. The surrounding neighborhood has seen significant improvements in recent years, but the park has remained unchanged. The Water Department has partnered with the Northern Liberties Neighborhood Association on a park improvement project at this gateway location. The project includes improved access across the site, amenities for visitors such as new benches and improvements to the existing statues, and stormwater management system that will manage runoff from both the park and the adjacent right-of-way.

Spring Garden Greenway

The Spring Garden Greenway provides a link between the Delaware and Schuylkill rivers and includes a 2.2-mile long "linear park" consisting of a Green Street with a high-quality walking and biking trail separate from traffic lanes. This segment also serves as a critical link in Philadelphia for the East Coast Greenway. The Pennsylvania Environmental Council (PEC) is the lead in coordinating this initiative and has received funding to initiate design of the greenway. There is the potential for significant greened acre accrual if GSI is

incorporated in final design. This project would also provide a significant visible demonstration of Green Street techniques.

American Street Corridor

The American Street Corridor presents an opportunity for a Green Street initiative involving public/private collaboration. The greening of American Street would manage runoff from the street and adjacent private properties, providing stormwater credits to industrial and commercial properties significantly impacted by the stormwater rate change. This project could present an interesting pilot and case study for application of Green Street technologies on commercial corridors and could serve as a model for other industrial sites/corridors and public/private partnership. The Water Department has initiated a project partnership with the Commerce Department and Streets Department to identify policy and physical constraints and opportunities. Appendix I of this plan contains a project summary and status update on American Street with more detail.

3.1.1.2 Piloting Green Stormwater Infrastructure Projects during the Proof of Concept Phase

Pilot projects are defined as GSI projects designed, constructed, and monitored under controlled conditions to provide information for optimal design and program development. Information from pilot projects will be collected to develop a cost effective GSI program by testing a variety of projects and evaluating them for a number of factors, including:

- Ability to meet performance requirements
- Ease of implementation for on-street and off-street settings
- Cost-effectiveness of various physical conditions
- Efficiency of various systems
- Effectiveness of various materials
- Ease of maintenance

GSI pilot projects can take many forms, be located in a variety of settings, and consist of differing technologies. The pilot program is designed to test the feasibility of GSI projects under the full range of potential conditions, captured by numerous variables. An initial list of variables has been organized into of the following categories:

- Location
- Physical Settings
- Systems
- Policies and Partnerships
- Implementation Strategies
- Materials/Technologies

A single pilot project is likely to be useful in testing multiple variables. Table 3-7 provides a theoretical GSI project located in a street within a university campus with a green street that includes bumpouts with underground storage and inlets and porous pavement in a parking strip along the curb. Table 3-7 denotes an initial list of variables that could be piloted with this single pilot project.

The intent of the pilot program is to design, construct, and monitor several projects for each variable during the course of the four and a half years leading up to the first Evaluation and Adaptation Plan (EAP) delivery. In this way, by year 5, it is expected that over 100 projects will be included in the pilot program, providing information leading to the most cost efficient designs, locations, maintenance procedures, and partners. This information will be used to continually enhance the program.

Table 3-7 Example of a Green Streets Project with Piloted Variables

Pilot Locations		Physical Settings		Pilot Materials/ Technologies	
School yards/ schools		Piedmont Areas		Porous Materials	
Recreation Centers		Coastal Areas	X	Pave Drain	
"Open Space" park sites		Slope Conditions		Porous Tiles	
Traffic Triangles		Flat ≤3%	X	Asphalt	X
Gateway Projects		Steep >3%		Concrete	
Alleys		**Pilot Systems**		Play surface	
Crosswalks		Curbless Street		Storage Types	
Centralized Facility		Single Stormwater Trees		Stone	X
Stormwater + Art Site		Rain Gardens/ Planters		Arched Systems	
Spraygrounds		Sidewalk Swales		Structural Vaults	
Athletic Fields		Pipeless Trenches		Crate Systems	
Vacant Underground Facilities		New Inlets	X	Silva Cell	
Medians		Blue Roof		Pre-treatment Technologies	
Commercial Corridors		Roof Leader Treatments		Vortex	
Bridge Runoff		Pumped Systems		Forebays	
Streets	X	Reuse Systems		Sumped Inlet Systems	X
Bumpouts	X	Injection Wells		Swales	
Crosswalks		Regrading Street Crown/ Median Treatments		Soil Types	
Tree Trenches		Bumpouts	X	Structural Soils	
Planters		**Policy/ Partnerships**		Native Soils	X
Porous	X	LEED/ Sustainable Sites Initiative		Amended Native Soils	
Sidewalk Swale		Civic Groups		Engineered Imported Soils	
Single Tree Pits		Center City District, University City District		Modular Planters	
Complete Street Concepts		Other Policy/ Partnership		Freno System	
Various Ownership Types		**Implementation Strategies**		Fencing	
Other Public Property		Storm Flood Relief			
Parking Lots		Physical networks			
Vacant Lands/ Land Acquisition		SMEDs			
Commercial		Green Campuses	X		

3.1.2 Implementing Green Stormwater Infrastructure with Public Works Projects

The Water Department developed a structure that will allow for accrual of GAs through modifications to some of the City's standard "public works" processes. During the first five years of implementation, the Water Department is committed to including GSI elements in an increasing percentage of the Water Department water and sewer line replacement projects, Streets Department paving and streetscaping projects, and PPR installations of street trees. The Water Department is calling this collective set of tools the "follow the public works" component of the program due to the opportunity to trigger GSI implementation as a standard procedure as the public works projects are designed and constructed. Although the Water Department will not have complete control of the number of projects and GAs accrued through these projects, the development of standard processes for implementation will decrease the need for Water Department-initiated projects to be identified, planned, designed and constructed as described above in Section 3.1.1. This Section of the IAMP describes the "follow the public works" project concepts, implementation strategies and projections for anticipated GAs.

3.1.2.1 Commitment to Incorporating Green Stormwater Infrastructure into Water and Sewer Projects

At present, Water Department replaces roughly 18-20 miles of water mains and 6-8 miles of sewers citywide each year. Most of these infrastructure projects are implemented within the right-of-way and require opening streets. The Water Department is working to synchronize the traditional infrastructure design process with the GSI design process. Wherever possible, standard infrastructure constructed by the Water Department will be coupled with GSI at or near the street surface. During the first year of implementation, the GSI Planning Group (described above in 3.1.1) will lead the integration of GSI into the design process. The GSI Planning Group currently evaluates each water and sewer replacement projects and documents opportunities for adding GSI. This process will evolve to a standardized process for adding GSI to this work. As standardization occurs, contractors and design professionals working on water and sewer projects will act with minimal assistance from the Planning Group.

An example of integrating stormwater management on a sewer replacement project includes:

> **800 Block of South Percy Street**
> Construction of a new sewer required deep excavation and the total replacement of the street and sub-base, thereby creating an opportunity to use porous asphalt. Constructed in the Spring of 2011, this project is the first porous green street in the City of Philadelphia. In the future, other streets with similar reconstruction needs may be considered for porous application.

3.1.2.2 Green Streets Design Manual

Streets and sidewalks are the largest category of publicly-owned impervious cover, accounting for approximately 38% of the impervious cover within the combined sewer system area. The Water Department recognized early in the demonstration phase of the GSI program that streets can provide a significant portion of the total target for GAs. To that end, the Water Department

has focused a great deal of attention on demonstrating various GSI tools in the streets including stormwater tree pits, curb cuts, bump-outs, porous pavement and tree trenches aimed at developing a series of standards and specifications. Soon after the Water Department submitted its LTCPU in 2009, the City's Deputy Mayor for Transportation and Utilities (MOTU) expressed interest in supporting the development of both a Green Streets Design Manual and a Complete Streets Handbook.

In the spring of 2011, the contracts for development of the Green Streets Design Manual and Complete Streets Handbook were awarded and the process commenced (scope of work attached in Appendix II). The process is led by a Task Force including representatives from the Water Department, the Streets Department, PPR, PennDOT, the Philadelphia City Planning Commission (PCPC), Department of Licenses and Inspections (L&I), the Pennsylvania Horticultural Society (PHS), the Southeastern Pennsylvania Transportation Authority (SEPTA), and invited members of the development community.

The development of the Manual began in the summer of 2011 and is anticipated to be completed in 2012. Upon release of this manual, the Water Department and the Streets Department and any others performing work in the streets will begin to use the new Green Streets Manual, to guide when and how to apply GSI on street-related projects.

3.1.2.3 Streetscaping

Streetscaping projects may present the Water Department with an opportunity to utilize creative solutions and go beyond the standard Green Streets implementation toolbox. There are many different partners in the City of Philadelphia that may become involved in streetscaping projects. These may include universities, neighborhood associations, Community Development Corporations (CDCs), non-Governmental Organizations (NGOs), Business Improvement Districts (BIDs), and others. The Water Department has been approached by a number of these agents with the request to partner on projects to increase the greening and stormwater management potential for the street design. The Green Streets Design Manual will increase the effectiveness of working with these partners as it provides standard details, specifications, and other information on the review process for those projects.

Example streetscaping project:

> **Market and JFK Boulevard Streetscaping**
> The Center City District initiated the Market and JFK Boulevard Streetscaping project, which will include the creation of buffered bike lanes along the two main corridors of Center City Philadelphia's business district, new signals for cars and bicycles, sidewalk reconstruction, and the installation of new portals to subway surface stations with real-time transit information. For the Water Department, this project provides the opportunity to incorporate an engineered green stormwater infrastructure system in a highly visible location.

3.1.2.4 Partnership with Philadelphia Parks & Recreation on Street Tree On Call Services Contract

In January 2011, to support the Mayor's GreenWorks goals, the City's capital budget allocated $2.5 million to PPR for street tree installation, including tree removal/replacement of PPR's existing backlog of 1600 hazardous trees. This is the first phase of a 5-year, $7 million commitment from the City's General Fund to PPR that will fund the installation of thousands of trees city-wide.

In July of 2011 PPR issued an RFP for an On Call Services Contract to install trees throughout the City. The requirements contract included a number of designs and specifications for tree pits, but also language that allowed for the Water Department to add additional designs and specifications for stormwater management tree pits as these are developed. The Water Department has supplied PPR with an initial stormwater tree pit design to be included with this requirements contract. Coordinating with PPR's tree planting contract offers an opportunity to leverage a partnership with PPR through this available contract mechanism to increase the number of trees planted in the City while piloting various types of stormwater tree pits. This effort will allow different tree pit technologies to be tested to confirm adequacy of designs, constructability, cost, and maintenance requirements. In addition, the opportunity to integrate stormwater tree pits into the more traditional tree planting contracts administered by other city agencies will be vetted. The current plan aims to develop a number of stormwater tree pit versions and to integrate a Version 1 stormwater tree pit into PPR's spring 2012 tree planting, with 2 additional design versions to be ready for spring 2012 planting. The possibility of the stormwater tree pits through the Water Department's available contract mechanisms while partnering with PPR to plant the trees through their requirements contract is also being considered.

3.1.3 Implementation Commitments for the first 5-years

Appendix G of the COA requires that the projected number and types of projects to be implemented in the coming years leading up to the first EAP were to be included in this IAMP. This section describes processes that will be undertaken in the coming years to streamline the implementation process to gain efficiencies, commitments to collaborations with partner initiatives and PENNVEST, and a listing of projects already conceptualized for implementation.

The project planning process is under revision to meet the increasing target for GAs in the coming years. The general categories of projects expected to be implemented in the next five years have been identified as parking, green streets, public property, water/sewer projects, green schools, and GSI associated with Streets Department projects. Each type of project has different characteristics that influence how projects for sites will be designed and bid. For example, a school may provide the opportunity for 2 GAs on a site, while a single block of green street typically only may offer 0.5 GA. Using typical characteristics for each category, the Water Department developed an understanding of the number of GSI projects that would need to be designed each year to meet the 5-year GA target.

Understanding the number of projects that must be designed every year helps to define the project queuing and project management effort that will be required. For project queuing, it is assumed that more projects need to be designed than will be required to be constructed to meet targets, allowing flexibility as needed for projects that become delayed or cancelled at later phases. The resources needed for project management tasks are based on the number of projects to be designed and how those projects will be combined into design packages. When projects are designed they are often grouped together to make larger construction packages. For example, 5-10 blocks of Green Street projects could be combined to make a single package. Packaging assumptions were made for each project category to develop the number of construction packages to be prepared. In order to accomplish the project queuing and management tasks, an increase in engineering capacity will be needed. Project identification and prioritization resources will be used to help identify projects and develop conceptual designs. A significant increase in engineering resources will be needed to develop the construction documents for GSI. The Water Department will ensure adequate resources to achieve the goals of the *Green City, Clean Waters* program. Support is needed to develop the methods to implement GSI as well as methods for improving and streamlining this process. The identification of the tasks and associated effort for the tasks are under development in a GSI Planning and Design Group workplan, and includes the development of technical standards, design manuals, and improving review processes. Project queuing includes those tasks associated with the identification and prioritization of potential projects, initial coordination efforts, and conceptual design development. Project management includes those tasks associated with managing the design of GSI projects and includes both the management and review of specific projects as well as general contract management activities.

3.1.3.1 Creating Efficiencies in the Green Stormwater Infrastructure Implementation Process

To meet the targets set within the WQBEL, the Water Department is evaluating the implementation process established during the demonstration phase, seeking opportunities to streamline and improve the process. In the coming years, the Water Department will continue to evaluate and revise its protocols for selecting, planning, designing and constructing GSI projects to make the process more efficient and to keep pace with greened acre goals established in the COA.

Preliminary considerations include:

- **Enhanced coordination with outside agencies**. Implementing GSI requires intensive cooperation with other agencies and utilities. The Water Department is evaluating methods to integrate other City agencies into the planning, design, and construction of green stormwater facilities to streamline communication and limit unexpected delays. (See section 4 of the IAMP for more information on this)
- **Proactive Survey:** Proactive survey data collection on a regional scale of geotechnical, infiltration and soils data would assist in expediting the project queuing process.

- **Cluster projects.** The Water Department is clustering projects to expedite the survey of baseline conditions, to save time during procurement by combining multiple GSI projects into one design and construction package, and to streamline the construction management/inspection process. The Water Department is evaluating the benefits and feasibility of further clustering projects at a larger scale.
- **Refine the procurement process.** The Water Department procurement process is based on designing and constructing large, traditional infrastructure projects. Revisions to that process are underway to better align with the implementation of GSI. Also, the City procurement process at present limits the number of project lettings allowed in each month. An evaluation will be conducted to determine if this will be a major impediment to large scale production of GSI projects. If necessary, the interagency coordination group will be tasked with evaluating solutions and working to reform the process.
- **Improve the construction inspection process.** The construction management process is under review for needs such as training programs to define expectations for GSI construction work.
- **On-demand Services Contracts:** The potential for creating efficiencies through the development of a series of requirements contracts to facilitate standardizing construction activities such as depaving, stormwater tree pit installation, or landscaping of rain gardens. The use of these contracts can reduce project timelines and may create better opportunities around typical fast-track projects such as GSI installations coordinated with private development projects and milling and repave projects.

A number of RFPs have and will continue to be issued to support the identification, planning and design of GSI to meet the WQBEL Performance Standards. In the meantime, the Water Department has identified a number of projects to go to construction in the coming year (Table 3-8) and the project queue has been assembled with project concepts to be constructed in the remaining years leading up to the first Evaluation and Adaptation Plan (Table 3-9). This is not a complete list of projects for implementation in the coming four and a half years, but rather a "snapshot" of the list in the queue as of Fall, 2001.

Table 3-8 Projects planned for first year of implementation by May 31, 2012

Project Name	Watershed
Benjamin Franklin Parkway from 21st St to 23rd St	Schuylkill
PHS PENNVEST Tree Trenches - 8th St	Delaware
PHS PENNVEST Tree Trenches - 9th St	Delaware
PHS PENNVEST Tree Trenches - Diamond St	Delaware
PHS PENNVEST Tree Trenches - Earl St	Delaware
PHS PENNVEST Tree Trenches - Front St	Delaware
PHS PENNVEST Tree Trenches - Reese St	Delaware
Belfield Ave from Chew Ave to Walnut Ln	TTF
Blair St from Hewson to Palmer	Delaware
Hewson St from Blair St to Trenton Ave	Delaware
Montgomery from Frankford Ave to Blair St	Delaware
58th St Connector	Schuylkill
Madison Memorial Park	Delaware

Table 3-9 Active projects conceptualized for the coming years leading up to the first Evaluation and Adaptation Plan

Project Name	Watershed
10th St from Wilder St to Reed St	Delaware
12th St and Reed St	Delaware
12th St from Dickinson St to Tasker St	Delaware
21st St from Venango to Pacific	Delaware
27th St from Indiana to Toronto	Schuylkill
29th and Cambria PWD Facility Employee Parking Lot	Schuylkill
29th and Chalmers Playground	Delaware
3rd St and Fairmount Ave Intersection	Delaware
A.S. Jenks School	Delaware
Alder St from Norris St to Diamond St	Delaware
American St from Thompson to Lehigh	Delaware
Andrew Hamilton School	Cobbs-Darby
Anna B. Day School	TTF
Baltimore Ave Island from S 60th St to Wharton St	Cobbs-Darby
Barry Playground	Schuylkill
Barton School	TTF
Belmont School	Schuylkill
Benjamin Franklin Pkwy from 16th St to 19th St	Schuylkill
Blue Bell Inn Triangle	Cobbs-Darby
Bodine High School	Delaware
Bridesburg Recreation Center and Bridesburg School	Delaware
Bryant Elementary School	Cobbs-Darby
Carmella Playground/Warren G Harding School/White Hall Commons	Delaware
Cassidy Elementary School	Cobbs-Darby
Cecil B Moore Recreation Center	Delaware
Chew Playground	Schuylkill
Christy Recreation Center	Cobbs-Darby
Congreso de Latinos Unidos	Delaware
Daroff School	Schuylkill
Dendy Recreation Center	Delaware
Diamond St from 25th St to Stillman St	Delaware
Dick Elementary School	Delaware
Dickinson Square	Delaware
Donald Finnegan Playground	Schuylkill
Dorsey Playground	Delaware
Durham Park	Schuylkill
E.H. Vare Middle School	Schuylkill
Epiphany of Our Lord School	Delaware
Francis Scott Key School	Delaware
Frederick Douglass Elementary School	Delaware
Harpers Hollow Park	TTF
HM Stanton School	Delaware
Hunting Park from Old York Rd to Roosevelt Blvd	TTF
James Rhoads School	Schuylkill
John F Kennedy Blvd from 30th St to 32nd St	Schuylkill
Julian Abele Park	Schuylkill
Kemble Park	TTF
Kenderton Field	Delaware
Little Sisters of the Poor	Schuylkill
Longstreth School	Cobbs-Darby

Project Name	Watershed
Magnolia Cemetery	Delaware
Markward Park	Delaware
McCreesh Playground / Catharine Elementary School	Cobbs-Darby
MLK Recreation Center	Delaware
Morris Leeds Middle School	TTF
Old Cathedral Cemetery	Schuylkill
Overbrook Elementary	Schuylkill
Parking Lot - 12th St, Marvine St, and Diamond St	Delaware
Passyunk Ave Bumpouts - Phase 1	Schuylkill
Passyunk Ave from Dickinson St To Reed St	Delaware
Philadelphia Military Academy	Delaware
Pleasant Playground	TTF
Poplar St from 8th St to Franklin St	Delaware
Roosevelt Playground	Delaware
Sacks Playground	Delaware
Samuel B. Huey Elementary School	Cobbs-Darby
Sayre High School	Cobbs-Darby
Shepard Recreation Center	Schuylkill
Shoemaker Middle School	Schuylkill
Simons Recreation Center	TTF
Sister Clara Muhammad School	Schuylkill
Smith Elementary School	Schuylkill
Southwark School	Delaware
Springfield Ave and Cobbs Creek Island	Cobbs-Darby
St Thomas Aquinas School	Schuylkill
Stephen Girard School	Schuylkill
Thompson St and Columbia Ave	Delaware
Towey Recreation Center	Delaware
Trenton Ave and Norris St	Delaware
Wakefield Park	TTF
Wakisha Charter School	Delaware
Welsh School	Delaware
William Cramp School	Delaware
William Gray Youth Center	Delaware
William Harrity School	Cobbs-Darby
Wilson Park	Schuylkill
Wister Woods Park	TTF
Womrath Park	TTF
Yorktown Park - Green Street Locations	Delaware
40th St. Portal	Schuylkill
73rd and Grays	Schuylkill
Beeber Middle School	Schuylkill
Chelten Hills Cemetery (Part 1)	TTF
Chelten Hills Cemetery (Part 2)	TTF
Connell Park	Schuylkill
Drexel College of Media Arts & Design	Schuylkill
Elmwood Park	Schuylkill
Finley Playground	TTF
Frankford from Placid to Ellie	Pennypack
Ivy Hills Cemetery	TTF
Kinsey School	TTF
Logan School	TTF
Malcolm X Park	Schuylkill
Mother Mary of Peace School	Schuylkill
Mt. Airy School of God in Christ	TTF
National Cemetery	TTF
Patterson School	Schuylkill

Project Name	Watershed
Pennypacker School	TTF
Richmond Library	Delaware
Rowen William School	TTF
Sedgwick Station	TTF
Sharswood School and Our Lady of Carmel School	Delaware
St. Dominic School	Pennypack
St. James Episcopal Church of Kingesessing	Schuylkill
St. Monica Manor	Delaware
Stokley Playground	Delaware
Taggert School	Delaware
Upland Way	Schuylkill
Vacant Triangle Lot- 42nd & Lancaster	Schuylkill
Wagner Louis Middle School	TTF
Wayne Ave. & Abbottsford Ave	TTF
Westmoreland and Tulip	Delaware
Windrim Ave from Wayne Ave to Germantown Ave	TTF

Stormwater Management Incentive Program:

In June 2011, the Water Department initiated the Stormwater Management Incentive Program (SMIP) to assist qualifying customers in achieving credits on their stormwater bills. The SMIP offers low-interest financing to stimulate investment in stormwater management practices which reduce a parcel's contribution of stormwater to the City's system. To further assist these customers, in winter 2011/2012 the Philadelphia Industrial Development Corporation (PIDC) will launch a grant program modeled after the anticipated success of the New York City Green Infrastructure Grant Program. Non-residential private property owners, commercial businesses or 501(c)3 organizations are eligible to apply. Grants may be supplemented by the existing low interest loan from the Water Department or a private source.

To qualify for the grant program, projects must cost effectively capture and retain the first one inch of rainfall or greater on the property and reduce impervious surface within Philadelphia. Projects will be ranked higher during the review and selection process based on feasibility, visibility, and the ability of the project to manage public runoff in addition to on-site runoff. Recipients of the grant will be eligible for credits on their stormwater bills once the project is completed. Grantees will receive the credits as long as they maintain the SMPs in good working condition.

