



DAY 2/NBS FOR URBAN AND RURAL LANDSCAPES

# Urban NBS Case Studies: United States



# Urban NBS for Stormwater Management

**Philadelphia, Pennsylvania**



**Wilmington, Delaware**



**Tucson, Arizona**



**Seattle, Washington**



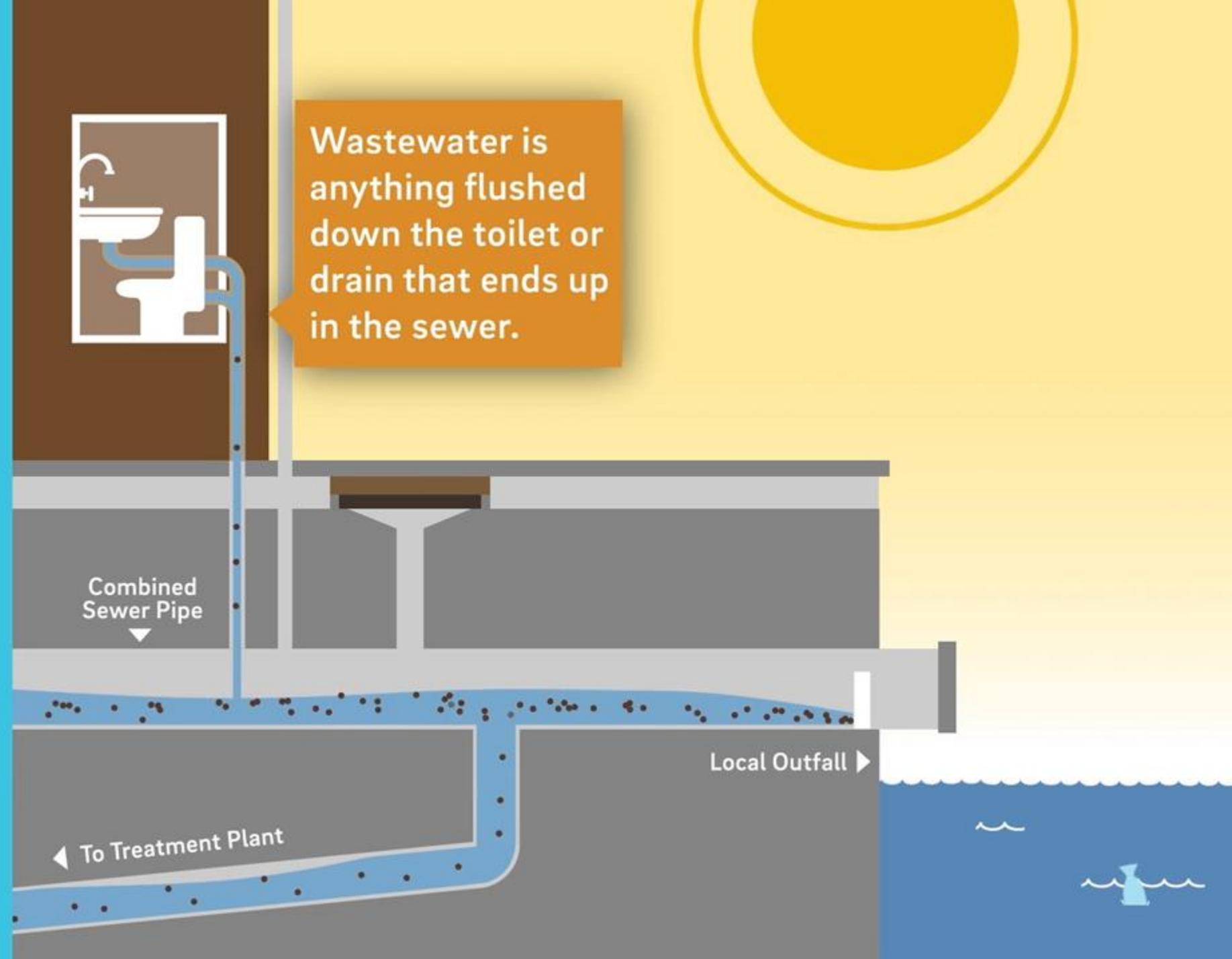
# Philadelphia, Pennsylvania



- 1.6 million people
- Bound by Delaware and Schuylkill rivers
- Historic U.S. city and infrastructure, including municipal water supply system
- High poverty rate (>22% of population)
- Inequitable distribution of parks and green spaces
- Northeast U.S. - climate impacts include increasing temperatures and increasing precipitation

