



MARC CAMMARATA

**DEPUTY WATER COMMISSIONER FOR PLANNING
PHILADELPHIA WATER DEPARTMENT**

Green City, Clean Waters

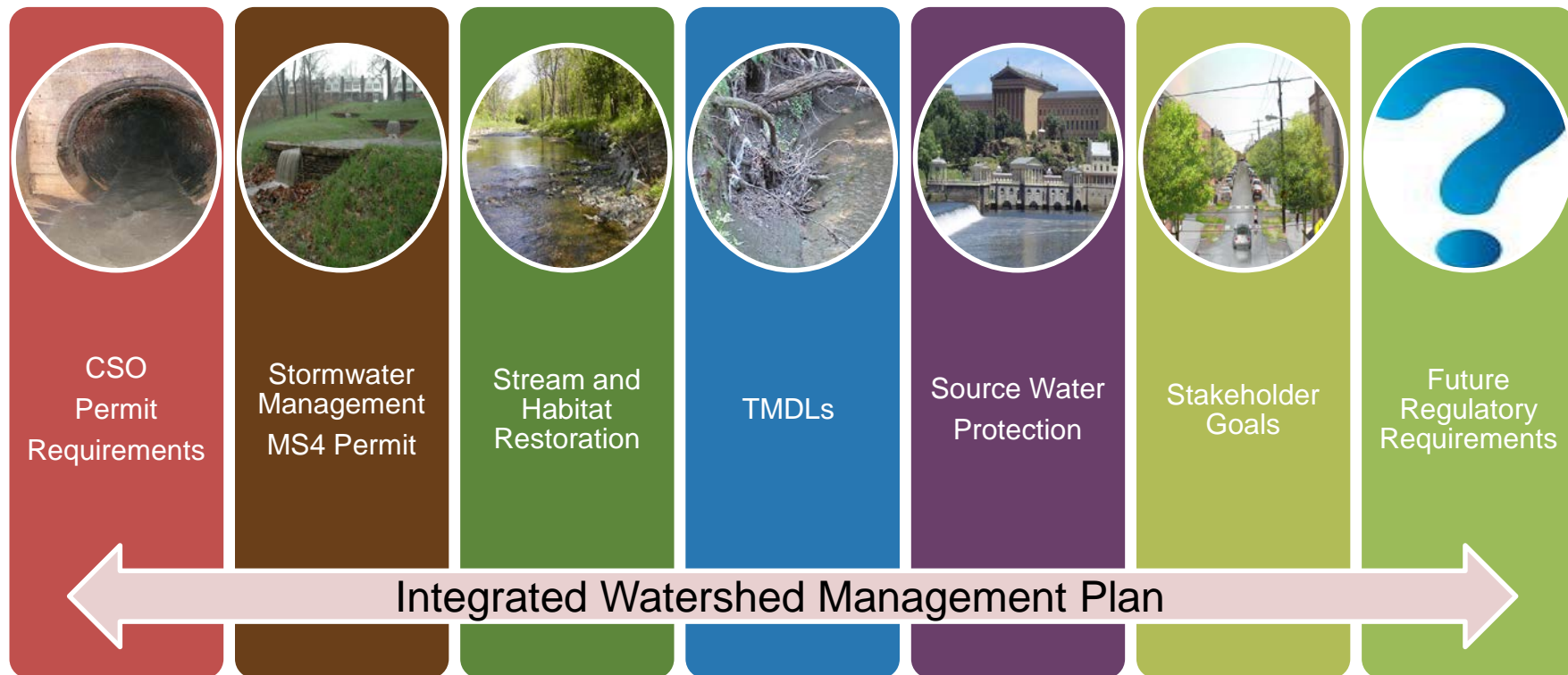
The City of Philadelphia's Combined Sewer Overflow Long Term Control Plan Update



PHILADELPHIA
WATER
— DEPARTMENT —

Integrated Planning | Watershed-Wide, Long-Term

Integrating PWD regulatory requirements to achieve long-term health and aesthetics of our environment



Investing in Green Infrastructure | Multi-Benefits

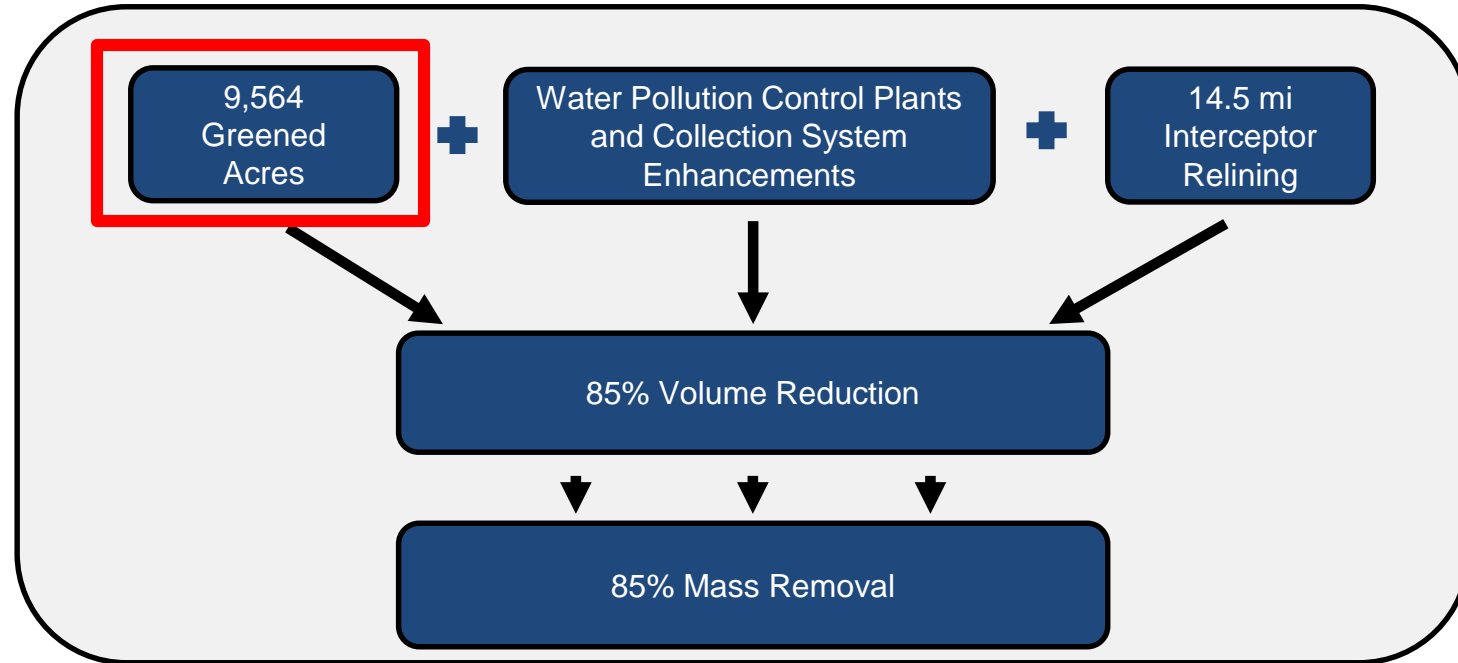
- Resilience to extreme weather / climate change
- Provide green, open space
- Advance livability and public health
- Increase market values and attractiveness
- Reduce stream pollutant loads
- Create local, green economy
- Support urban revitalization
- Enhance the infrastructure network
- Advance City-wide sustainability programs
- Transform river and stream corridors
- Preserve and restore habitat
- Maximize return on every dollar spent



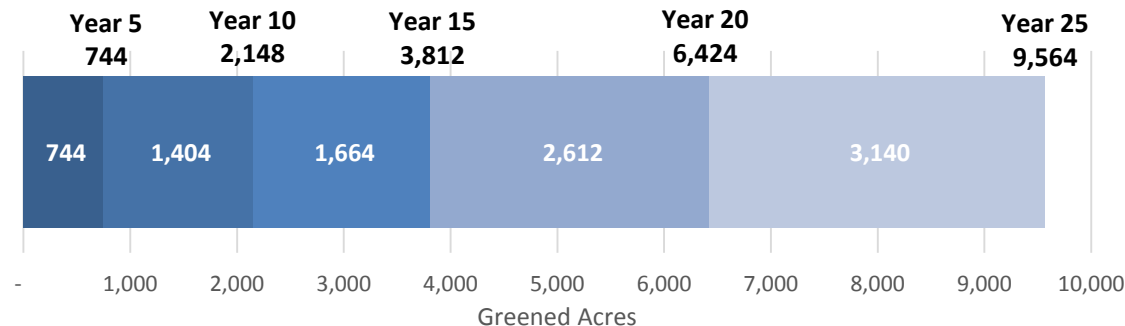
Fishable – Swimmable – Drinkable – Safe – Attractive – Accessible

Green City, Clean Waters | CSO Long Term Control Plan Update

Consent Order and Agreement / Administrative Order for Compliance on Consent



25 Year COA/NPDES Greened Acre Obligation



Green Stormwater Infrastructure | Requirements

25-Year Implementation of Green City, Clean Waters

Year	Greened Acres	Square Miles	% Impervious cover managed
5	750	1	3%
10	2,100	3	8%
15	3,800	6	14%
20	6,400	10	23%
25	9,600	15	34%

Green Stormwater Infrastructure | Defined

A range of soil-water-plant systems that ***intercept stormwater, infiltrate*** a portion of it into the ground, ***evaporate and transpire*** a portion of it into the air, ***harvest and reuse*** as a resource, and in some cases ***slowly release*** a portion of it back into the sewer system



