Venema Natural Drainage System

Seattle's Green Stormwater Infrastructure (GSI) Program

September 19, 2018 // WaterNZ

Tracy Tackett
Capital Portfolio Manager

Seattle Public Utilities

BRIEFING OBJECTIVES:

Contextualize Seattle's green infrastructure work

Share highlights on two existing programs:
RainWise & NDS Partnering

Provide overview program direction

N. Transfer Station Project

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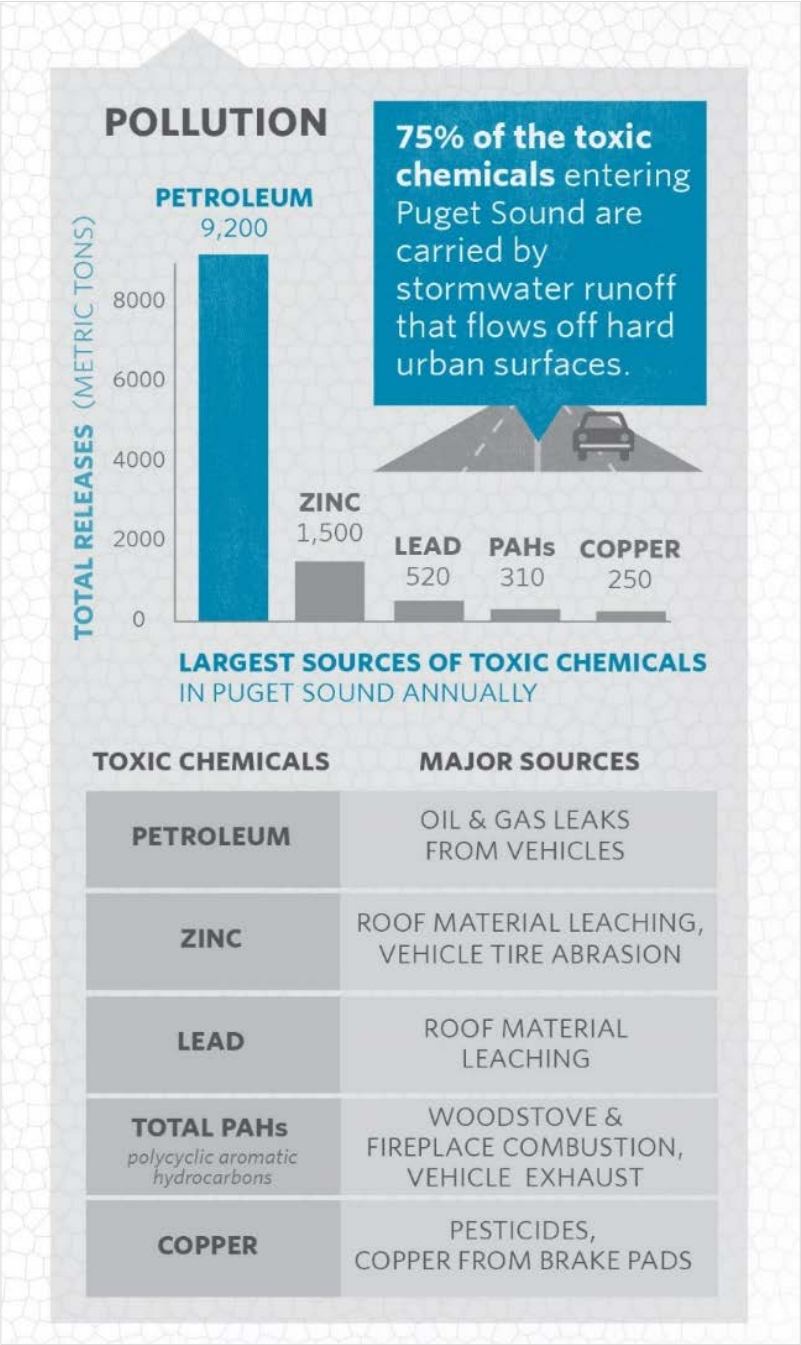

TOXIC CHEMICALS	MAJOR SOURCES
PETROLEUM	OIL & GAS LEAKS FROM VEHICLES
ZINC	ROOF MATERIAL LEACHING, VEHICLE TIRE ABRASION
LEAD	ROOF MATERIAL LEACHING
TOTAL PAHs *polycyclic aromatic hydrocarbons*	WOODSTOVE & FIREPLACE COMBUSTION, VEHICLE EXHAUST
COPPER	PESTICIDES, COPPER FROM BRAKE PADS

12M pounds of pollution are released into our waterways every year, carried by stormwater rushing off Seattle's roads and roofs

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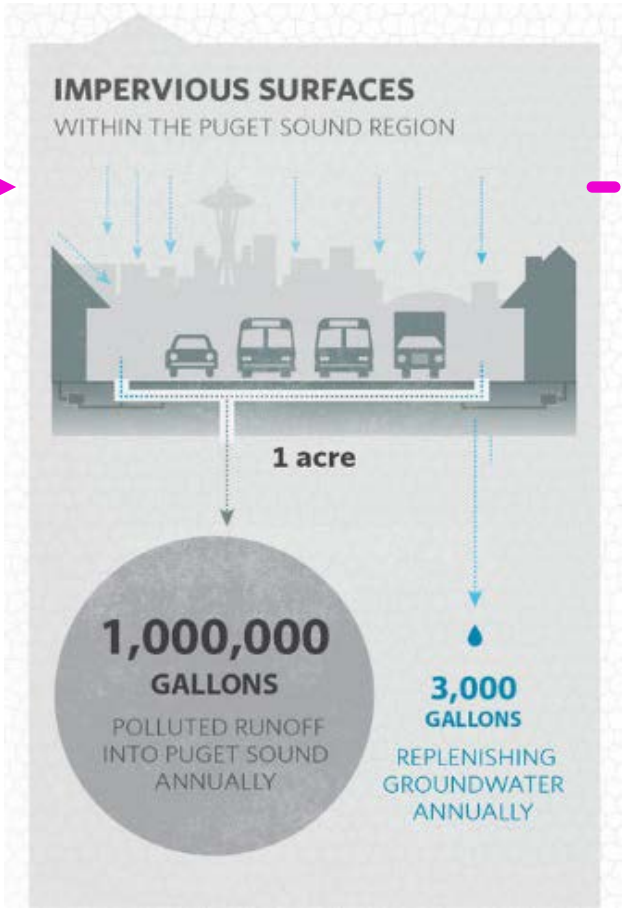

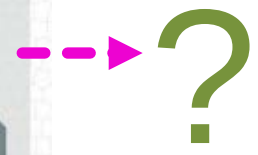

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TOOLS ON PRIVATE LAND

	RESIDENTIAL SCALE	COMMERCIAL SCALE
CISTERNS	 RainWise cisterns	 Greenfire, Ballard
GREEN ROOFS	 Garage roof	 Gates Foundation
PERVIOUS PAVING	 Pervious Driveway	 Pervious Parking Lot
RAIN GARDENS/ BIORETENTION	 RainWise raingarden	 Portland School Yard