The Water Department envisions applicants using a variety of GSI designs including bioretention swales, constructed wetlands, green roofs, infiltration bioswales, infiltration trenches, permeable pavers, porous asphalt, porous concrete, rain barrels and cisterns. In support of PIDC's grant program, the Water Department has set aside $5 million for PIDC for the first year of the grant program. Additional funding may be allocated to the program in the future depending on the success of the program during the first year.

3.1.4 Green Stormwater Infrastructure on Private Property

Private investment in GSI on private property is a well-established practice in the City of Philadelphia. The City's Stormwater Regulations were revised in January of 2006, which

provided the foundation for the private sector's role in the *Green City, Clean Waters* program. As projects are developed in the combined sewered area, they accrue GAs through compliance with the regulations. This section describes the regulations and the plan review process, and incentives that the Water Department developed to encourage the private sector to build GSI, such as the parcel-based billing structure and the stormwater credit program.

3.1.4.1 Philadelphia Stormwater Regulations

The Philadelphia Stormwater Regulation revisions of 2006 address more than the typical peak runoff rate controls previously required. Through the regulation revisions, stormwater management now addresses smaller more frequent storms in terms of water quality volume and channel protection for development projects greater than 15,000 square feet. The Water Department spends approximately $2 million annually to review private sector development plans for compliance with the Stormwater Regulations. Philadelphia's stormwater regulations are published online at http://www.phila.gov/water.

The stormwater regulations were revised to address the following technical components:

Water Quality: The first inch of precipitation over directly connected impervious cover must be recharged. Where recharge is not feasible, or limited, any remaining volume is subject to an acceptable water quality practice.

Channel Protection: The 1-year, 24-hour storm must be detained and slowly released over a minimum of 24-hours and maximum of 72-hours.

Flood Control: Watersheds that have been part of an Act 167 planning effort are to follow the model results for flood management districts.

Non-Structural Site Design: Projects are required to maximize the site potential for stormwater management through appropriate placement and integration of stormwater management practices.

Documented in Table 3-10 are the required components of each type of project and any qualified exemptions from the flood control component.

The process and level of review of a private development project varies depending on the size of the earth disturbance associated with the development, the individual watershed requirements based on Act 167 Stormwater Management Plans and special zoning code regulations, and the associated state and federal permit requirements. Table 3-11 summarizes the different triggers for the Water Department's Stormwater Plan Review and types of forms and permits required.

Erosion and Sediment Control (E&S) Best Management Practices (BMPs): Stormwater BMP's are required for any earth disturbance projects by the Pennsylvania Clean Streams Law regulations, to prevent site soil erosion and reduce sediment pollution in nearby streams. Development or redevelopment projects disturbing more than 5,000 square feet are required to have the Water Department review an E&S Control Plan, and those greater than one acre require an NPDES permit issued by PA DEP.

The Existing Resources and Site Analysis (ERSA) Worksheet: Project applicants submit the ERSA and associated attachments (map, concept plan or preliminary plat and 1 color photograph from each face of the parcel) online. An ERSA contains basic project information regarding existing site conditions along with an existing conditions site plan, conceptual plan and site photographs. This worksheet is required for any level of review by the Water Department.

Watershed Specific Requirements: The Philadelphia City Planning Commission (PCPC) and the Water Department share the responsibility for reviewing these projects. The Darby- Cobbs Creek Act 167 Plan was completed in 2004 and contains special runoff release rates for stormwater management. Neighboring communities and the Water Department have completed Act 167 Plans for the Tookany/Tacony-Frankford and Pennypack Creek Watersheds and currently are working to develop plans for the Poquessing and Wissahickon Creek watersheds. It is expected that a 5,000 square feet threshold will be phased in through the Act 167 planning process over the next five years.

Table 3-10 Exemptions for technical components of Stormwater Regulations

	Earth Disturbance Associated with Development			
		0-15,000 sq. ft.	15,000 sq. ft. – 1 acre	> 1 acre
Section 600.5 (a) Water Quality Requirement	New Development	N/A	Yes	Yes
	Redevelopment	N/A	Yes	Yes
Section 600.5 (b) Channel Protection Requirement	New Development	N/A	Yes	Yes
	Redevelopment	N/A	Exempt	Yes (Alternate Criteria)
Section 600.5 (c) Flood Control Requirement	New Development	N/A	Yes	Yes
	Redevelopment	N/A	Yes (Alternate Criteria)	Yes (Alternate Criteria)
Section 600.6 Nonstructural Project Design Requirement	New Development	N/A	Yes	Yes
	Redevelopment	N/A	Yes	Yes
Section 600.8 Post-Construction Stormwater Management Plan Requirement	New Development	N/A	Yes	Yes
	Redevelopment	N/A	Yes	Yes

Table 3-11 Triggers for Stormwater Management Plan Review

Site Information		Project Requirements					
Earth Disturbance Area (square feet)	Project Location	Submit an ESRA	Comply with Stormwater Management Regulations	Implement E&S BMPs as Needed	Submit an E&S Plan to the Water Department	Have an E&S Plan Approved by the Water Department	Obtain an NPDES Permit
Less than 5,000 square feet	Project is not located in the Wissahickon Watershed			☑			
	Project is located in the Wissahickon Watershed	Contact the Water Department and PCPC for instructions	Contact the Water Department and PCPC for instructions	☑	Contact the Water Department & PCPC for instructions	Contact the Water Department and PCPC for instructions	
More than 5,000 square feet and less than 15,000 square feet	Project is not located in the Darby-Cobbs or Wissahickon Watershed	☑		☑	☑		
	Project is located in the Wissahickon Watershed	☑	Contact the Water Department and PCPC for instructions	☑	Contact the Water Department and PCPC for instructions	Contact the Water Department and PCPC for instructions	
	Project is located in the Darby-Cobbs Watershed	☑	☑	☑	☑	☑	
More than 15,000 square feet and less than 1 acre	All project locations	☑	☑	☑	☑	☑	
More than 1 acre	All project locations	☑	☑	☑	☑	☑	☑

Stormwater Plan Review

The City of Philadelphia's Stormwater Regulations strive to employ new approaches to stormwater management that include controls to improve the quality of stormwater prior to discharge; controls to reduce the erosive effects of stormwater; and measures to increase groundwater recharge within the areas of Water Quality, Channel Protection, Flood Control and Non-structural Site Design. The Water Department's Stormwater Plan Review group is made up of engineers, planners, GIS Specialists, inspectors and managers. Their responsibility is to review Post Construction Stormwater Management Plans for compliance with Philadelphia's Stormwater Regulations. This plan review process ensures that Philadelphia's stormwater program meets state and federal requirements while also coordinating with changing regulations in upstream municipalities.

The stormwater plan review process starts with an applicant's submission of the ERSA worksheet and includes the following phases:

1. **Conceptual Review:** The Plan Review Unit reviews concept plans in the early stages of design to ensure that the Stormwater Management Practices (SMPs) are included in the overall site design. A signed and stamped Conceptual Approval is one of the required components of a complete zoning application.

2. **Technical Review:** The technical review includes details on the size and function of each individual SMP. The Post Construction Stormwater Management Plan is approved once the site's design meets Stormwater Regulations, and the SMP will be properly operated and maintained.

3. **Construction and Inspections:** The Water Department currently inspects construction sites for compliance with the Post Construction Stormwater Management Plan and Erosion and Sedimentation Control Plan. Any sub-surface SMP requires a Water Department inspector to be present during the installation.

4. **Project Close-out:** In the coming years, the Water Department will focus on streamlining the Stormwater Plan Review close-out process and creating additional enforcement mechanisms to ensure stormwater management practices are built as designed and approved. The primary component of this requirement is the submission of as-built plans, or record drawings, after SMPs are constructed. Staff at the Water Department currently is working with the Philadelphia Department of Licenses and Inspections to develop the requirement that as-built plans of SMPs be submitted and approved before L&I will issue a Certificate of Occupancy to assist in enforcing this requirement.

The Stormwater Plan Review process monitors and tracks each phase of development where the stormwater regulations have been triggered.

Accounting Greened Acres

With a citywide redevelopment rate of up to 1% annually, the Water Department estimates that more than the equivalent of a $1 billion (present value) private sector investment in GSI will be applied toward the City's greening goals in the coming 25 years. Assuming a redevelopment rate of .5 to 1% per year, an estimated 3,000 to 6,000 GAs could be gained through private development within the combined sewer system drainage during the 25 year program.

The number of technically approved plans will be monitored by the Water Department as a surrogate for tracking the redevelopment rate. Close monitoring of this process will help to establish short-term goals for the Water Department's capital GSI planning program.

The impact of the regulations in terms of total acres developed, area removed from contributing to the sewer system, available slow release and infiltration storage volumes, increase in number of GSI projects (*i.e.*, structural basins, green roofs, porous paving, and rain gardens) will be

calculated and tracked in the *Green City, Clean Waters* Project Tracking System (explained in more detail in Section 2.2.1).

In order to calculate the number of GAs accrued by private development since 2006, the Water Department is verifying the number of sites with technically approved plans (2006-present) that were constructed. During this time period, disruption in the United States economy and real estate market may have caused the delay or abandonment of approved development projects. GAs will be counted once SMPs are constructed, inspected and accepted by the Water Department as functioning. The Water Department plans to conduct detailed inspections on all constructed approvals to verify that all approved SMP components are properly installed and that the overall systems have been maintained and properly functioning.

3.1.4.2 Incentives for Private Development to Implement Green Stormwater Infrastructure

Parcel-based Stormwater Rates

As described in Section 1 of the LTCPU and its supplements, 2010 was the first year of a four year phase-in of the City's revised Stormwater Parcel Based Billing Initiative, from a meter-based charge to a parcel-based charge for Commercial and Condominium accounts. This basis of the cost allocation was implemented for residential customers in the 2001 rate proceeding.

The City's stormwater rate changes were based on the recommendation of the 1996 Stormwater Citizens Advisory Council (CAC) that the City develop a stormwater charge with a formula based upon the gross size of a customer's property and the imperviousness of the property.

The transition from a meter-based to parcel-based system results in fees representative of the relationship between the stormwater runoff contribution from a parcel to the sewer collection system or nearby stream. A parcel based stormwater management charge results in a fair and true cost of service allocation that provides incentives for Commercial and Condominium and stormwater-only customers to incorporate stormwater management practices where practicable. In addition, customers will become more aware of stormwater runoff impacts and the importance of urban stormwater management practices.

Customers are impacted by parcel-based rates in a variety of ways. In general, properties with a small footprint and large water use, such as hospitals or high-rise residential buildings, have seen a rate decrease, while large impervious parcels with little to no water use, such as parking lots, have seen a significant increase in their stormwater bill.

Stormwater Credits

In an effort to reduce the burden of the parcel-based approach on customers, the Water Department designed a credit system to allow customers to decrease their bills by installing stormwater controls to manage at least the first inch of runoff. The Water Department offers free design assistance and site evaluation to the most highly impacted customers to identify potential stormwater management opportunities that might exist on the site, and to perform

cost-benefit analyses to help the property owner weigh the cost of the retrofit against the annual savings on the stormwater bill.

The current Water Department credit program is intended to achieve the following objectives:

1. Provide incentives to non-residential and multi-family property owners to implement and maintain functional SMPs to help the City meet its stormwater management goals.

2. Provide the opportunity for non-residential and condominium owners to reduce their monthly Stormwater Management Service Charge.

The Water Department believes that the Parcel Based Billing Initiative likely will incentivize some large parcels to retrofit to manage the first inch of runoff, adding GAs.

Three classes of credits are offered to non-residential and condominium ratepayers with non-delinquent accounts. Two of the three classifications of credits offer incentives for private development to build green stormwater infrastructure:

> **Impervious Area Stormwater Credit (IA Credit)** is offered to encourage the implementation of GSI practices by managing at least the first inch of runoff from all DCIA. This requirement can be met by infiltrating the water quality volume or implementing a Water Department approved SMP.
>
> **Gross Area Stormwater Credit** is intended to encourage property owners to reduce the pollution and runoff from their parcels by either reducing the imperviousness or the runoff related characteristics, or by further managing stormwater from their properties. This requirement can be met by demonstrating the runoff characteristics of the site based upon the site's soil and ground cover or installing a Water Department approved SMP which attenuates stormwater runoff.

The Water Department provides assistance to customers in the credit application process and to perform a conceptual review before the stormwater retrofit is fully designed and built to ensure the project will be eligible for credit. The Stormwater Credit Application form is included in Appendix VI.

Other Incentives for Private Green Stormwater Infrastructure Development

The City has instituted standards, incentives and programs to encourage GSI, including:

> **Green Roof Tax Credits:** The Philadelphia City Council, which has been working to address stormwater management costs, passed an ordinance in 2007 granting tax credits to businesses that install green roofs on their buildings (http://www.phila.gov/revenue/pdfs/Internet_Summary_-_B.pdf).
>
> **Fast-track Stormwater Plan Review Project Review:** Projects with 95% or more of the impervious area disconnected from the combined or separate storm sewer can

qualify for a fast track Green Review in which the stormwater management section of the project will be reviewed within five days of submittal.

Free Assistance Program: The Water Department provides free assistance through site inspections and design recommendations for green retrofits that allow customers to obtain fee credits.

Stormwater Management Incentive Program: The Water Department offers incentives to private parcel owners to implement stormwater management best practices through both a low-interest loan program and a grant program administered by Philadelphia Industrial Development Corporation (PIDC).

Residential Rain Barrel Program: The Water Department provides a program to encourage residential participation in stormwater management through a program providing free rain barrels and free installation for residential properties.

Special Consideration Plan Review Standards: Stormwater regulations passed in 2006 require all developers planning to use ground space of 15,000 square feet or more to submit stormwater plans early in the permitting process. Any redevelopment projects reducing directly connected impervious area by at least 20 percent are exempt from standard Channel Protection and Flood Control Requirements.

A new Customer Advisory Committee (CAC) convened in 2011 is examining rate relief options, special rate issues, and revisions to the credits and incentives programs. This customer group will make recommendations to the Water Department on these and other issues that customers have brought to the Water Department's attention. Any changes resulting from these recommendations will be incorporated into the next rate case filing.

3.2 Waterfront Disconnection

Appendix G of the COA requires that the Capital Projects Section of the IAMP provide an update on sewer separation projects. As described in the LTCPU and its supplements, the target area for sewer separation lies in the corridor between Interstate 95 (I-95) and the Delaware River. The Pennsylvania Department of Transportation (PennDOT) is re-habilitating the I-95 corridor through the City of Philadelphia to improve traffic flow on the interstate and on the local roads near interchanges. In order to meet Philadelphia's stormwater regulations, PennDOT will build pipes to convey stormwater from the highway to the Delaware River. PennDOT will work with the Water Department to design the stormwater conduits with an increased capacity to accommodate stormwater runoff from future riverfront development between the interstate and the Delaware River.

Disconnection of the waterfront area from the combined sewer service system may occur through future private development. All development or redevelopment projects regulated by the 2006 Stormwater Regulations are required to build two lateral pipes to the curb line, one for sanitary wastewater and a second for stormwater and meet pre-treatment requirements. If all

parcels between I-95 and the Delaware River are disconnected from the combined sewer system, it will reduce the total combined sewer system area of the City of Philadelphia by 2%.

The 2011 Master Plan for the Central Delaware envisions the waterfront area to become fully redeveloped with high density development between Oregon Avenue and Alleghany Avenue over the coming years, including the "Uplands" from The Benjamin Franklin Bridge to Frankford Avenue. This area is expected to see a high rate of redevelopment due to proximity to the Northern Liberties neighborhood and Delaware River Waterfront Corporation's primary investment interest at Festival Pier at the terminus of Spring Garden Street (Figure 3-3).

Figure 3-3: Images from the Master Plan for the Central Delaware illustrating build out development between Interstate 95 and the Delaware River (1) Existing conditions for the Uplands area near Spring Garden Street, 2) point of reference for image perspective and 3) illustrative rendering of re-developed Festival Pier Site)

Waterfront Disconnection Implementation Schedule

The schedule for disconnection from the CSO system will depend on PennDOT's construction timeline in combination with other factors affecting waterfront development. This will require the Water Department to coordinate with the Delaware Watershed partners. PennDOT has proposed a general schedule to design and construct six initial sections, from Race Street north to Academy Avenue; and has engaged engineering firms to manage the design of each section. Figure 3-4 illustrates the proposed schedule for the planned and designed segment of construction over the next five years. PennDOT is starting on the re-design and construction of the Cottman-Princeton Interchange (CPR) and the Girard Interchange (GIR), and will follow with the interchange and highway areas in between.

Figure 3-4: Proposed schedules for the PennDOT Interstate 95 expansion phases

Discussions between the Water Department and PennDOT to refine cost sharing and project details are ongoing through the stormwater plan review process for each section of highway expansion as each segment is planned and designed. For the first segment of highway to undergo construction (CPR), PennDOT will build a stormwater conveyance system and temporarily connect to a City outfall conduit below the regulating structure. For the second segment of highway construction (GR3), in approximately 2013, PennDOT will build new outfalls. The Water Department will provide assistance in acquiring permits for new stormwater outfalls and to use existing utility rights-of-way. The Water Department will work with PennDOT to develop agreements that will define responsibilities and ensure proper maintenance of these facilities.

In the coming five years, the Water Department will:

1. Coordinate with PennDOT to share costs of construction of stormwater infrastructure for each segment of I-95 construction
2. Monitor the progress of infrastructure and redevelopment
3. Document the area disconnected from the Combined Sewer System
4. Refine H&H models to reflect system changes as needed

Green Stormwater Infrastructure and the Waterfront Disconnection

As PennDOT moves forward with construction of segments of the I-95 expansion, opportunities for incorporation of GSI will be evaluated for joint investment. Early successes have been seen with the construction of the GIR segment. This section required the reconstruction of Richmond Street, from Aramingo Avenue to Ann Street, an at-grade street that runs parallel to I-95. The reconstructed street will be put in place with two vegetated medians designed to allow runoff from Richmond Street to be collected and managed within the newly created open space. A third rain garden will also be placed in a triangular area by the sidewalk at the southern end of the project. This space will treat runoff from the right-of-way and may also serve as a gateway feature to the new Richmond Street. In those areas where Richmond Street is not wide enough to allow for vegetated medians, trees will be planted in tree pits specifically designed to allow runoff to enter the pits and saturate the soil. Finally, the embankments between Richmond St and the elevated highway are to be planted with a meadow mix instead of typical turf grass. The meadow plants will retain and use more stormwater that turf grass and also require less frequent mowing.

3.3 Interceptor Rehabilitation Program Commitments

Appendix G of the COA requires that the Capital Projects section of the IAMP provide information regarding the Water Department's commitment to interceptor rehabilitation to meet the 5-year WQBEL Performance Standards.

As a part of the Water Department's commitment to achievement of Target A (Improvement of water quality and aesthetics in dry weather) in both the Cobbs and Tacony-Frankford watersheds, the integrated watershed management plans include commitments to lining the interceptors that run along the mainstems of each. This commitment was re-affirmed with the *Green City, Clean Waters* program and formalized in the COA and WQBEL Performance Standards.

Benefits to Interceptor Lining:

- Decrease pollutant loads to surface waters by decreasing exfiltration
- Decrease amount of flow in sewer system by decreasing infiltration
- Rehabilitation of sewers increase the efficiency of the sewer system

Planning and design is underway for lining of the entire length of interceptor within Philadelphia in the Cobbs and Tacony-Frankford Watersheds. For planning purposes, the interceptors within both watersheds were split into sections, or projects, of approximately 1.5 miles in length, with plans to line one section each year. In the Cobbs Watershed, two of these segments already have been lined, one in 1999 and the other in 2004. Construction began on the first of the four remaining sections in the Cobbs Watershed during FY 2011. The Tacony-Frankford Watershed interceptor was split into 5 sections and the lining of the first segment

began in March 2010. Tables 3-12 and 3-13 describe the interceptor lining project within each watershed and the figures provide a map view.

Table 3-12 Cobbs Watershed Sewer Lining Project Data

Project Title	Design Status:	Construction Status:	Extents:
40518 - Cobbs Creek Interceptor Phase 1 CIPP Lining Contract	Design Complete	In Progress	63rd and Market to 62nd and Baltimore
40612 - Cobbs Creek Intercepting Sewer Lining Phase 2	Design Complete	In Projects Control	61st and Baltimore to 60th and Warrington
40613 - Cobbs Creek Interceptor Lining Phase 3	Design 95 % Complete	-	City Avenue to D R/W in former 67th Street
40614 - Cobbs Creek Intercepting Sewer Lining Phase 4 (Indian Creek Branch)	Design 95 % Complete	-	City Avenue to D R/W in former 67th Street

Table 3-13 Tacony – Frankford Watershed Sewer Lining Project Data

Project Title	Design Status:	Construction Status:	Extents:
40615 - Tacony Creek intercepting Sewer Lining Phase 1	Design Complete	In Progress	Chew & Rising Sun to I & Ramona
40616 - Tacony Creek intercepting Sewer Lining Phase 2	Design Complete	In Projects Control	2nd St & 64th Ave to Chew & Rising Sun; DRW Mascher to Tacony Interceptor; Cheltenham Ave to Crescentville & Godfrey
40617 - Tacony Creek intercepting Sewer Lining Phase 3	Design 30% Complete	-	I & Ramona to O & Erie
40618 - Upper Frankford LL Collector/Tacony Intercepting Sewer Lining Phase 4	Design 30% Complete	-	Castor & Wyoming to Frankford/Hunting Park
46019 - Upper Frankford Creek LL Collector/Tacony Intercepting Sewer Lining Phase 5	Design Started	-	Frankford/Hunting Park to Luzerne & Richmond

Figure 3-5: Segment Order for Relining in the Cobbs Creek

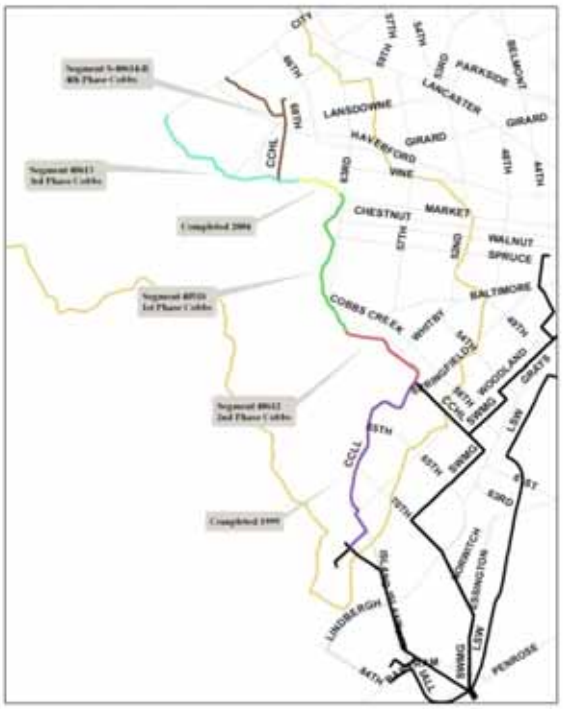
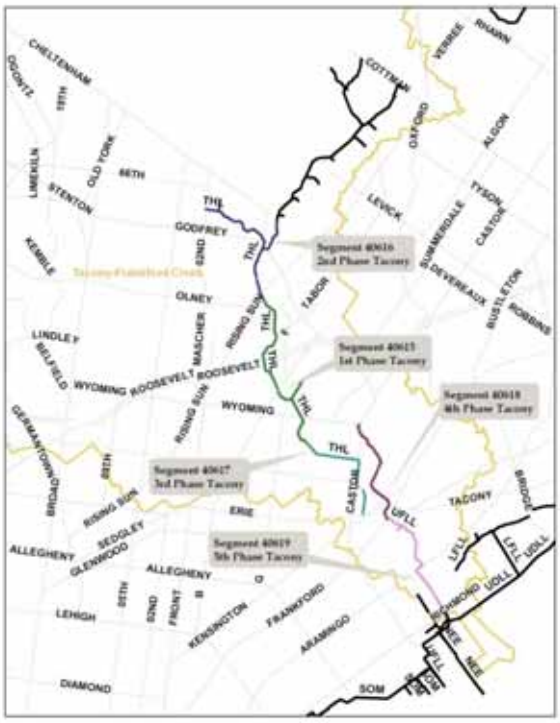


Figure 3-6: Segment Order for Relining in the Tacony – Frankford



3.4 Facility Concept Plans for each of the Water Pollution Control Plants

The COA requires the development of individual Facility Concept Plans for the three Water Pollution Control Plants. The Facility Concept Plans will provide the basis and background of the specific improvements proposed to accomplish the goals for plant performance described in the LTCPU and its supplements.