Cliveden Park



Herron Playground



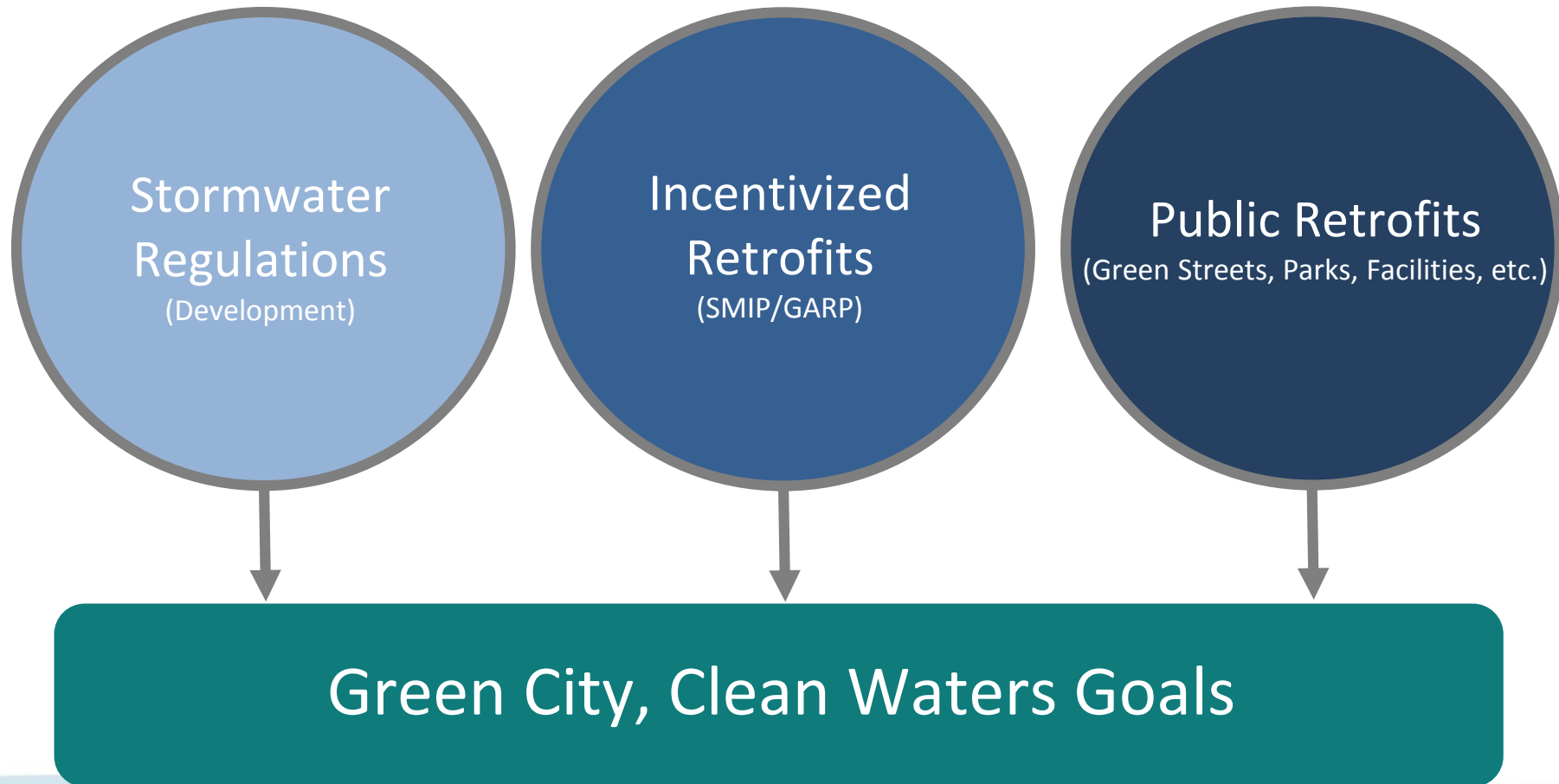
Free Library of Philadelphia

$$\text{GA} = \text{IC} * \text{Wd}$$

Greened Acre Impervious cover Water Depth

Green Stormwater Infrastructure | Delivery

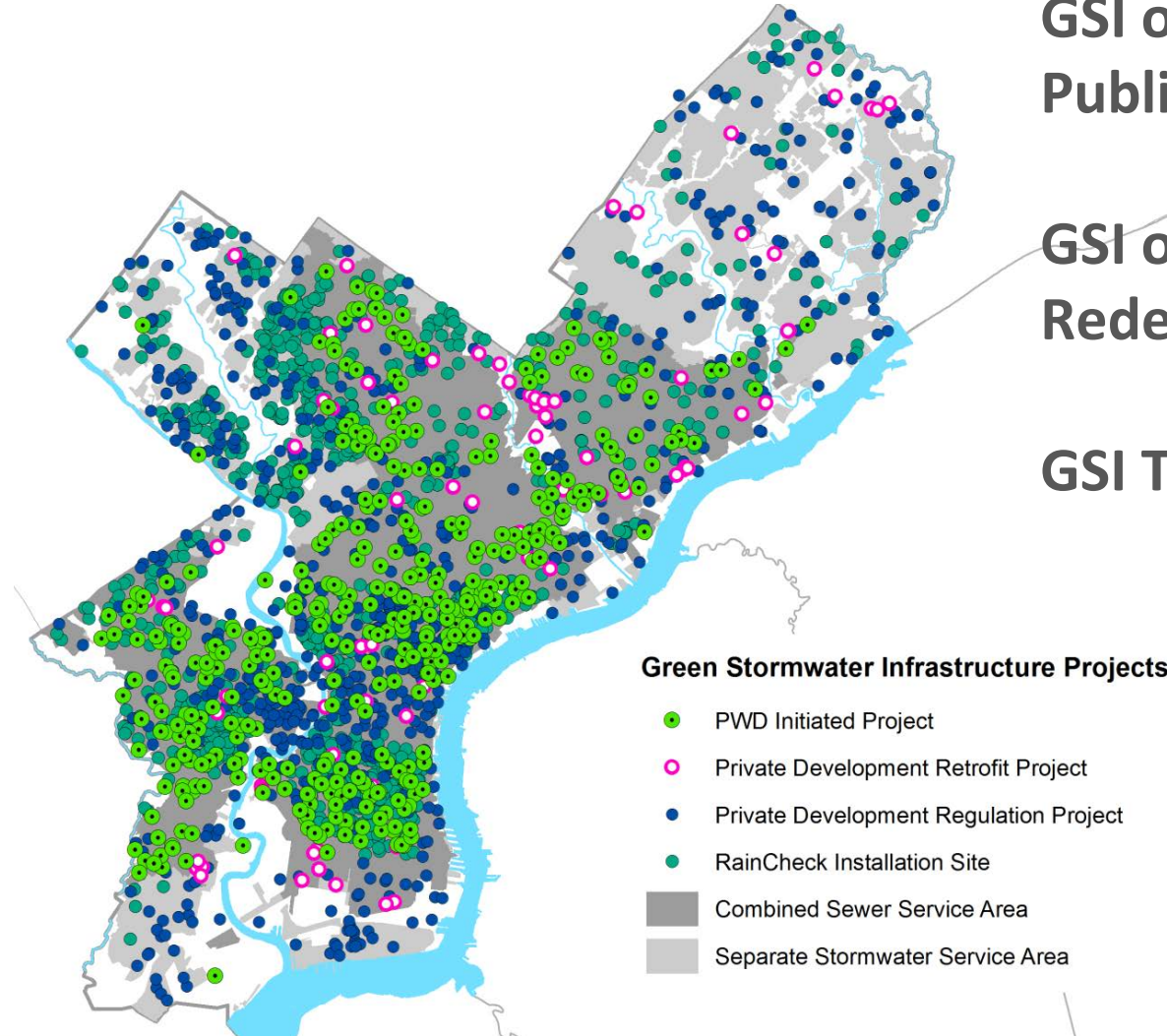
The three main ways Green Stormwater Infrastructure (GSI) is built in the city...





Green City, Clean Waters Turns ~~5~~ 6.5
Thank you for making our neighborhoods greener and our rivers cleaner!

Green City, Clean Waters | Through Year 6.5



GSI on Streets, Schools, Parks and other Public Property: **226 acres**

GSI on Private Development and Redevelopment Projects: **496 acres**

GSI Through Incentivized Retrofits: **351 acres**

**1073
Greened
Acres**

Public Investments | Parks



Public Investments | Streets



Public Investments | Streets



Public Investments | Schools



Public Investments | Homes



Private Investment | Development Regulations



Stanley's True Value, Roxborough



Granary Green Roof

Public-Private Investments | Incentivized Retrofits



Greene Street Friends School



Dependable Distribution



Wharton Street Lofts

Lessons Learned



GSI Planning | Example Study Area



Kensington AOA

 Study Area Boundary

Total Area: 450 acres

Mix of Landuses:

- Parks
- City Owned Facilities
- City Owned Vacant
- School Properties
- Residential
- Commercial

GSI Planning | Example Study Area

8

150AC



Opportunities for Public GSI

 **ROW Already Managed**

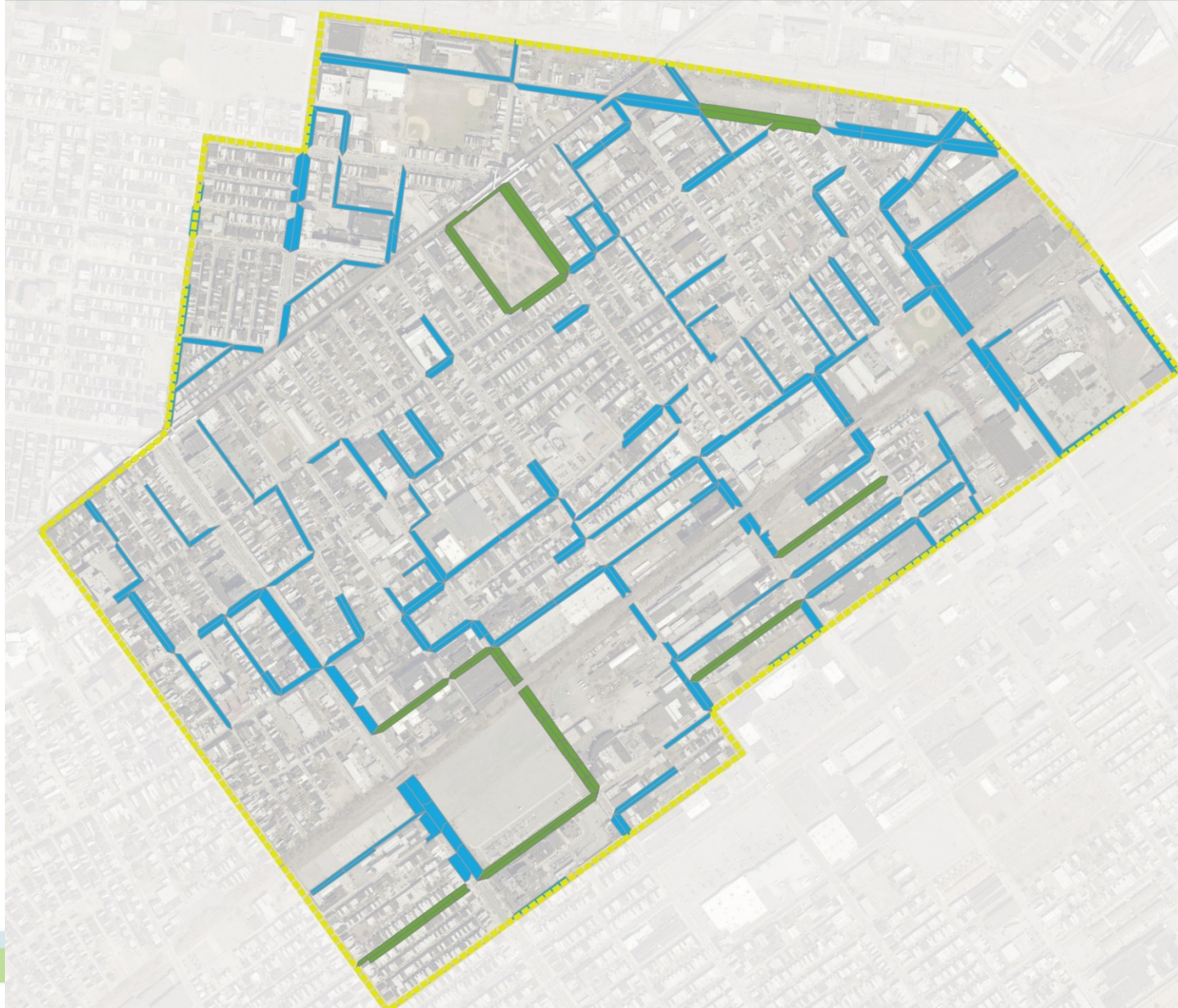
8 acres of ROW drainage area is already being managed by street SMPs