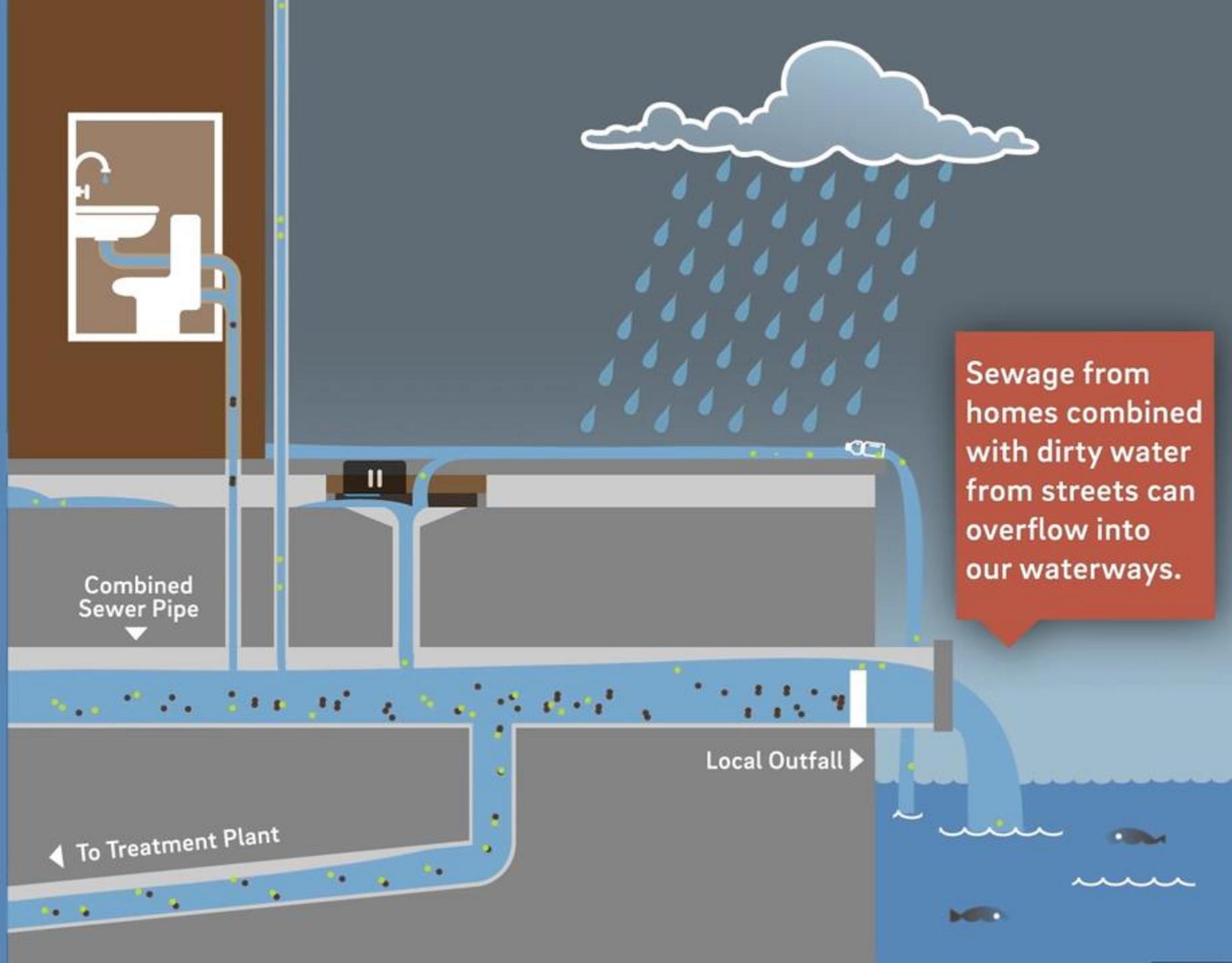
# Philadelphia's Combined Sewer Overflow

In dry weather,  
only wastewater  
from homes  
flows into our  
combined sewers...  
and then to the  
treatment plant.