TOOLS ON PUBLIC LAND

total drainage area
129 ACRES


Highpoint

total drainage area:
435 ACRES

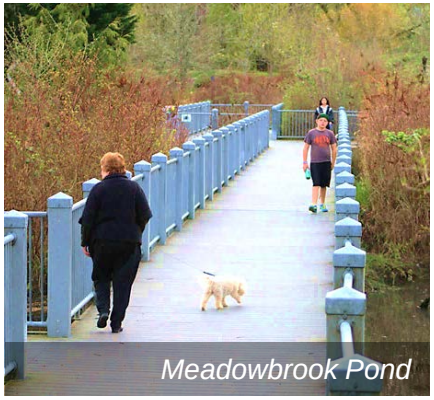

Swale on Yale

multi-benefit use of the right-of-way

primary project purpose:
FLOOD PREVENTION


Madison Valley

primary project purpose:
FLOOD PREVENTION


Meadowbrook Pond

multi-benefit use of parcels

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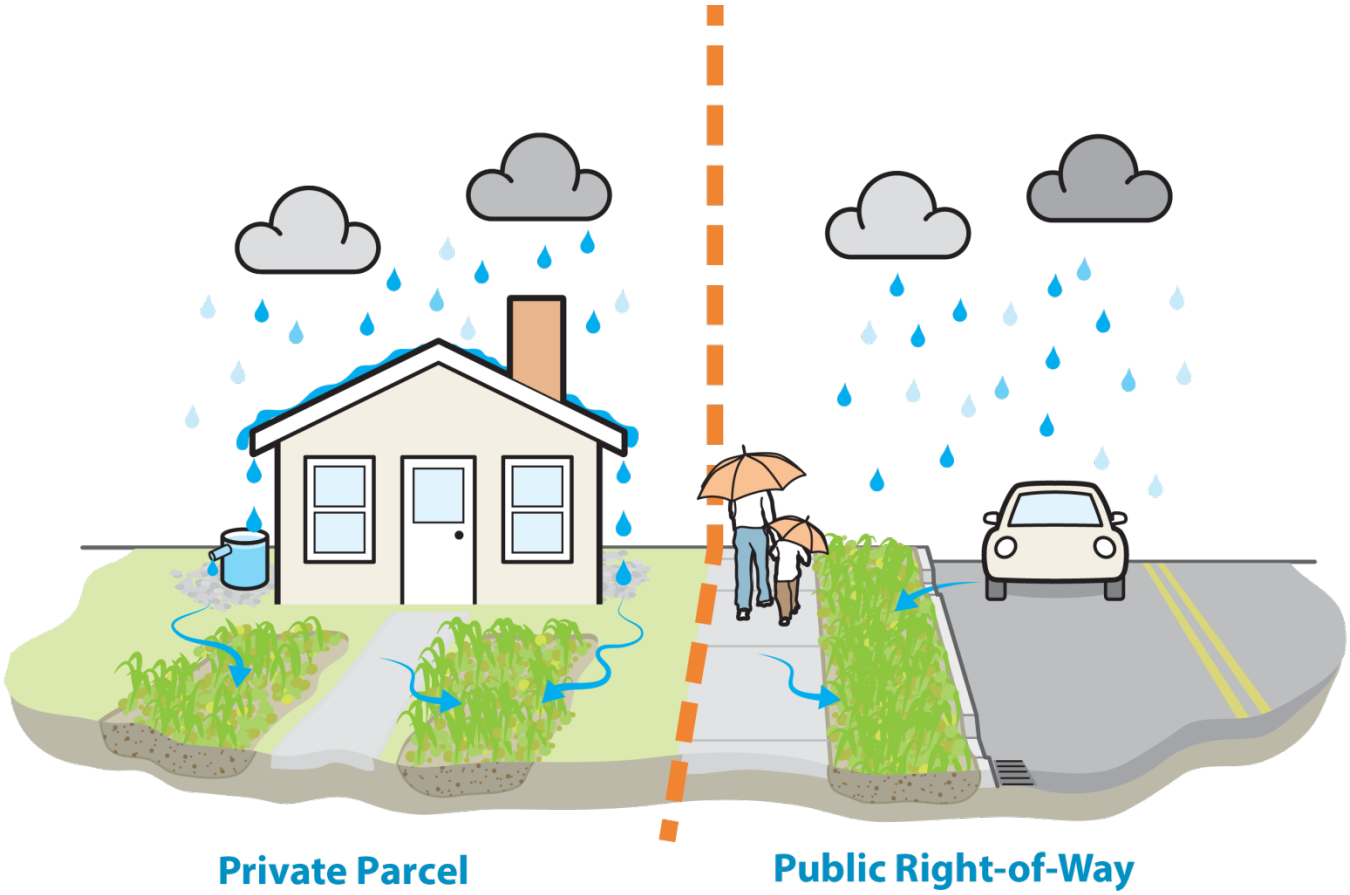
Terminology Clarification



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Green Stormwater Infrastructure Program History

GSI work driven by

Examples

2000

Creek protection and salmon recovery

SEA Street; 110th St. Cascade; Pinehurst and Broadview Green Grids;

HighPoint Redevelopment

2008

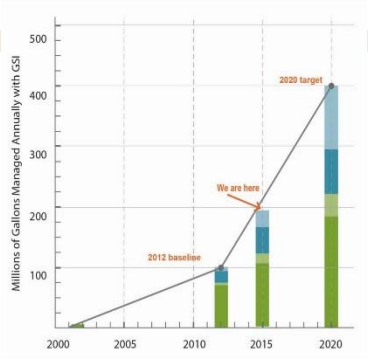
Early CSO compliance and Stormwater Code

RainWise program development

GSI required in Stormwater Code

2013

Citywide policy & code updates and Integrated (CSO/SW) Plan



Citywide commitment and target

$35M Natural Drainage System Partnering Program

2017

Investments integrated with open space, transportation, and development

$35M Urban Village Program

North Transfer Station; Fremont Building

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SEA Street

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Broadview Green Grid

Natural Drainage System
at 107th from Palatine facing west

Broadview Green Grid

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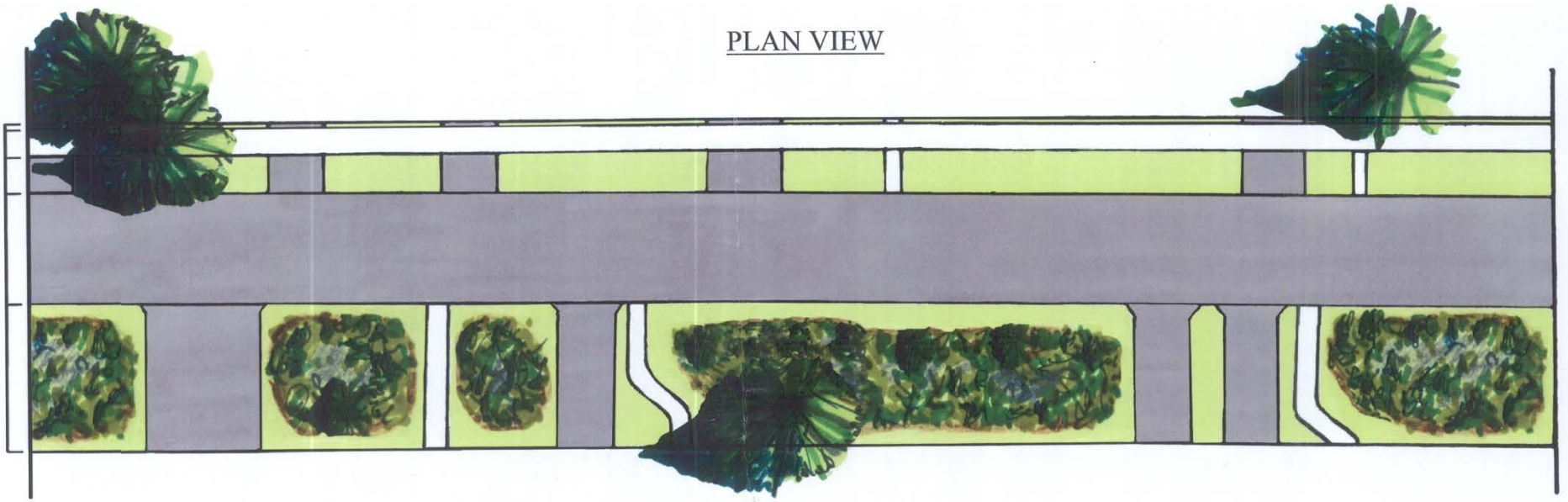
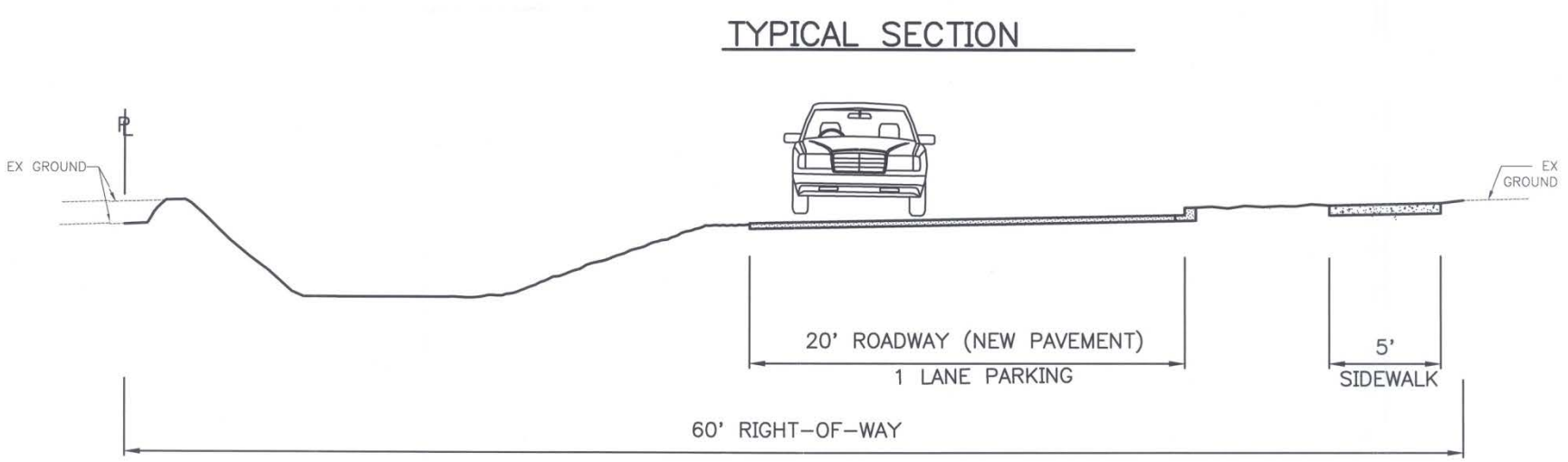
Pinehurst Green Grid

Pinehurst Green Grid





High Point Redevelopment

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Porous Pavement

High Point Redevelopment

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Ballard Roadside Raingardens

Capitol Hill Water Quality Channel

"Swale on Yale"

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Ballard NDS Project

Shortened Crossings

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Ballard NDS

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Performance Innovation

Taking Advantage of the Area Under the Sidewalk

Legend

- A Raingarden
- B Modular Subsurface Soil Cell
- C 18" Pedestrian Step-out Area
- D Pedestrian Access Route Per Plans
- E New Sidewalk w/ Decorative Pattern
- F 4" Pedestrian Curb
- G Curb Cut Inlet/Outlet
- H Weathered Steel Weir
- I Street Tree Planting

* Illustration represents approximately 3 years growth following installation.