GSI Planning | Example Study Area


48

40

150AC



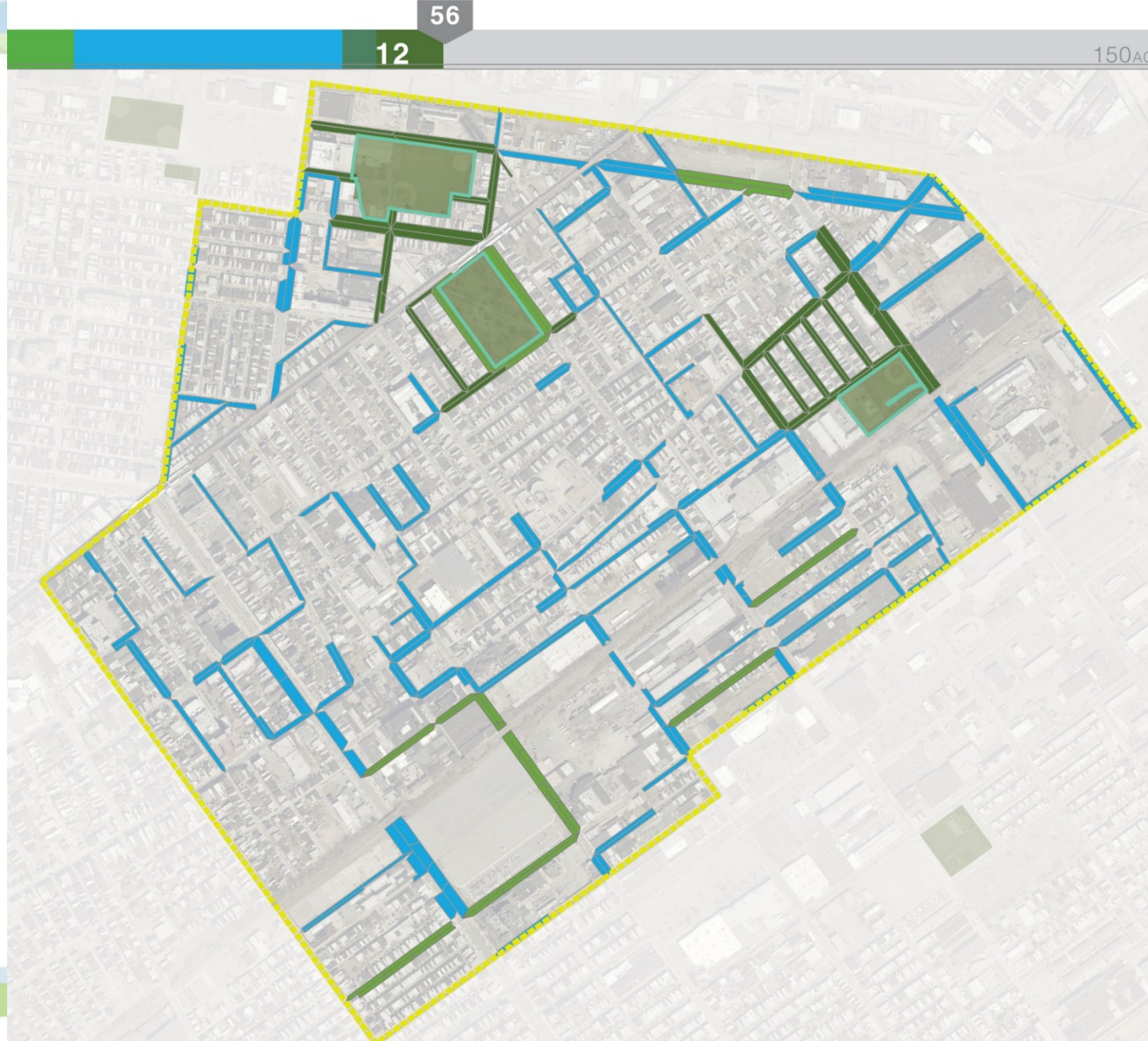
Opportunities for Public GSI

 ROW Already Managed

 Recommended Street Projects

40 acres can be managed following standard GSI design guidelines

GSI Planning | Example Study Area



Opportunities for Public GSI

- ROW Already Managed
- Recommended Street Projects
- City Owned Parks
- 12 Acres** of drainage can be managed on Park Sites

4 of these acres could be managed in the ROW but would be more cost effectively managed on the parks

GSI Planning | Example Study Area



Opportunities for Public GSI

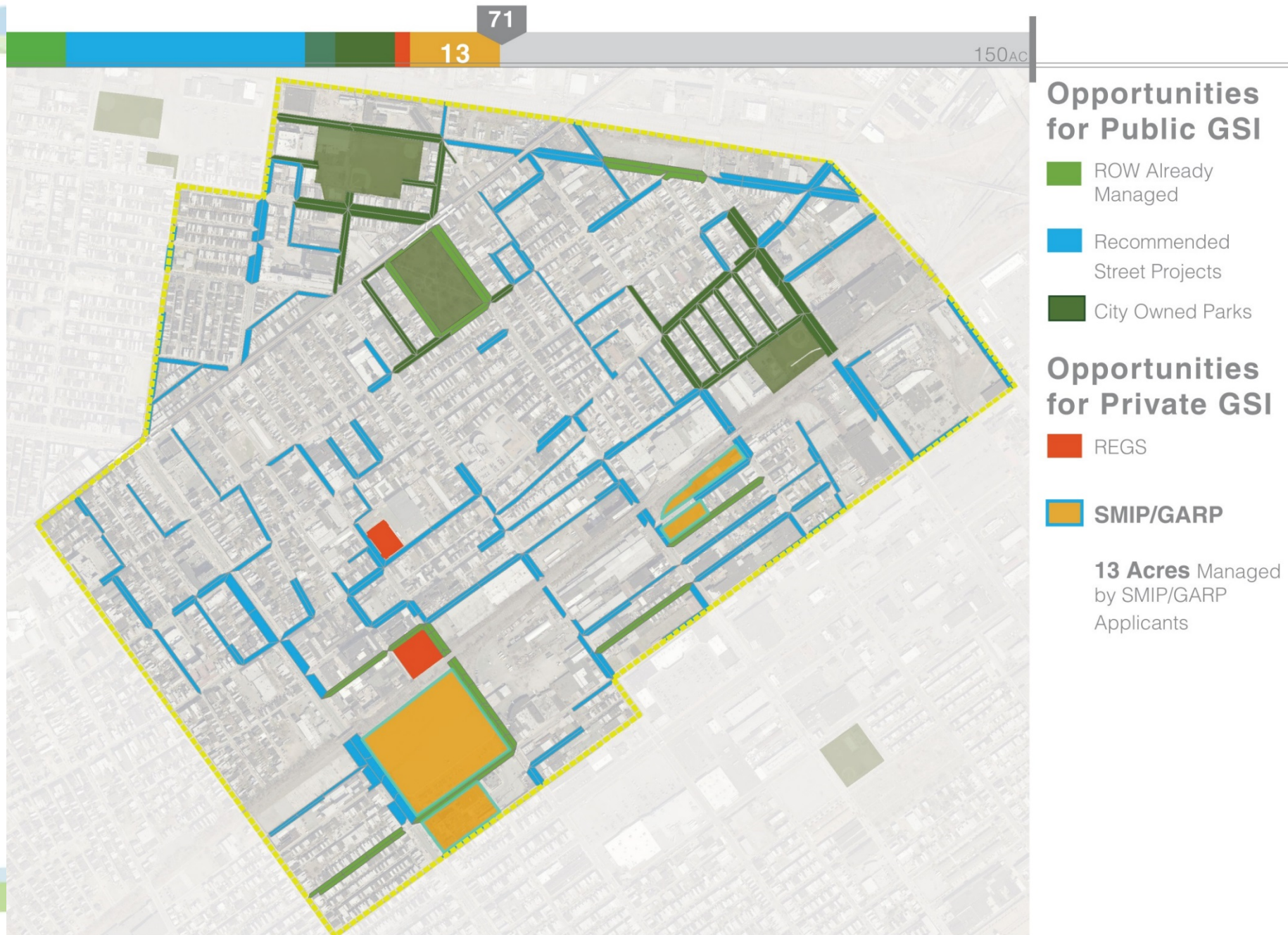
- ROW Already Managed
- Recommended Street Projects
- City Owned Parks