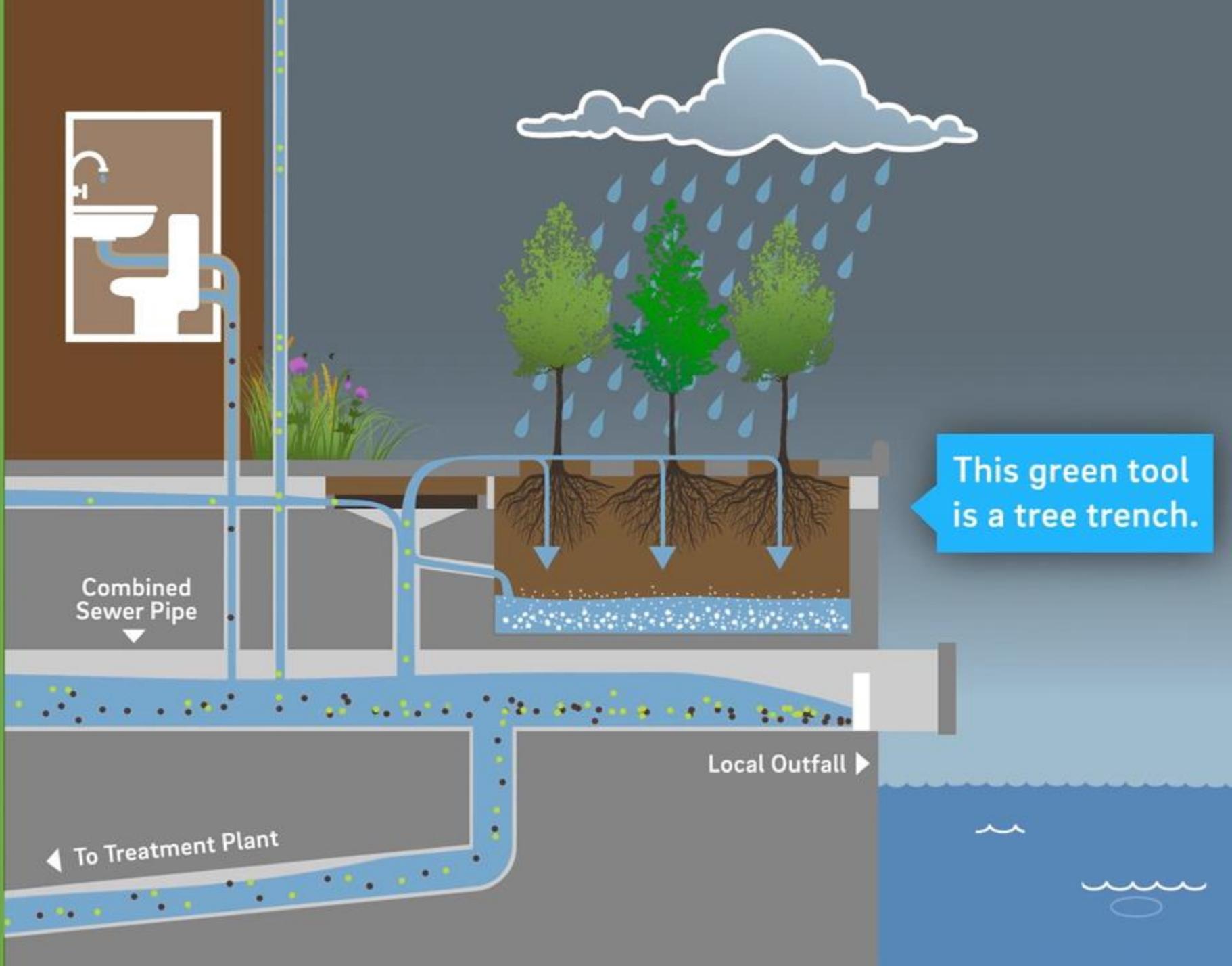
## Philadelphia's Combined Sewer Overflow

Those combined  
sewers can't  
always handle  
the extra water  
from storms...  
and can overflow.