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Ballard NDS Innovation

Structural soil cells

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Venema

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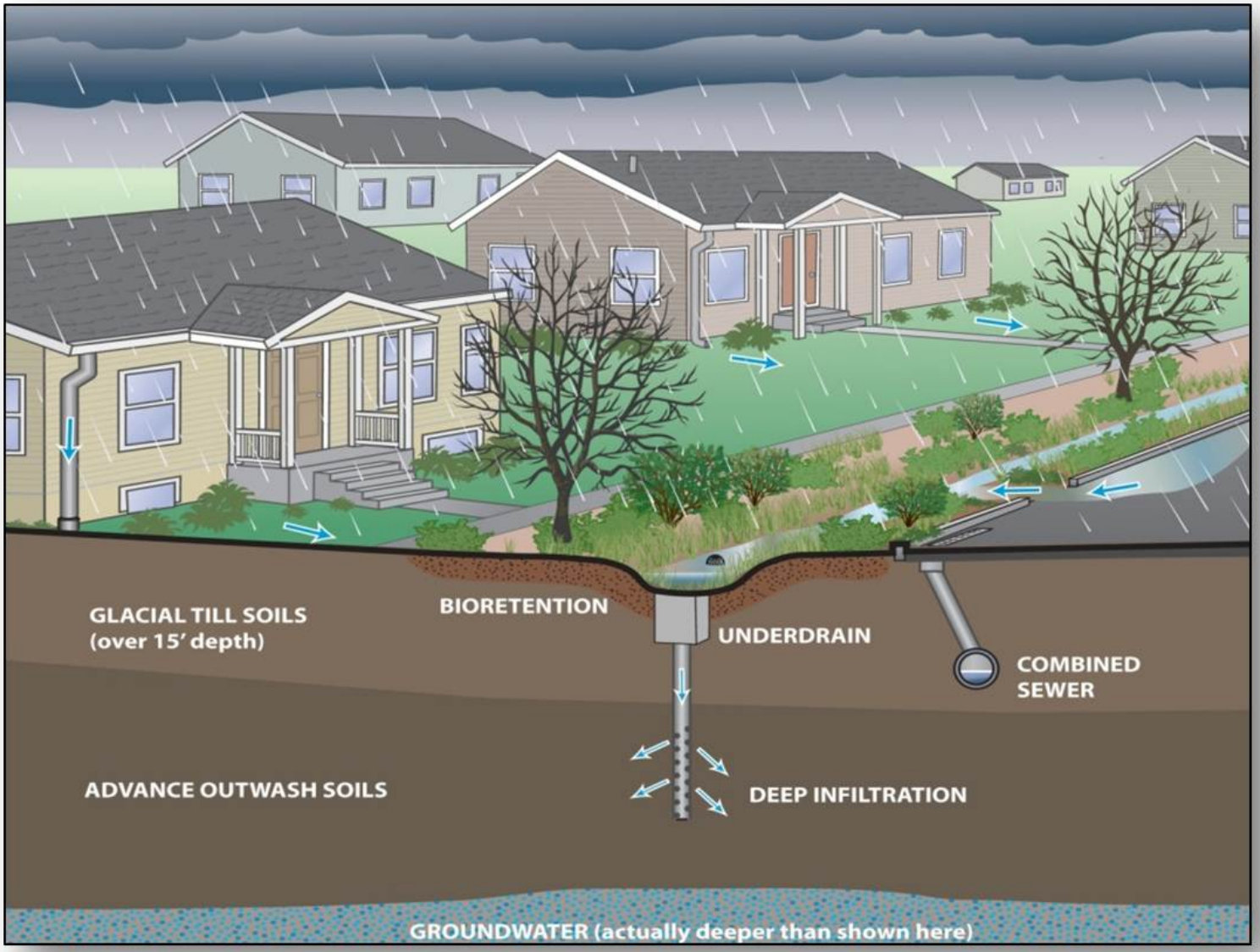
Deep Infiltration:

Underground Injection Control (UIC) Wells



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Delridge NDS

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30th Ave NE Project

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Highland Park Community Center
Depave & Raingarden Project

Why we lead with green:

- Best management practice & in some areas, the only cost effective approach
- Higher value per rate payer dollar
- People-centered

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NEARBY NATURE = HUMAN HEALTH*

*Improvements to support a healthy environment for all can exacerbate displacement risk in communities of color and low income communities. This must be addressed with cohesive Citywide strategy.

Stormwater Pollution Is a Regional Challenge

Seattle Helps Set the Pace for Green Solutions

Menu The Seattle Times **Environment**

LOCAL BIZ/TECH SPORTS ENTERTAINMENT LIFE TRAVEL HOMES OPINION |

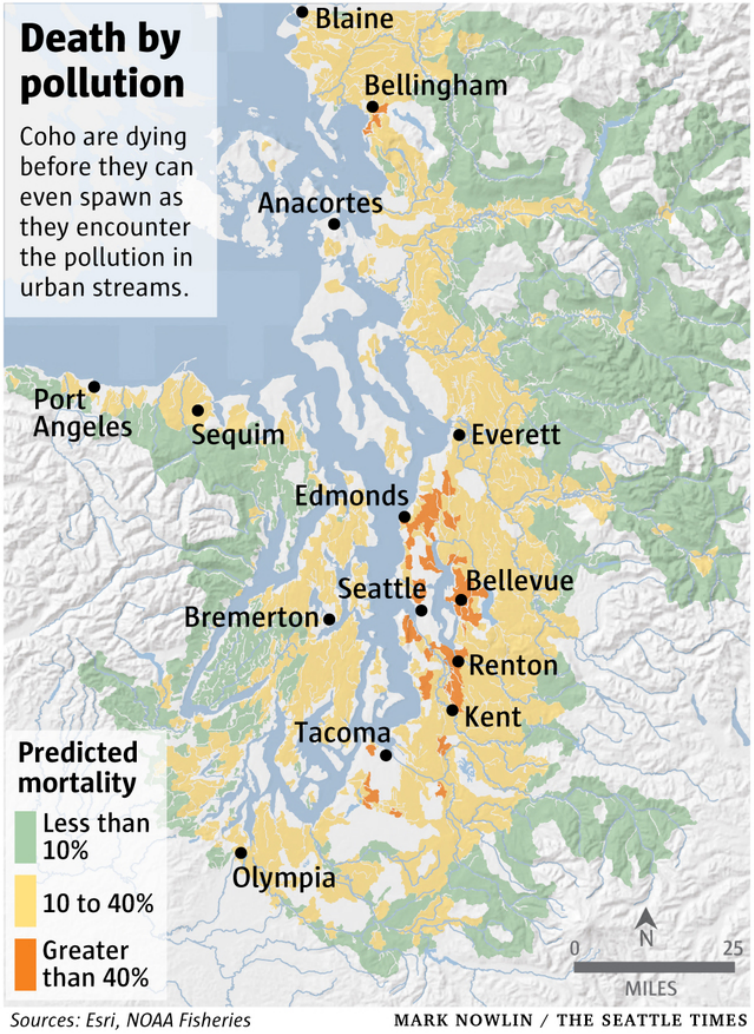
Traffic Lab Project Homeless Crime Local Politics Education Eastside Health Data

Environment | Local News | Northwest | Puget Sound

Stormwater pollution in Puget Sound streams killing coho before they can spawn

Originally published October 18, 2017 at 7:00 am | *Updated October 18, 2017 at 12:27 pm*

1 of 2 *Coho salmon, including females full of eggs, are dying before they can spawn in Puget Sound streams polluted with stormwater runoff. (NOAA Fisheries)*



Sources: Esri, NOAA Fisheries MARK NOWLIN / THE SEATTLE TIMES

Stormwater Pollution Is a Regional Challenge

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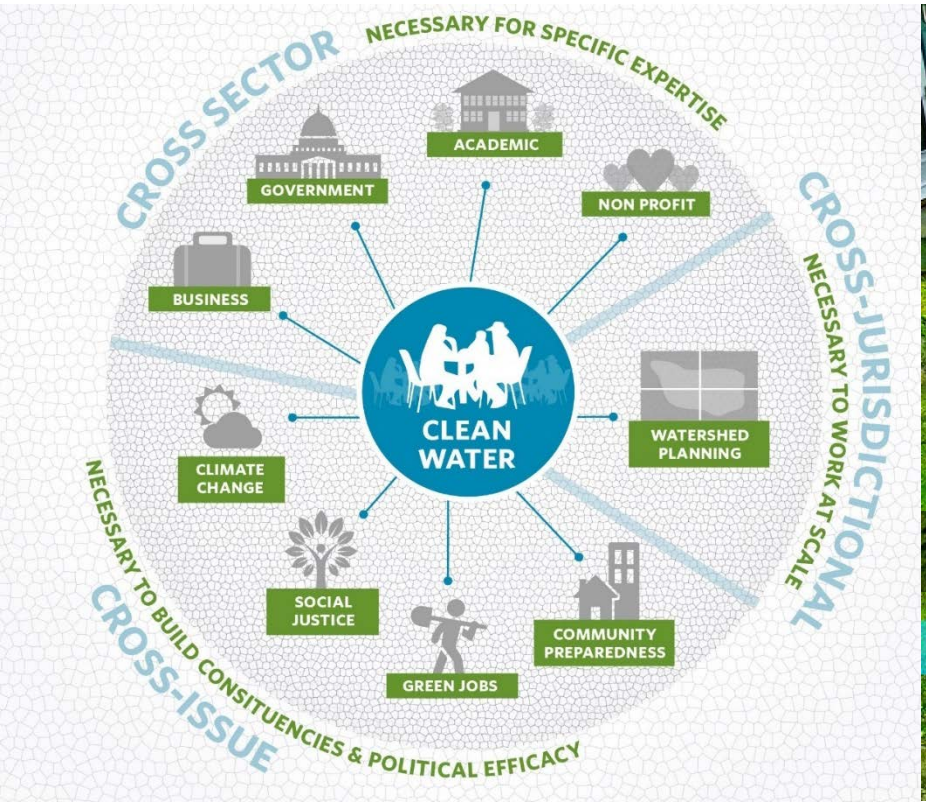

Seattle began its retrofit rebate program – RainWise -- in 2010. There are now similar programs across the Puget Sound region.