During the past decade, a number of evaluations and studies were conducted, and reports prepared, for each of the three WPCPs. Each of the reports provided recommendations (some of which were incorporated

Facility Concept Plans for Plant Expansion

Delivery: June 1, 2013

Metric: Overflow Reduction

The COA describes the Facility Concept Plans for Expansion:

There will be a separate Facility Concept Plan for each of the three Water Pollution Control Plants. Each Plan will describe specific engineering and construction proposed to increase the maximum wet weather flow rate through the facility, and thereby to increase the capture rate of combined sewage. These Plans will provide design and construction performance standards (in terms of "percent complete") for the five-year, ten-year, and fifteen-year milestone periods. These performance standards will become permit requirements by being incorporated into future versions of the NPDES permits.

into the LTCPU and its supplements) to enhance performance for CSO control. Of those selected recommendations, some already were acted upon, while others will be scheduled for future implementation. The Facility Concept Plans will consolidate the results of the past studies for each plant, establishing a timeline for implementing the selected recommendations described in the LTCPU and its supplements, and establishing metrics for measuring design and construction progress.

3.5 Implementation of Nine Minimum Controls Update

In the first phase of the Water Department's CSO strategy, and in compliance with its NPDES permits, the Water Department submitted CSO Documentation: Implementation of Nine Minimum Controls to the PA DEP on September 27, 1995. In addition, each Nine Minimum Control's (NMC's) status is updated as part of the Combined Sewer and Stormwater Annual Reports. As a compliance requirement of the COA, the Water Department will prepare an update to the original NMC document by June 1, 2013. This document will review and update each of the nine minimum controls to summarize progress and significant accomplishments since the original documentation of these measures. The documentation process and updated report will ensure that the Water Department is operating a well-functioning combined sewer system that maximizes the benefits of implementation of GSI.

Updated Nine Minimum Controls Report

Delivery: June 1, 2013

Metric: Overflow Reduction

The COA describes the NMC report:

To support the LTCPU, the City will update the "Implementation of Nine Minimum Controls" document, which was originally submitted in September, 1995. The updated report should indicate how the City's activities are being carried out currently, and highlight how these activities may have changed as a result of new technology, new practice, or other circumstances.

4.0 Streamlining

As described previously, to meet WQBEL Performance Standards, the Water Department undertook a process to transition from the demonstration phase to full-scale implementation. This evolution may require some changes to the Water Department's organizational structure, procedures and policies, and how the Water Department works with fellow City agencies. The Water Department is reviewing how it interacts with other City agencies and non-City entities to identify and, where needed, resolve any conflicts between current regulations and the implementation goals of the *Green City, Clean Waters* program. Also, the Water Department is identifying and mapping out strategies for overcoming potential future legal obstacles as they emerge during program implementation.

This section of the IAMP identifies actions underway or completed by the Water Department to address previously identified needs, and describes the framework for continuing to address policy and coordination needs as they emerge during implementation. There are three categories of these actions. The first includes streamlining the Water Department's structure, protocols, and communication pathways. The second includes actions that facilitate the identification, prioritization and resolution of policy obstacles to effective *Green City, Clean Waters* implementation. The third category defines steps that streamline coordination with organizations outside of the Water Department to maintain compliance with the COA.

4.1 Streamlining the Water Department's Processes

The Water Department formed a Strategic Policy and Coordination Program to address policy issues and more effective interagency coordination to streamline the Water Department's structure, protocols and communication pathways to better align with full-scale GSI implementation. In addition, an Internal Communications Plan to improve synchronization within the Water Department is in development.

4.1.1 Strategic Policy and Coordination Program

One of the first steps in the evolution from demonstration to implementation was the initiation of an internal staff evaluation aimed at understanding staffing needs to support programmatic expansion. In doing so, the Water Department recognized the value of a new working group dedicated to issues of streamlining policy and coordination needs. This Strategic Policy and Coordination Program staff will identify and evaluate policy barriers to *Green City, Clean Waters* implementation, and will initiate strategies to address these challenges. Many of the priority policy and coordination needs will be identified by the GSI planning group that, as described in Section 3, is responsible for building the queue of projects for implementation. A liaison position was created to collect and prioritize policy and coordination needs as they develop, and to ensure that they are evaluated by the Strategic Policy and Coordination staff. The group also will track local, state and federal policy developments that may affect *Green City,*

Clean Waters goals, and will identify strategies to address or respond to them. This group will centralize coordination with other City and Non-City agencies to achieve policy goals and realize opportunities to enhance the *Green City, Clean Waters* program.

4.1.2 Internal Communications Plan

As described in Section 1, the Water Department is a large City agency with over 1800 employees, made up of 7 divisions, 32 units, and countless working groups that run its various programs and meeting compliance obligations. With so many regulatory tasks under its purview, the Water Department has over the years separated responsibilities among its working groups for the sake of efficiency. In an effort to better understand the responsibilities of these groups, to streamline processes where possible, and to raise efficiency in tackling implementation commitments, the Strategic Policy and Coordination staff will support the Water Department's Public Affairs Division in developing an Internal Communications Plan. This plan will identify key points of contact and clarify roles and responsibilities intended to improve the effectiveness of internal collaboration, maintain a shared vision, and support the realization of COA obligations.

4.2 Streamlining Resolution of Policy Barriers

This section highlights proposed processes to identify, prioritize, evaluate and resolve policy obstacles and needs as they emerge.

4.2.1 Identification and Prioritization of Policy Needs

A principal responsibility of the Strategic Policy and Coordination staff is to identify and prioritize policy needs for *Green City, Clean Waters* implementation. These needs may include addressing existing regulations or policies that conflict with the goals of the program, or more proactive actions to facilitate efficient achievement of program goals. Many of these policy needs will be identified through the liaison in the GSI Planning group whose responsibility it is to receive and communicate policy issues as they are discovered while building a project queue. This new liaison role represents a change in how the Water Department addresses these issues and may enhance the Water Department's success in overcoming obstacles to implementing GSI projects.

With the initial list of policy issues and needs in place, Strategic Policy and Coordination staff will interview key Water Department managers to affirm priorities and the continued relevance of issues identified during the demonstration phase. At the same time, Water Department staff will analyze relevant ordinances and laws to identify possible conflicts with implementation needs. This review will incorporate City ordinances, including the City Plumbing Code, Building Code and Water and Sewer Code, and State regulations such as the State Utility Law. Upon completion of this review, Strategic Policy and Coordination staff will collate the outstanding policy needs and categorize them according to whether they exist within the City's own codes and procedures, or whether they originate with an outside organization. The Water Department

will prioritize policy needs based primarily on how critical they are to effective implementation of the COA requirements.

This list of policy needs will not remain static. As additional policy needs are discovered, they will be communicated to the Strategic Policy and Coordination staff for prioritization, evaluation and eventual resolution.

4.2.2 Evaluation and Resolution of Policy Needs

As implementation progresses, the priority of policy issues likely will change and evolve. At this early stage, policy needs have been prioritized, and represent a first assessment of needed actions by the Strategic Policy and Coordination staff. For the current view on the highest priority policy issues, Strategic Policy and Coordination staff will work with the Water Department legal staff on analyses of, and recommendations for, addressing the issues. For issues involving other City and non-City agencies, Strategic Policy and Coordination staff will formulate strategies to work with those groups to identify and negotiate solutions. These strategies will become part of a Coordination Plan, as described in Section 4.3. When resolutions are reached, Strategic Policy and Coordination staff may include them in new policies, procedures or work with legal staff to include them in new regulations. The Strategic Policy and Coordination staff will help facilitate underlying structural changes needed to institutionalize the new policies, and will help promote the policy changes to ensure they are adopted

4.2.3 Tracking Federal and State Policy Developments

In addition to identifying existing policy barriers, the Water Department will track developments in State and Federal policies that may impact the Water Department programs. A protocol to track and evaluate evolutions in state and federal regulations is underway. To keep current on all relevant policy developments, Strategic Policy and Coordination staff will utilize policy resources such as http://www.govtrak.us, Open Congress, session updates from the State General Assembly, and legislative updates provided by member-based groups such as the National Association of Clean Water Agencies, American Association of Metropolitan Water Agencies, and the Water Environment Federation. The Strategic Policy and Coordination staff will track these policy developments, evaluate their implications for the Green City, Clean Waters program, develop policy statements that reflect the Water Department's program needs, and initiate preparations by the Water Department and the City to accommodate the changing policies.

4.2.4 Policy Priorities

A preliminary list of policy issues, legal obstacles and needs for procedural changes, identified during the demonstration phase, are categorized according to topic area and priority. Many of these policies are captured in the outreach strategies described in Section 4.3.

Policies Relating to Green Streets

Short-term Priority

- Advocate for a City-wide requirement to incorporate *Green City, Clean Waters* policies into standard operating procedures of all City agencies.
- Develop a "Green Streets Manual" to standardize design and construction elements for Green Streets that can be integrated into agency protocols.
- Develop an agreement with the Streets Department to standardize maintenance responsibilities for green streets.
- Advocate for an ordinance to permit easier installation of bumpouts that improve stormwater management.*
- Work with the Streets Department Transportation Engineering and Planning Section (TEPS) to create standard review process for Green Street projects.
- Pilot a street-tree opt-out form to replace tree request form and reduce time required for approval of street tree placement.

Longer-term Priority

- Consider modifying the stormwater regulations to include street work so that Green Streets are automatically triggered by an earth disturbance threshold.
- Evaluate alternatives to current impervious surface requirements, including number of parking spots and allowances of pervious materials.
- Improve existing processes of inter-agency notification to avoid conflict among projects of individual agencies.

Policies Relating to the Water Department's Stormwater Regulations and Credits Program

Short-term Priority

- Evaluate policies for off-site alternatives to meet stormwater regulations and achieve credits.
- Evaluate mechanisms to alleviate the cost of implementing GSI retrofits for private properties, including evaluating the credits system to ensure equity and to confirm expected benefits, evaluating a green infrastructure grant program, and evaluating insurance discounts.
- Establish clearer policies for the Stormwater Credit Program, in particular how credits are applied when the Water Department funds a project on private property, or if a public project treats runoff from private property.
- Work with the City's Department of Licenses and Inspections to ensure that As-Built plans are filed with the Water Depart
- Eliminate Stormwater D-Permits, a "grandfather clause" allowing certain parcels to be exempt from stormwater bills. *

*Denotes that policy issue has already been addressed. More information about these issues is available in Section 4.3.3.

Longer-term Priority

- Evaluate the potential benefit of modifying the Water Department's stormwater regulations to increase the depth of required stormwater management from 1 inch to 1.5 inches.
- Develop a strategy for reducing the stormwater regulations triggering threshold from 15,000 square feet to 5,000 square feet.
- Evaluate the current Green Project Review process to determine its impact on incentivizing green infrastructure.
- Evaluate the length of time and cost of project review process due to multiple agency involvement and look for opportunities to streamline the process.
- Evaluate Leadership in Energy and Environmental Design (LEED) Certification; look for opportunity to increase the LEED credit value for stormwater management.

Policies Relating to the Project Procurement Process

Longer-term Priority

- Work with City Agencies to evaluate procurement process for the advertising and conformance of construction contracts to determine if it meets the expanding needs of the *Green City, Clean Waters* program.
- Optimize the procurement process to better align with the implementation of decentralized GSI.
- Evaluate opportunity to utilize On-call Services Contracts to reduce contracting time for installation of standardized systems.

Policies Relating to the Water Department's Investments on Parks, Schools and Private Property

Short-term Priority

- Evaluate potential legal and policy obstacles to spending municipal capital funds on parks, schools and private properties.*
- Establish an agreement with the PPR and the School District to certify the use of park and school land for GSI, confirm and clarify maintenance responsibilities, etc.
- Establish clear conditions for investments on private property that consider fairness to all rate payers.
- Evaluate policies that protect the City from liability relating to GSI.
- Evaluate policies to guide construction of Green Streets during private land development.
- Establish protocols, policies and procedures allowing the Water Department access to GSI facility sites when maintenance is not being performed by the landowner.

* Denotes that policy issue has already been addressed. More information about these issues is available in Section 4.3.3.

Longer-term Priority

- Evaluate models for managing public street runoff via a stormwater management system on private property
- Develop policies for property management and changes in land use designation for implementation of GSI on vacant land.
- Develop policies to address change in ownership of properties that manage stormwater from multiple parcels or public right of way

Policies Relating to Maintenance and Inspections

Short-term Priority

- Refine the Water Department's construction inspection protocol for public and private GSI projects. The protocol should improve the construction inspection process by better defining expectations for construction work and prescribing information necessary for As-Built documentation.
- The protocol also should allow for flexibility in maintenance procedures to accommodate designs of new and innovative pilot GSI designs.
- Develop legal tools and agreements to clarify and confirm maintenance responsibilities with relevant agencies and private property owners.

Policies Relating to Technology Needs

Short-term Priority

- Investigate potential for facilitation of a citywide exchange of utility data, ideally through existing Citywide effort to consolidate GIS data.
    - The Water Department will assist with the process of digitizing the Highway Supervisors' Integrated Utility Plans (currently only available in hard-copy).*
    - Investigate opportunities for sharing electronic mapping files with other underground utilities to improved project prioritization process.

Recommendations for Existing City Codes and Ordinances

Short-term Priority

- Continue to work with the Zoning Code Commission to revise the Philadelphia Zoning Code and provide comments that facilitate the implementation of *Green City, Clean Waters*.

Longer-term Priority

- Evaluate impact of water conservation and gray water reuse policy scenarios on CSO control.
- Support changes to the Philadelphia Plumbing Code that recognize allowable uses for non-potable water.

* Denotes that policy issue has already been addressed. More information about these issues is available in Section 4.3.3.

4.3 Streamlining the Water Department's Coordination with Outside Agencies

4.3.1 Coordination Strategy Development

The Water Department developed a preliminary Coordination Strategy to streamline interactions with outside organizations whose cooperation is critical to *Green City, Clean Waters* implementation. Target organizations generally belong to one of two categories. The first category includes organizations that have resources that can directly support *Green City, Clean Waters* implementation. These organizations have a significant land area to implement greened acres, can offer funding to leverage the Water Department's investments, or support initiatives that are complementary to *Green City, Clean Waters*. The second category includes groups that can influence the direction and reach of *Green City, Clean Waters*. These groups make critical policy decisions, influence key policy-makers or otherwise facilitate or present challenges to green infrastructure implementation. For each priority organization, the Coordination Strategy identifies overall goals, policy needs or specific opportunities that could be gained through coordination with the organization.

Two analyses completed by the Water Department provide the underlying data to support the Coordination Strategy development. The first is the assessment of policy needs in Section 4.2. High priority policy needs from that analysis are aligned with the organization(s) critical to addressing those needs in the Coordination Strategy. The second analysis evaluated major Philadelphia programs with connections to *Green City, Clean Waters*. The Water Department identified the lead agency, specified how the program is connected to *Green City, Clean Waters*, and, if possible, defined specific opportunities to facilitate *Green City, Clean Waters* implementation. Several key results from this analysis were included in the Coordination Strategy. The results from the Interagency Opportunities Analysis are available in Appendix III.

4.3.2 Preliminary Outreach Strategy

Table 4-1 Philadelphia Department of Parks & Recreation (PPR)

Priority:	Short-term
Description:	The Philadelphia Department of Parks and Recreation promotes the wellbeing of the City, its citizens and visitors, by offering beautiful natural landscapes and parks, historically significant resources, high quality recreation centers and athletic programs, along with enriching cultural and environmental programs.[1]
Overall Goal:	Maximize opportunities for GSI on park land and recreational facilities operated by the PPR
Policy Needs and Opportunities:	• Align with PPR's Green2015 program, which is intended to meet the Greenworks Philadelphia goal of increasing publicly accessible green space. The Water Department's commitment will ensure that sites incorporate GSI elements and the Water Department will work with PPR to define a process for collaboration. • Support PPR's tree planting program that is intended to increase tree coverage to 30% in all neighborhoods by 2025 and coordinate tree plantings in priority areas. • Work with PPR on development of a Green Park and Recreation Facility Manual with design standards and specifications using the Green Streets Manual as a model. • Develop an agreement with PPR that establishes park land and recreational facilities as opportunities for GSI, that clarifies roles and responsibilities of all parties in the installation, maintenance of, and liability for GSI, and that includes a commitment from both agencies to coordinate capital project planning efforts.

Table 4-2 Philadelphia Streets Department

Priority:	Short-term
Description:	The mission of the Philadelphia Streets Department is to provide clean and safe streets. The Streets Department maintains the streets and highways systems, collects and disposes of trash, and performs traffic engineering and street lighting for all of Philadelphia.[2]
Overall Goal:	Align standards and specifications with the Philadelphia Streets Department to make Green Streets the accepted and required practice throughout the City.
Policy Needs and Opportunities:	• Collaborate to develop a manual of design specifications and standard details for green streets. • Identify opportunities to optimize inclusion of GSI into the City's capital projects for street work. • Collaborate to develop a Complete Streets Guidebook. • Develop an agreement for both agencies to coordinate capital project planning and to clarify maintenance responsibilities and liability for green streets. • Evaluate the potential to implement a street sweeping policy and program to reduce the accumulation of trash, debris and sediment in storm inlets and GSI facilities. • Evaluate modifications to street standards, materials, widths, turning radii, parking requirements and others as relevant.

[1] From the Philadelphia Department of Parks and Recreation document, Vision, Mission and Goals. www.fairmountpark.org/pdf/Vision%20Mission%20Goals%20Final.pdf

[2] From the Philadelphia Streets Department website. *www.philadelphiastreets.com/about.aspx*

Table 4-3 Philadelphia City Planning Commission (PCPC)

Priority:	Short-term
Description:	The City Planning Commission is responsible for guiding the orderly growth and development of the City of Philadelphia. The nine member commission evaluates all planning and development within the City, with particular attention to land use controls, facilities planning, physical planning, economic development, housing policy, environmental concerns and historic preservation.[3]
Overall Goal:	Incorporate *Green City, Clean Waters* into PCPC's major planning initiatives via Philadelphia2035, leverage the City's Capital Program budget which is coordinated by the PCPC, better understand the City's overall planning direction, and better utilize planning staff to support implementation of *Green City, Clean Waters*.
Policy Needs and Opportunities:	• Investigate and document opportunities to align GSI in neighborhood or District planning initiatives to leverage the Water Department's investments of City capital dollars. • Coordinate with the City's capital budget to help prioritize mutually beneficial project implementation.

Table 4-4 Mayor's Office of Sustainability (MOS)

Priority:	Short-term
Description:	The Mayor's Office of Sustainability supports and promotes efforts to make Philadelphia the "Greenest City in America." The office coordinates among various City departments and non-profit organizations to make sustainability a priority in City operations.[4]
Overall Goal:	Sustain Mayoral level support for the Water Department's initiatives.
Policy Needs and Opportunities:	• Examine the possible alignment of the metrics of success for *Green City, Clean Waters* with those of Greenworks Philadelphia. • Investigate potential project synergies and opportunities via GreenWorks Philadelphia and Green Philly, Grow Philly. (Green Philly, Grow Philly is the MOS campaign to plant trees along public streets, in riparian buffer zones, and on public lands near municipal and neighborhood parks.) • Advocate for a standard requiring all City agencies to incorporate *Green City, Clean Waters* into their standard operation procedures.

[3] From the Philadelphia City Planning Commission website. *www.philaplanning.org/pubinfo/overview.html*
[4] From the Philadelphia Mayor's Office of Sustainability website. *www.phila.gov/green/*

Table 4-5 Mayor's Office of Transportation and Utilities (MOTU)

Priority:	Short-term
Description:	Mayor's Office of Transportation and Utilities promotes a coordinated decision-making process among agencies and departments that invest and plan the City's infrastructure. It fosters collaboration between departments and agencies to ensure a brighter, greener future for Philadelphia.[5]
Overall Goal:	Sustain Mayoral level of support for the Water Department's initiatives and utilize MOTU's role of building a shared vision and supporting collaboration among City agencies and departments to facilitate Citywide GSI.
Policy Needs and Opportunities:	• Work with MOTU on development of the Green Streets Manual. • Work with MOTU on development of a "Complete Streets" handbook for the development community that represents a single guide to the design of the roadway, road geometry, curb cuts and extensions, intersections, sidewalks and transit supportive design and parking for a more livable and sustainable Philadelphia. • Advocate for an interagency notification process for infrastructure projects to ensure that conflicts to do not occur.