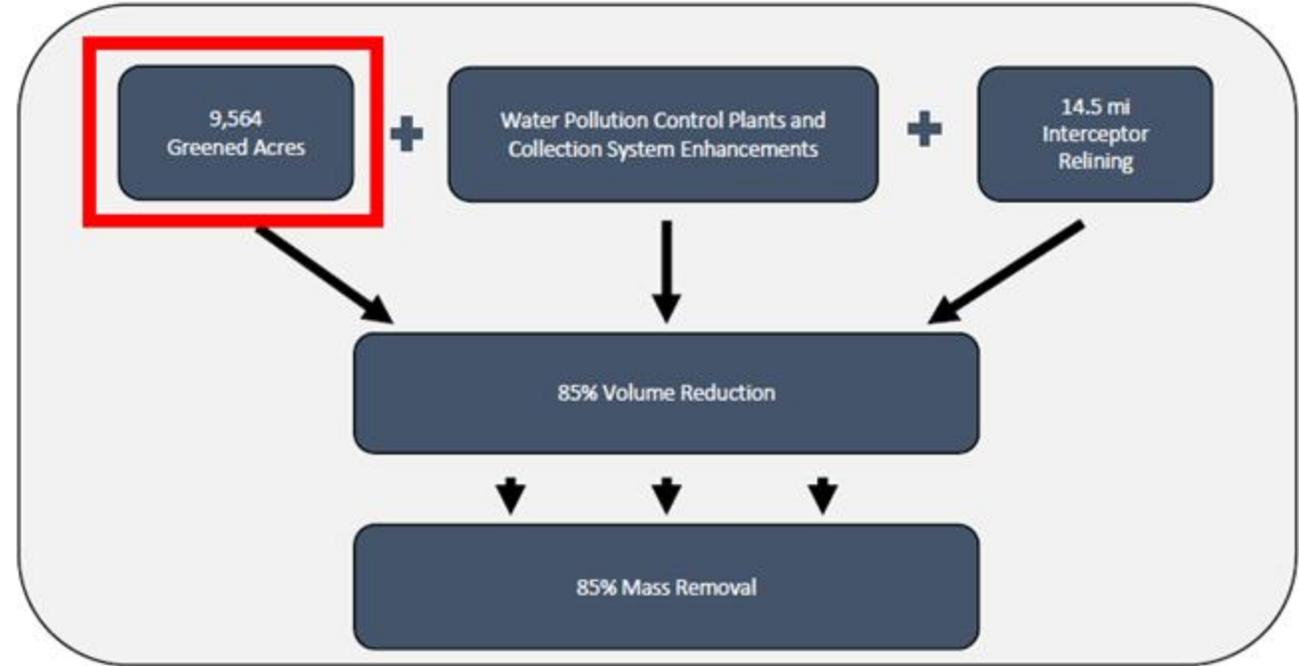
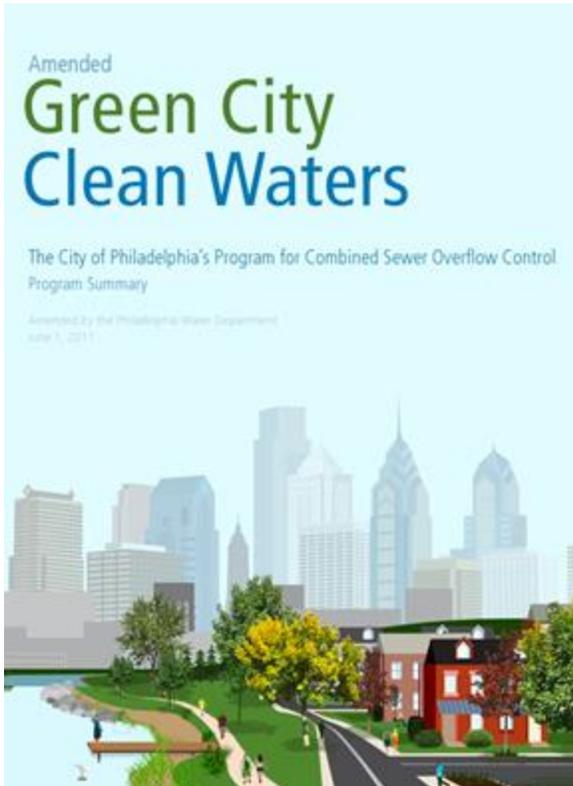
# Philadelphia's Combined Sewer Overflow

Green tools store  
polluted runoff  
and plants soak  
up some extra  
water... helping  
stop overflows.