Seattle is a founding partner of:

The Green Infrastructure Partnership (GrIP)
Puget Sound Green Infrastructure Summit
Regional RSJ Learning Cohort
City Habitats

GSI Requirements

Stormwater Code

On-site **Flow Control** **Water Quality**

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RainWise

Property Owners = Part of the Solution

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Property Owners = Part of the Solution

Small Contracts, Big Opportunities

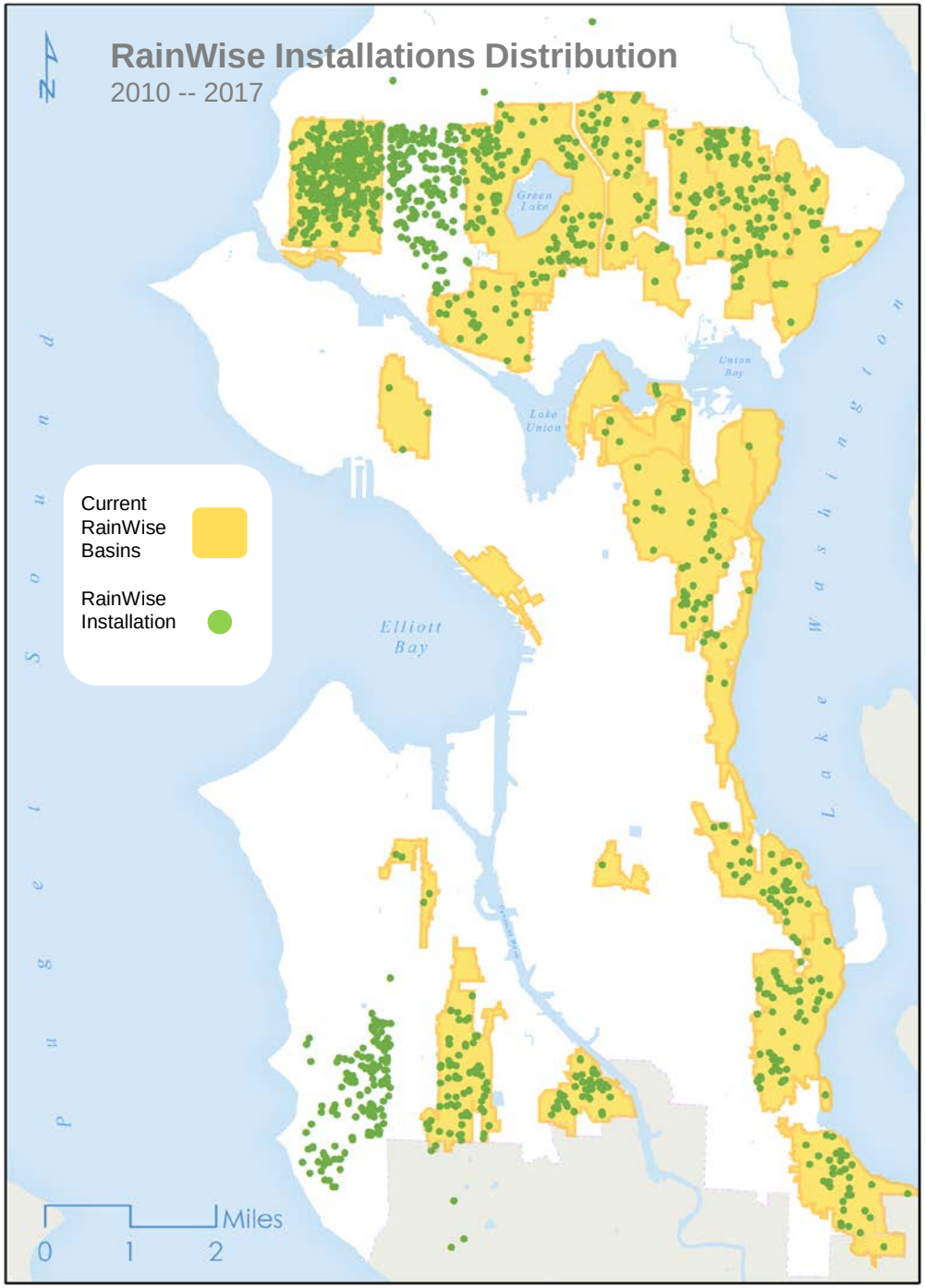
Average install cost: $5K

Most participating contractors are sole proprietorships

First-generation immigrants: 10%

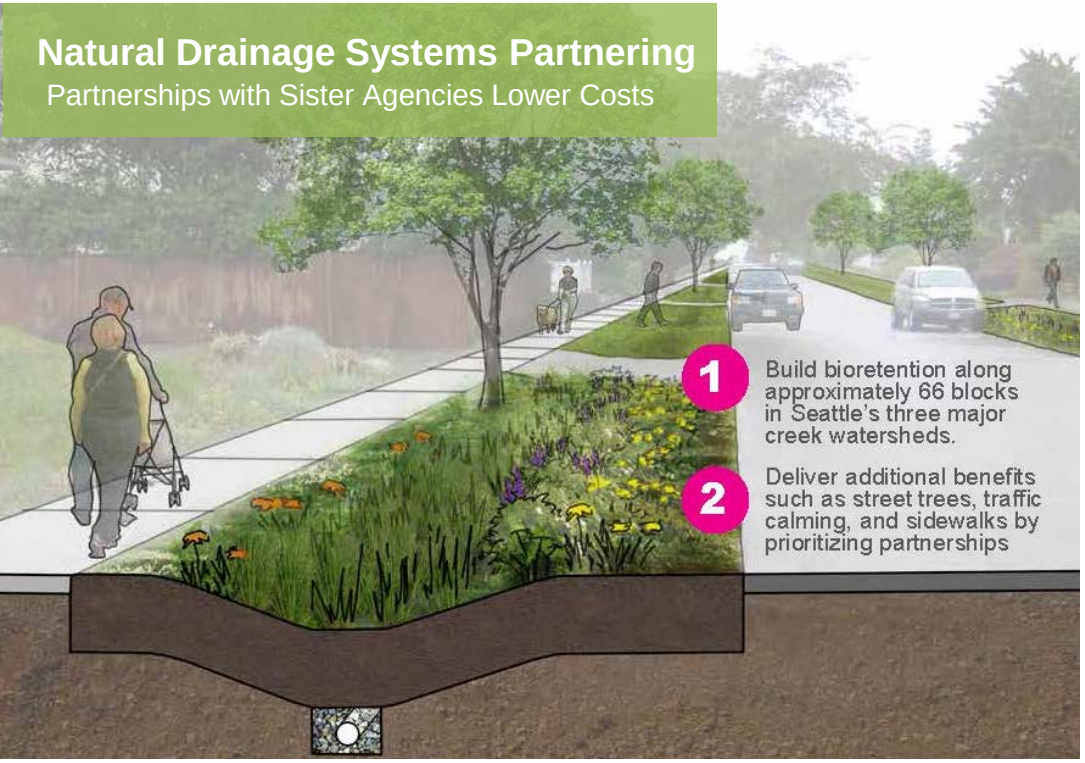
Highest grossing contractor: $200K

Key challenge: business development support



Natural Drainage Systems Partnering

Partnerships with Sister Agencies Lower Costs



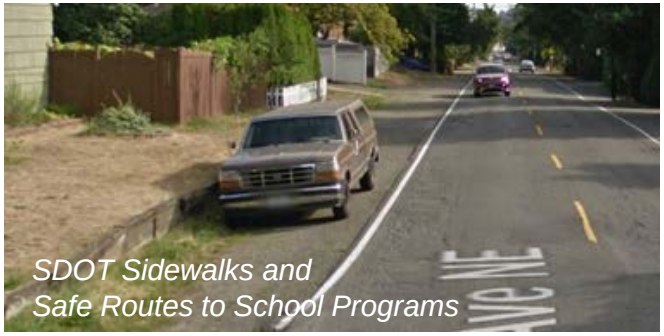
Watershed	Begin Design	Begin Construction
Thornton – 30th NE (SDOT led)	2017	2018
Longfellow	2018	2019
Thornton – south	2018	2019
Thornton – North	2019	2021
Pipers	2020	2022

Highlighted streets are *potentially technically feasible* for a natural drainage system.

SPU is funded to build projects on about 4% of these blocks.

Natural Drainage Systems Partnering

Partnerships with Sister Agencies Lower Costs



SDOT Sidewalks and Safe Routes to School Programs

Localized Flooding

30th Ave. NE in Partnership with SDOT

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Urban Village Program

Improve Drainage, Water Quality, and Livability
In Most Rapidly Growing Areas of Seattle

Projected Population Growth 2015-2035

Seattle's population will grow by 120,000 people in the next 20 years.