Table 4-6 Philadelphia City Council

Priority:	Short-term
Description:	The Philadelphia City Council is the legislative arm of Philadelphia municipal government and consists of seventeen elected members. The functions of City Council influence a wide range of public affairs in Philadelphia and directly impact the quality of life for its citizenry.[6]
Overall Goal:	Secure Council support for the Water Department's initiatives.
Policy Needs and Opportunities:	• Work to establish annual or semi-annual meetings with Council members to address issues and discuss new opportunities and showcase *Green City, Clean Waters* implementation within their districts. • Advocate for various ordinances needed to facilitate GSI.

[5] From the Philadelphia Mayor's Office of Transportation and Utilities website. *www.phila.gov/MOTU/about.html*
[6] From the Philadelphia City Council website. *www.phila.gov/citycouncil/About.html*

Table 4-7 Department of Public Property

Priority:	Short-term
Description:	The Department of Public Property manages the physical infrastructure that supports City government operations. To this end, the Department is responsible for the acquisition, disposition, lease, design, construction, renovation, and maintenance of City properties and the management of the City's municipal radio and switchboard system.[7]
Overall Goal:	Streamline protocols for stormwater bill credits on behalf of City entities; work with the agency to improve stormwater management designs for public facilities; clarify roles and responsibilities with respect to maintenance of GSI on public property.
Policy Needs and Opportunities:	• Develop an agreement between the Department of Public Property and the Water Department to clarify roles and responsibilities with respect to GSI maintenance. • Explore and document policy changes to ensure that cost savings generated through stormwater credits to the Department of Public Property can be directed toward GSI maintenance or implementation instead of to the General City Fund. • Seek a commitment by the Department of Public Property to go beyond Water Department's stormwater management regulations for any capital improvements to City-owned property. Identify opportunities and resources to help support this effort. • Coordinate planning of capital investments on City-owned property. • Develop a plan, in consultation with the Department of Public Property, for the development of GSI on vacant lands.

Table 4-8 School District of Philadelphia

Priority:	Short-term
Description:	The School District of Philadelphia provides a high-quality education that prepares, ensures, and empowers all students to achieve their full intellectual and social potential in order to become lifelong learners and productive members of society.[8]
Overall Goal:	Maximize opportunities for installing GSI on School District Property and explore opportunities to leverage funding for GSI.
Policy Needs and Opportunities:	• Develop an agreement with the School District that establishes the use of GSI on school properties as a standard of practice, that clarifies roles and responsibilities with respect to the coordination, installation, maintenance of, and liability for GSI, and that includes a commitment from both agencies to coordinate capital project planning efforts. • Continue coordination for GSI projects at the individual schools-level – building on the successes established during the demonstration phase of the program. • Continue to build on the success of the first phase of the Green2015 initiative, evaluate potential for additional phases.

[7] From the Philadelphia Department of Public Property website. www.phila.gov/property/
[8] From the Philadelphia School District website. www.phila.k12.pa.us/about/

Table 4-9 Philadelphia Industrial Development Corporation (PIDC)

Priority:	Short-term
Description:	The Philadelphia Industrial Development Corporation provides financing programs and real estate products to business and non-profit clients in all neighborhoods of Philadelphia. PIDC also coordinates tax incentive and work force development programs offered by both City and Commonwealth.[9]
Overall Goal:	Align programs and priorities with PIDC to implement *Green City, Clean Waters*
Policy Needs and Opportunities:	• Establish an agreement with PIDC to expand the current Stormwater Management Incentives Grant and Loan Programs to better facilitate the use of the Water Department's funds for installations of GSI on private property. • Coordinate the Water Department's resources with PIDC's Industrial Market and Land Strategy, which outlines the agency's agenda for conscientious industrial land development in Philadelphia including green industry and adaptive reuse of waterfront properties. • Develop and document agreements for GSI design and construction contract procurement by PIDC on behalf of the Water Department. • Make the use of GSI on all PIDC development initiatives a standard of practice.

Table 4-10 Philadelphia Zoning Code Commission (ZCC)

Priority:	Short-term
Description:	The Commission was created in 2007 to reform and modernize Philadelphia's outdated and complex zoning code.[10]
Overall Goal:	Synchronize the Water Department's needs for GSI with Philadelphia's first zoning code update since 1962. Monitor the progress of the Zoning Code update as the ZCC presents its recommendations to the City Council and make sure any concerns are addressed.
Policy Needs and Opportunities:	• Work together with the Commission to update the Zoning Code with recommendations that specifically support GSI.

[9] From the Philadelphia Industrial Development Corporation website. *www.pidc-pa.org/*

[10] From the Philadelphia Zoning Code Commission Facebook Page. *www.facebook.com/PhillyZCC*

Table 4-11 Licenses and Inspections and Plumbing Board (subgroup under L&I)

Priority:	Short-term
Description:	The Department of Licenses and Inspections administers and enforces the City's code requirements for the enhancement of public safety, including building, plumbing, electrical, and mechanical, fire, property maintenance, business, and zoning regulations. The Department is responsible for regulating the conduct of businesses and persons by issuing licenses, by conducting inspections, and by enforcing applicable codes and regulations.[11]
Overall Goal:	Address conflicts, discovered during the demonstration phase, among procedures, policies and codes, and *Green City, Clean Waters*.
Policy Needs and Opportunities:	• Develop and document commitments between the agencies to resolve any policy conflicts. • Work with L&I to codify requirements for the submission by land developers of as-built record drawings of SMPs before issuing certificates of occupancy. • Work with Plumbing Board to explore standards for the use of rain water, gray water and black water facilities. • Improve the Water Department's coordination with L&I around the issuance of building permits, which give developers the right to begin construction. • As the Water Department builds its own inspection program, continue to coordinate with L&I to ensure inspection protocols are well aligned.

Table 4-12 Energy Coordinating Agency (ECA)

Priority:	Medium
Description:	The Energy Coordinating Agency is a non-profit corporation whose mission is to help people save energy and to promote a sustainable and socially equitable energy future for all in the Philadelphia region. [12]
Overall Goal:	Pursue collaborative opportunities for green jobs training and water conservation.
Policy Needs and Opportunities:	• Look for opportunities to develop green jobs training in GSI design, construction and maintenance. • Continue to collaborate in implementing water conservation measures.

Table 4-13 Philadelphia Housing Authority (PHA)

Priority:	Longer-term
Description:	The Philadelphia Housing Authority is the nation's fourth largest public housing authority and is also an award-winning housing community developer, currently managing $250 million in redevelopment projects citywide.[13]
Overall Goal:	Maximize opportunities for GSI on PHA-owned lands.
Policy Needs and Opportunities:	• Seek to develop and document commitments to work with the Water Department to manage public runoff on PHA owned land, including vacant lands. • Seek to retrofit PHA properties with GSI. • Investigate policy options to offset stormwater fees with credits. • Establish agreements that define maintenance responsibilities and confirm liability.

[11] From the Licenses and Inspections Board website. *www.phila.gov/li/ContentPage.asp?TopNode=about&level1=1&level2=&level3*

[12] From the Energy Coordinating Agency website. *http://ecasavesenergy.org/about*

[13] From the Philadelphia Housing Authority website. *www.pha.phila.gov*

Table 4-14 Philadelphia Department of Commerce

Priority:	Short-term
Description:	The Philadelphia Department of Commerce coordinates economic development activity in the City. Coordinating the work of related agencies, including PIDC and the RDA, the Department leads efforts to develop business-friendly strategies to help both small businesses and major corporations in Philadelphia thrive.[14]
Overall Goal:	Secure cooperation in implementing *Green City, Clean Waters*.
Policy Needs and Opportunities:	• Seek collaborative opportunities to support businesses in meeting the Water Department's stormwater regulations and in implementing stormwater retrofits for credits. • Coordinate an evaluation of policies and opportunities for GSI on private development.

Table 4-15 Philadelphia Redevelopment Authority (RDA)

Priority:	Short-term
Description:	The Redevelopment Authority focuses on planning and developing balanced mixed-use communities to create thriving, well-served neighborhoods.[15]
Overall Goal:	Secure cooperation and buy-in for *Green City, Clean Waters*
Policy Needs and Opportunities:	• Explore collaborative opportunities to support businesses in meeting the Water Department's stormwater regulations, achieving LEED certification, supporting community green initiatives, and redeveloping vacant land for GSI.

Table 4-16 Philadelphia Office of Innovation and Technology (OIT)

Priority:	Short-term
Description:	The Office of Innovation and Technology's (OIT) mission is to increase the effectiveness of the information technology infrastructure, where the services provided are advanced, optimized, and responsive to the needs of the City of Philadelphia's businesses, residents and visitors.[16]
Overall Goal:	Maximize opportunities for data management to support GSI planning and implementation initiatives.
Policy Needs and Opportunities:	• Explore a cooperative citywide clearinghouse of data electronic planning tools that can streamline GSI project planning and implementation.

[14] From the Philadelphia Department of Commerce website. www.phila.gov/commerce/comm/
[15] From the Philadelphia Redevelopment Authority website. *www.phila.gov/rda/about.html*
[16] From the Philadelphia Office of Innovation and Technology website. www.phila.gov/dot/

Table 4-17 Philadelphia Procurement Department

Priority:	Longer-term
Description:	The mission of the Procurement Department is to obtain quality, cost-effective goods, services, and construction in a timely and professional manner through a competitive, fair, and socially responsible process in accordance with the law.[17]
Overall Goal:	Facilitate bidding and contracting of GSI projects.
Policy Needs and Opportunities:	• Work with City Agencies to evaluate procurement process for the advertising and conformance of construction contracts to determine if it meets the expanding needs of the *Green City, Clean Waters* program moving forward. • Optimize the procurement process to better align with the implementation of decentralized GSI. • Evaluate opportunity to utilize Requirement Contracts to reduce contracting time for installation of standardized systems.

Table 4-18 Schuylkill River Development Corporation (SRDC)

Priority:	Longer-term
Description:	SRDC works with federal, state, city and private agencies to coordinate, plan and implement economic, recreational, environmental and cultural improvements and tourism initiatives on the lower Schuylkill River between the Fairmount Dam and the Delaware River. The Schuylkill River Development Corporation released a master plan for the Tidal Schuylkill River area in 2003.[18] Since then they have been very successful in implementing incremental projects to create a connected greenway along both the east and west banks of the lower Schuylkill River.
Overall Goal:	Ensure consistency with *Green City, Clean Waters* and develop opportunities to leverage the Water Department's investment with funding raised by SRDC.
Policy Needs and Opportunities:	• Support connectivity of the Grays Ferry Crescent Greenway and other trails efforts that promote access and stewardship. • Provide assistance in incorporating GSI in future greenway planning.

Table 4-19 Delaware River Waterfront Corporation (DRWC)

Priority:	Longer-term
Description:	The Delaware River Waterfront Corporation is a non-profit corporation organized exclusively for the benefit of the City of Philadelphia and its citizens. DRWC acts as the steward of the Delaware River waterfront to provide a benefit to all of the citizens and visitors of the City. The fundamental purpose of DRWC is to design, develop and manage the central Delaware River waterfront in Philadelphia between Oregon and Allegheny Avenues.[19]
Overall Goal:	Ensure consistency with *Green City, Clean Waters* and leverage the Water Department's investments with funding raised by DRWC.
Policy Needs and Opportunities:	• Monitor the progress of and promote redevelopment in areas between I-95 and the Delaware River to ensure disconnections of properties from the combined sewer system.

[17] From the Philadelphia Procurement website. *www.phila.gov/phils/docs/inventor/textonly/agencies/A089.htm*
[18] *www.schuylkillbanks.org/sites/72.27.230.230/files/SRDC%20Master%20Plan.pdf*
[19] From the Delaware River Waterfront Corporation website.
www.delawareriverwaterfrontcorp.com/index.php?pageID=61&image

Table 4-20 Delaware Valley Regional Planning Commission (DVRPC)

Priority:	Longer-term
Description:	The Delaware Valley Regional Planning Commission (DVRPC) is dedicated to uniting the region's elected officials, planning professionals and the public with a common vision for the Delaware Valley region. DVRPC helps build consensus and policy for improved transportation, smart growth, strong economy and a healthy environment.[20]
Overall Goal:	Secure support for *Green City, Clean Waters* and ensure consistency with its goals.
Policy Needs and Opportunities:	• Explore and document collaboration opportunities for GSI within DVRPC's "Connections Plan." The Connections Plan recognizes that community-scale green infrastructure, including increased tree coverage, green streets, green schoolyards and urban agriculture, can contribute to more livable communities. • Work with DVRPC to understand and exploit federal transportation and other funding opportunities to support GSI implementation.

Table 4-21 Delaware Valley Green Building Council (DVGBC)

Priority:	Short-term
Description:	The Delaware Valley Green Building Council's mission is to transform the Delaware Valley through sustainable and environmentally responsible planning, design, construction and operation of the region's buildings, landscapes, cities and communities, mindful of the legacy left for future generations. The DVGBC has developed a report on what sustainable water practices green builders would like to implement in Philadelphia and what barriers they are coming up against. [21]
Overall Goal:	Coordinate with the DVGBC on policy research opportunities.
Policy Needs and Opportunities:	• Explore and document solutions to potential obstacles resulting from the DVGBC report "Sustainable Water Strategies in Philadelphia: Toward Green Building Practices that Conserve, Reuse, and Manage Water." • Investigate and document opportunities to support businesses in meeting the Water Department's stormwater regulations, achieving LEED certification and supporting community green initiatives.

Table 4-22 Southeastern Pennsylvania Transportation Authority (SEPTA)

Priority:	Short-term
Description:	SEPTA is dedicated to delivering safe, courteous, convenient and dependable public Transit services for the people of the Philadelphia region. They contribute to the region's economic vitality, sustainability and enhanced quality of life. [22]
Overall Goal:	Secure support for *Green City, Clean Waters*, leverage capital funding and align capital initiatives.
Policy Needs and Opportunities:	• Identify, evaluate and pursue opportunities within SEPTA's new Sustainability Plan. • Explore and document opportunities to partner with SEPTA to ensure that GSI is implemented in development of SEPTA properties as a standard of practice. • Support SEPTA in implementing stormwater retrofits and achieving stormwater bill credits.

[20] From the Delaware Valley Regional Planning Commission website. *www.dvrpc.org/*
[21] From the Delaware Valley Green Building Council website. www.dvgbc.org/
[22] From the SEPTA website. *www.septa.org/reports/pdf/strategic.pdf*

Table 4-23 Building Industry Association of Philadelphia (BIA)

Priority:	Short-term
Description:	BIA is the leading association promoting residential development and construction in the City of Philadelphia. They provide education to homebuilding stakeholders, work with housing agencies and neighborhood CDCs and promote policies for expanding the market for all housing.[23]
Overall Goal:	Seek BIA endorsement of *Green City, Clean Waters.*
Policy Needs and Opportunities:	• Evaluate and support implementation of Stormwater Citizen's Advisory Council recommendations when appropriate and feasible. • Explore and document creative financing techniques that can facilitate spending of Water Fund capital on private property when it makes economic sense to do so. • Investigate collaborative opportunities to support businesses in meeting the Water Department's stormwater regulations, achieving LEED certification and supporting community green initiatives.

Table 4-24 Pennsylvania Department of Transportation (PennDOT)

Priority:	Short-term
Description:	PennDOT provides service and a safe intermodal transportation system that attracts businesses and residents and stimulates Pennsylvania's economy.[24]
Overall Goal:	Seek PennDOT endorsement of *Green City, Clean Waters.*
Policy Needs and Opportunities:	• Explore and document cost-sharing mechanisms for projects that address both PennDOT and Water Department infrastructure. • Work with PennDOT to use the Water Department's stormwater management regulations as guidelines for incorporating GSI into infrastructure improvement projects. • Coordinate with PennDOT on I-95 phasing and construction to ensure disconnection from the Water Department's combined sewer system and to enhance opportunities to develop green streets and other stormwater management techniques. • Coordinate capital project planning. • Evaluate PennDOT's role in implementing Green Streets.

Table 4-25 Center City District

Priority:	Short-term
Description:	The Center City Business Improvement District attempts to enhance the vitality of Center City Philadelphia as a thriving 24-hour downtown and a great place to live, work or have fun.[25]
Overall Goal:	Secure support and cooperation with the goals of *Green City, Clean Waters.*
Policy Needs and Opportunities:	• Explore and document partnership opportunities within the Plant!Philly program to maximize opportunities for GSI. • Explore a pilot program for street trees that manage stormwater. • Explore and document possible partnerships for GSI maintenance.

[23] From the Building Industry Association of Philadelphia website. *www.biaofphiladelphia.com/index.php*

[24] From the PennDOT website. *www.dot.state.pa.us/Internet/Bureaus/pdadminths.nsf/mission*

[25] From the Center City District website. *www.centercityphila.org/about/CCD.php*

Table 4-26 University City District

Priority:	Short-term
Description:	The University City District Business Improvement District works towards commercial revitalization and improving quality of life in University City, by emphasizing public safety, public space maintenance, planning, economic development, capital improvements, and marketing and promoting the District's attractions and amenities.[26]
Overall Goal:	Secure support and cooperation with the goals of *Green City, Clean Waters*.
Policy Needs and Opportunities:	• Support the incorporation of stormwater management features into the site design of the 40th Street Portal Redevelopment Project. • Establish and document working relationships to ensure GSI is included in any future redevelopment plans. • Establishment for maintenance agreements for jointly implemented SMPs

Table 4-27 Sports Complex Special Service District (SCSSD)

Priority:	Short-term
Description:	The SCSSD serves the unique needs of South Philadelphia residents living in close proximity to the Sports Complex. It is involved in ongoing projects, programs, and studies to address neighborhood concerns and improve community quality of life.[27]
Overall Goal:	Secure support and cooperation with *Green City, Clean Waters*.
Policy Needs and Opportunities:	• Assist in creating a stormwater master plan for the stadium complex and its surrounding areas. • Develop an agreement for GSI maintenance.

Table 4-28 Pennsylvania Environmental Council (PEC)

Priority:	Short-term
Description:	The Pennsylvania Environmental Council promotes the protection and restoration of natural and built environments through innovation, collaboration, education and advocacy.[28]
Overall Goal:	Maximize opportunities for GSI and secure support for *Green City, Clean Waters*.
Policy Needs and Opportunities:	• Work with PEC to incorporate adequate stormwater infrastructure in the Spring Garden Street Greenway Project. • Establish working relationship with PEC to ensure proper coordination with other mutually-beneficial programs.

[26] From the University District website. *www.universitycity.org/about*

[27] From the Sport Complex Special Service District website. *www.scssd.org/about.htm*

[28] From the Pennsylvania Environmental Council website. http://www.pecpa.org/

Table 4-29 Pennsylvania Horticultural Society (PHS)

Priority:	Short-term
Description:	The Pennsylvania Horticultural Society motivates people to improve the quality of land and creates a sense of community through horticulture.[29]
Overall Goal:	Coordinate with PHS programs to enhance GSI throughout the City.
Policy Needs and Opportunities:	• Provide support to PHS "Plant 1 Million" and seek to coordinate planting with GSI guidelines. • Coordinate work with vacant land to determine if GSI can be installed. • Attempt to coordinate Philadelphia Green parks and community garden programs with the Water Department's GSI goals.

Table 4-30 Sustainable Business Network

Priority:	Medium
Description:	The mission of the Sustainable Business Network is to build a just, green, and thriving economy in the Greater Philadelphia region. They accomplish this by educating and growing a broad base of local, independent businesses and educating policymakers and the public.[30]
Overall Goal:	Secure support and cooperation with *Green City, Clean Waters* and encourage businesses to invest in GSI.
Policy Needs and Opportunities:	• Establish a working relationship to offer support to the business community for GSI implementation. • Collaborate on education and outreach about *Green City, Clean Waters* to the business community. • Explore and document opportunities to support businesses in meeting the Water Department's stormwater regulations, achieving LEED certification and supporting community green initiatives. • Explore opportunities to establish GSI design, construction and maintenance jobs training.

Table 4-31 Greater Philadelphia Green Business Program

Priority:	Medium
Description:	The program provides Philadelphia area businesses with guidance on green operational practices. Area Companies participate in the program and are ranked as Basic, Silver, Gold or Platinum based on the number of green practices they have adopted.[31]
Overall Goal:	Secure support and cooperation with *Green City, Clean Waters* and encourage businesses to invest in GSI.
Policy Needs and Opportunities:	• Establish a working relationship to offer support to the business community for GSI. • Collaborate on education and outreach about *Green City, Clean Waters* to the business community. • Explore opportunities to establish GSI design, construction and maintenance jobs training.

[29] From the Pennsylvania Horticultural Society website. *http://www.pennsylvaniahorticulturalsociety.org/home/index.php#*

[30] From the Sustainable Business Network website. *http://www.sbnphiladelphia.org/about_sbn/vision_mission/*

[31] From the Greater Philadelphia Green Business Program website. *www.phillygreenbiz.com/learn-more*

Table 4-32 University of Pennsylvania

Priority:	High
Description:	The University of Pennsylvania is an Ivy League school in West Philadelphia with a history of innovation in interdisciplinary education and scholarship.[32]
Overall Goal:	Maximize opportunities for GSI on University campus and recreational facilities.
Policy Needs and Opportunities:	• Seek to partner with the university through a Green Campus Initiative. • Provide support and coordinate with various school redevelopment projects to ensure GSI is included in designs and maximizes the number of Greened Acres. • Continue to support the ongoing development of a campus-wide stormwater master plan. • Provide design and monitoring assistance. • Track Greened Acres as projects are completed. • Explore private/public partnership possibilities.

Table 4-33 Temple University

Priority:	Medium – High
Description:	Temple University is a national center of excellence in teaching and research with an international presence. Temple provides access to superior education for committed and capable students of all backgrounds.[33]
Overall Goal:	Maximize opportunities for GSI on University campus and recreational facilities.
Policy Needs and Opportunities:	• Seek to partner with the university through a Green Campus Initiative. • Provide support and coordinate with various school redevelopment projects to ensure GSI is included in designs and maximizes the number of Greened Acres. • Continue to support the ongoing development of a campus-wide stormwater master plan. • Provide design and monitoring assistance • Track Greened Acres as projects are completed • Explore private/public partnership possibilities.

Table 4-34 Drexel University

Priority:	Medium-High
Description:	Drexel University serves their students and society through comprehensive integrated academic offerings enhanced by technology, co-operative education, and clinical practice in an urban setting, with global outreach embracing research, scholarly activities, and community initiatives.[34]
Overall Goal:	Maximize opportunities for GSI on University campus and recreational facilities.
Policy Needs and Opportunities:	• Seek to partner with the university through a Green Campus Initiative. • Provide support and coordinate with various school redevelopment projects to ensure GSI is included in designs and maximizes the number of Greened Acres. • Continue to support the ongoing development of a campus-wide stormwater master plan. • Provide design and monitoring assistance. • Track Greened Acres as projects are completed. • Explore private/public partnership possibilities.