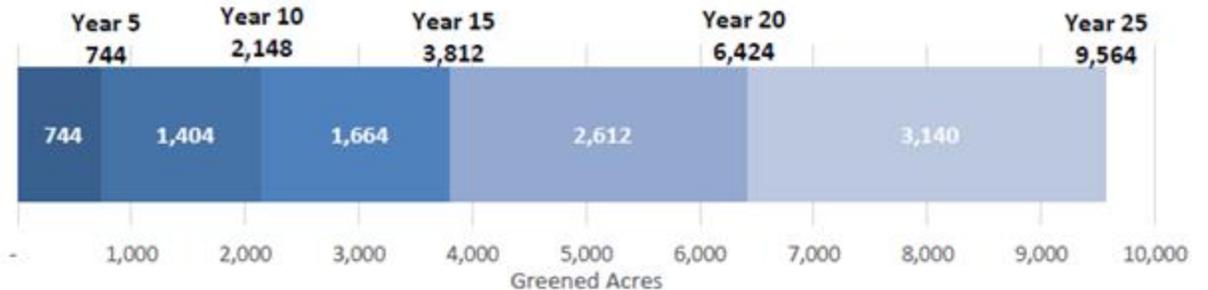


This green tool  
is a tree trench.

# Green City, Clean Waters Plan



25 Year COA/NPDES Greened Acre Obligation



# “Green tools”

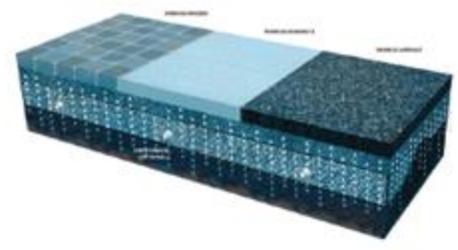
## Rain Gardens



## Stormwater Bumpouts



## Porous Pavement



## Stormwater Planters and Green Gutters



## Downspout Planters and Rain Barrels / Cisterns



## Tree Trenches & Stormwater Trees

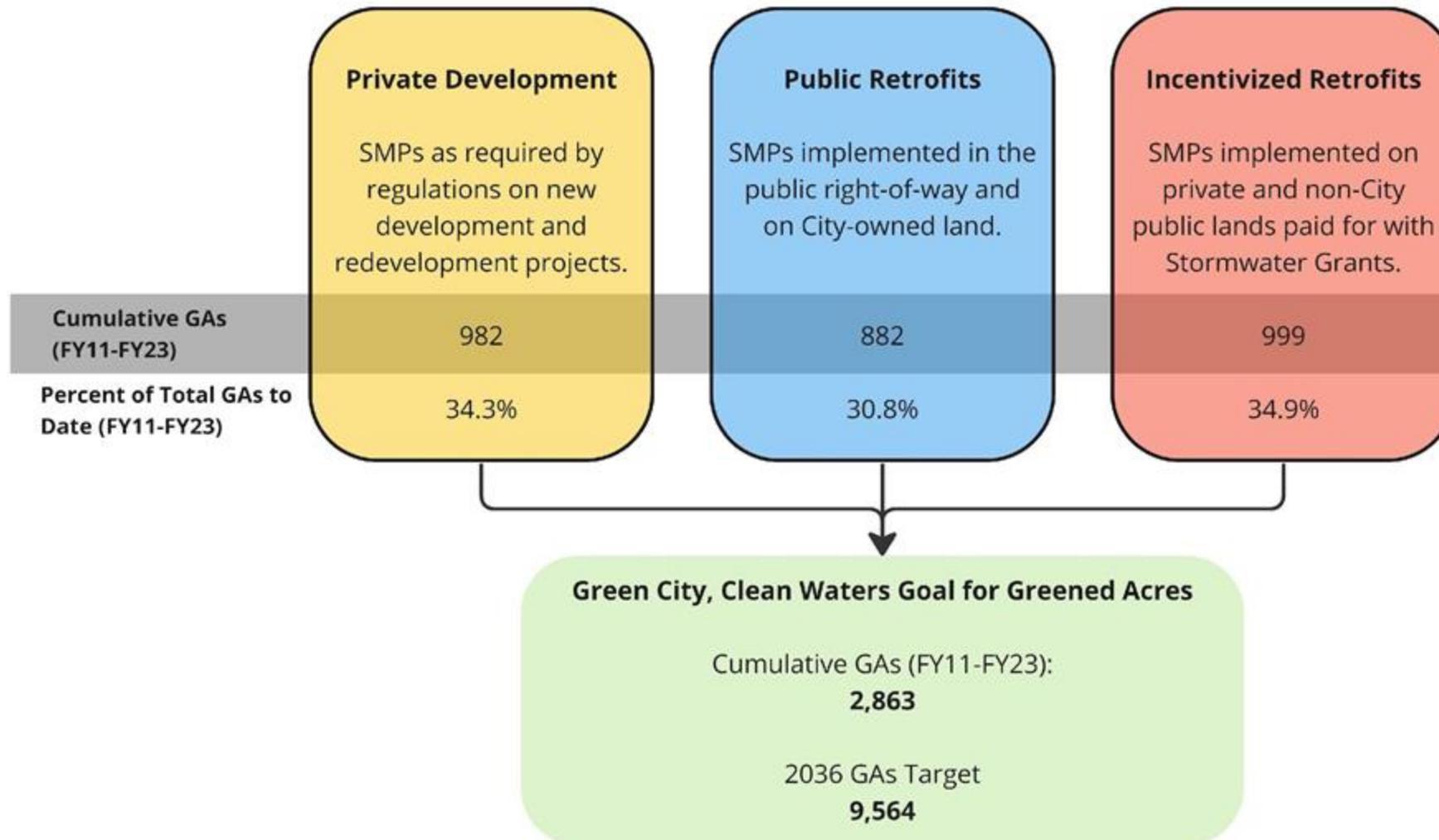


# Approaches adapted to specific sites



Image credit: Philadelphia Water Department