How will we leverage the moment of redevelopment **– the lowest cost moment to update our infrastructure systems –** to optimize public and private value, including:

- A climate-ready drainage & wastewater system
- Multi-functional/multi-seasonal open space
- Long-term stewardship of stormwater facilities
- Greater flexibility and creativity for developers
- Clear/explicit racial equity outcomes

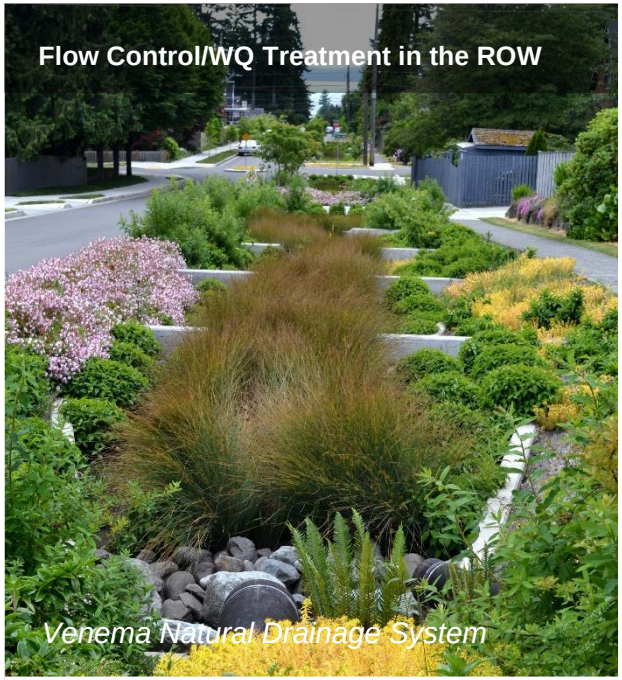
Tanner Springs Park
Pearl District, Portland

Urban Village Program

Improve Drainage, Water Quality, and Livability
In Most Rapidly Growing Areas of Seattle

POTENTIAL TYPOLOGIES

Flow Control/WQ Treatment in the ROW



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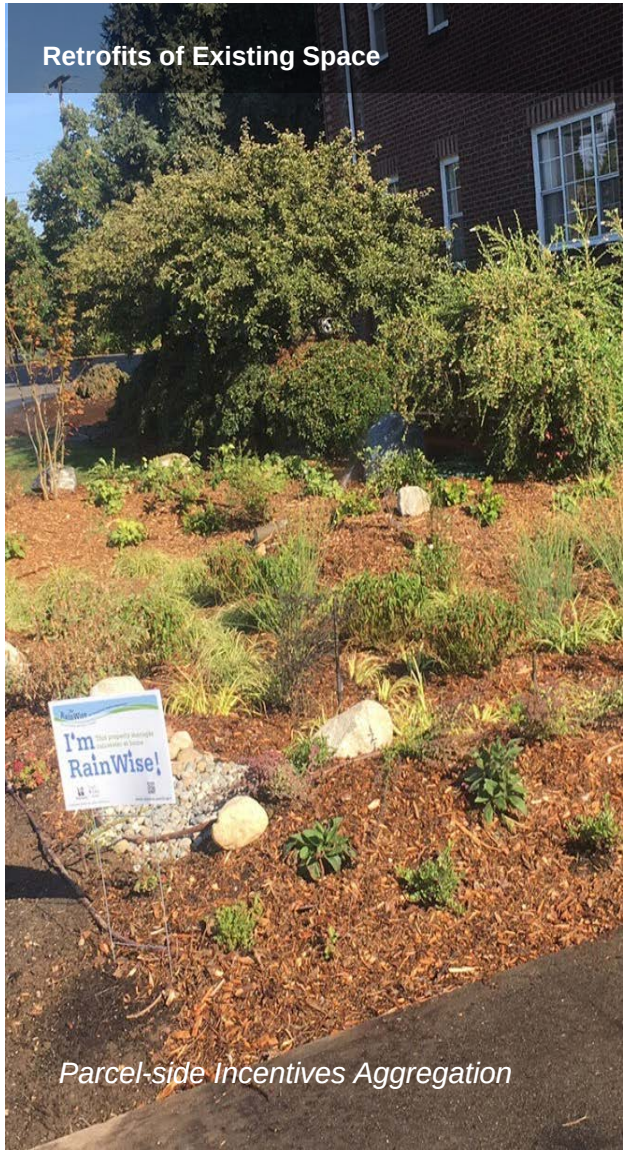
Swale on Yale

Purpose-built Stormwater Parks

Madison Valley

Manchester, Kitsap County

Retrofits of Existing Space



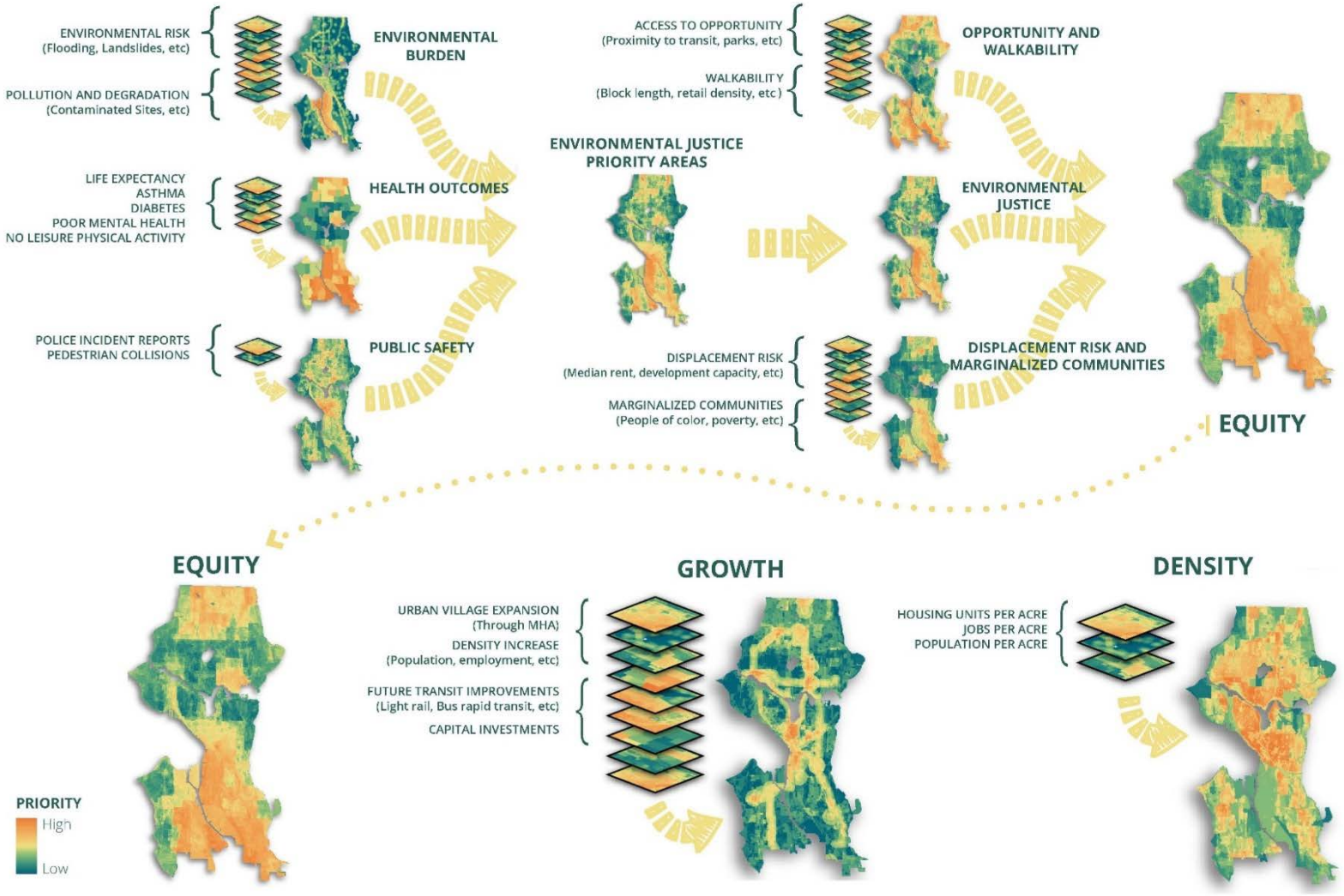
Parcel-side Incentives Aggregation

Urban Village Program

Improve Drainage, Water Quality, and Livability
In Most Rapidly Growing Areas of Seattle