[32] From University of Pennsylvania website. *www.upenn.edu/about/welcome.php*

[33] From Temple University website. *www.temple.edu/factbook/Mission.htm*

[34] From Drexel University website. *www.drexel.edu/about/mission/*

Table 4-35 St. Joseph's University

Priority:	Medium
Description:	Saint Joseph's University is a Catholic and Jesuit university that instills in each member of its academic community: a love of learning and of the highest intellectual and professional achievement; moral discernment reflecting Christian values; and a transforming commitment to social justice.[35]
Overall Goal:	Maximize opportunities for GSI on University campus and recreational facilities.
Policy Needs and Opportunities:	• Seek to partner with the university through a Green Campus Initiative. • Provide support and coordinate with various school redevelopment projects to ensure GSI is included in designs and maximizes the number of Greened Acres. • Continue to support the ongoing development of a campus-wide stormwater master plan. • Provide design and monitoring assistance. • Track Greened Acres as projects are completed. • Explore private/public partnership possibilities.

Table 4-36 La Salle University

Priority:	Medium
Description:	La Salle University is dedicated to the traditions of the Christian Brothers, to excellence in teaching and to concern for both ultimate values and for the individual values of its students. It is a private Roman Catholic University committed to providing a liberal education of both general and specialized studies.[36]
Overall Goal:	Maximize opportunities for GSI on University campus and recreational facilities.
Policy Needs and Opportunities:	• Seek to partner with the university through a Green Campus Initiative. • Provide support and coordinate with various school redevelopment projects to ensure GSI is included in designs and maximizes the number of Greened Acres. • Continue to support the ongoing development of a campus-wide stormwater master plan. • Provide design and monitoring assistance. • Track Greened Acres as projects are completed. • Explore private/public partnership possibilities.

35 From Saint Josephs University website. *www.sju.edu/sju/mission_statement.html*

36 From La Salle University website. *www.lasalle.edu/mission/*

Table 4-37 Community College of Philadelphia

Priority:	Medium
Description:	Community College of Philadelphia is the largest public institution of higher education in the City, offering over 70 degree and certificate programs in art, science, business, technology and liberal arts.[37]
Overall Goal:	Maximize opportunities for GSI on University campus and recreational facilities.
Policy Needs and Opportunities:	• Seek to partner with the university through a Green Campus Initiative. • Provide support and coordinate with various school redevelopment projects to ensure GSI is included in designs and maximizes the number of Greened Acres. • Continue to support the ongoing development of a campus-wide stormwater master plan. • Provide design and monitoring assistance. • Track Greened Acres as projects are completed. • Explore private/public partnership possibilities. • Support PCC's Streetscape project and identify opportunities to maximize management of public stormwater runoff.

Table 4-38 Community Development Corporations

Priority:	Medium-High
Description:	Not-for-profit organizations incorporated to provide programs, offer services and engage in other activities that promote and support community development.
Overall Goal:	Maximize opportunities for GSI in any redevelopment or community improvement projects.
Policy Needs and Opportunities:	• Collaborate with area CDCs to encourage the use of GSI in community projects and neighborhood planning. • Provide CDCs with guidance on stormwater management planning and GSI installation and design. • Establish community support for GSI on vacant land. • Explore and document possible partnerships for GSI maintenance.

Table 4-39 William Penn Foundation

Priority:	High
Description:	Dedicated to improving the quality of life in the Greater Philadelphia region through efforts that foster rich cultural expression, strengthen children's future, and deepen connections to nature and community.[38]
Overall Goal:	Secure funding to leverage the Water Department's investments.
Policy Needs and Opportunities:	• Align funding goals with the priorities of *Green City, Clean Waters.*

[37] From the Community College of Philadelphia website. *www.ccp.edu/site/about/*

[38] From the William Penn Foundation website. *www.williampennfoundation.org/TheFoundation.aspx*

Table 4-40 United States Environmental Protection Agency (USEPA)

Priority:	Critical
Description:	US EPA's mission is to protect human health and the environment.[39]
Overall Goal:	Secure support for the *Green City, Clean Waters* program
Policy Needs and Opportunities:	• Join in an innovative partnership with the USEPA to advance Green Infrastructure (GI) for urban wet weather pollution control. This partnership may serve as a model for cities nationally for sustainable stormwater management yielding multiple benefits for community livability and other urban environment improvements. • Support the Office of Water in developing an integrated planning approach framework that supports municipalities in making cost effective decisions. • Work with EPA to implement integrated stormwater and wastewater plans to achieve Clean Water Act water quality objectives.

Table 4-41 Pennsylvania Department of Environmental Protection (PA DEP)

Priority:	Critical
Description:	PA DEP is responsible for administering Pennsylvania's environmental laws and regulations.[40]
Overall Goal:	**Secure continued suppor**t of *Green City, Clean Waters.*
Policy Needs and Opportunities:	• Maintain consistent communication with PA DEP personnel. • Comply with stipulations of the COA.

Table 4-42 US Congress

Priority:	High
Description:	The legislative arm of the federal government, which consists of two houses of elected government officials. Among other duties, representatives introduce bills and resolutions, offer amendments and serve on committees.[41]
Overall Goal:	Secure legislative support for GSI.
Policy Needs and Opportunities:	• Continue to provide testimonies before the House Committees, including Transportation and Infrastructure, regarding the benefits of GSI as appropriate. • Follow the status of legislative bills and provide support to complementary initiatives such as H. R. 4202 the ''Green Infrastructure for Clean Water Act of 2009'', H. R. 2222 the ''Green Communities Act'' and H. R. 4690 the ''Livable Communities Act of 2010''.

[39] From the USEPA website. *www.epa.gov/aboutepa/whatwedo.html*

[40] From the PA DEP website. *www.depweb.state.pa.us/portal/server.pt/community/dep_home/5968*

[41] From the House of Representatives website. *www.house.gov/content/learn/*

Table 4-43 Pennsylvania Department of Conservation and Natural Resources (DCNR)

Priority:	Medium
Description:	DCNR's mission is to conserve and sustain Pennsylvania's natural resources for present and future generations' enjoyment.[42]
Overall Goal:	Secure funding for GSI implementation.
Policy Needs and Opportunities:	• Evaluate applicability of DCNR grant programs to *Green City, Clean Waters*.

Outreach Strategy as a "Living" Document

As policy needs are discovered, methods of coordination are tested, and new relationships developed, the Water Department will update the outreach strategy to reflect changing conditions. The Water Department also will work to expand the content of the preliminary coordination strategy. The Water Department will define current relationships with groups and agencies and identify outreach plans that factor in the political climate, challenges to coordination, and key messages for successful communication.

Connections to External Outreach and Communication Strategy

The Coordination Strategy is different from but related to the External Communications Plan that is under development by the Public Affairs Division. The primary goal of the Coordination Strategy is to identify changes in policies and procedures that may be needed to help facilitate *Green City, Clean Waters*. The primary goal of the External Communication Plan is to seek ambassadors to support community outreach. The outreach goals for each are different, yet in some cases the target audiences may overlap. The Strategy and Plan development will be coordinated to avoid inconsistencies.

Section 4.3.3 Early Successes

Examples of successful coordination and policy achievements are highlighted in this Section. These early achievements helped to establish a foundation for *Green City, Clean Waters* implementation. They provide models for future efforts and validate the Water Department's approach to meeting the compliance goals of the first five years.

[42] From the PA Department of Conservation and Natural Resources website. *www.dcnr.state.pa.us/discoverdcnr/ataglance/index.htm*

4.3.3.1 Green City, Clean Waters as the Water Department's Program and a City Initiative

The *Green City, Clean Waters* plan has evolved into a Citywide program with the full support of the Mayor. The success of the Greenworks Philadelphia plan - the initiative to make Philadelphia the greenest City in the nation - now depends in part on the implementation of the *Green City, Clean Waters* program. To support Greenworks Philadelphia and other key greening initiatives, the Mayor charged all City staff with the responsibility to coordinate and cooperate in greening efforts. Mayoral support for departmental coordination is critical for successful launch of *Green City, Clean Waters* implementation. The creation of the Mayor's Office of Transportation and Utilities, charged with building a shared vision and coordinating decision making among its agencies and departments and their interactions with agencies outside of the City, has enhanced coordination between the Water Department and fellow City agencies. Efforts to improve and better-coordinate implementation efforts throughout the City's utilities systems involves the Streets Department, Commerce Department, Department of Public Property, Traffic Police, Department of City Planning, School District, Parks and Recreation, Department of Aviation, waterfront and port agencies, SEPTA, Port Authority Transportation Corporation, PennDOT, Amtrak, DVRPC and the Water Department.

4.3.3.2 Departmental Coordination in Pilot Programs

The Water Department is exploring a number of pilot programs, including cross departmental liaisons, funding transfers, and green program coordinators, to improve coordination among the City departments critical to the success of *Green City, Clean Waters*. These pilot programs are models of successful collaboration and a framework for the future of interdepartmental coordination.

Streets Department Liaison

The Water Department embarked on a pilot liaison program with the Streets Department to improve coordination in the implementation of Green Streets. A Water Department staff member with expertise in GSI design and complete street design now serves as a liaison with the Streets Department, reviewing the Water Department's Green Street projects for compliance with Streets Department standards, and reviewing other streetscaping projects in the City for possible Green Street opportunities.

In time, the Streets Department liaison staff position will take responsibility for developing conceptual designs, coordinating development of professional services contracts, reviewing project documents for compliance with green streets standards, and coordinating external review by other City departments as needed. The liaison position also will assist in development of the Philadelphia Green Streets Design Manual, requiring the employee to have an understanding of the priorities of both departments.

The liaison works in both the Water Department and the Streets Department offices. While at the Streets Department, the employee becomes familiar with the Transportation Engineering and Planning Section (TEPS) review process, assists in the coordination of TEPS reviews of all

Green Street projects, and reviews other streetscaping projects for the potential to add GSI. This unique cross-training will facilitate successful Green Streets implementation.

Licenses and Inspections Green Building Program Manager

In fall of 2009, L&I filled a Green Building Program Manager position to serve as a resource to developers and residents interested in building "green," to improve the permitting and development process for green buildings, to expedite L&I's building review process for LEED certified projects, and to promote water efficiency and stormwater management. This position offers several advantages to the Water Department. With knowledge of the review requirements and standards of both L&I and the Water Department, this employee can help developers navigate the review process, facilitating implementation of the Water Department's stormwater regulations. This staff member also assists in streamlining the L&I and the Water Department stormwater review requirements to produce a more efficient process. Overall coordination between the departments is improved by having a common resource who understands both perspectives.

Coordination with Philadelphia Parks and Recreation

The Water Department, PPR and the Fairmount Park Conservancy formed a partnership in 2005 and began to share costs for stormwater projects in the Fairmount Park system. Over the past six years, the partnership evolved to eight staff positions at PPR with the goal of supporting initiatives in both departments and exploring opportunities for leveraging programs.

During the summer of 2010, PPR and the Water Department held a retreat entitled "Living the Partnership" to share information on their respective initiatives and to explore opportunities for collaboration, coordination and synergy to better utilize limited resources. One important result of the retreat was the formation of four workgroups that now convene regularly to identify issues and develop plans to address them.

The Built Environment Workgroup

The group defined the term "built environment" as manmade and constructed areas focused on PPR facilities and with a larger vision to include the institutionalization of stormwater practices Citywide. This working group seeks to improve communication, coordination and prioritization of projects within the City's Capital Budgeting process. A task of this group in the coming years will be to collaboratively develop a Green Park and Recreation Facility Manual that includes standards and specifications for GSI practices on PPR sites.

Goals of this group include:

- Collaboration of the departments in project planning and capital budget planning
- Development of design standards
- Preparation of maintenance plans with adequate staffing and funding
- Soliciting support from the Mayor's Office on these initiatives

Street Trees Workgroup

As described in Section 3.1.2.3, the Water Department and PPR are collaborating on a street tree planting initiative. PPR is looking to have a Street Trees program be part of a larger Urban Forest program, with the ability to plant trees along street fronts and in parking lots and other areas. This working group seeks to increase Citywide tree planting and collaborate on the design of a tree pit that collects stormwater, reduces maintenance, and alleviates residents' fears of trees, such as root issues. (It has been noted within this group that an immediate parallel need will be an intensive outreach program designed to inform residents of the benefits of street trees.)

Goals of this group include:

- Coordination of site selections for street trees
- Sharing of data - GIS coverage's of City tree canopy layers, geocoding tree layers, LIDAR mapping, and the Water Department green streets plans
- Collaboration of tree pit designs (tree pits that manage street runoff) and planting/soil specifications

Natural Lands Workgroup

PPR has a commitment to gaining an additional 500 acres of publicly accessible green space by 2015 through the Green2015 initiative. This group identifies opportunities for coordinating efforts to maximize benefit for the investment. This working group seeks to incorporate PPR community amenities into the Water Department's stream restoration design and implementation and align the Water Department and PPR priorities in all natural area restoration projects.

Goals of this group include:

- Coordinate restoration of natural lands, such as those along the Cobbs and Tacony Creeks, to meet the Water Department and PPR long-term goals
- Align the Water Department's stream restoration goals with work of Urban Forest and Ecosystem Management Plan
- Overlay recreation and community goals (trails, public access, safety, etc) with stream restoration design and implementation

Stewardship Workgroup

Both departments have ambitious greening/sustainability goals over the next five years and into the future. PPR and the Water Department have been combining education and outreach programs successfully for several years. In the coming years this group would like to grow this model to embrace the School District and other partners to ensure that City agencies "speak with one voice" to communities about greening and sustainability goals.

Goals of this group include to collaborate on public education and outreach around combined missions focused on areas that are a priority for both departments.

4.3.3.3 Other Early Successes

Ordinance for Stormwater Bumpouts

In December of 2009, the Philadelphia City Council passed Bill No. 090749 to revise how the Board of Surveyors may approve supplemental plans relocating the curb lines and changing the widths of streets. The revisions allow for relocating curb lines and decreasing roadway width to accommodate stormwater management practices, while maintaining traffic safety, providing sufficient sidewalk widths for pedestrians, and preserving the street houseline.

Complete Streets Executive Order

In June of 2009, Mayor Nutter signed Executive Order No. 5-09, the first City-level policy in Pennsylvania related to complete streets. The Executive Order calls for Philadelphia's streets to balance the needs of all users when designing or retrofitting streets and sidewalks. A related plan, the Philadelphia Pedestrian and Bike Plan, acknowledges the synergies between increased street landscaping and increased pedestrian and bicycle safety. The plan encourages that implementation of bike and pedestrian safety measures and new bike trails be aligned with the implementation of the Water Department's *Green City, Clean Waters* plan.

Use of the Water Department's Funds for GSI on Public and Private Property

During the Demonstration Phase of *Green City, Clean Waters*, the Water Department limited the use of its funding of stormwater projects to the public right-of-way. The Water Department sought opinions of bond counsel on methods to use bond revenues to fund GSI applications on non-traditional infrastructure. Counsel suggested that the Water Department may grant funds to private property owners for GSI implementation if a deed restriction, easement or other property interest is secured on the property ensuring the long-term function of the GSI. Further, the green infrastructure projects and facilities proposed to be financed under the Program can meet the definitions of the City of Philadelphia's water and waste water system even where located on land owned by private parties, so long as the City obtains and maintains a property interest in the projects to be financed. In addition, a similar mechanism will be required to maintain control over green infrastructure on property managed by other City departments; however this can be accomplished through a memorandum of understanding with that department.

Green Streets Manual

Streets and sidewalks account for approximately 38% of the impervious cover within the combined sewer service area of Philadelphia. Described in section 3.1.2.2, the Water Department is collaborating with the Streets Department and the MOTU on development of a Green Streets Design Manual. The Green Streets Manual will standardize design specifications and details for green streets and identify opportunities to optimize and streamline interagency coordination for the inclusion of GSI in the City's street work. The Manual is scheduled for release in 2012.

Zoning Code Update

Recent updates to the City of Philadelphia Zoning Code presented a unique opportunity for the Water Department to request procedural changes to facilitate the implementation of the LTCPU and its supplements. Several of these requests that were incorporated in the final draft of the new zoning code are summarized below.

§14-101 (2) (b): The purpose of the zoning code is to "promote sustainable and environmentally responsible practices" including to "encourage water conservation" in support of the City's sustainability goals as laid out in Greenworks Philadelphia.

§14-203 Definitions: The new definition for Directly Connected Impervious Surface is: "An impervious or impermeable surface, which is directly connected to the City's drainage system, as defined by the Philadelphia Water Department."

§14-301 (10): The Water Department's scope of review was expanded from "stormwater impacts" to "stormwater runoff, erosion and sedimentation impacts." Rather than explicitly stating which districts the Water Department can help review, it is implied that PCPC will reach out to the Water Department as appropriate when master plans are under review for special purpose districts.

§14-306 Enforcement: New language that enables the Water Department to inspect stormwater systems to determine compliance.

§14-506 /CDO, Central Delaware Riverfront Overlay District: This section is reserved for anticipated zoning standards that will be adopted as part of the Master Plan for the Central Delaware once it is adopted by PCPC. The final Master Plan for the Central Delaware has many elements supporting the incorporation of green stormwater management into new development along the riverfront.

§14-507 /DRC, Delaware River Conservation Overlay District: This is a new overlay district created to promote and protect a system of parks and trails along the North Delaware River called the 'Delaware River Greenway." One of the permitted uses in this district is "recreation trails, which must conform to any design regulations adopted by the Commission." This presents an opportunity for the Water Department to work with the Commission to ensure recreational trail standards GSI management.

§14-705 Open Space and Natural Resources:

(2) Steep Slope Protection: Protection criteria was expanded to slopes greater than 15% citywide, following PCPC's new "Philadelphia Steep Slopes Map."

(3) Stormwater Management: This section refers to stormwater regulations rather than listing individual triggers.

(5) Stream Buffers: The buffer width was increased from 25 to 50 feet. The stream buffer applicability requirements are expanded to include lots located along watercourses listed on the Water Department's Hydrology Map, rather than listing individual streams. New text prohibits "any other directly connected impervious surface," allowing for the development of riverfront trail systems and other forms of public access to Philadelphia's water resources.

§14-706 Landscape and Trees: Certification of the landscape plan is now required. Text requiring landscaped areas to include plants from Philadelphia Parks and Recreation's low-water species list is added.

§14-803 Motor Vehicle Parking Standards: New standards allow for use of pervious paving material and required use of pervious paving material if more than 20 spaces beyond the minimum off-street parking requirement are provided along with a cross-reference to the Philadelphia Stormwater Management Guidance Manual. The new code reduces the number of required parking spaces for certain land classes, such as shopping centers, and places a maximum on the number of spaces for all parking lots. The code also requires parking lots to be included in landscape area plans, which incorporate stormwater management design.

Stormwater D-Permit Elimination

In June 2011, City Council passed an ordinance requiring parcels without a water meter, such as parking lots, to pay a stormwater service charge. Prior to this ordinance, parcels without a water mater were exempt from paying the charge. The ordinance, which amends Philadelphia Code 19-1601, was signed by the Mayor on July 5, 2011.

Leveraging Opportunities

Examples of leveraging opportunities and coordination among City agencies and partners to enhance the community value of projects include:

The Big Green Block

A project that exemplifies the types of clustered and collaborative GSI applications that the Water Department seeks to replicate over the next 25 years is "The Big Green Block." This multi-faceted project includes a variety of green stormwater controls, including street tree trenches, rain gardens, porous paving with infiltration chambers, green roofs, and rainwater cisterns for reuse. The site improvements at the Big Green Block are a result of the collaboration between the Pennsylvania Horticultural Society (PHS), New Kensington Community Development Corporation (NKCDC), Sustainable 19125 initiative, Mural Arts Program, the Water Department, and PPR. The New

Kensington Creative and Performing Arts School (CAPA) implemented several GSI systems on its property, spurred by both the Philadelphia's stormwater regulations and the LEED Platinum criteria.

The Big Green Block initiative promotes greening and stormwater management of the blocks within the neighborhood surrounding the Shissler Recreation Center by showcasing GSI examples and engaging the local community through interpretive art, and through a connection of the neighborhood to the Delaware River, an important goal of Philadelphia's waterfront planning initiatives. The collaborative work on the Big Green Block was made possible through strong partnerships and the active involvement of the local community, resulting in an area transformed into a neighborhood amenity, integrating stormwater management into the context of Philadelphia's neighborhoods. The illustration titled 'Green Connection: Shissler to the River' and the Big Green Block description (Appendix V) demonstrates this connection and gives an overview of each of the collaborative projects.

The GSI systems at The Big Green Block manage runoff from impervious surfaces within the public right-of-way, recreation center parcels, and school property, demonstrating how several of the Water Department's land based programs, including Green Streets, Green Public Property, and Green Schools, may be implemented in an integrated and collaborative manner.

Green2015

Green2015 is an initiative of the PPR to add or enhance 500 acres of publicly accessible green space to the City by 2015. Currently, parkland is not distributed evenly across the City, leaving many citizens with little or no access to green public space. More than half of Philadelphia's residents currently do not have access to a park within convenient walking distance. The City's long-term goal is to have every resident living within a 10 minute walk of green, open space by 2025.

The Water Department views Green2015 as an excellent opportunity to fund stormwater management features on public land and has committed to supporting the first phase of the initiative. Phase one of Green2015 will concentrate on making improvements to one 'pilot' school playground and one 'pilot' recreational facility. The planning and implementation of phase one is a collaborative effort between the Water Department, PPR, the Philadelphia School District (PSD) and the Trust for Public Land (TPL). The Water Department will be funding Green GSI projects through separate agreements with PPR and PSD. Additionally, the Water Department will be providing support to the partners through participation in the GSI design development process. A memorandum of understanding is under development to codify responsibilities and define the collaborative process needed for effective project implementation.

5.0 Operation and Maintenance

5.1 Green Stormwater Infrastructure Maintenance

The Water Department is committed to ensuring that SMPs for which GA credits are taken continue to operate as designed. The Water Department is evaluating and documenting maintenance requirements of green stormwater infrastructure to prepare for development of the Green Stormwater Infrastructure Maintenance Manual Process Plan, due on June 1, 2012.

The Water Department anticipates GAs both from public and private investments, each requiring ongoing inspection and maintenance. This section describes the current maintenance protocols, the anticipated changes as the program grows.

The Water Department's GSI maintenance program seeks to:

- Ensure sufficient maintenance of GSI to keep assets performing as designed,
- Develop long-term maintenance and monitoring protocols,
- Assess existing organizational capacity for supporting maintenance and monitoring among the Water Department's partnering organizations, and
- Provide feedback loops to inform the GSI design group based on maintenance, inspection and monitoring experiences to improve future designs.

Over the coming year, the Water Department will develop guidelines for an expanded maintenance program as the number of GSI sites increases.