# Project Pipelines



# Green City, Clean Waters Plan

*Green City, Clean Waters* continues to make tremendous progress since launching in 2011. We exceeded our 10-year pollution reduction goal, with new infrastructure investments now keeping nearly **three billion gallons** of stormwater runoff and sewer overflow out of local waterways.



We've installed more than 2,800 green tools...

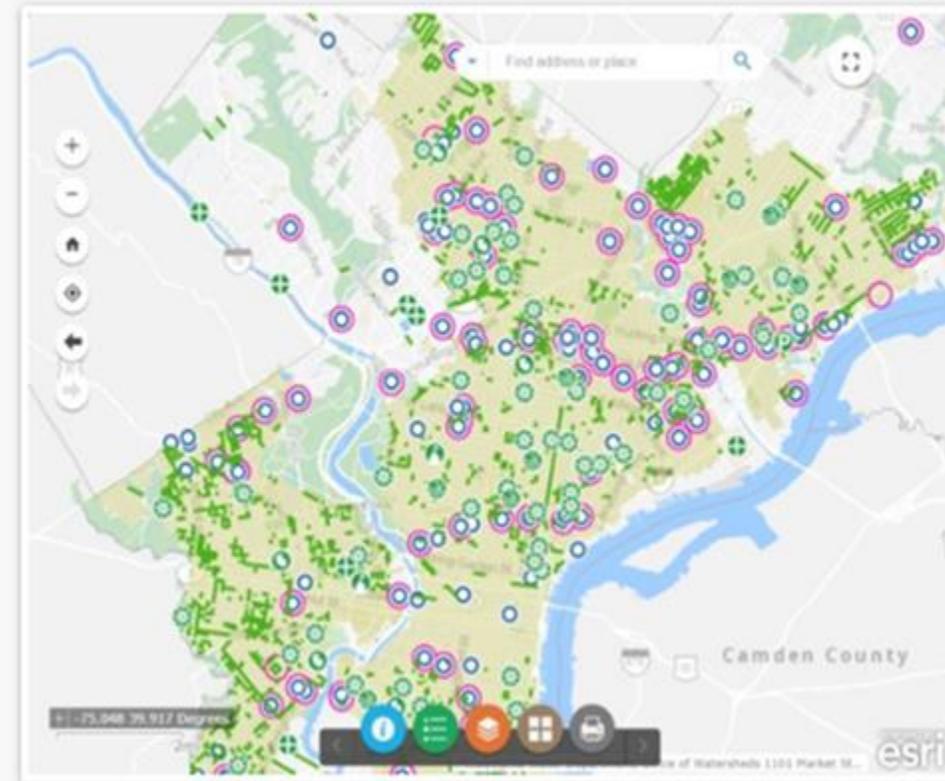


...at nearly 800 sites throughout the city...



...keeping more than 2.7 billion gallons of polluted water out of our rivers.