Opportunities for Private GSI

- REGS

2 Acres Already Managed by Private Development

GSI Planning | Example Study Area



GSI Planning | Example Study Area



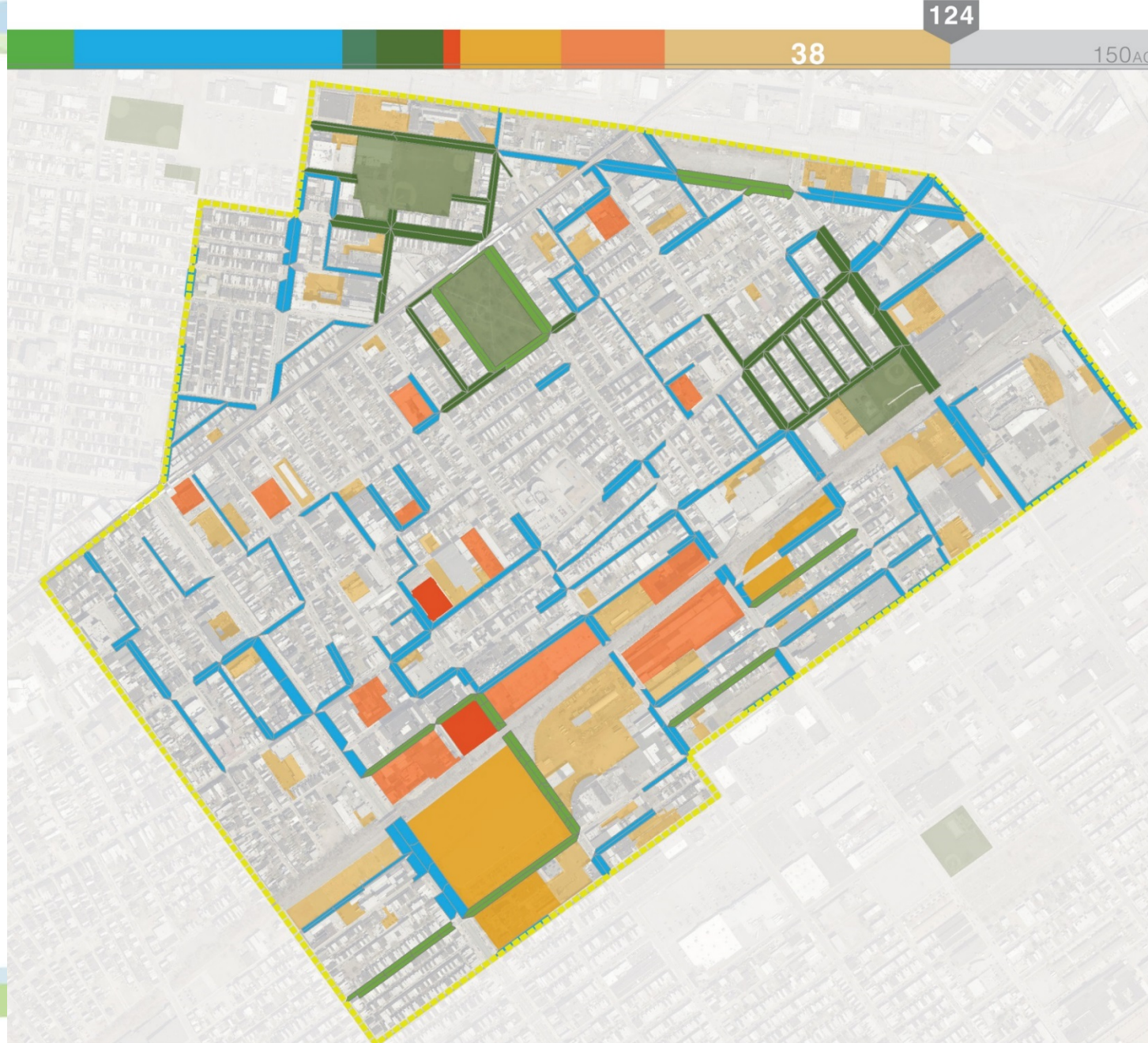
Opportunities for Public GSI

- ROW Already Managed
- Recommended Street Projects
- City Owned Parks

Opportunities for Private GSI

- REGS
- SMIP/GARP
- Future Development

GSI Planning | Example Study Area



Opportunities for Public GSI

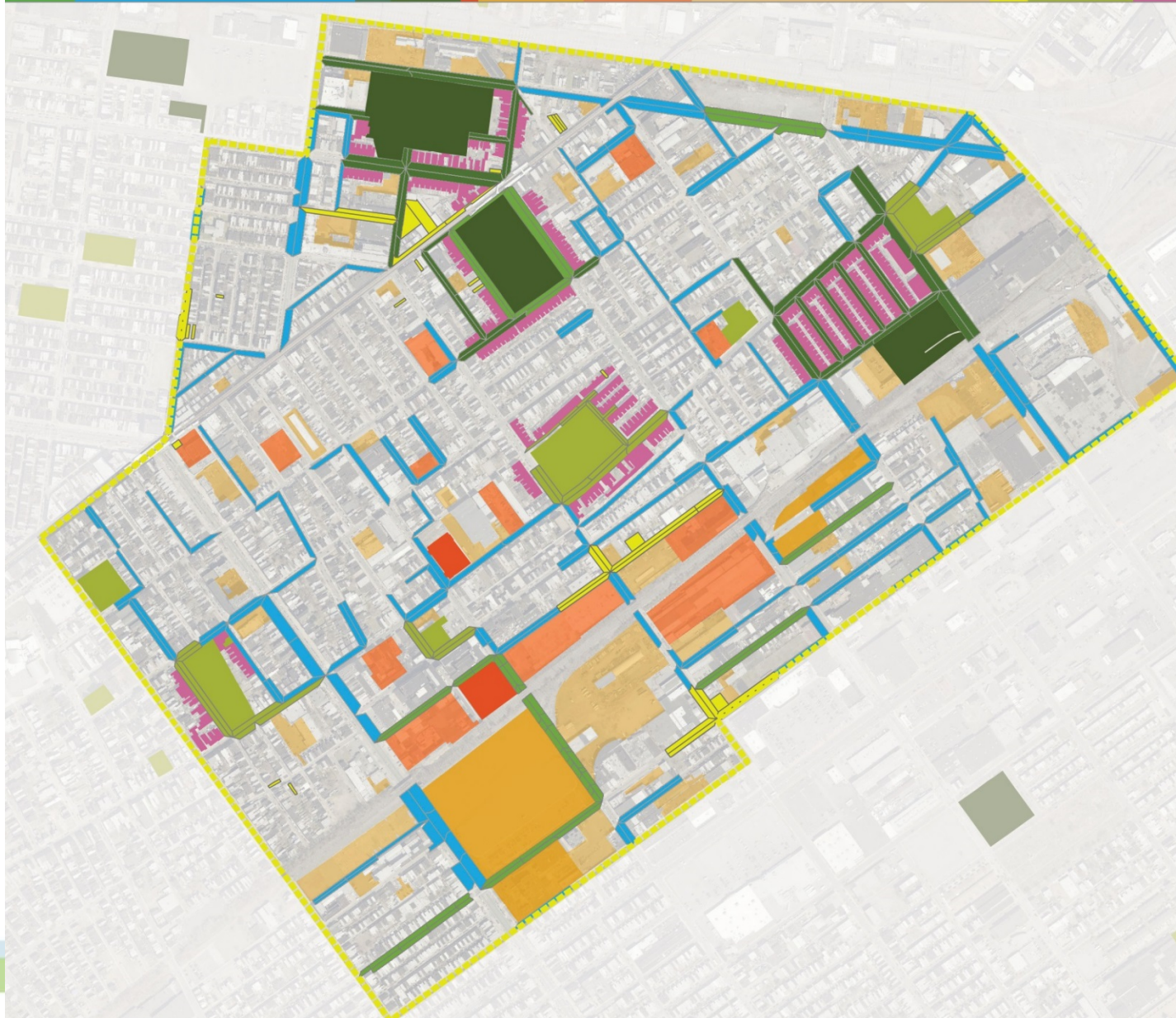
- ROW Already Managed
- Recommended Street Projects
- City Owned Parks

Opportunities for Private GSI

- REGS
- SMIP/GARP
- Future Development
- Future SMIP/GARP

GSI Planning | Example Study Area

150



Opportunities for Public GSI

- ROW Already Managed
- Recommended Street Projects
- City Owned Parks

Opportunities for Private GSI

- REGS
- SMIP/GARP
- Future Development
- Future SMIP/GARP

Additional Opportunities

- City Owned Facilities, Vacant, Parking
- Schools
- Residential Roof

Design | Lessons Learned

- Establish **standards** early in program
- Keep talking, set-up **feedback loops** to improve upon standards
- Consider existing use of site; **community input** can be a key factor in design decisions
- Investigate **site history** and existing conditions thoroughly
- Incorporate time in schedules for **internal/external review** times and changes from stakeholders
- Set up regular **coordination meetings** with internal reviewing units and external reviewing agencies/partners
- Maximize the Managed **Drainage Area**
- Achieve **water quality goals** – Surface vs Subsurface / Infiltration and Evapotranspiration vs Storage and Slow Release
- **Minimize costs** whenever and wherever possible
- Consider the **site context** – not just now but into the near future



Design | Subsurface Storage



Design | Bumpout



Design | Planter



Design | Rain Garden



Design | Swale



Design | Large Subsurface Storage



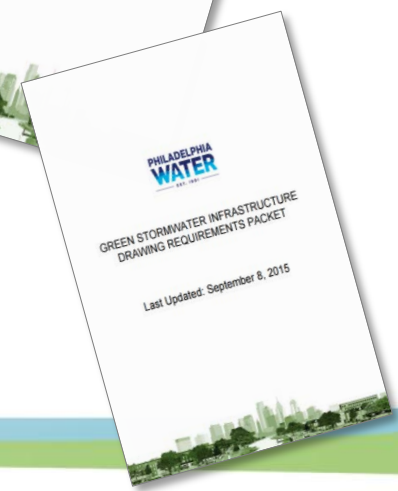
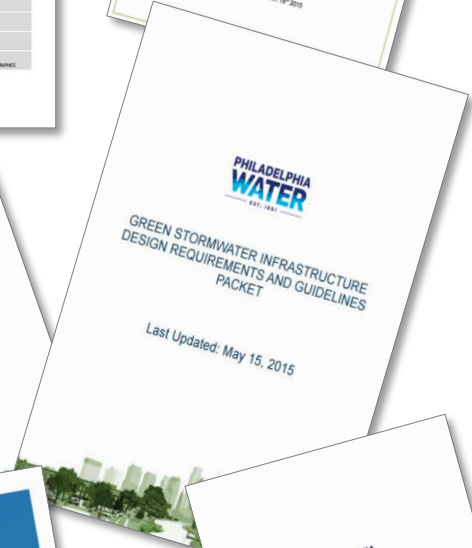
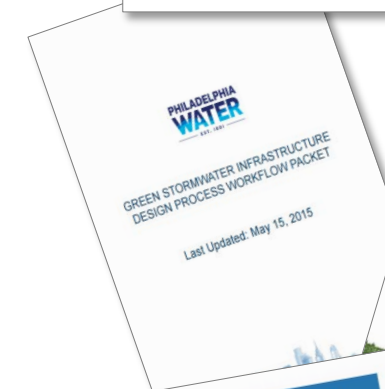
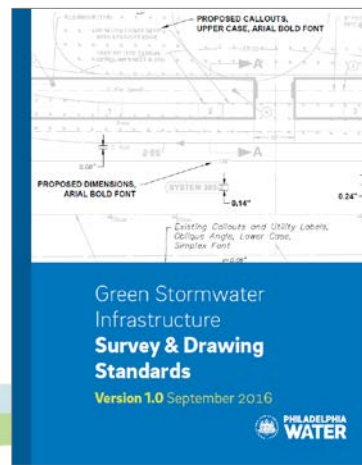
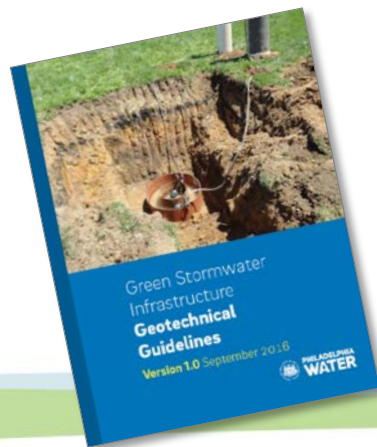
Design | Key Resources