Green Infrastructure Maintenance Manual Development Process Plan

Delivery: June 1, 2012

Metric: Greened Acres

The COA describes the Green Infrastructure Maintenance Manual Development Process Plan:

This deliverable will describe the process and schedule for developing the Green Stormwater Infrastructure Maintenance Manual.

Green Infrastructure Maintenance Manual

Delivery: June 1, 2014

Metric: Greened Acres

The COA describes the Green Infrastructure Maintenance Manual Development Process Plan:

"The Manual will address the operation and maintenance of the full range of types of green stormwater infrastructure projects that have been, and that are proposed to be, implemented by the City as part of the CSO Program. The Manual will be designed to be used by City agencies and anyone else who has responsibility for performing maintenance of green stormwater infrastructure. The Deliverable required by the Consent Order and Agreement should be considered the "first edition" of the Manual, since it is expected that the Manual will need to be updated periodically as the technology of green stormwater infrastructure advances, and as experience is gained with practices. The first edition of the Manual should propose a schedule for the planned preparation of a second edition."

5.1.1 Maintenance of Public Facilities

The Water Department has held a maintenance contract since 2008 to ensure that publicly funded GSI projects are maintained at regular intervals. The goals of the contract are to determine the maintenance needs associated with various types of Stormwater Management Practices (SMPs), to better understand maintenance costs, and to gather information needed to establish a long-term maintenance and monitoring program for the Water Department. This contract maintains 20 demonstration projects as of summer 2011.

5.1.1.1 Public Maintenance Process

Figure 5.1 is a conceptual illustration of the role of the Water Department's green stormwater infrastructure maintenance program within the overall design and construction process. The Water Department anticipates that future SMP design modifications may be influenced by previously built demonstration projects through multiple feedback and communication pathways.

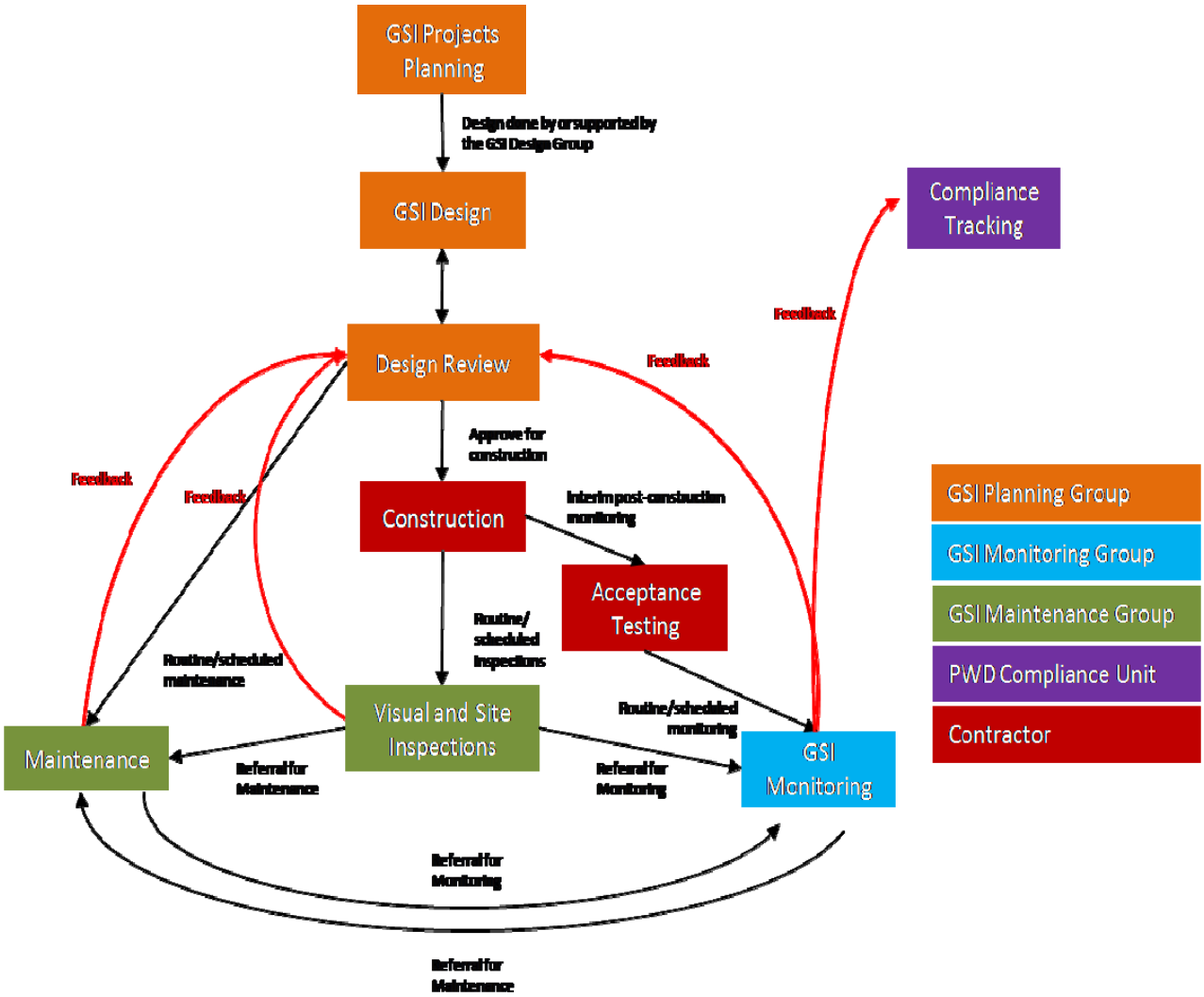


Figure 5-1 Role of Maintenance of Public Property SMPs in the Design and Construction Process

5.1.1.2 GSI Planning and Design

The Water Department and its contractors will continuously improve future designs based on information gathered during maintenance. For example, experience has shown that tree grate openings need to be able to expand over the life of the tree; however, removable metal grates are at risk for being stolen. Future tree pit installations may include lockable, removable tree grates to deter theft and accommodate tree growth. During the first five years of the program, various designs will be piloted to identify necessary modifications. Coordination between the maintenance unit and the GSI planning and design units will result in improved designs and more streamlined maintenance protocols.

5.1.1.3 Design Review

In tandem with the design process is a detailed design review that includes review by the Water Department's Operations personnel as well as external stakeholders, such the Streets Department and all utilities, to assess operational/maintenance concerns and construction feasibility.

5.1.1.4 Construction

Obtaining As-Built plans from construction contractors is important to understanding the SMP locations and design details. Additionally, feedback loops between construction, inspection and maintenance units will be established to exchange information promoting more effective maintenance activities.

5.1.1.5 Acceptance Testing

The Water Department is considering a requirement for an acceptance test, performed immediately post-construction of the SMP by the design contractor, to ensure that the SMP was constructed according to design. Documentation of successful performance would be required prior to the Water Department accepting the new SMP as an asset.

5.1.1.6 Maintenance

The Water Department's existing maintenance contracts ensure maintenance at the surface level, while the Water Department's Operations Division manages maintenance of all underground infrastructure associated with an SMP. While most of the maintenance of vegetated areas and debris collection is done by contractors, inlet cleaning and pipe flushing activities must be coordinated with the Water Department crews. The Water Department's Operations staff also provides feedback on design improvements based on their ability to perform maintenance.

5.1.1.7 Visual and Site Inspections

Post-construction site visits may provide information that could influence maintenance, monitoring, and future GSI design. Depending on the project location, SMP characteristics, public acceptance and the impacts of severe weather, an SMP may require more or less maintenance than the typical protocol predicts. For example, visual inspections of an SMP may find uneven settling of a porous basketball court. This would be referred to the GSI Planning and Design Coordination group to determine if the issue is due to improper compaction during

construction or some other design or construction flaw. The construction management group would then be notified of the need for potential changes to construction Standard Practices. If uneven settling or debris accumulation appears to have impeded function of the SMP, the monitoring team may be notified of the need to perform additional testing.

5.1.1.8 GSI Monitoring

Monitoring results during the first five years at multiple SMP locations will help to determine the frequency of maintenance. Depending on the primary function of a particular SMP, increased or decreased maintenance levels may be indicated by abnormal monitoring results. For example, if a site is showing decreasing levels of infiltration, maintenance crews will be sent out to inspect and flush distribution pipes for potential issues such as clogging by debris. This may result in changes to design or modified maintenance procedures and frequency.

5.1.2 Maintenance of Private Facilities

The Water Department anticipates that SMPs will be designed, built, owned, and operated by the private sector as areas of the City are redeveloped, triggering the City's Stormwater Regulations. The Water Department developed several mechanisms to ensure that the stormwater management facilities put in place by private entities will continue to function as designed.

5.1.2.1 Private Maintenance Process

The City's Stormwater Regulations require any development or redevelopment disturbing 15,000 square feet or more to submit a stormwater management plan to the Water Department for review.

The Stormwater Plan Review process is concurrent with other city building permits administered by the L&I. A signed and stamped Conceptual Approval is one of the required components of a complete Zoning Application. This helps ensure that SMP design, operation, and maintenance are considered early in the development process. The Water Department's Plan Review Unit manages the maintenance of private SMPs through the process illustrated in Figure 5.2.

Prior to Water Departmental sign off on a building permit application, an Operations and Maintenance (O&M) Agreement is recorded against the land deed(s) associated with the development project. The O&M Agreement's purpose is to clearly define the location of the SMPs on the property and to record the proper maintenance practices and schedule for each SMP type.

The O&M Agreements also provide the Water Department with the right to inspect SMPs to verify that they are properly functioning and that maintenance is occurring. If a property owner fails to properly maintain the system, the Agreement provides the Water Department with the ability to correct deficiencies and charge the costs of repairs to the property owner. An example of an Operations and Maintenance Agreement deed restriction is included Appendix V.

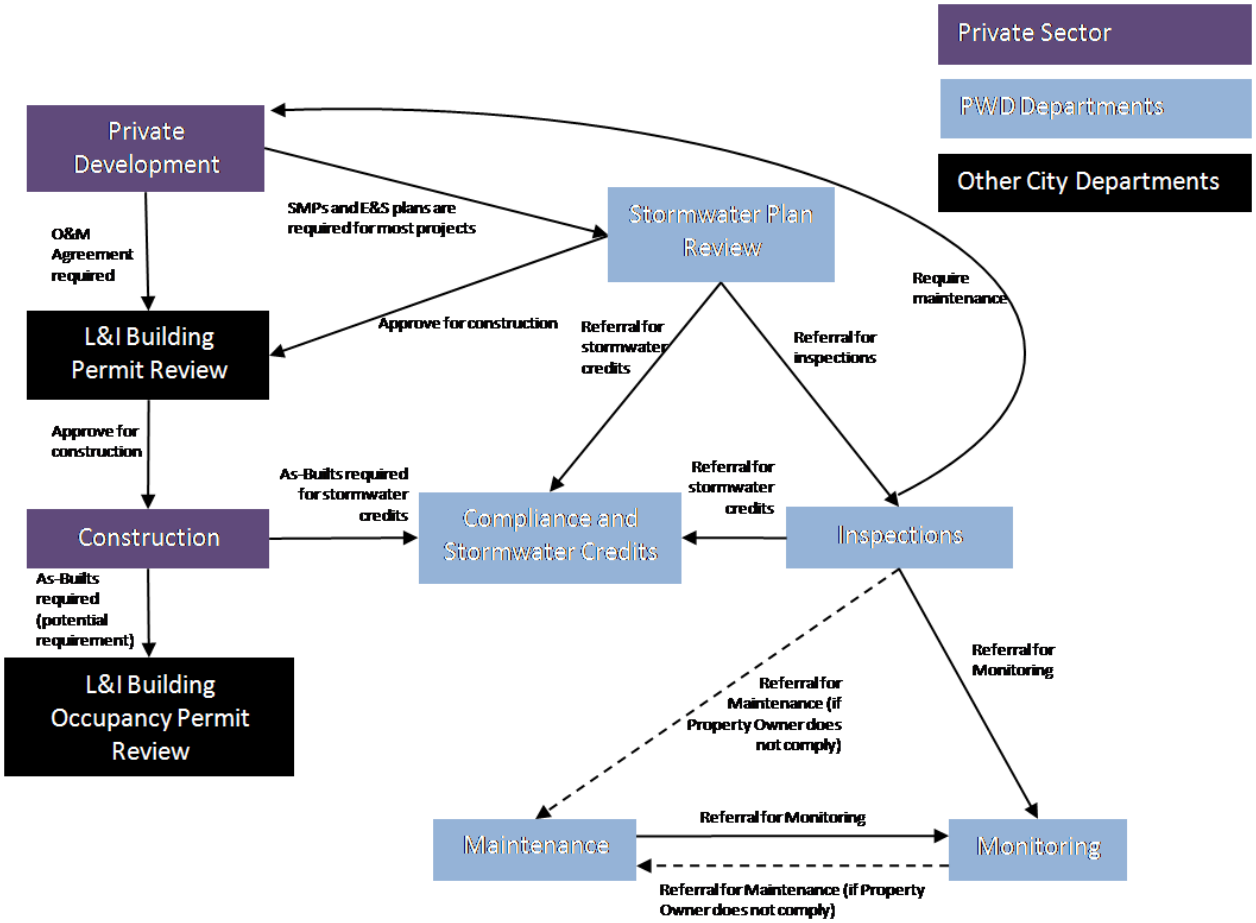


Figure 5-2 Conceptual Diagram of Maintenance of Private Development SMPs in the Design and Construction Process

The Water Department inspects construction sites during the installation of SMPs so that functional problems can be addressed before the maintenance period starts. As-Built Plans are required after SMPs are constructed and provide detailed drawings important for planning and administering proper maintenance activities.

Maintenance and monitoring activities will remain the responsibility of the private owner or operator. If inspection or monitoring reports indicate that an SMP is no longer functioning, there are several maintenance response mechanisms the Water Department has the right to implement. The Water Department will evaluate the following options over the next five years to increase enforcement and ensure the long-term maintenance of private GSI:

- Remove the stormwater credit from the property's water bill,
- Perform necessary maintenance or repairs on the SMP and bill the work back to the property owner,
- Work with the existing L&I enforcement procedure through the Philadelphia Property and Maintenance Code,
- Work with PA DEP to enforce compliance with NDPES permits and Post Construction Stormwater Management Plans, and

- Develop a new enforcement procedure in the Philadelphia Stormwater Regulations allowing the Water Department to issue fines for non-compliance with the approved Stormwater Management Plan.

The Water Department will use a combination of these approaches to ensure long-term maintenance of private SMPs.

5.1.2.2 Compliance and the Stormwater Credit Program

The Stormwater Management Incentive Program (SMIP), created in conjunction with the Water Department's parcel-based billing system (described in Section 3.1.4.2), will help promote the long-term operation and maintenance of private green stormwater infrastructure facilities. Customers receive a discount on their stormwater bill through the stormwater credits program if they have, or choose to implement, properly functioning SMPs that manage the first one-inch of runoff from impervious cover. Any new development or redevelopment that meets Philadelphia's Stormwater Regulations is eligible for stormwater credit as long as an As-Built plan is submitted showing the SMPs are constructed as designed and properly functioning (Appendix VI).

Stormwater credits must be renewed once every four years. This requirement will create a financial incentive for the land owner to keep their SMP functioning. As part of the expanded stormwater inspections program (see Section 3.1.3.1), the Water Department inspection or self-inspection reports will be required for a customer to renew their credit eligibility. This process ensures the ongoing functionality of constructed SMPs.

5.1.3 Green Stormwater Infrastructure Maintenance Manual Process Plan Development

The Water Department is required to submit a GSI Maintenance Manual Process Plan by June 1, 2012, that describes the process leading to the development of the GSI Maintenance Manual. Described herein are anticipated tasks necessary for developing this deliverable and preparing the Water Department for development of the Green Stormwater Infrastructure Maintenance Manual - First Edition, due June 1, 2014.

5.1.3.1 Green Stormwater Infrastructure Maintenance Manual Process Plan Development Tasks

Evaluate Staff Needs

Program support needs will be evaluated as the number of SMPs to be maintained increases. Initial estimates will be based on current staffing and budgeting, with an evaluation of the projected needs as the program evolves.

Evaluate Data from Current GSI Maintenance Contract

Quantitative and qualitative data from monitoring reports for the last four years of maintenance contracts will be used to determine the appropriate level of monitoring, maintenance and data reporting for each type of SMP in the long-term. Data from on-going maintenance of current

publicly-owned SMPs will also provide cost estimates for the maintenance of SMPs and will help the Water Department determine a budget for SMP maintenance.

Research Other GSI Maintenance Protocols

The Water Department staff compiled SMP maintenance protocols from across the country (Appendix VII) and will continue to collect this information. The compiled information will be used to better understand routine maintenance tasks and their recommended frequency. This research will also help the Water Department develop standard operating procedures (SOPs) for maintenance and construction processes.

Create Protocols for Coordination within various Water Department Units

As described in Section 2.1.1, the Water Department is developing a *Green City, Clean Waters* Program Tracking system to store standard data input forms, processe the input data, and connects with the Cityworks Maintenance Management System. The Cityworks system is where maintenance, monitoring and inspection activities will be scheduled and tracked. The *Green City, Clean Waters* Program Tracking system will track information collected during the maintenance process. This system could be used to notify the respective units electronically of projects requiring attention. The Water Department views this centralized system as a tool for staff and contractors to view equipment needs for the assigned tasks, to view past work on the site and to download site plans including As-Built plans.

Reporting and feedback loops between the Water Department and other City agencies for public and private SMP development should be formalized so that maintenance activities are triggered by appropriate monitoring and inspection data.

Create Maintenance Protocols, Checklists and Schedules

The Water Department will continue research to refine SOPs for SMPs, and will determine maintenance schedules and checklists, as appropriate. Maintenance responsibilities specific to each SMP type will be added to the Green Stormwater Infrastructure Maintenance Manual. This will standardize maintenance practices and eliminate the need for details to be located in individual O&M agreements attached to deeds.

Create Training and Education Program(s) for Staff, Contractors

The training of maintenance staff and contractors should be integrated with the training of inspection and monitoring staff. This will ensure that all three groups understand how their actions and testing results can trigger actions by another group. Common monitoring and inspection triggers and maintenance responses should be extracted from the Water Department research and earlier maintenance contract reports. Once the common triggers are identified, monitoring and inspections units must be informed of what to look for and what data to collect.

It is also important to ensure that there is communication with property owners adjacent to SMPs to inform them how they may support site maintenance with periodic evaluation for trash removal, by watering of vegetation, and by contacting the appropriate unit within the Water Department if an issue emerges.

Create SMP Maintenance Contract Management Protocols

The Water Department will develop standard SMP Maintenance Contract Management protocols detailing site maintenance protocols, SOPs, scheduling, reporting and emergency maintenance processes.

Establish a Budget for SMP Maintenance

Utilize information from the Water Department's current SMP maintenance contract, Water Department Operations maintenance of subsurface components of SMPS and additional research to assist in determining an appropriate budget for maintenance of future SMP projects.

Develop the Private Property Maintenance Program Priorities

The Process Plan will address the priority issues identified during the first year of implementation. These issues may include streamlining the Project Review close-out process for projects that have submitted As-Built plans for constructed SMPs; evaluating the feasibility for online, searchable files to assist private SMP owners with understanding their stormwater management systems and maintenance responsibilities.

The Private Green Stormwater Infrastructure Inspections program will expand to include periodic post-construction inspections to ensure long-term maintenance of the SMPs. This will require additional staff, training for developers and contractors, and establishment of a defined inspection schedule based on a number of criteria. A framework for this program's development will be included in the Green Stormwater Infrastructure Maintenance Manual Development Process Plan. A full program description will be included in the Green Stormwater Infrastructure Maintenance Manual.

To formalize the post-construction process to ensure long-term maintenance, the Water Department is considering the following options:

- Use Right-to-Access for regular inspections of all sites at least once a permit cycle (every 5 years)
- Random inspections
- Targeted inspections to supplement and enforce a self-inspection program
- On-going inspection program

The Water Department hopes to establish a time table for the Plan Review process from conceptual review to submitting As-Built Plans at final inspection. The Water Department is working on an agreement with the Philadelphia L&I to require As-Built Plans of SMPs before a Certificate of Occupancy is issued.

5.2 Floatables Control and Waterway Aesthetics

The Water Department has made a number of commitments to maintaining water quality and aesthetics of the City's waterways through the control of solids and floatables discharged during wet weather events. The Water Department controls solids and floatables at the source (street level) and through in-stream maintenance and clean-up. The Water Department's source control program includes the inspection and cleaning of approximately 79,000 stormwater

inlets throughout the City of Philadelphia to remove sediment and debris before it enters the collection system. The Water Department's Waterways Restoration Team (WRT), created in 2003 as a result of a partnership with the PPR, protects the Water Department's streamside infrastructure. Since 2003, the WRT has taken on management of 100 miles of streams and rivers, supporting the Cobbs and TTF Integrated Watershed Management Plans. Target A of these plans focuses on the improvement of water quality, aesthetics and recreation during dry weather.

5.2.1 Stream Cleanup and Maintenance of the Non-Tidal Tributaries

The WRT will continue to inspect and assess the condition of infrastructure along the Tacony/Frankford Creek, the Cobbs Creek and their tributaries.

The stream clean up and maintenance activities conducted on the tributaries include:

- Identification, prioritization and maintenance of a list of obstructions, aesthetic, nuisances, and debris removal needs,
- Collection of litter and large debris,
- Removal of hydrologic impediments such as trees, debris, and sediments blocking flow at bridges, headwalls, or other infrastructure points,
- Non-emergency complaints – post storm clean-up, sewage odor, discolored water, and investigation of right-of-way complaints,
- Emergency complaints – discharge, choked sewer, compromised infrastructure,
- Stream restoration projects to protect compromised infrastructure,
- Plunge pool removal at CSO outfalls,
- Preparation of waterway corridors for sewer lining, and
- Infrastructure maintenance support.

These measures keep sediment and debris out of the streams and the Water Department's infrastructure.

5.2.2 Floatables Control on the Delaware and Schuylkill Rivers

The City maintains two floatables control vessels to providing a mobile control program to manage debris at various locations. These boats are also a visible presence on the rivers, increasing public awareness of the impact of floatables.

The Water Department's largest skimming vessel, the R.E. Roy, is a 39-ft, front-end loader, single hull, shallow draft, debris skimming vessel with a hydraulically controlled grated bucket and 5.6 cubic yards of storage on-board. The vessel is operated approximately five days per week, 8 months of the year. The vessel's main purpose is to perform general debris collection and removal on both the Delaware and Schuylkill Rivers. The vessel is also used to skim debris from the river prior to events such as the Schuylkill Regatta, serving as a public relations highlight.