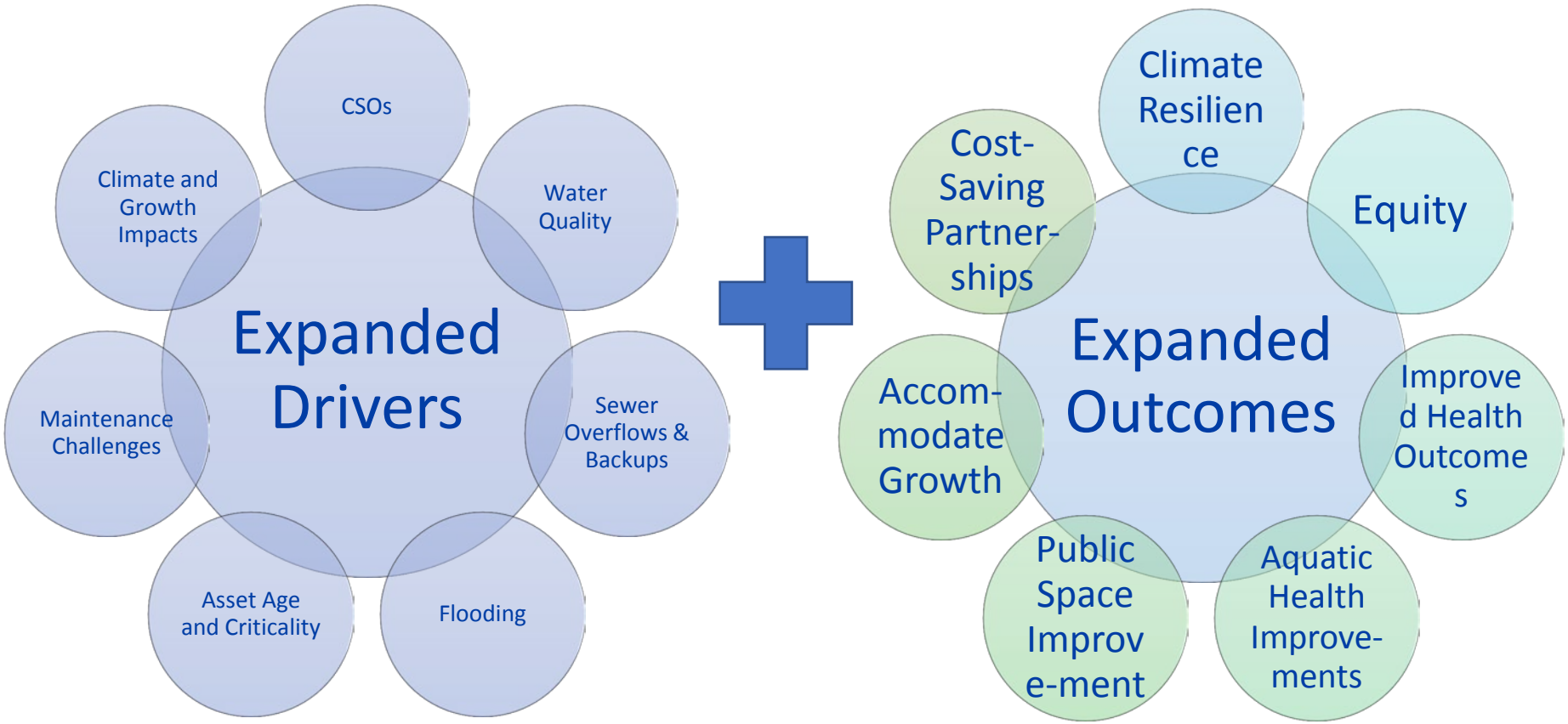
Urban Village Prioritization Approach Is Considering:

- OPCD analyses (data below) for racial equity, density, and growth
- Best-available SPU data on infrastructure needs and ecological variables
- Best-available data on parks and open space gaps
- Technical feasibility
- Partnership potential



In Summary

Expanding Partnership Capacity


Expanded Drivers
CSOs
Water Quality
Sewer Overflows & Backups
Flooding
Asset Age and Criticality
Maintenance Challenges
Climate and Growth Impacts
Expanded Outcomes
Climate Resilience
Equity
Improved Health Outcomes
Aquatic Health Improve-ments
Public Space Improv e-ment
Accom-modate Growth
Cost-Saving Partner-ships

Learn and Share

Learn more at 700milliongallons.org

Share ideas: rainwise@sattle.gov

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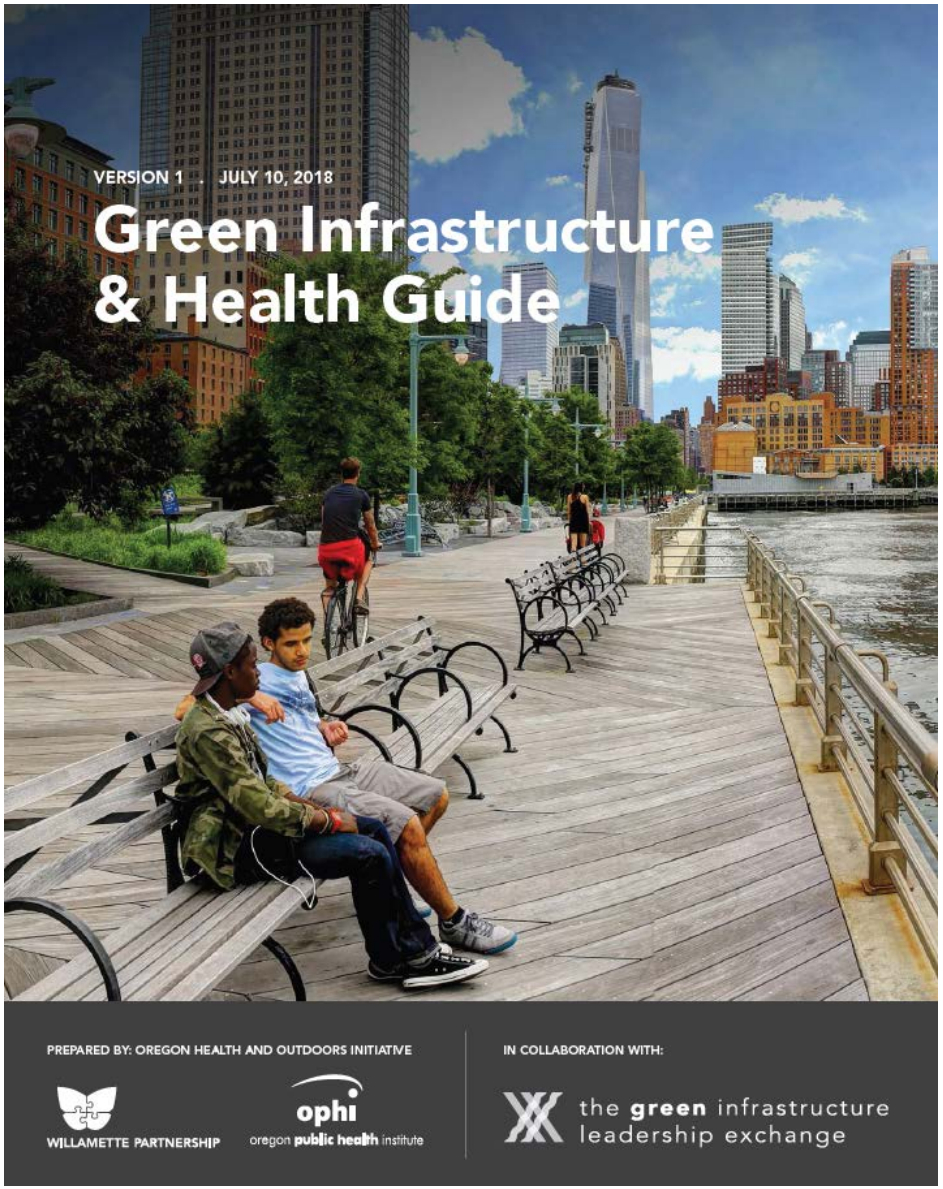

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Growing the Program:
Building GSI Experience and Knowledge

Project	Project Drainage Area
SEA Street #1	2 acres
Carkeek Cascade	28 acres
Broadview Natural Drainage System	32 acres
Pinehurst Natural Drainage System	49 acres
High Point	129 acres
Thornton Creek Water Quality Project	660 acres
Ballard Roadside Bioretention	3 impervious acres
Swale on Yale	435 acres
Venema Natural Drainage System	80 acres
Delridge Natural Drainage System 2015	5.3 impervious acres
Ballard Natural Drainage System 2015	6.2 impervious acres

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GSI Projects Primary Driver

Project	Water Quality	Flow	
SEA Street #1		✔	(2-year)
Carkeek Cascade @ 110th	✔		maximize
Broadview NDS		✔	(1-2 year)
Pinehurst NDS		✔	(1-2 year)
High Point	✔	✔	Delay (6-mo storm)
Thornton Creek Water Quality Project (primary bioFILTRATION)	✔		
Ballard Roadside Bioretention		✔	(1 year)
Swale on Yale (primary bioFILTRATION)	✔		
Venema Natural Drainage System	✔	✔	(1-2 year)
Delridge Natural Drainage System 2015		✔	(1 year)
Ballard Natural Drainage System 2015		✔	(1 year)