www.philadelphiawater.org/gsi/planning-design

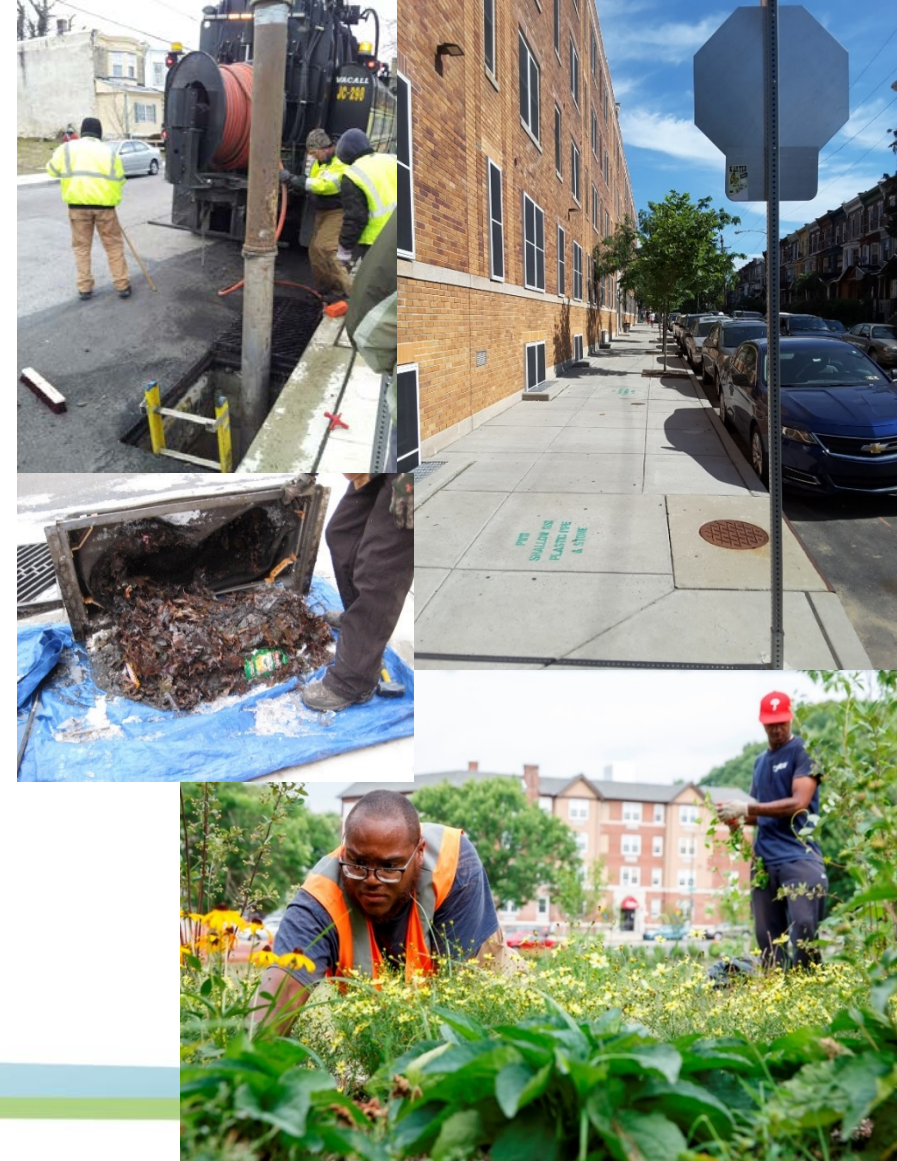
Design | Key Resources

- GSI Design Process Workflow Packet
- GSI Design Requirements & Guidelines
- GSI Drawing Requirements Packet
 - GSI CAD Standards
- GSI Standard Details
- GSI Project Implementation Workflows
- Landscape Guidebook
- Survey & Drawing Standards
- Geotechnical Testing Guidelines
- Project Summaries Guidance Manual

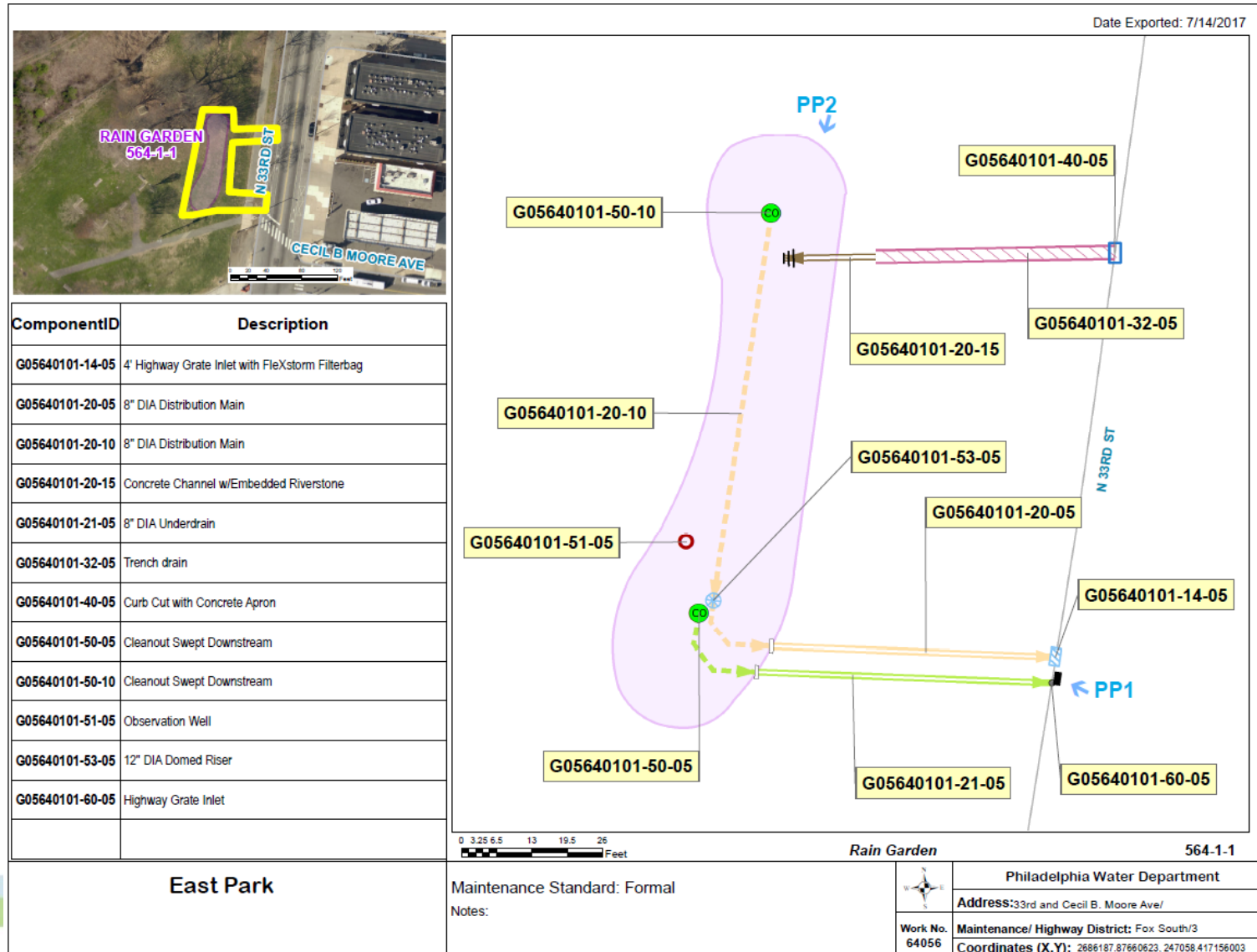


Maintenance | Components

- Inspection:
 - Visual/photographic & video
 - Record condition of vegetative and structural features (pipes)
- Maintenance:
 - Trash and sediment removal
 - Jetting and Vactoring
 - Weeding, pruning, etc.
 - New product testing
 - Structural repairs
 - Erosion control
 - Reseeding / Watering
- Reporting:
 - Labor effort & materials
 - Defects
- Creating Standards and Protocols:
 - Required tools & crew size
 - Frequency
 - Repairs



Maintenance | Work Order Mgmt Systems



Maintenance | Diversity



Maintenance | PowerCorpsPHL



Partnerships | Initial Focus

City Agency Partnerships

- Streets
- Parks
- Vacant Land
- City Facilities

Non-City Public Partnerships

- PennDOT
- Philadelphia School District
- Philadelphia Housing Authority
- SEPTA
- Universities: Temple, Drexel, University of Pennsylvania



Partnerships | Green Streets

PROJECTS:

- ~125 Green Streets Complete
- ~175 Green Streets Underway
- Tree trenches, stormwater planters, bumpouts, porous streets
- **Partners:** Streets Department, Commerce, PennDOT, SEPTA, Planning Commission
- **Monthly Project Review**
- **Quarterly Green Streets Coordination**
- **Green Streets Maintenance MOU 2013**
- **Green Streets Design Manual 2014**

GOALS:

- Incorporate GSI into all City transportation investments
- Joint transportation funding applications
- Align capital planning, repaving, ADA ramps
- Initiate pilot technologies (green gutter)



Partnerships | PennDOT

PROJECTS:

- I-95 Stormwater Management Regulations
- Penn's Landing Cap Park
- Adding GSI to State Route Street Reconstruction Projects

GOALS:

- Manage impervious surface from PennDOT highways as they undergo expansion
- Gain PennDOT approval to develop GSI in state-owned city streets
- Prioritize street reconstruction within the city for federal funding that includes stormwater management costs
- Ensure maintenance of stormwater systems constructed to meet regulations



Partnerships | Parks and Recreation

PROJECTS:

- **12 Park Projects Complete**
- **40 Park Projects In Design**
- **City Partners:** Parks and Recreation, Dept. Public Property
- **Non-Profit Partners:** Fairmount Park Conservancy, Pennsylvania Horticultural Society, Trust for Public Land
- **GSI Maintenance MOU Drafted**
- **Rebuild Partnership** [City Soda Tax]

GOALS:

- Incorporate GSI into all City park investments; Maximize stormwater management on park properties
- Work with non-profit partners to identify funding for non-GSI elements: play equipment, benches, lighting, etc.
- Ensure maintenance of stormwater systems constructed to meet regulations



Partnerships | City Facilities

PROJECTS:

- **1 Projects Complete**
- **4 Projects in Design**
- **Partners:** Public Property, Art Museum, Philadelphia Free Library, Police Department, Fire Department, Prisons, Health, Fleet
- **City Facilities Maintenance MOU Drafted**

GOALS:

- Incorporate GSI into all City facility investments
- Maximize stormwater management on city facility property in parking lots and other open spaces
- Ensure maintenance of stormwater systems constructed to meet regulations



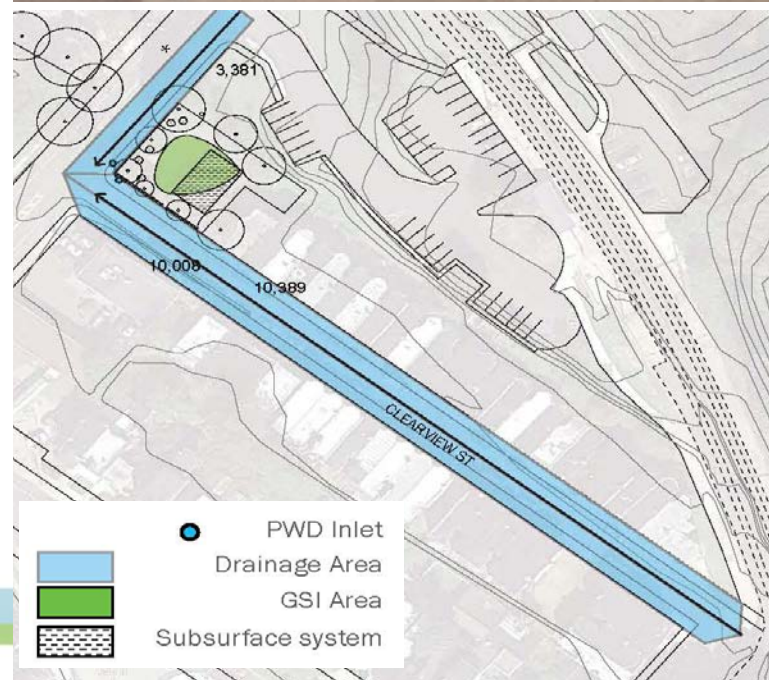
Partnerships | Vacant Lands

PROJECTS:

- **5 Projects Complete**
- **8 Projects in Planning / Design**
- **City Partners:** City Council Dept. Public Property, Redevelopment Authority, Philadelphia Land Bank
- **Non-Profit Partners:** Neighborhood Gardens Trust, Local CDCs and Civics

GOALS:

- Identify stormwater management opportunities on vacant lots prioritized for permanent greening by communities and city council members
- PWD-led projects that manage ROW runoff
- Acquire MOUs with City Property to ensure permanency of GSI
- Work with community groups for stewardship and maintenance of sites



Partnerships | Brownfield Sites

- **Partners:** Commerce Department, Office of Sustainability, Farm Philly / Urban Ag, City Legal Counsel
- Land Use History for parcel-based projects: Sanborn Maps, Zoning records
- Industrial or other potential contaminant uses are further investigated
- Former graveyards also a concern
- **EPA Brownfields Assessment Grant Effort**
 - Urban Gardens
 - Vacant Lots for GSI
- Potential future consideration for **Brownfields Cleanup Grants**
- Excavation can assist in remediation