The Water Department also operates a pontoon vessel on the non-tidal portion of the Schuylkill River within Philadelphia on an as-needed basis (Table 5.1). The vessel is used to retrieve

floating trash and debris from the waterways within the service area. The debris is hand netted from the water surface by employees. The pontoon vessel can be utilized in tight spaces commonly found in marinas, among piers, and in near-shore areas.

Table 5.1 the Operational Area of Skimming Vessels

River Name	Segment Description	Segment Length	Vessel Used
Delaware River	Philadelphia City boundary	18.8 mi	R.E. Roy Skimming Vessel
Non-tidal Schuylkill River	Flat Rock Dam to Fairmount Dam	7.2 mi	Pontoon Vessel
Tidal Schuylkill River	Fairmount Dam to the confluence with the Delaware River	8.1 mi	R.E. Roy Skimming Vessel

5.2.2.1 Potential Opportunities for Waterway Aesthetic Improvement Measures

In Philadelphia, the Delaware and Schuylkill River waterfronts are focal areas for redevelopment. Many of the Water Department's partners are improving access to the waterways and promoting recreation along and on the Delaware and Schuylkill Rivers. The City of Philadelphia is committed to supporting implementation of the visions of other stakeholder initiatives focused on enhancing recreational opportunities along the Schuylkill and Delaware Rivers. The Water Department has not committed funding to support implementation of these plans, however, as the Water Department moves forward with implementation of land-based and in-stream restoration commitments, opportunities to support the vision as laid out by these plans will be evaluated.

6.0 Data Collection and Analysis

The monitoring and assessment of GSI performance, sewer system response to precipitation, receiving water quality, meteorological conditions and groundwater, are integral parts of the implementation and adaptive management approach. In addition to the ongoing monitoring and assessments of the sewer system, receiving waters, meteorological and groundwater conditions, the Water Department's efforts also are focused on developing, testing and refining monitoring protocols and improving design concepts for GSI. Those efforts will lead to the development of the Comprehensive Monitoring Plan that will be completed by December 1, 2012. That plan also will address the use of hydrologic, hydraulic and hydrodynamic models for characterizing sewer overflow reductions and receiving water quality improvements resulting from the implementation of the *Green City, Clean Waters* program.

Comprehensive Monitoring Plan

Delivery: December 1, 2012

Metric: Greened Acres

The COA describes the Comprehensive Monitoring Plan:

This document will contain a description of the City's plan for performing monitoring of natural and engineered systems that are associated with the CSO Program. It will address the monitoring and assessment of surface waters, groundwater, rainfall, CSO discharges, sewer flows, and green infrastructure performance.

In addition to monitoring, the Plan will also address hydrologic and hydraulic modeling. The City uses modeling to support various aspects of the CSO Program. A description will be provided of the methods to be used for performance tracking of the CSO Program in the form of hydrologic/hydraulic modeling with verification using metered data, as discussed in Section 10 of the LTCPU. There will also be a discussion of how the City will handle future updates or changes to the model itself. If the City should make changes to the model, DEP will wish to have a way to make a meaningful comparison between future modeling results and the information already presented as part of this effort, including information in the September 2009 LTCPU.

6.1 Green Stormwater Infrastructure Monitoring

The Water Department continues to evaluate the effectiveness of GSI through monitoring hydrologic conditions, sewer hydraulics, groundwater levels, and individual control performance. The GSI performance monitoring has begun to yield valuable information that will be used to refine control measure designs and the predictive capabilities of the hydrologic and hydraulic models. The experience gained through the conduct of the current efforts is being used in the development of the Comprehensive Monitoring Plan.

Performance monitoring capabilities are integrated into the design of a number of the GSI controls. This typically includes installation of monitoring chambers and wells and instrumentation at flow control points and adjacent to storage elements to record water depths or flow rates. Measurement techniques may include tracking flow into or out of control structures, recording storage volume over time, and soil moisture conditions. These

measurements are intended to inform analyses and evaluations of the infiltration, evapotranspiration, storage and release rate performances under a range of hydrologic conditions for comparison to the design goals.

6.2 Sewer System Monitoring

Monitoring of the combined sewer system response to precipitation provides a direct measure of the cumulative performance of controls at the sewershed level and provides information for the continuing process of validating the hydrologic and hydraulic models of the sewer system. The Water Department continues to expand the sewer system monitoring program.

Long-term monitoring locations and parameters include:

- Water Pollution Control Plant influent points, including hourly flow quantities and daily water quality sampling for suspended solids, and biochemical oxygen demand
- Flow at outlying community metering chambers
- Water levels at selected locations such as various CSO regulators, interceptors, and hydraulic control points
- Pump station flows and wet well levels

In addition to these sources of data from fixed long-term monitoring locations, the Water Department's continuous portable flow monitoring program will be used in the implementation of the Comprehensive Monitoring Plan. The Plan will detail the portable flow monitoring program proposed in terms of types of monitor locations, the typical frequency and duration of deployments, and typical deployment schedules.

The data collected early in the implementation phase will be evaluated and used to further validate the hydrologic and hydraulic models and to evaluate the effectiveness of the controls that in turn will be used to refine GSI designs.

Detailed information about the existing data used in the development of the LTCPU and its supplements, including previous locations of portable flow monitors and outlying community meters, are summarized in Section 3 of the LTCPU.

6.3 Receiving Water Monitoring

Receiving water monitoring and sampling is conducted by the Water Department and through various partnerships with the USEPA, the Delaware River Basin Commission (DRBC), the National Oceanic and Atmospheric Administration (NOAA), and the U. S. Geological Survey (USGS). The hydrologic and water quality data collected are used in the ongoing development of the hydrodynamic and water quality models of the Tacony-Frankford Creek, the Cobbs Creek, and the tidal Schuylkill and tidal Delaware Rivers.

Assessment work now is directed primarily on supplementing the legacy hydrodynamic and water quality information available for the tidal Delaware and Schuylkill Rivers, and the two

tributaries that receive overflows of combined sewage, the Tacony-Frankford and Cobbs Creeks. Although there is a long history of Delaware River monitoring by DRBC, more recent efforts by the Water Department are focusing on spatially discrete samples to better understand the effects of multiple discharges in the area around Philadelphia. Samples are collected from the tidal Delaware River and Schuylkill from boats on a monthly basis, and those efforts will continue for a minimum of two years, and perhaps as long as 4 years.

Process studies are underway to support the development of the Dissolved Oxygen (DO) models of the Tacony-Frankford and Cobbs Creeks. These include studies to provide estimates of DO fluxes due to sediment oxygen demand and reaeration. Field measurements of sediment oxygen demand will be made throughout 2011 and 2012, focusing initially on Tacony Creek.

Receiving water monitoring and sampling in the tributaries will continue to be conducted by the Water Department staff and USGS. An ongoing cooperative agreement with the USGS provides hydrologic and water quality monitoring data in the form of continuous 15-minute stream stage measurement and flow estimation, and water quality data at 5 stream locations.

The Water Department also collects grab samples for bacteria and nutrients at the USGS gages. In addition to targeted watershed monitoring, macroinvertebrate samples are collected at randomly selected sites within the monitoring network each year. Data from these programs is analyzed and summarized in annual reports submitted to the PA DEP.

Hourly tidal data is collected by NOAA at the Delaware River station # 8545240 (United States Coast Guard station at Washington Avenue), which will be utilized in the development of the hydraulic and hydrodynamic models.

Information regarding receiving water data locations, processing, and utilization are discussed in Section 3 of LTCPU and its supplements. Any additional receiving water data updates will be summarized as part of the Comprehensive Monitoring Plan.

6.4 Meteorological Monitoring

Precipitation information is a fundamental component of a combined sewer system monitoring program, especially in the validation of hydrologic and hydraulic models and the characterization and estimation of CSO statistics. Both long-term temporal precipitation data and event based precipitation data, collected synoptically with sewer system flow data, are needed to appropriately characterize the combined sewer system. There are three primary sources of precipitation data used in the CSO Program:

- Philadelphia International Airport (PIA) surface observation station operated by NOAA's National Weather Service (NWS)
- The Water Department's citywide rain gage network
- Radar-rainfall adjusted estimates

The detailed information regarding meteorological monitoring sources is discussed in Section 3 of LTCPU and its supplements. The Water Department will provide any necessary updates to the status of this data, including monitoring locations and any additional calibrated radar rainfall, as part of the Comprehensive Monitoring Plan.

6.5 Groundwater Monitoring

The Water Department contracted the USGS to install a network of groundwater level recording wells at 15 locations throughout the City, intended to establish a baseline of groundwater levels throughout the City and to monitor for changes over time. In addition, groundwater levels will be recorded at selected SMP locations to assess short-term groundwater effects in response to precipitation. A complete description of these data collection efforts will be included in the Comprehensive Monitoring Plan.

6.6 Hydrologic and Hydraulic Modeling

The Water Department uses the USEPA SWMM5 model to characterize the combined sewer system for all permit related requirements. Documentation of the hydrologic and hydraulic models utilized for the development of the LTCPU and its supplements is described in Section 5.2.4 of the LTCPU. Documentation describing the rationale for the conversion of the combined sewer system hydrologic and hydraulic models from USEPA SWMM4 to SWMM5 is provided in LTCPU Supplemental Documentation Volume 18: Supplemental Documentation in support of the City of Philadelphia's Combined Sewer Overflow Long Term Control Plan Update.

The hydrologic and hydraulic models are continually updated as additional data on the sewer system and its operating characteristics are measured or verified. Much of the monitoring described in this section will be utilized to further refine the hydrologic and hydraulic models to assess the projected impact of the *Green City, Clean Waters* program. Additional changes to the methods and application of the hydrologic and hydraulic models will be documented in the Comprehensive Monitoring Plan.

6.7 Water Quality Modeling

The COA requires the development of receiving water quality models for the tidal Delaware and Schuylkill Rivers, and the Tacony-Frankford and Cobbs Creeks. Development of these models requires the collection of field data for model development and validation, as described briefly in Section 6.3. The models will be used to simulate improvements in area water quality conditions resulting from the implementation of the *Green City, Clean Waters* program.

6.7.1 Bacteria Model for the Tacony-Frankford Creek and the Cobbs Creek

The development of the bacteria water quality model for the Tacony-Frankford and Cobbs Creeks involves several tasks focused around data acquisition leading to model formulation.

Key tasks include:

- Data acquisition and preparation including:
  - In stream bacteria measurements
  - Water temperature
  - Watershed hydrology
- Literature reviews of similar analyses
- Hydraulic and water quality model linkage
- Development of boundary and initial conditions
- Model parameterization, sensitivity analysis and validation

The report to be completed in 2013 will describe the methods and model.

Tributary Water Quality Model – Bacteria

Delivery: June 1, 2013

The COA describes the Bacteria Tributary Water Quality Model:

This report will describe the methods, and provide the results, of a project to model the receiving water quality in the Tacony/Frankford Creek and the Cobbs Creek. The work will include the collection of field data for model development and validation. The model will be used to assess the projected impact of the CSO Program in future years, and to evaluate alternative implementation options.

6.7.2 Dissolved Oxygen Model for the Tacony-Frankford Creek and the Cobbs Creek

The development of the DO water quality model for the Tacony-Frankford and Cobbs Creeks involves several tasks focused on data acquisition prior to model formulation.

Key tasks include:

- Data acquisition and preparation including:
  - In stream water quality measurements, including: DO, biological oxygen demand, sediment oxygen demand and ammonia
  - Water temperature
  - Watershed hydrology
  - Creek hydraulics
- Literature reviews of similar analyses
- Hydraulic and water quality model linkage

Tributary Water Quality Model – Dissolved Oxygen

Delivery: June 1, 2014

The COA describes the Dissolved Oxygen Tributary Water Quality Model:

This report will describe the methods, and provide the results, of a project to model the receiving water quality in the Tacony/Frankford Creek and the Cobbs Creek. The work will include the collection of field data for model development and validation. The model will be used to assess the projected impact of the CSO Program in future years, and to evaluate alternative implementation options.

- Development boundary and initial conditions for relevant parameters, including:
  - Biological oxygen demand, DO, nitrogen and phosphorous concentrations
  - Water temperature
  - Solar radiation
  - Periphyton concentration
- Model parameterization, sensitivity analysis and validation

The report to be completed in 2014 will describe the methods, and provide results of the receiving water quality model.

6.7.3 Hydrodynamic and Water Quality Model for the Tidal Delaware and Schuylkill Rivers

The 3-dimensional hydrodynamic model is being developed from existing data used previously for the Water Department's 2-dimensional model of the system, and will incorporate additional data yet to be collected. The building and validation of the hydrodynamic model is intended to facilitate the development of the water quality modules for bacteria and dissolved Oxygen.

Key tasks for the development of the hydrodynamic model include:

- Data acquisition and preparation including:
  - Bathymetry
  - Point source locations, amounts and concentrations
  - Tidal levels at monitored locations
  - Salinity concentrations
  - Water temperature
  - Other meteorological data
- Grid Development
- Model validation to water level, currents and salinity concentrations

Key tasks for the development of the bacteria water quality module include:

- Data acquisition and preparation including:
  - In stream bacteria measurements
  - Water temperature
  - Watershed hydrology
  - Literature reviews of similar analyses
  - Hydraulic and water quality model linkage
- Development boundary and initial conditions

Tidal Water Quality Model – Bacteria

Delivery: June 1, 2015

The COA describes the Bacteria Tidal Water Quality Model:

This report will describe the methods, and provide the results, of a project to model the receiving water quality in the tidal Delaware River and the tidal Schuylkill River. The work will include the collection of field data for model development and validation. The model will be used to assess the projected impact of the CSO Program in future years, and to evaluate alternative implementation options.

Tidal Water Quality Model – Dissolved Oxygen

Delivery: June 1, 2015

The COA describes the Dissolved Oxygen Tidal Water Quality Model:

This report will describe the methods, and provide the results, of a project to model the receiving water quality in the tidal Delaware River and the tidal Schuylkill River. The work will include the collection of field data for model development and validation. The model will be used to assess the projected impact of the CSO Program in future years, and to evaluate alternative implementation options.

- Model parameterization, sensitivity analysis and validation

Key tasks for the development of the dissolved oxygen water quality module include:

  - Literature reviews of similar analyses:
  - In stream water quality measurements, including: DO, biological oxygen demand, sediment oxygen demand (SOD) and ammonia
  - Water temperature
  - Watershed hydrology
  - Creek hydraulics
- Literature reviews of similar analyses
- Hydraulic and water quality model linkage
- Development boundary and initial condition for relevant parameters, including:
  - Nitrogenous biochemical oxygen demand (NBOD), Carbonaceous biochemical oxygen demand (CBOD), DO, nitrogen and phosphorous concentrations
  - Water temperature
  - Solar radiation
  - Phytoplankton
- Model parameterization, sensitivity analysis and validation

6.8 Assessment of Program Effectiveness

The monitoring and modeling proposed for inclusion in the Comprehensive Monitoring Plan will be utilized to assess the effectiveness of GSI at reducing CSOs. GSI, sewer system, meteorological, and receiving water monitoring each provide data to refine hydrologic and hydraulic models and verify the results. Both the monitoring data and the modeling results may be used to determine GSI effectiveness.

Candidate areas for assessing GSI effectiveness at reducing CSOs will include a variety of scales, control types and programs. Individual control monitors will provide data to assess performance and the hydraulic influence the control has on the combined sewer system. Larger candidate areas could include sewersheds with adequate concentration of GSI, and could be identified as areas with concentrated development and redevelopment activity, properties impacted by parcel based stormwater charges, and hydrologic uniformity.

Individual GSI control monitoring data will be analyzed to assess the effectiveness of reducing stormwater runoff volumes and flow rates. Specific stormwater runoff control functions, such as infiltration or retention, will dictate expected control effectiveness. Monitoring data analysis will measure actual versus expected effectiveness and will provide data for inclusion in hydrologic and hydraulic models to determine CSO volume reduction effectiveness.

Sewer system monitor locations will be evaluated and where monitors are located in areas of higher concentrations or near known GSI controls, the data will be analyzed to determine if

reductions in stormwater runoff volumes and flow rates are comparative to expected hydrologic and hydraulic modeling results.

Monitoring and modeling uncertainty must be considered as part of the data analysis and assessment of CSO reductions. Various factors may affect both monitoring data and modeling results. The hydrologic and hydraulic model uncertainty estimation methodology is described in the LTCPU Supplemental Document Volume 4: Hydrologic and Hydraulic Modeling. Individual control and sewer system monitoring uncertainties could include constrictions creating backflow conditions or unknown inflows or discharges to the sewer system.

Monitoring data analyses to refine and update models will be used to assess CSO program effectiveness. The hydrologic and hydraulic models refined in combination with the updated monitoring data will be utilized to assess progress at reducing CSOs for the entire system. As described in further detail in LTCPU Supplemental Documentation Volume 18, system-wide overflow volume is the aggregation of each interceptor and WPCP district CSO volume.

6.9 Inflow and Infiltration Reduction

The Water Department collection system includes large networks of both combined and sanitary sewers. The sanitary sewers often experience increased flows during wet weather. As part of the requirements of the COA, the Water Department will undertake an evaluation of these sanitary sewer flows and determine if wet weather inflow and infiltration reduction could benefit CSO control. The Water Department will complete the process in three phases; the first two are part of a Sewer System Evaluation Survey (SSES) and include data collection and a detailed study. The third phase is a summary report of documenting, if appropriate, potential improvements to sanitary sewer systems that may benefit CSO control.

6.9.1 Sewer System Evaluation Survey

As required in the COA, the Water Department will conduct the SSES within 3 years of the effective date of the COA. The scope of work for the SSES will borrow from the analytical approaches suggested in the American Society of Civil Engineers (ASCE) and the Water Environment Federation (WEF) Manual of Practice FD-6, "Existing Sewer Evaluation and Rehabilitation."

The primary goal of the SSES plan is to address inflow and infiltration in the separate sewer area tributary to the City's WPCPs by identifying critical sewers with excessive inflow and infiltration. The study will identify separate sewer areas in the City that can be targeted for rehabilitation or other capital improvements that have the potential to significantly reduce CSO discharges. The study will also identify outlying community sanitary sewer connections that contribute excessive wet weather flows and suggest possible further investigatory needs.

6.9.1.1 SSES Approach

A systematic approach to performing the SSES is being used to meet the goals of the COA. The primary steps of the process to be followed are:

Phase 1: Problem Identification

- Identify Historical Data Available and Assess its Reliability
- Supplementary Data Collection and Analysis

Phase 2: Analytical Study Phase

- Perform Global Analytical Assessment of Study Area
  - Develop Investigation Approach
  - Define Study Area Boundaries
  - Define Analytical Methods to Apply
- Complete Detailed Evaluation of Subareas
  - Develop Investigation Approach
  - Prioritize Order of Investigation
- Manage and Analyze Collected Data
  - Determine Data Management Requirements
  - Data Management and Analysis Considerations
  - Selection of Data Management Software
  - Analytical software
    - USEPA Sanitary Sewer Overflow Analysis and Planning (SSOAP) software tools.
    - USEPA SWMM5
- Perform Quality Checks
  - Identify Quality Standards
  - Formulate Quality Check Procedures
  - Use Quality Check Tools

Phase 1 – Problem Identification

The first phase of the SSES is to identify historical data available, assess its reliability, and to identify additional data needs and how these data needs will be collected. It is expected this phase of the SSES will be completed in the first year of program implementation. The primary data types and the evaluation procedures to be performed for the problem identification phase are discussed in more detail below:

Identify Historical Data Available and Assess Reliability

The first step in the SSES is to identify historical data available and assess its reliability. This important first step involves the cataloging and evaluating of existing historical data that will be critical to successfully and efficiently performing the SSES.

These data include:

- Sanitary sewer flow monitoring data collected within the City
- Sanitary sewer flow monitoring data from outlying community service area billing meters
- Sanitary sewer system infrastructure data and GIS coverages within the City
- Sanitary sewer system infrastructure GIS coverages and maps for outlying community service areas

- Sanitary sewer rehabilitation projects completed and planned within the City
- Sanitary sewer inspection data and assessment score results within the City
- Water table elevation, historic stream, and subsurface conditions within the City
- Historic local rainfall data within the City and within Outlying Community service areas
- Demographic, orthographic, topographic and land-use GIS data coverages both within the City and Outlying Community service areas

Existing sanitary sewer flow monitoring data will be evaluated and rated for reliability for use in estimating peak wet weather flows. GIS coverage maps will be generated showing the sewered areas covered by each monitor with acceptable quality rated data. The results of existing hydraulic evaluations performed on quality rated data will be reviewed for consistency based on established quality standards.

GIS coverage of sanitary sewer collection system networks within the City will be evaluated for completeness and connectivity and repaired as needed to allow flow routing and other network analyses to be performed.

Sanitary sewer collection system infrastructure maps and GIS coverages for Outlying Community service areas will be inventoried and assessed for age and completeness.

Recently completed and currently planned sewer rehabilitation projects within the City of Philadelphia will be inventoried and mapped.

The results of existing sanitary sewer inspections performed within the City will be collected along with GIS spatial information to generate maps summarizing sewer assessment results.

Historic local rainfall data within the City and covering Outlying Community service areas will be inventoried and assessed for reliability for use in performing hydraulic evaluations of wet-weather flows in sanitary sewers.

Census demographic data, ortho-photography and land-surface data covering both City and Outlying Community service areas will be inventoried and assessed for completeness and consistency with other spatially referenced collection system data.

Supplementary Data Collection and Analysis

The assessment of historical and existing data will identify critical gaps or deficiencies in the availability or reliability of data needed to complete the SSES. A summary of the data needs and the tasks necessary to collect and analyze the data will be completed as part of Phase 1.

Phase 2 – Analytical Study Phase

The Analytical Study Phase of the SSES involves using all reliable data for performing analyses and evaluations of the sanitary sewer system WWII conditions. This primarily will involve hydraulic evaluations of sanitary sewer flow monitoring data using U.S. EPA SSOAP software tools. Phase 2 of the SSES will be completed following Phase 1 and a report submitted to PADEP by June 1, 2014. An outline with descriptions of the Study Phase tasks is included below.

Perform Global Assessment of Study Area

Develop Investigation Approach: The approach to this investigation will focus on hydraulic analyses of sanitary sewer flow monitoring data both within the City and at monitored connections to outlying community service areas. These hydraulic analyses will result in estimates of dry-weather and wet-weather flow rates including the components of base wastewater flow (BWWF), groundwater and stream inflow and infiltration (GWI), and rainfall derived inflow and infiltration (RDII). The relative fraction of dry-weather flow attributed to GWI, and the fraction of wet-weather flow volume attributed to RDII will be used to evaluate inflow and infiltration conditions in monitored sewer areas. Estimates of per capita and per acre BWWF and GWI rates also will be determined and used along with landuse information to evaluate the results of hydraulic analyses. Areas identified with inflow and infiltration rates that, if reduced, could affect a significant improvement on CSO control, will be prioritized for subarea investigations to identify specific areas to target for rehabilitation or other capital improvements.