For systems designed for Flow control, you still get WQ treatment

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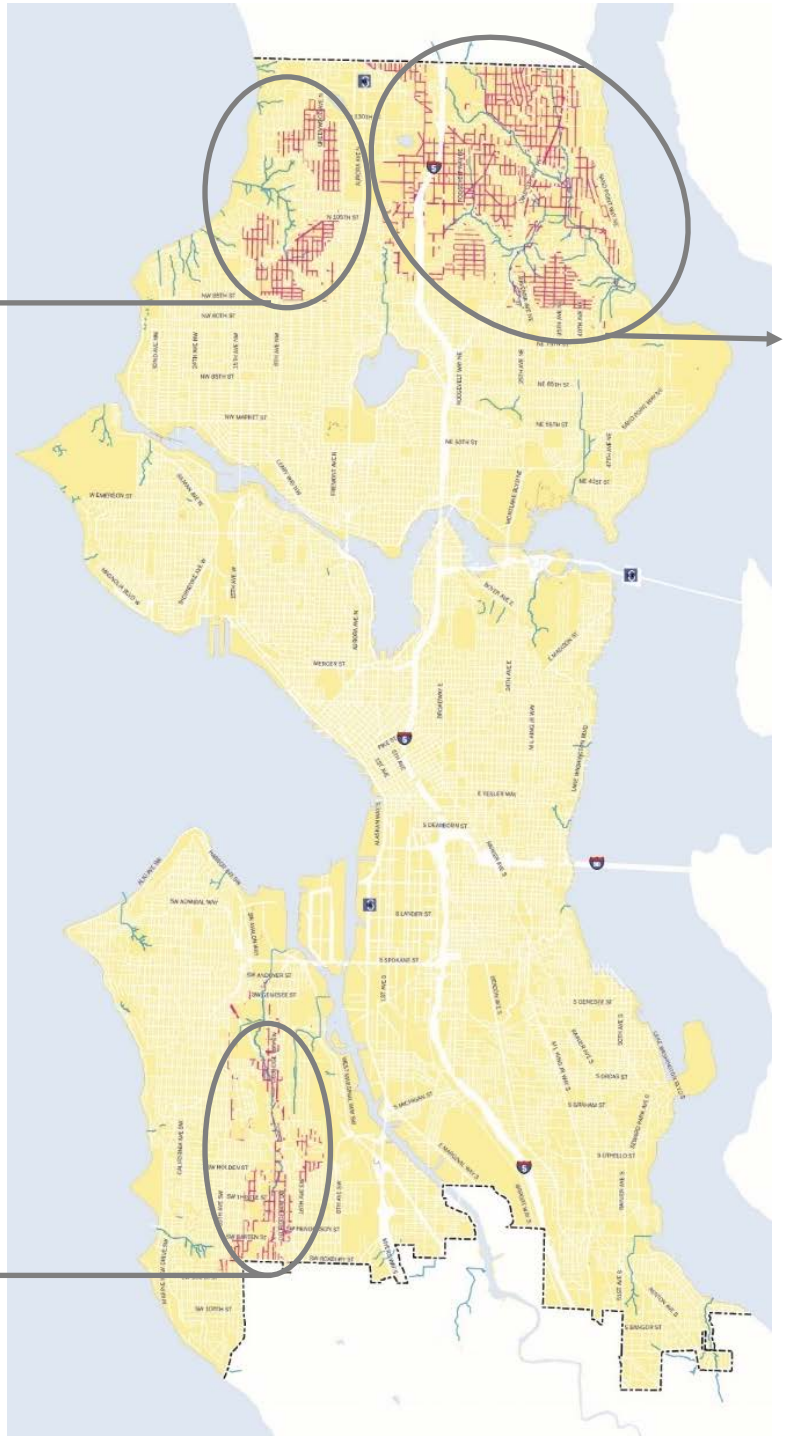
Long Term Control Plan

NDS Partnering Program

Watershed	Begin Design	Begin Construction
Longfellow	2017	2019
Thornton	2018	2019
Pipers	2019	2020

Highlighted streets are *potentially technically feasible* for a natural drainage system.

SPU is funded to build projects on about 4% of these blocks. This means we will be able to build natural drainage systems on a small sub-set of potentially feasible blocks.



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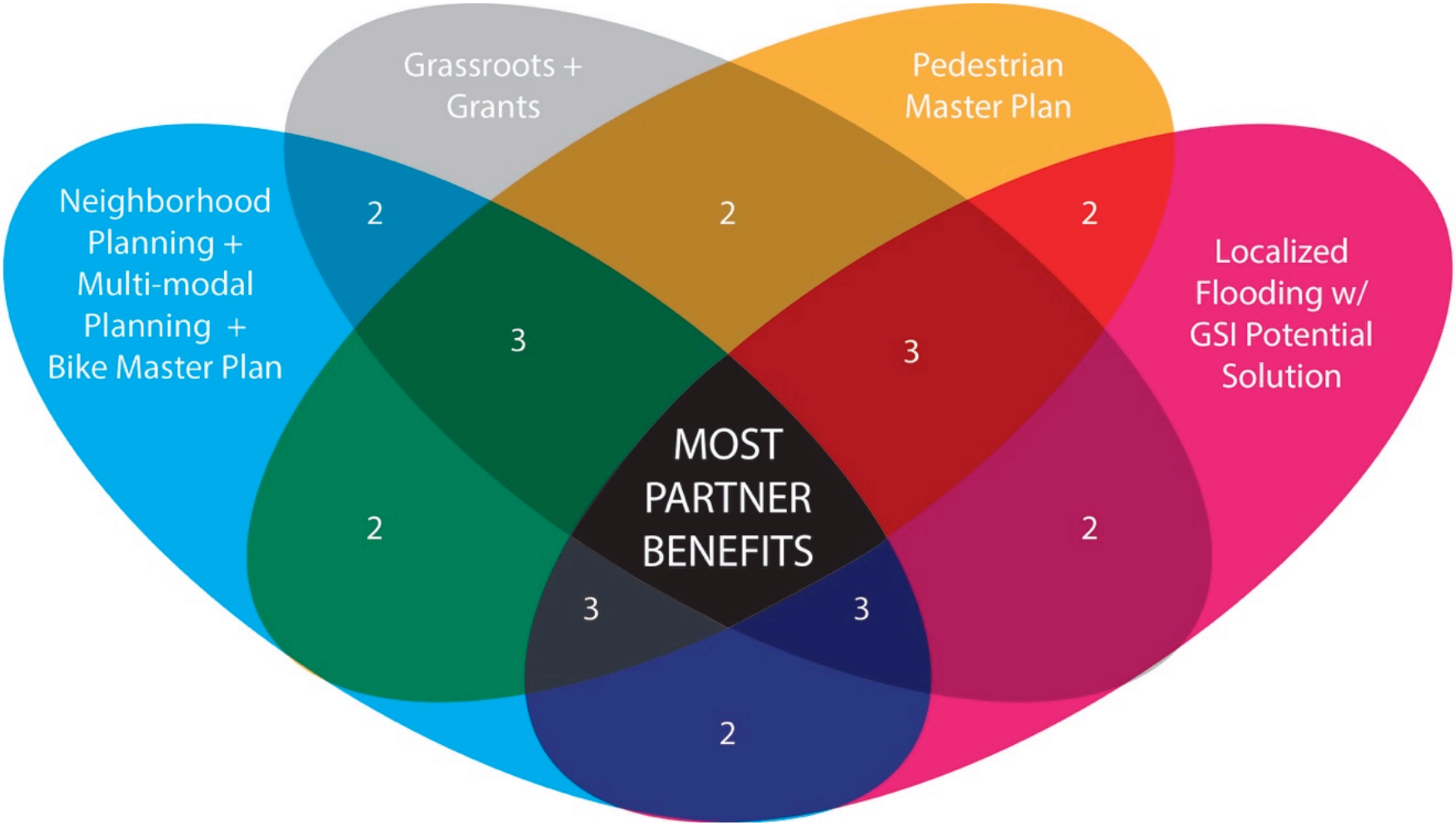
NDS Partnering Program

Partner with SDOT, Internal SPU departments (Localized Flooding), Grassroots/Communities, and Private Entities, to identify opportunities and implement GSI



Neighborhood Co-benefits

water pollution prevention +

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GSI in Urban Villages

STORMWATER FUNCTION + PARK FUNCTION

Madison Valley Facility, SPU

Manchester Park, Kitsap County

Meadowbrook Pond, SPU

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RainWise Customer Path

Outreach:
- Postcards
- Events
- Tabling
- Website
- Media

Outreach:
- Website
- Fairs
- Events
- Match-making

Contractor Training (2x/year)

CM Inspectors:
- Pre-inspection
- Post-inspection

Program Manager + Admin + AP

Outreach:
- Reminders
- Guides
- Videos
- Hands on education

Follow-up Inspections

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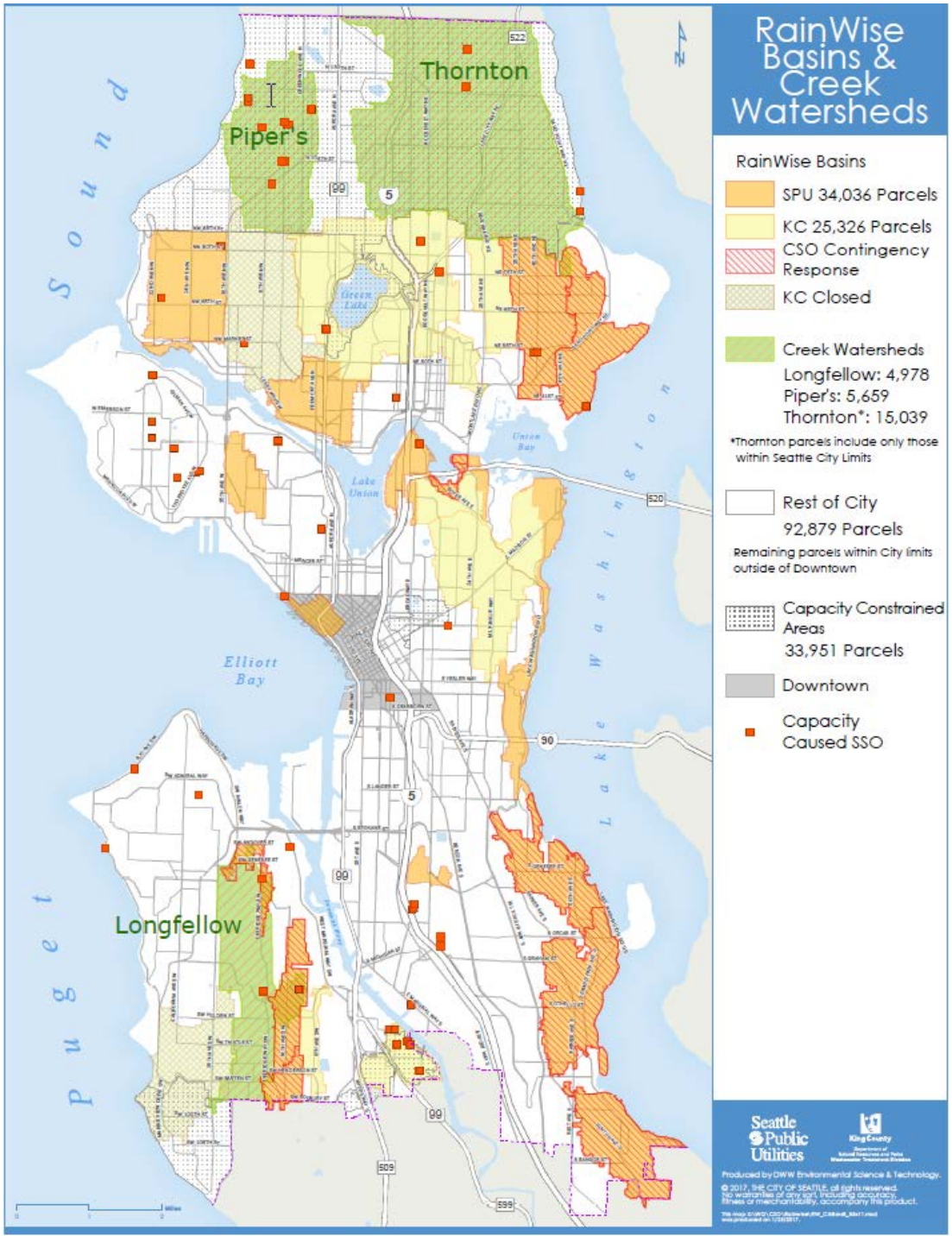