Partnerships | Schools

PROJECTS:

- **13 Grant-Funded Green Schools Complete**
- **5 Grant-Funded Schools in Design**
- **2 PWD-led Schools in Design**
- **Partner:** Philadelphia School District
- **Non-Profit Partners:** Community Design Collaborative, Trust for Public Land, The Big Sandbox

GOALS:

- Provide grant funds for District and Partners to build GSI in schoolyards
- Develop an easement agreement for PWD to build GSI in schoolyards that manages runoff from adjacent neighborhoods
- Work with non-profit partners to identify funding for non-GSI elements: play equipment, benches, lighting, etc.
- Ensure maintenance of stormwater systems constructed to meet regulations



Partnerships | Public Housing

PROJECTS:

- 3 Green Streets Projects In Design
- \$30 Million Choice Neighborhoods Grant
- **Partner:** Philadelphia Housing Authority
- **Additional Partners:** Habitat for Humanity, City Division of Housing and Community Development, Local Developers

GOALS:

- Maximize stormwater management in new housing developments, including green streets.
- Jointly pursue funds for housing development and redevelopment of low-income communities
- Ensure maintenance of stormwater systems constructed to meet regulations
- Retrofit existing housing projects to manage stormwater



Partnerships | Grants and Leveraged Funds

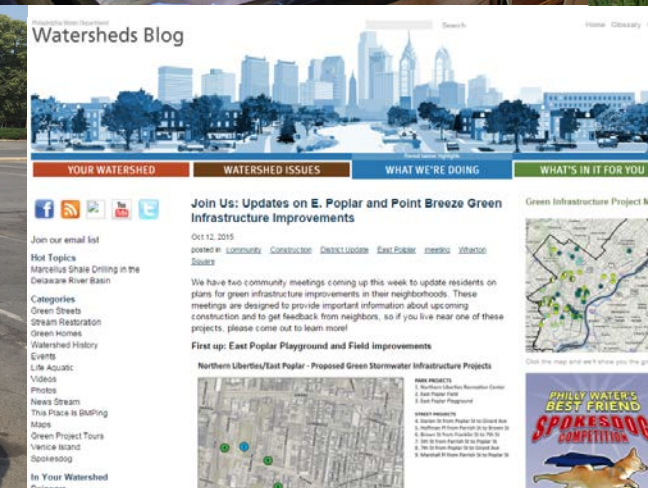


- **\$49M Total**
- **\$10.8M STREETS**
- **\$3.3M SCHOOLS**
- **\$2.9M PARKS**
- **\$30M PUBLIC HOUSING**
- **\$2M GSI RESEARCH**



Outreach & Education | You're ripping up my sidewalk for what?! And why?!





Public Engagement | Approach

GSI Notification & Outreach Process

- Formal process for notifying communities about each GSI project
- Primary goal is to inform



GSI Wrap-around Programming

- Programs and tools that reach a broader audience
- Primary goal is to inspire and help people take action



Public Engagement | What's in the Toolbox?

Residential Programs



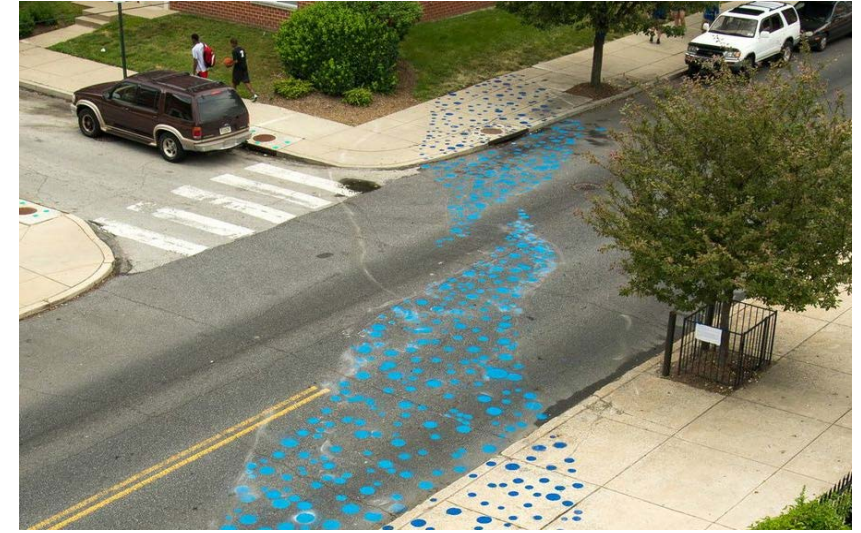
Rain Check participant with new downspout planter

Community Programs



Soak it Up Adoption Training

Art & Interpretation



Public Engagement | Lessons Learned



- Determining outreach goals is essential
- Project-specific outreach is critical, but a comprehensive program needs to engage residents who aren't on a block with GSI

Private Development Regulations | Requirements

Project Applicability: Regulations are City-Wide

- Development over 15,000 SF disturbance must manage stormwater on-site

Technical Requirements:

WQ Volume/Rate/Treatment

Infiltrate the first 1.5 inches of runoff from 100% of impervious surfaces

Detain and slowly release at 0.05 cfs/ac of impervious area

Treat 100% of impervious area through a pollutant reducing SMP

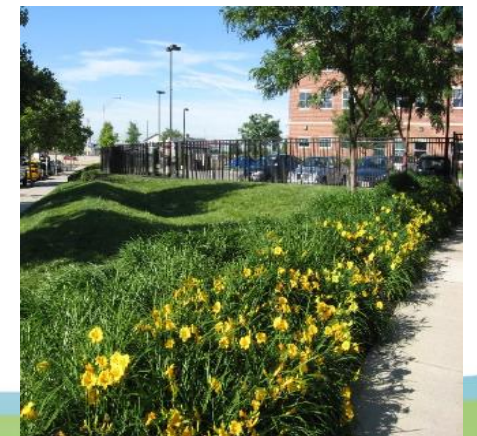
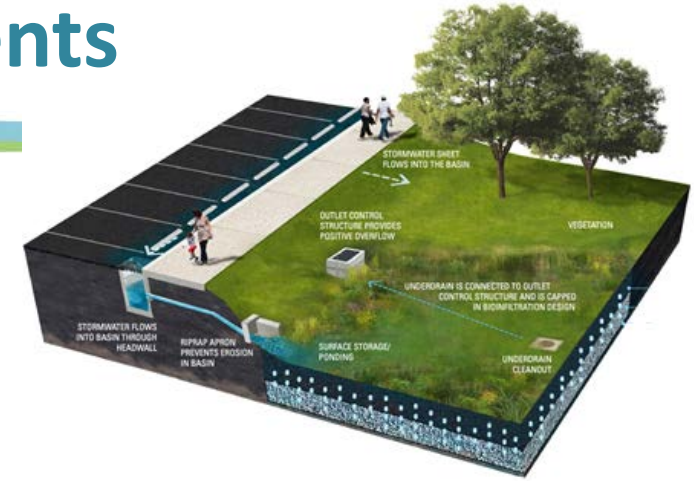
Flood Protection / Channel Protection / Public Health and Safety Rates

Review Process

- Pre-requisite to L&I Permits

Construction and Inspection

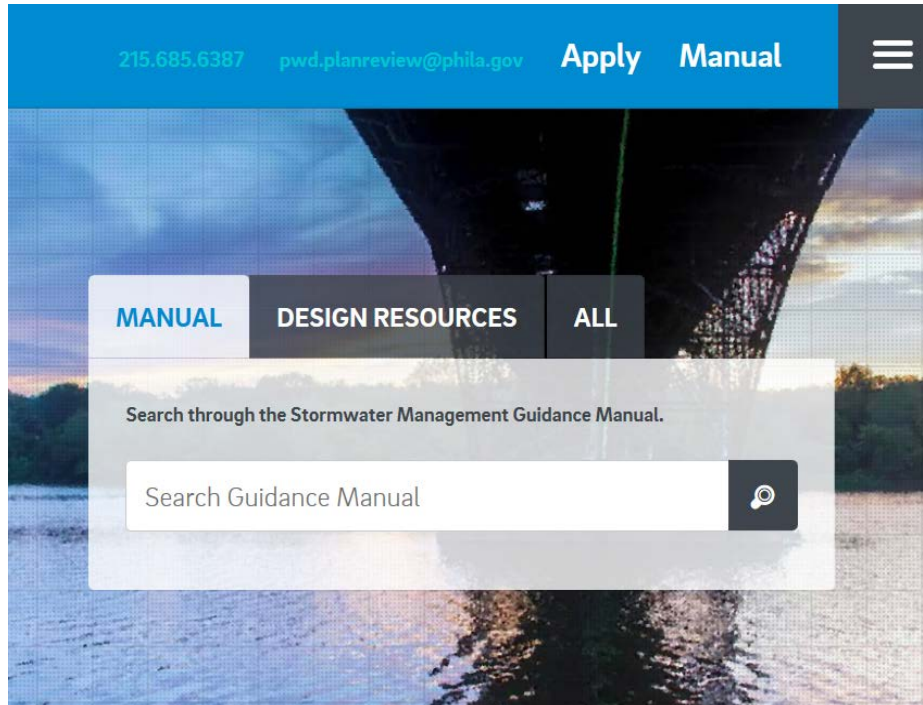
Operation and Maintenance



Private Development Regulations | Resources

Stormwater Plan Review Website

- Online ERSA Application and web-based Guidance Manual
- General information about stormwater management
- User login and project status information



Guidance Manual

- Follows project life cycle from conceptual planning to post-construction maintenance
- Content is fully searchable and links connect related information

Stormwater Tracking Database

- Internal system tracking critical project information: applicability, project contacts, compliance data, and review status

Private Development Regulations | Review Process

Conceptual Review (5-day)

Online application and upload plans via website

Preliminary review of site layout, SWM strategy, and utility connections

Pre-requisite to the City Zoning Permit

Technical Review (15-day)