For more details, see the city's CSO Long Term Control Plan and Annual Reports →



Click the map to see Green Infrastructure in your neighborhood or visit [Projects & Construction](#) to see what's coming soon

# Co-benefits of Urban NBS



## Environmental

*Using plants in green tools benefits our environment*

- Improves water quality and supply
- Improves air quality
- Reduces carbon emissions
- Creates wildlife habitat



## Economic

*Investing in green tools boosts Philadelphia's economy*

- Creates local jobs
- Increases property values
- Promotes recreation and tourism
- Increase local business investments
- Save on energy costs
- Avoided infrastructure replacement costs



## Social

*Adding green tools creates healthier communities*

- Reduces urban heat
- Reduces flood risk
- Improves physical and mental health
- Creates parks and green space
- Increases equitable access
- Promotes social cohesion

# Quantifying Co-benefits of Urban NBS

**GSI IMPACT CALCULATOR**

- Welcome
- Define Scenario
- Refine GSI Portfolio
- Evaluate Benefits
- Review Costs
- Explore Results

## Welcome to the GSI Impact Calculator!

This calculator allows you to quantify and monetize the multiple benefits, or co-benefits, associated with green stormwater infrastructure (GSI) projects early in the planning process. Users can input information at the block level to determine recommended GSI Best Management Practices (BMPs) and estimate associated benefits and costs from proposed projects that extend beyond typical water quality and quantity goals. The calculator incorporates the following benefit categories:

- Avoided Infrastructure Costs
- Avoided Replacement Costs
- Energy Savings
- Water Supply
- Air Quality
- Property Values

- Ecosystem
- Heat Stress
- Recreation
- Water Quality
- Green Jobs
- Carbon Sequestration

Visit [GSI Impact Hub](#) to learn more about the multiple benefits of GSI and designing stormwater projects for the greatest impact.

PROCEED

Capturing the Multiple Benefits of Green Infrastructure
Date: <DATE>

### Present Value Benefits and Costs

Over the 30-year analysis period, total present value benefits amount to \$X, or an average of \$X per year. This compares to total present value costs of \$X, including capital and maintenance costs over time.

Category	Value
Costs	\$12,090,481
Financial	\$15,317,899
Social	\$565,500
Environmental	\$12,090,481

Note: present value benefits and costs are calculated using a discount rate of 3%

### GSI Benefits

The GSI scenario selected for this analysis will result in multiple benefits. The makeup of these benefits is shown below.

Benefit Category	Percentage
Enhanced recreation	75%
Community uplift values	13%
Improved habitat	7%
Avoided infrastructure costs	2%
Avoided replacement costs	1%
Reduced urban heat stress	1%
Improved air quality	1%
Other	1%

# Wilmington, Delaware



## Southbridge Wilmington Wetlands Park

- 20-acre park completed in 2022
- Reduce flooding to Southbridge neighborhood
- Restore and enhance existing tidal wetlands
- Included separation of existing combined sewer system
- Remediated contaminated soils at brownfield site
- Improved recreation and access to new development

# Southbridge Wilmington Wetlands Park

**BEFORE CONSTRUCTION**  
At Flood's Peak

- 12.6 acres of Southbridge flooded
- 2.1 million gallons of combined sewage and stormwater have backed up into the streets



Image credit: RK&K, City of Wilmington

# Tucson, Arizona



## Sweetwater Wetlands

- Completed by Tucson Water in 1996
- Constructed to refine effluent from wastewater treatment plant and recharge into aquifer for water supply
- Urban wildlife refuge
- Recreational amenities and connection to bike trail
- Southwest U.S. - climate change impacts include increasing temperatures (and less snowpack) as well as decreasing precipitation

# Sweetwater Wetlands



# Seattle, Washington



## Aurora Bridge Bioswales

- Bio-swales and other green infrastructure practices completed in 2020
- Located below I-5 highway bridge
- Mitigates 98 million gallons of runoff to Lake Union and neutralizes toxins that are lethal to salmon
- Creates community green space
- Incorporates environmental education
- Northwest U.S. - climate change impacts include increasing temperatures leading to less snowpack and more rain

# Aurora Bridge Bioswales



Image credit: Weber Thompson, Meghan Montgomery/Built Work  
pHOTOGRAPHY, Justin weber



# THANK YOU