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GSI Implementation Tools

Design Manuals

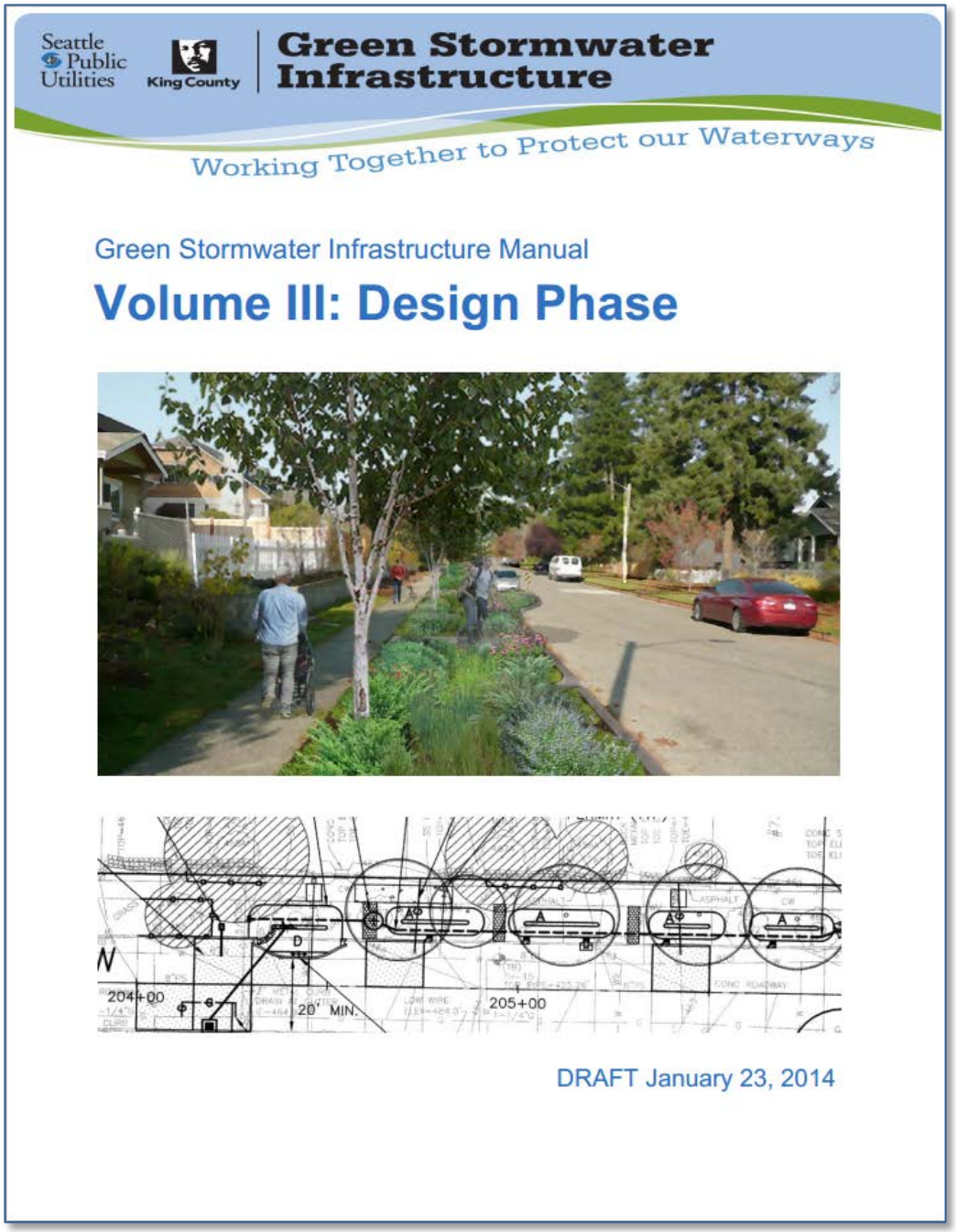
Manuals to support CIP design

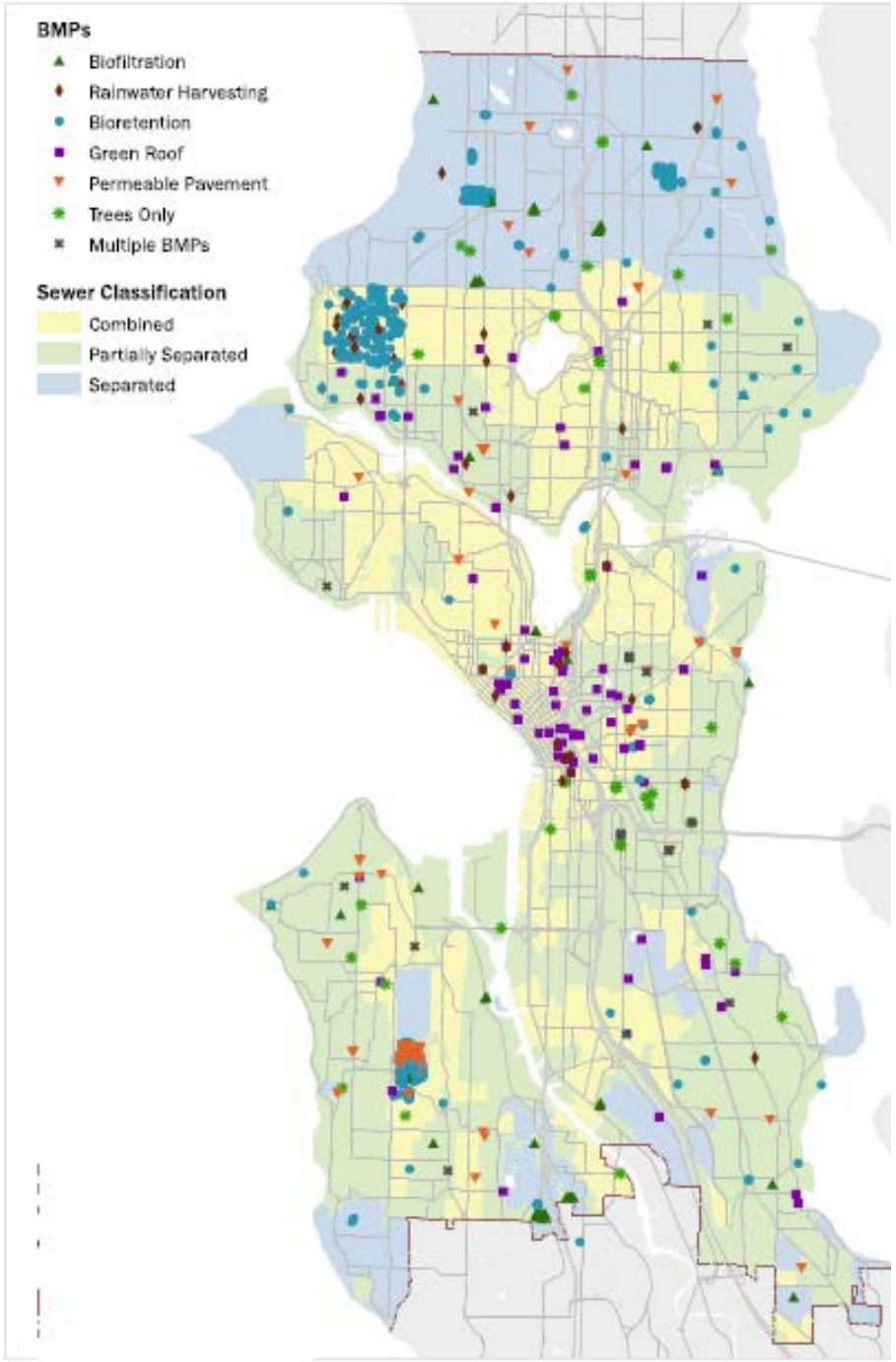
- Volume I: Project Initiation Phase
- Volume II: Options Analysis
- Volume III: GSI Design Phase
- Volume III: Construction
- Volume IV: O&M
- Volume V: Monitoring

Project phase flow charts

- Sequence of tasks

Add to list?
Lessons learned?





map shows installations through 2012