Full engineering review, including E&S

Joint review with PADEP for >1 acre

Operation & Maintenance Agreement

Pre-requisite to the City Building Permit



Private Development Regulations | Active Construction Inspection

Inspector assigned to each site

Pre-construction meeting to review sequencing, procedures, E&S

Must notify inspector before starting SMP construction

Submit Construction Certification Package for each SMP and related features

Enforcement with Notice of Violation and Stop Work Order



Private Development Regulations | Project Closeout

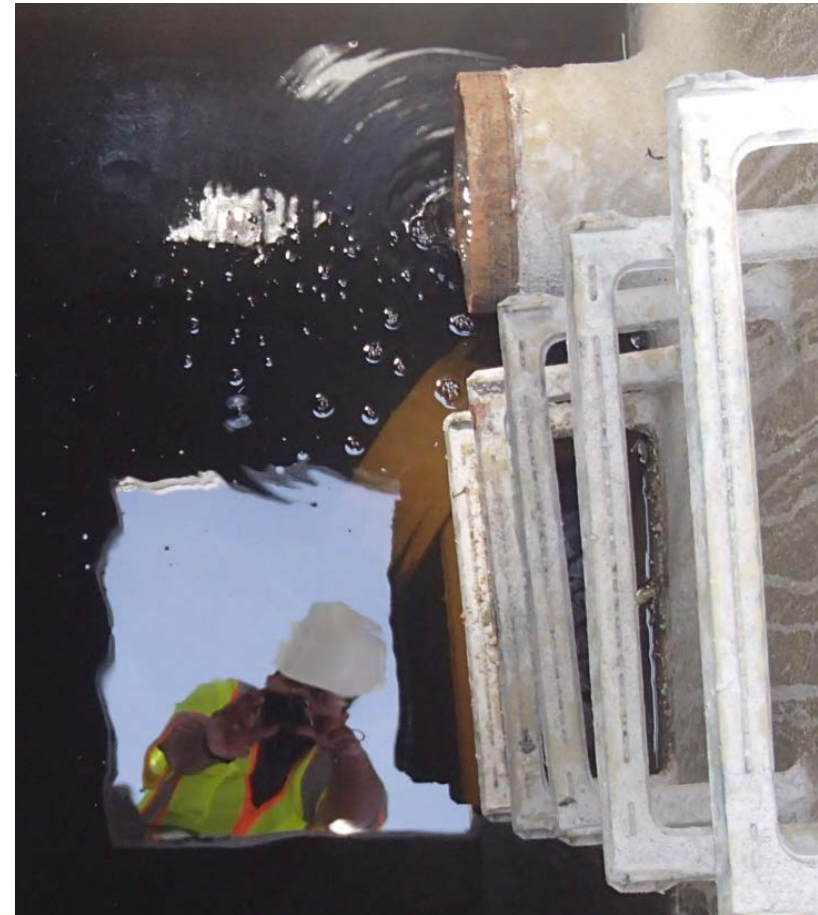
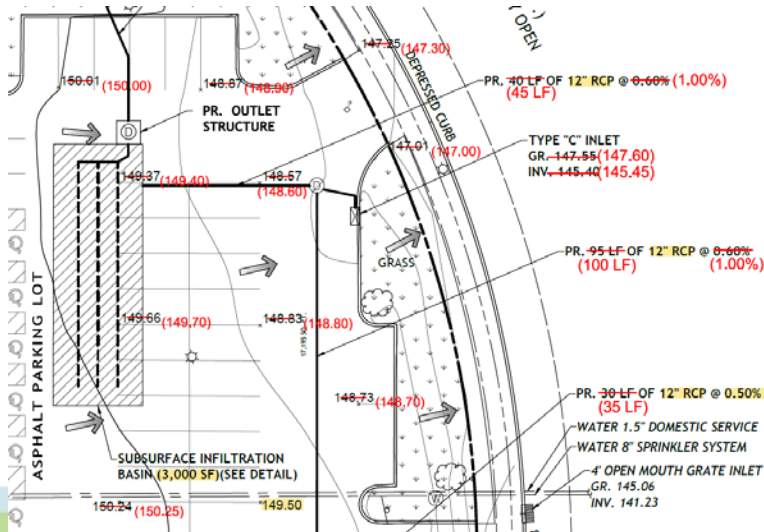
Final inspection and walk-through

- Project: property owner, engineer, and contractor
- PWD: technical reviewer and inspector

Record Drawing

Verified project data

Encourage applicant to apply for credits



Private Development Regulations | Post Construction Inspection

Inspect installed SMPs to ensure maintenance and functionality

- Inspection frequencies align with PWD permit commitments
- Perform outreach and education with property owner responsible for maintenance
- Monitor systems to evaluate performance and design standards

Enforcement mechanisms to ensure compliance

Regular maintenance is a requirement of O&M Agreement and to continue credit on stormwater bill



Private Development | Coordination



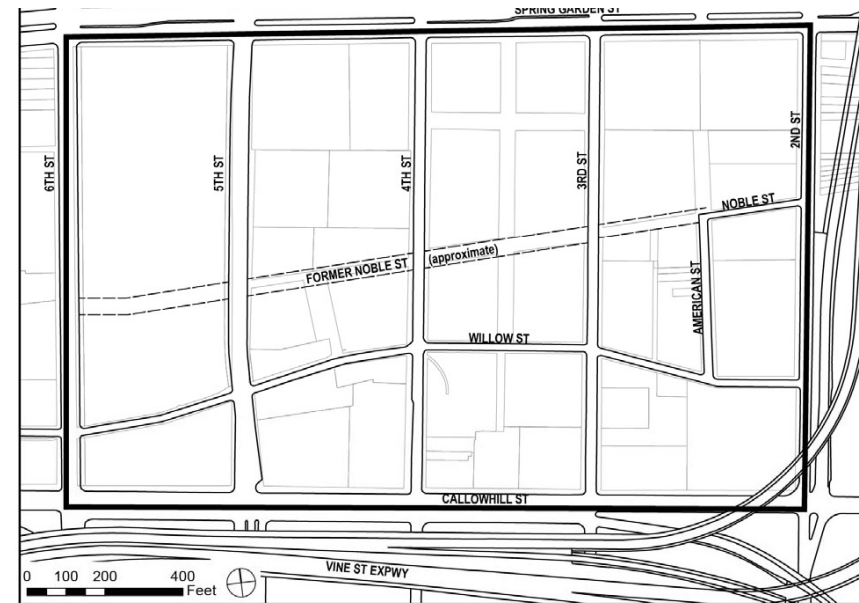
Green Roof Density Bonus

Zoning Code §14-602(7)

The green roof conditions necessary to satisfy the density exceptions for RM-1 and CMX-2 districts are as follows:



- **Density and Height Bonuses and Tax Incentives** for stormwater management beyond regs will help PWD to get additional GAs and provide benefits to both the community and developers



□ East Callowhill Overlay (applies to all lots)

Parcel Based Billing and Incentives | Stormwater Credits

- Private properties with maintained SMPs are eligible for stormwater credits
 - Non-residential only
 - Includes development and voluntary retrofit projects
- PWD offers up to 80% credit for the management of 1" of stormwater
 - **Approximately 250 properties currently receiving credits**
 - **Credits must be renewed every 4 years**
 - Recommended annual inspection by qualified professional
 - Required every 4 years with renewal application



Parcel Based Billing and Incentives | Stormwater Management Incentives

Stormwater Management Incentives Program Grant



This program offers grant funding to non-residential PWD customers for design and construction of stormwater projects.

Eligibility

Only non-residential properties are eligible for SMIP grant funds. Applicants must be owners of the property or have permission from the property owner(s). The applicant cannot be an agency with the City of Philadelphia, the Commonwealth of Pennsylvania or any United States Department or Federal Agency. Use of funds is restricted to projects that support the design and construction of stormwater mitigation measures. These may include, but are not limited to: detention and retention basins, tree trenches, green roofs, porous paving, and rain gardens.

Evaluation Requirements

Projects will be evaluated based on a variety of criteria, including, but not limited to, the total volume of runoff managed, the expected benefits of the project and the ability of the grantee to leverage other funding sources. Competitive applications will limit grant requests to \$100,000 per impervious acre managed or less. All funded projects will be required to file a deed restriction in the form of an Access, Operations, and Maintenance Agreement with the property.

Process

A selection committee comprised of PWD staff will evaluate applications. Applications must be submitted electronically by 12pm January 31, 2014. Applicants will be notified by July 1, 2014 if their applications have been accepted. Selected grantees will be eligible to receive credits towards their stormwater charges upon successful construction of the stormwater project.



Learn More & Apply

For more information about the SMIP Grant go to:
www.phillywatersheds.org/what_were_doing/SMIP_Grant.

To apply for the SMIP Grant go to:

www.pidc-pa.org/development-and-contract-opportunities/rfp-rfq-opportunities.

For questions about the grant contact Erin Williams at Erin.Williams@phila.gov or 215.685.6070.



Green City, Clean Waters

phillywatersheds.org

Greened Acre Retrofit Program Grant



This program provides grant funding to companies or contractors to construct stormwater projects across multiple properties in Philadelphia's combined sewer area.

Eligibility

Funding for the Greened Acre Retrofit Program (GARP) is reserved for stormwater retrofit projects on private property in the combined sewer area only. Properties undergoing redevelopment are not eligible for GARP funding and must comply with PWD's Stormwater Regulations. Recipients of the grant funds are limited to companies and project aggregators that can assemble large areas, often over multiple properties, for stormwater management projects. The recommended minimum project size is 10 acres.

Evaluation Requirements

GARP applications will be evaluated based on a variety of criteria including total area managed, cost to PWD, quality of long-term maintenance plan and availability of matching funds. Competitive applications will limit grant requests to \$90,000 per impervious acre managed or less. Agreements or contracts with any participating property owners must be included in the application.

Process

Applications can be submitted electronically to PIDC at any time. A selection committee comprised of PWD staff will evaluate applications and issue decisions at the close of each fiscal quarter. Selected grantees will enter into a subgrant agreement with PIDC to move forward with project design and implementation. Owners of properties participating in the GARP grant project are required to execute an Operations and Maintenance Agreement with PWD. Project aggregators are required to execute an Economic Opportunity Plan as part of the subgrant agreement.



Learn More & Apply

For more information about the GARP Grant go to:
www.phila.gov/swgrant

To apply for a GARP grant go to:

www.pidc-pa.org/development-and-contract-opportunities

For questions about the grant contact Erin Williams at erin.williams@phila.gov or 215.685.6070.