Define Study Area Boundaries: The overall study area boundaries include all separate sanitary sewer service areas contributing flows to the City's collection and treatment system. The overall study area will be divided into manageable study units based on major collection system interceptor drainages and areas contributing to individual outlying community service connection locations.

Define Technology Applications and Field Methods to Apply: Hydraulic evaluations will be performed using USEPA SSOAP software tools to evaluate sanitary sewer inflow and infiltration rates for all monitored sanitary sewer areas. These hydraulic evaluations include dry-weather flow characterization and wet-weather flow separation.

Dry-weather flow characterization will include determination of average daily weekday and weekend dry-weather flow (DWF) hydrographs, and estimates of component BWWF and GWI rates.

Wet-weather flow characterization will include identification of wet-weather event boundaries within the sanitary sewer flow monitoring record, and removal of estimated dry-weather flows in order to obtain RDII hydrographs for each monitored wet-weather event. The rainfall volume falling over the monitored area will also be estimated for each event in order to determine the fraction of the rainfall volume accounted for by the monitored RDII volume.

The monitored areas will be further characterized by estimating relevant demographic and landuse attributes to help evaluate results of hydraulic analyses. This characterization will include population data for estimating per capita dry-weather flows and landuse data for identifying residential and commercial areas used for selecting appropriate analysis procedures.

Complete Detailed Evaluation of Subareas

Develop Investigation Approach: The next step in the study phase is to perform detailed evaluations of subareas with extraneous flows, as identified through the results of the global

study area investigation. The goal of the detailed evaluation of selected subareas is to identify specific sections of sewer that, if significant reductions are possible, can be targeted for rehabilitation or other capital improvement projects to reduce downstream CSOs.

The approach for performing detailed evaluations of subareas within the City will begin with evaluation of results of all existing infrastructure assessments, along with maps of surface hydrology, subsurface conditions, and groundwater elevations. These data will be used to determine further field investigations needed to identify sewer segments requiring significant improvement to reduce inflow and infiltration.

Prioritize Order of Investigation: The subarea investigations will be prioritized based on the relative magnitude of inflow and infiltration identified during the global study phase and its potential to contribute to overflows.

The results of sanitary sewer flow monitoring investigations may be used for calibration of hydrologic and hydraulic collection system models. The calibrated models may then be used to help assess the relative potential that inflow and infiltration in individual subareas will have for increasing CSOs.

Determine Where and When Field Methods Will Be Applied: The field methods employed for detailed investigations within prioritized subareas will be determined based on evaluation of all available data collected from previous investigations in the area. System infrastructure attributes such as sewer age, size, material, and location relative to surface water, groundwater table, or subsurface streams will be considered in determining the location and method of field investigations to be performed.

Manage and Analyze Collected Data

Determine Data Management Requirements: Data management requirements for SSES shall be determined based on the volume and types of data generated. This will include consideration of the analytical requirements and the ease of use of software applications.

Develop Data Management and Analysis Plan: Data management and analysis considerations will be developed as part of the quality control procedures for each step of the SSES. These will include data storage locations and formats, as well as, detailed data processing procedures.

Selection of Data Management Software: Relational database management software such as Microsoft ACCESS will be used for storage and analysis of the flow monitoring data and analysis results generated as part of the SSES.

Spatial data management and analysis play an important role in performing the SSES. ArcMap ESRI software will be used for storage and analysis of all geospatially referenced data. This will include the use of geodatabases, likely in Microsoft Access.

Additionally, data analyses, tracking, and reporting functions may be facilitated with the use of Microsoft Excel workbooks.

Perform Quality Check

Identify Quality Standards: Quality standards will be identified for all data sources used as part of the SSES. These standards will be used to evaluate the accuracy and reliability of collected data, and to ensure reliability and consistency in applying analysis procedures.

Formulate Quality Check Procedures: Quality Assurance and Quality Control (QAQC) procedures will be formulated for the collection, processing, storage, analysis, and evaluation of all data used for the SSES. Quality checks will be performed by individuals not directly involved in those data management tasks.

Use Quality Check Tools: The use of quality check tools to support the QAQC procedures will include the application of checklists and quality rating tables to determine the completeness and reliability of data used for performing the SSES and whether it meets the established quality standards.

6.9.2 Outlying Communities Report

The Water Department monitors sanitary sewer flow from outlying communities for billing purposes at 52 major connection points to the combined and sanitary sewer systems. As part of the SSES process, described in Section 6.9.1, the Water Department will determine the dry weather and wet weather flow components of the outlying community connection points. The Water Department will use the results to complete a report identifying any outlying communities that contribute excessive wet weather flows that increase CSOs. In addition, the report will summarize the Water Department's efforts to reduce outlying community wet weather flows, primarily through contract terms and requirements. The Water Department will submit this report to PA DEP for its use to assist these municipalities in completing the remaining portions of the SSES. The Outlying Communities Report will be completed by June 1, 2015.

7.0 Public Outreach and Participation

The Water Department is expanding its public outreach and public participation efforts as part of the evolution from the demonstration phase to implementation phase of the *Green City, Clean Waters* program. The Water Department plans to continue public outreach efforts, including notifying impacted communities, soliciting feedback, conducting outreach, strengthening partnerships, raising awareness and creating educational opportunities related to the *Green City, Clean Waters* program. These efforts are in addition to public participation through existing and new partnerships aimed at increasing the adoption of GSI by stakeholders and partners City-wide. Outreach efforts will enable the Water Department to keep the public informed as the program continues to develop and generate support and excitement for the Water Department's innovative and green approach to stormwater management. The public participation programs and events described in Section 2 of the LTCPU and its supplements will continue. Ultimately, the Water Department anticipates that stakeholders, partners and communities impacted by CSOs will become advocates that want to implement GSI either on their own properties, in their communities or throughout the City.

7.1 Public Outreach

The Public Affairs Division is responsible for external public communications on behalf of the Water Department. The Division has developed an external communications plan designed to enable the Water Department to better communicate important messages about *Green City, Clean Waters* to stakeholders, including outreach to rate payers, community representatives, and other partners.

7.1.1 *Green City, Clean Waters* Outreach

A core commitment of the Public Affairs Division is to develop the best methods and preferred tools for engaging a broad range of stakeholders. Table 7.1 includes descriptions of some of the community outreach tools the Water Department is utilizing and evaluating for future use.

Table 7.1 Community Outreach Tools

Community Outreach Tool	Description
***Green City, Clean Waters* Blog**	A daily blog that covers GSI, stream restoration and other relevant water-related news has been developed and posted on the Water Department's website. The blog enables the Water Department to inform the public of current programs and events, relevant partner initiatives, and programs that support GSI, the City's waterways, parks and the urban landscape. The URL is: http://phillywatersheds.org/blog.
***Green City, Clean Waters* Year-in-Review**	The Public Affairs Division plans to utilize an online photojournalistic-style portfolio to visually document projects and events on an annual basis. The Water Department will use this to keep rate payers and partners aware of initiatives and projects.

Community Outreach Tool	Description
***Green City, Clean Waters* Partner Master List**	This master distribution list of email addresses has approximately 5,000 entries as of September 2011 and will continually be updated. Those on the list receive periodic emails notifying them of programs and events related to *Green City, Clean Waters*. The Public Affairs Division plans to produce e-campaigns and e-newsletters for these supporters.
GSI Project-specific Events	The Water Department understands the importance of public interactions as important opportunities to promote the Water Department's investments, build excitement around GSI, and communicate the goals of the *Green City, Clean Waters* program to the public through the media. Successes, small and large, are celebrated on a regular basis. Events take the form of a press conference highlighting a GSI demonstration project, or a ribbon-cutting ceremony for the completion of a major project. The Water Department will continue coordinating events, highlighting successful projects over the first five years of the program.
GSI Branding	*Green City, Clean Waters* program branding will be explored in the coming years. The Water Department is interested in creating a green symbol as an identifiable feature that would unify all GSI projects throughout the City. By branding program elements, the Water Department feels that the public will be able to better recognize the Water Department's green initiatives. The Water Department will explore branding tools such as art, medallions, unique features or colors, and barcodes or links to informative websites.
Interpretive Signage	Interpretive signs will be installed at select GSI locations. The Water Department and PPR are currently developing a standard template and process for GSI interpretive signage.
***Green City, Clean Waters* Documentary Video Series**	The Water Department and GreenTreks Network, Inc. work together to produce engaging documentary videos that communicate the stories behind *Green City, Clean Waters*. The *Green City, Clean Waters* videos are shown at public meetings, public events and conferences, on television and at the Fairmount Water Works Interpretive Center (FWWIC). They are also available on-line on the Water Department's web page, the *Green City, Clean Waters* Facebook page and on the *Green City, Clean Waters* Vimeo Channel, in addition to YouTube. The primary URL for these videos is: http://vimeo.com/channels/greencity. Several videos have already been successfully produced covering the following topics: • *Green City, Clean Waters* Overview (3 minute promo, 9 minute and 30 minute versions) • Street Greening Creates Community • Greener, Healthier Play • Solving Runoff Block by Block • Keeping Water On Site • Protecting the River at East Falls • Greenfield School • Rain Barrels • Green Homes
GSI Interactive Tours, Podcasts & Maps	The Water Department is developing interactive tools such as on-line tours, podcasts, maps and videos, to provide the public with additional ways to experience the Water Department's GSI projects. These educational tools will feature the Water Department's green projects and events, in addition to other initiatives that support the *Green City, Clean Waters* mission.
The Flower Show & GSI	The Water Department will continue partnering with the Pennsylvania Horticultural Society (PHS) on integrating the theme of GSI into the annual The Flower Show hosted by PHS. The Water Department will also explore the possibility of integrating elements of The Flower Show GSI exhibits into pop-up gardens and green tours.

Community Outreach Tool	Description
Fairmount Waterworks Interpretive Center (FWWIC)	The mission of the FWWIC includes fostering stewardship of our shared water resources by encouraging informed decisions about the use of land and water. The FWWIC uses technology, experiential education, partnerships and collaboration to reach and educate visitors about water and the environment. The innovative and interactive educational exhibits and programs will continue to evolve. A *Green City, Clean Waters* curriculum, recently developed by the FWWIC educators, will be offered to all Philadelphia-based schools that visit.
Philadelphia Department of Parks & Recreation	The partnership between the Water Department and the PPR environmental educators on *Green City, Clean Waters* outreach and education will continue. These programs take place in schools, recreation centers and in the communities where GSI projects and stream restoration projects are either constructed or planned. Approximately 5,000 children and adults have participated in the *Green City, Clean Waters* program over the past year. It is anticipated that this number will grow in the coming years.
GSI-Themed Exhibits & Presentations	The Water Department will continue to work with FWWIC to create opportunities to integrate GSI related themes into exhibits and presentations. Recent exhibits and panel discussions highlighted "Faith & Environment" and "Green Homes." These events highlight partner projects and inspire property owners to make a difference on their properties and in their communities. The Water Department plans to continue hosting GSI-related exhibits and events in the coming years at the FWWIC and throughout the City.
Green Tours	The Public Affairs Division will continue to offer GSI tours to partners and the general public. Since the submission of the CSO LTCPU in 2009, the Water Department has led tours for approximately 325 participants. The Water Department is actively exploring opportunities for interactive tours and podcasts.
***Green City, Clean Waters* Websites**	The Water Department will continue to support a series of websites dedicated to communicating the services provided by the Water Department. The URL for the *Green City, Clean Waters* website is: http://www.phillywatersheds.org.
***Green City, Clean Waters* Facebook Page**	Social media efforts have proven successful in spreading the message regarding the Water Department's project unveilings and public events. The Water Department plans to continue to enhance the use of this tool with a focus on the *Green City, Clean Waters* Facebook account. This page helps the Department build its *Green City, Clean Waters* fan base and keep its "Friends" up-to-date with blog posts, news and upcoming events. It also provides the Water Department with a direct link to an interested public and a forum to gather feedback on projects and programs. The URL for the *Green City, Clean Waters* Facebook page is: http://www.facebook.com/green.cities.clean.waters. The Water Department plans to continue outreach efforts through social media during coming years.
Collateral Materials	Tools, such as posters, handouts, brochures, postcards, graphics and PowerPoint presentations, will continue to be developed, and opportunities to disseminate these materials will be sought. Development of direct mailings, such as the Water Wheel publication, Drinking Water Annual Report, and other bill stuffers will also continue.
Green Streets Adoption Guide	The Water Department is developing a "How to" guide designed for communities, schools and businesses to care for green streets projects.
Green City, Clean Waters Ambassador Program	The Water Department is creating an educational program to empower civic organization representatives to adopt GSI projects, to become stewards of the project and to be the ambassador for the *Green City, Clean Waters* program in their community.

Community Outreach Tool	Description
Demonstration Projects through Art & Greening	The Water Department is working with local artists and exploring various artistic mediums to coordinate creative interpretations of *Green City, Clean Waters* in visible locations, hence creating opportunities to raise awareness of the program. Potential types of projects may include: • Decorative rain barrel wraps that incorporate artwork • Murals near GSI projects • Educational "graffiti" (using moss, yarn and other non-damaging materials) on public property • Art installations that represent *Green City, Clean Waters* messaging • Downspout art on public propertyLiving walls

7.1.2 Public Participation

The Public Affairs Division develops and maintains public participation activities for a broad range of stakeholders. The following includes descriptions of some of the community engagement and participation tools the Water Department is utilizing and evaluating for future use.

Green City, Clean Waters Advisory Committee

The Green City, Clean Waters Advisory Committee, which actively participated throughout the LTCPU planning process, will be reconvened at least once a year for the first five years of the Green City, Clean Waters implementation period, or as often as the advisory committee requests. The goal of reconvening the committee is to brief the group on progress made and decisions under consideration by the Water Department. Continuing the advisory committee meetings will also provide the Water Department with an important opportunity to obtain feedback from the new and existing partners, from environmental organizations to neighborhood civic groups.

USEPA – Philadelphia Water Department Outreach Working Group

The USEPA and Water Department have formed an outreach working group. The goal of this partnership is two-fold: to conceive, plan and/or implement outreach projects and programs together and to provide an opportunity for status updates on related public outreach and public participation programming. An example of a program that has resulted from the working group includes the Low Impact Development Design Challenge.

Low Impact Development Design Challenge

A partnership for a Philadelphia Low Impact Development Design Challenge is being created between the Water Department and the U.S. Environmental Protection Agency (USEPA). This event will provide professionals in the region with an opportunity to design GSI technologies that are cost-effective and sustainable solutions to the complex stormwater management issues in Philadelphia. This event, scheduled for 2012, will replace the bi-annual Urban Watersheds

Revitalization Conference previously coordinated by the Water Department. The launch of the Design Challenge is planned for 2012.

The Water Department is also interested in exploring contests with local artist networks and university communities around the theme of GSI.

Watershed Partnerships

The Water Department will continue to support the work of the watershed partnerships on projects and events that advance GSI and stream restoration. The watershed partnerships increase opportunities for individuals to directly experience GSI projects and reestablish connections to creeks and parks. Examples of recent projects with the watershed partners include the planting of rain gardens,, the construction of a porous pavement parking lot and porous basketball court, a "Walk in the Park with the Mayor" and a "5K Run/Walk" along the creek in the park.

Every watershed that drains to Philadelphia has a Water Department-sponsored watershed partnership:

- Darby-Cobbs Watershed Partnership
- Tookany/Tacony-Frankford Watershed Partnership
- Delaware Direct Watershed Partnership
- Schuylkill Watershed Partnership and Schuylkill Action Network
- Wissahickon Watershed Partnership
- Pennypack Watershed Partnership
- Poquessing Watershed Partnership

For more information on the Water Department's watershed partnerships, view Section 2.2.3 of the LTCPU and its supplements or visit: http://www.phillywatersheds.org/your_watershed.

7.1.3 Green Public Programs

Green Stormwater Infrastructure Outreach Process

A streamlined outreach process has been developed for Green Streets demonstration projects that allow the Water Department to effectively work with communities on planning, design and construction. Utilizing a thoughtful notification process, the Water Department gathers feedback on the design and construction of the project and provides educational opportunities for the schools and recreation centers in the impacted communities. The Water Department believes that these efforts will help increase understanding (and ultimately adoption) of GSI projects.

The Green Streets Outreach Process (summarized in Table 7-2) may serve as a template as the Water Department develops outreach processes for other green public programs, such as green open space, green schools, etc. For outreach associated with larger project sites, such as the Stadium area and Navy Depot under the Stormwater Management Enhancement Districts

program, the Water Department will explore the creation of steering committees, which will guide the public participation process for these sites.

Table 7-2 Current Green Streets Outreach Process

Phase	Philadelphia Water Department to Partners	Purpose
I. Design	Philadelphia Water Department contacts various units and offices within Philadelphia Parks and Recreation	The PLANNING, PRESERVATION & PROPERTY MANAGEMENT UNIT and the OFFICE OF VOLUNTEERS & STEWARDSHIP are contacted to notify and to help distribute design plans to impacted recreation site leaders and recreation district managers from whom the Water Department will then solicit feedback.
		The ENVIRONMENTAL EDUCATION TEAM is contacted to notify educators of design plans. The educators will in turn contact impacted recreation centers to coordinate education programs, introduce GSI and assist the Water Department in partnering on a green street adoption program.
		The ENVIRONMENTAL EDUCATION TEAM is also contacted to notify environmental educators of impacted schools, so that they can reach out to the schools with environmental education programs, introduce GSI and assist the Water Department in partnering on a green street adoption program.
	Philadelphia Water Department contacts various teams within the School District of Philadelphia	The PHILADELPHIA SCHOOL IMPROVEMENT TEAM and the CAPITAL IMPROVEMENT PROGRAM are contacted to notify and to inform them of work planned in the impacted school areas and to obtain feedback on the design.
	Philadelphia Schools	The impacted SCHOOLS are contacted directly to notify principals in order to obtain design feedback and to secure contact information for science teachers and other school representatives who may be interested in environmental education programming.
	Civics	The impacted CIVIC organizations are contacted to notify them of GSI projects in their community and to obtain feedback on the design and to discuss partnership opportunities (such as green street adoption program).
II. Construction	Selected contracting company	The selected CONTRACTOR is contacted by the Water Department to request that the contractor notify all residents and businesses directly impacted by the construction
	Civics, Philadelphia Parks and Recreation, schools and other partners	ALL PARTNERS to date are provided a project status update; the Water Department also satisfies requests for presentations to interested parties, and further discusses green street project "adoption" opportunities for operation, monitoring & maintenance
III. Launch and Celebration	Civics, community (including all partners to date) and media	All PARTNERS to date in addition to the MEDIA and POLITICAL DIGNITARIES are contacted, as the Water Department hosts a celebratory event, such as a ribbon-cutting, to launch the GSI projects. The Water Department also offers partnership opportunities and educational resources at this time as well to the impacted community. The Water Department aims to promote the project and event through various outlets –the Water Department's website (including blog), social media and other appropriate outlets, in addition to print, radio and TV.
IV. Continued partnership	Civics, schools, and recreation centers	The Water Department will be available for requests and to provide updates to impacted sites/partners and will further developing adoption opportunities.

7.1.4 Green Private Programs

Green Homes

The Water Department will seek opportunities to collaborate on projects and programs that provide homeowners with guidance, technical resources and experiences that the Water Department believes may inspire residents to take on GSI projects on their own properties and in their communities.

The following Green Homes initiatives have been identified for the next five years:

Residential Stormwater Incentives Pilot Program: Rain Check

A framework for a pilot program is under development that will evaluate the experiences of homeowners with GSI on their properties. The evaluation will focus on the efficacy of incentives to purchase residential green tools such as rain gardens, downspout planters and tree planting. The Energy Coordination Agency (ECA), with the Water Department's guidance, will develop a curriculum, training program and certification program for contractors interested in conducting site assessments and installing residential green tools.

Rebuilding Together Philadelphia (RTP) Block Builds

In 2011, the Water Department and RTP staff, along with approximately 100 volunteers, installed residential green tools on three blocks in the Cobbs Creek neighborhood of Philadelphia as a Green Homes demonstration project. Block Builds is an on-going program of RTP designed to improve the lives of homeowners in need. Projects often focus on energy efficiency upgrades, repair projects, clean-ups, water conservation and other projects that improve the safety, security and value of their homes. After the success of the Green Homes demonstration project, RTP now includes GSI tools as a home upgrade option for homeowners in all Block Builds.

Rain Barrel Program

The Water Department will continue their free rain barrel distribution program and offer rain barrel workshops. ECA currently distributes and installs the barrels on the Water Department's behalf. The Water Department will continue to work with ECA on this program in the coming year. The Water Department is also exploring an opportunity to offer a rain barrel wrap option in partnership with the Mural Arts Program that would diversify the look of the barrels.

Green Roof Bus Shelters

The Water Department will continue to develop GSI demonstration projects in partnership with other City agencies that provide high visibility opportunities. In June, 2011, the Water Department partnered with the Mayor's Office of Transportation and Utilities (MOTU), Mayor's Office of Sustainability, Titan, and Roofmeadow to install a demonstration green roof bus shelter at 15th and Market Streets. The goal of this highly visible project is to inspire homeowners to implement green stormwater management projects on their properties and in their communities. The Water Department and its partners are exploring the possibility of constructing additional green roof bus shelters throughout the City, funded by advertisement

dollars. The Water Department will continue to partner with City agencies on innovative and educational demonstration projects and pocket parks. More information on the green roof bus shelter project can be found at http://www.phillywatersheds.org/green-roof-bus-shelter.

Green Home Tool Technology Improvements

The Water Department is tracking the development of technology improvements for residential stormwater downspout planters. The Water Department plans to explore the feasibility of fabricating a plastic stormwater downspout planter, a Do-It-Yourself stormwater planter starter kit and a higher quality version of the standard stormwater planter.

Green Home Events & Guidance Documents

The Water Department will also continue to create opportunities for homeowners to better manage stormwater runoff on their properties and in their communities. The Water Department hosted a Green Homes panel discussion as a component of the Schuylkill Soundings lecture series at FWWIC. The Water Department will continue to support partner projects that increase awareness of residential stormwater management tools. In partnership with the Water Department, PHS hosted a Green Homes Charrette to challenge local professionals to design better stormwater residential tools for homeowners. The Water Department will also explore the development of guidance documents for homeowners to implement green infrastructure projects such as de-paving and green roofs.

The Water Department's Green Homes webpage will continue to provide technical guidance, designs and other resources at: http://www.phillywatersheds.org/residents.