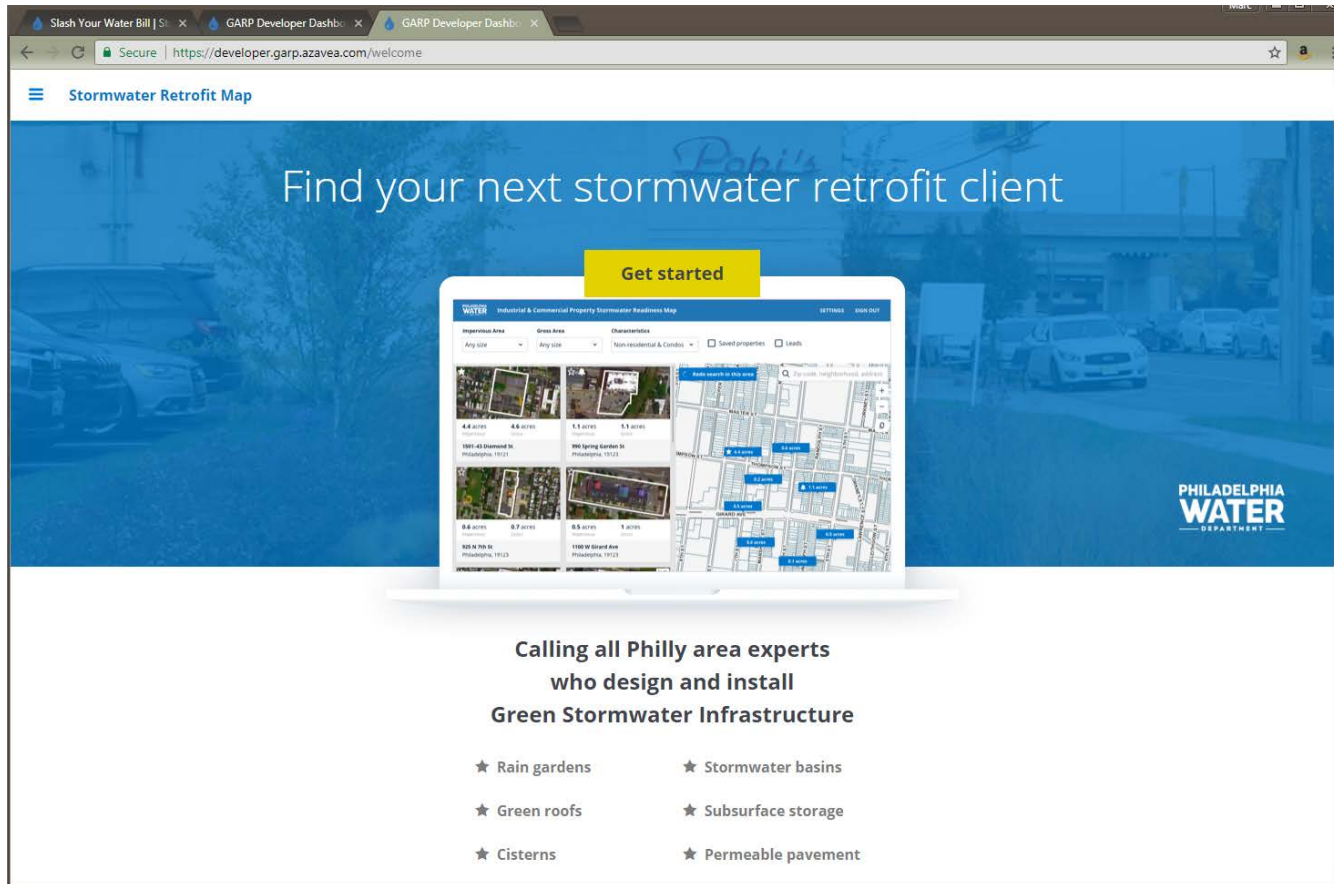
www.phila.gov/swgrants

Parcel Based Billing and Incentives | SMIP & GARP Grants

- PWD in partnership with PIDC provides money to
 - Non-residential property owners for design and construction of SMPs (SMIP)
 - Companies or project developers to design and build SMPs across multiple properties in combined sewer (GARP)
- Owners/customers receive stormwater fee credits
- PWD receives property interest for 45 years
- Owners must maintain stormwater projects to continue receiving credits and as condition of receiving grant funds

Incentives | SMIP & GARP Grants Growth

Retrofits “Matchmaking” Website



Stormwater Retrofit Map

Find your next stormwater retrofit client

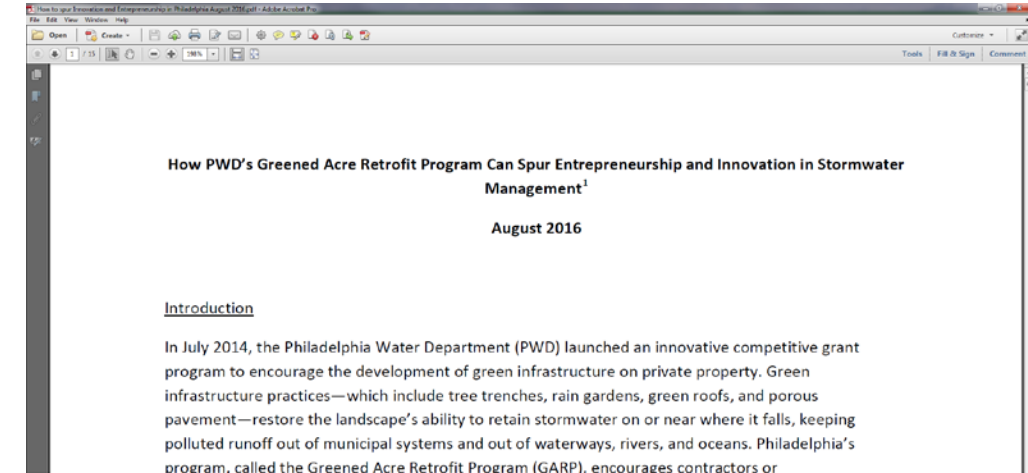
Get started

PHILADELPHIA WATER DEPARTMENT

Calling all Philly area experts who design and install Green Stormwater Infrastructure

- ★ Rain gardens
- ★ Stormwater basins
- ★ Green roofs
- ★ Subsurface storage
- ★ Cisterns
- ★ Permeable pavement

WPF – SBN/NRDC Report Aug 2016



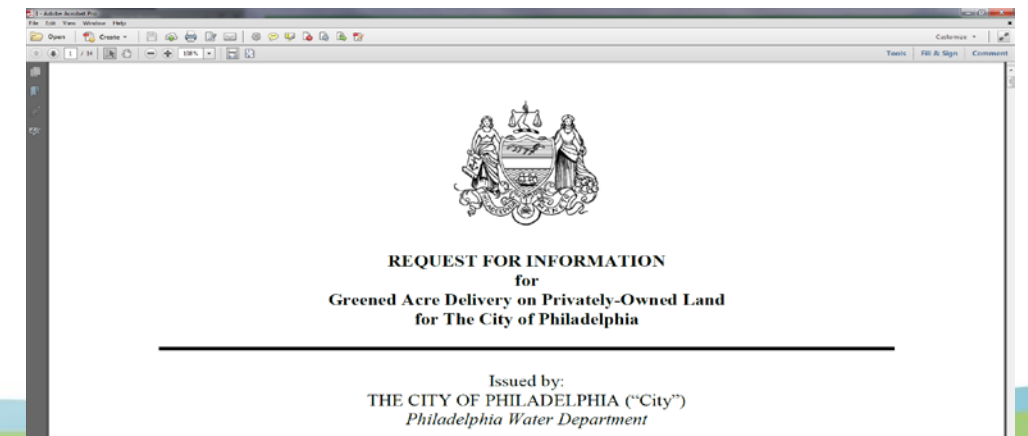
How PWD's Greened Acre Retrofit Program Can Spur Entrepreneurship and Innovation in Stormwater Management¹

August 2016

Introduction

In July 2014, the Philadelphia Water Department (PWD) launched an innovative competitive grant program to encourage the development of green infrastructure on private property. Green infrastructure practices—which include tree trenches, rain gardens, green roofs, and porous pavement—restore the landscape's ability to retain stormwater on or near where it falls, keeping polluted runoff out of municipal systems and out of waterways, rivers, and oceans. Philadelphia's program, called the Greened Acre Retrofit Program (GARP), encourages contractors or

RFI – GA Delivery Feb 2018



REQUEST FOR INFORMATION
for
Greened Acre Delivery on Privately-Owned Land
for The City of Philadelphia

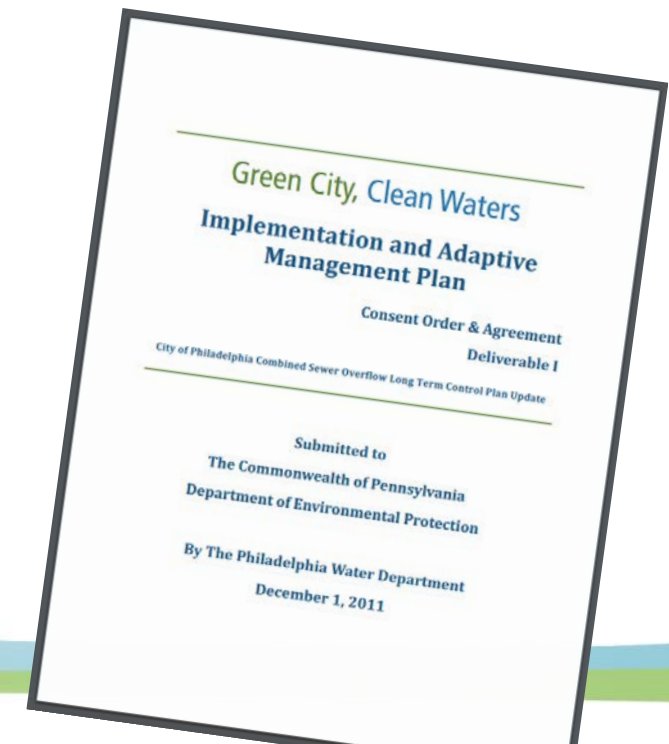
Issued by:
THE CITY OF PHILADELPHIA ("City")
Philadelphia Water Department

Monitoring | Importance

“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***

Feedback Loop!



Monitoring | Program Performance/Pilot Results Summary and Lessons

- The performance monitoring of GSI (results of infiltration rate, storage use, and drain down duration analyses together) makes a strong case that GSI systems are performing better than predicted using current engineering design assumptions
 - The systems **overflow less often than predicted**
 - The systems experience **higher infiltration rates and faster drain down times than predicted**
 - The systems have **more excess storage capacity available than predicted** over a range of events
 - Water is **efficiently captured** by GSI once inflow structure retrofits are performed
 - Earlier ID of **bypass** at new systems is critical

Co-Benefits | Triple Bottom Line – People / Planet / Profit Product



Economic Benefits

- Property values
- Job creation
- City competitiveness

Environmental Benefits

- Fish in streams
- Swimmable streams
- Habitat quality
- Air quality
- Energy savings
- Carbon footprint



Social Benefits

- Safe and accessible streams
- Recreation
- Aesthetics
- Public health
- Social equity
- Heat Stress Reduction
- Crime Reduction



Co-Benefits | Not your traditional return on investment

- **Public Health and Safety**

- Significant ***reductions in narcotics possession*** and ***narcotics manufacture***

- **Crime**

- 10% increase in urban tree canopy was associated with a roughly 12% ***decrease in crime***

- **Mental Health**

- Areas that have the most trees along the streets also had ***fewer prescriptions for antidepressants***
- ...people reported ***less mental distress*** and ***higher life satisfaction*** when they were living in greener areas
- Life satisfaction increased by 2% and psychological distress decreased by 4%
- As green space increased within a 2.5-mile radius of where they lived, overall ***well-being increased*** proportionally

Co-Benefits | Not your traditional return on investment

- **Academics**

- Richer and poorer areas saw similar ***increases in scores*** with increasing vegetation
- ...that surrounding greenness has approximately equal effects on student academic performance regardless of financial status or gender
- ...consistent and systematically ***positive relationships between nature exposure and student performance***
- Views with greater quantities of trees and shrubs from cafeteria as well as classroom windows are ***positively associated with:***
 - ***standardized test scores, graduation rates***, and percentages of students planning to ***attend a four-year college***
 - ***restoration from mental fatigue*** and ***stress reduction***

Co-Benefits | Economic Impacts of First 5 Years

- \$47 million PWD investment + \$60 million private
- \$1 million local tax revenue
- \$1.46 million local GSI industry
- 14% increase GSI industry annual revenue, 2013-14
- 430 local jobs each year



GREEN STORMWATER
INFRASTRUCTURE
PARTNERS
REIMAGINING STORMWATER



So, What's Next...

- **Innovation**
 - Cost reduction and efficiencies particularly within Design, Construction, Maintenance and Monitoring elements
 - Standardizing best practices
 - Expanding programs and incentives for private green infrastructure activities
 - **Alternative Project Delivery Methods**
 - **Development Incentives**
 - National GSI Practitioners Information Exchange
- Continue to generate more **Green Jobs**
- **Monitoring performance at scale**
- Grow **community partnerships** to engage in planning and to address local needs
- Integrate GSI/CSO controls with **flooding and climate change**

Green City, Clean Waters

www.phila.gov/water

www.phillywatersheds.org

www.pwdplanreview.org

www.phila.gov/water/swmap/

@PhillyH2O





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