Making the Invisible Visible: Ballard Roadside Raingardens

Presented by:

Tracy Tackett, PE and Shanti Colwell, PE

Green Stormwater Infrastructure Program

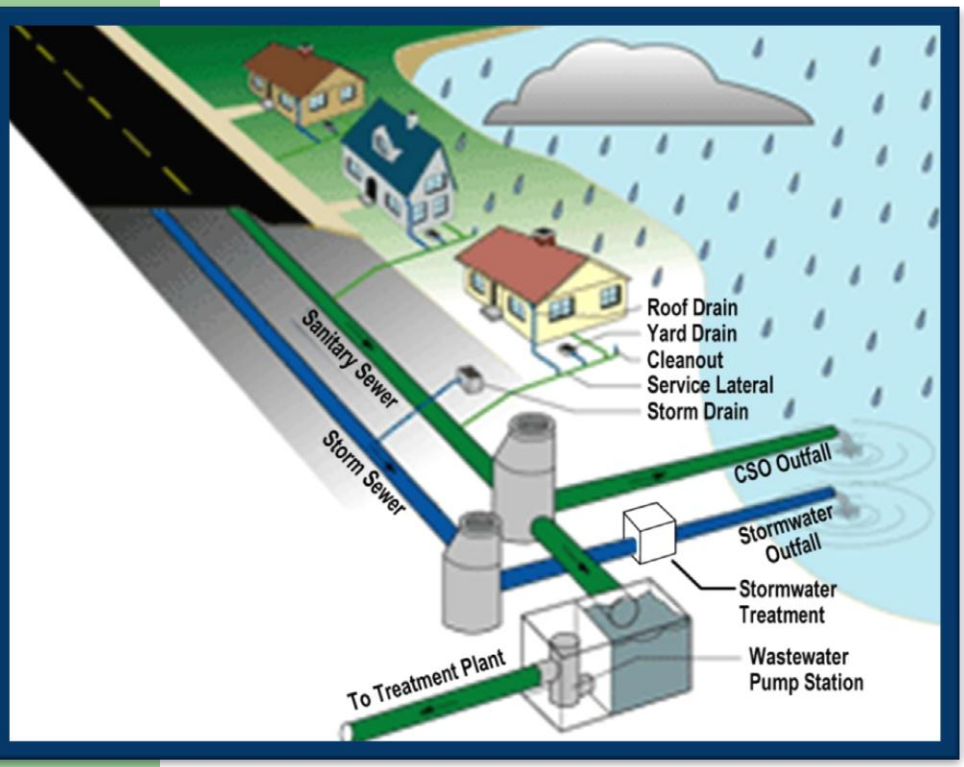
Seattle Public Utilities

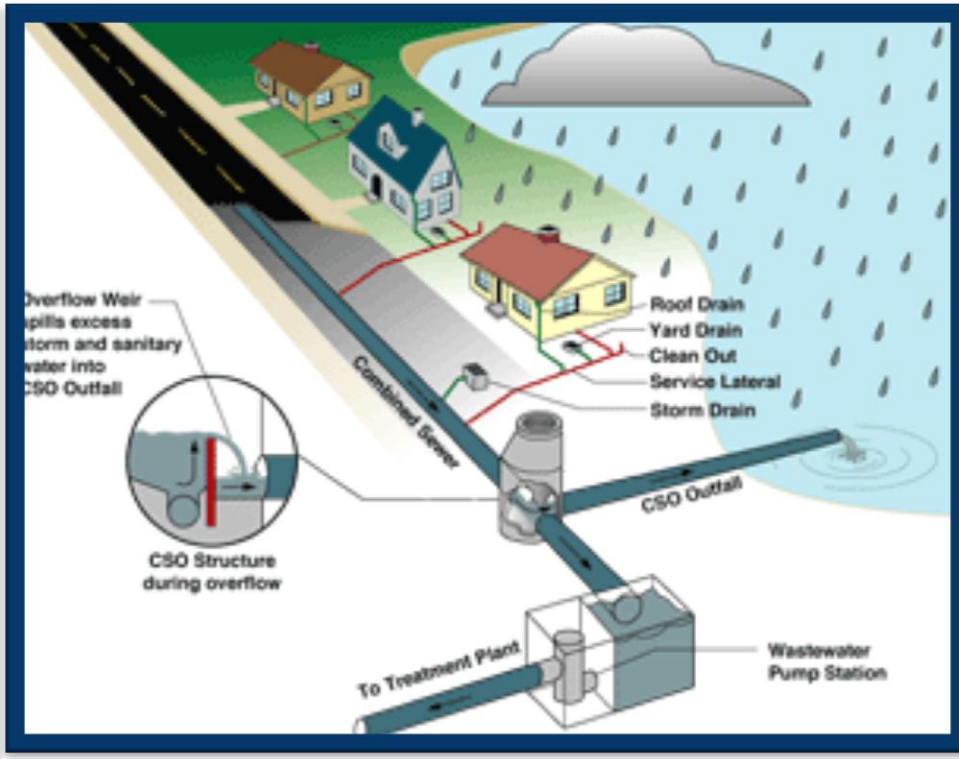
www.seattle.gov/util/naturalsystems

Presentation Overview

- Big Picture
  - What are Combined Sewer Overflows
  - Grey versus Green Infrastructure
- Why Here?
- Roadside Raingardens
  - Design
  - O&M
  - Schedule
- Phase 2 efforts

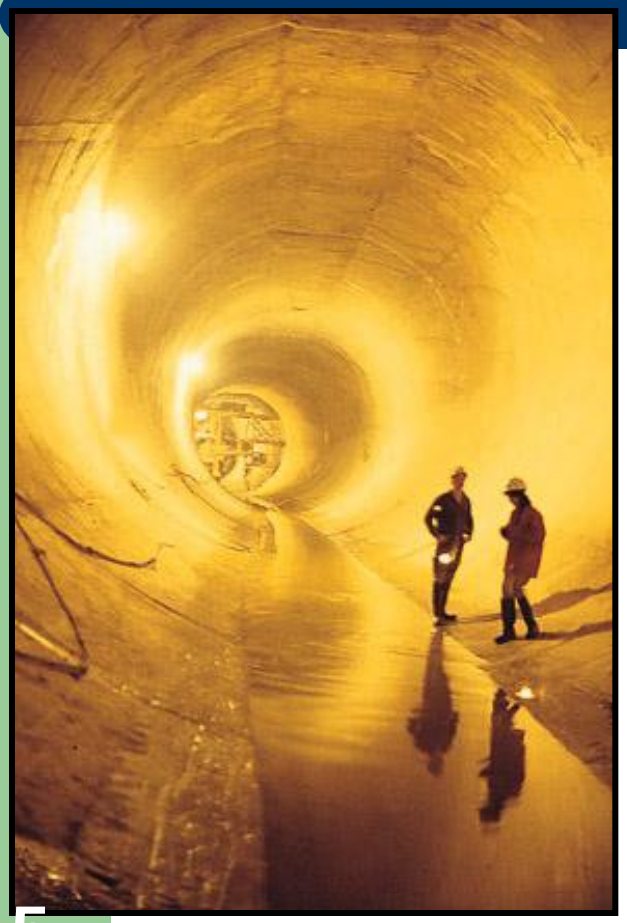
Separated Sewers and Combined Sewers





City of Seattle CSO Outfalls

Grey Infrastructure



Photos Courtesy of Portland B. E. S.

Photos Courtesy of Metropolitan Water Reclamation District of Greater Chicago

Green Infrastructure

Green Stormwater Infrastructure

Tries to make this…

…function more like this.

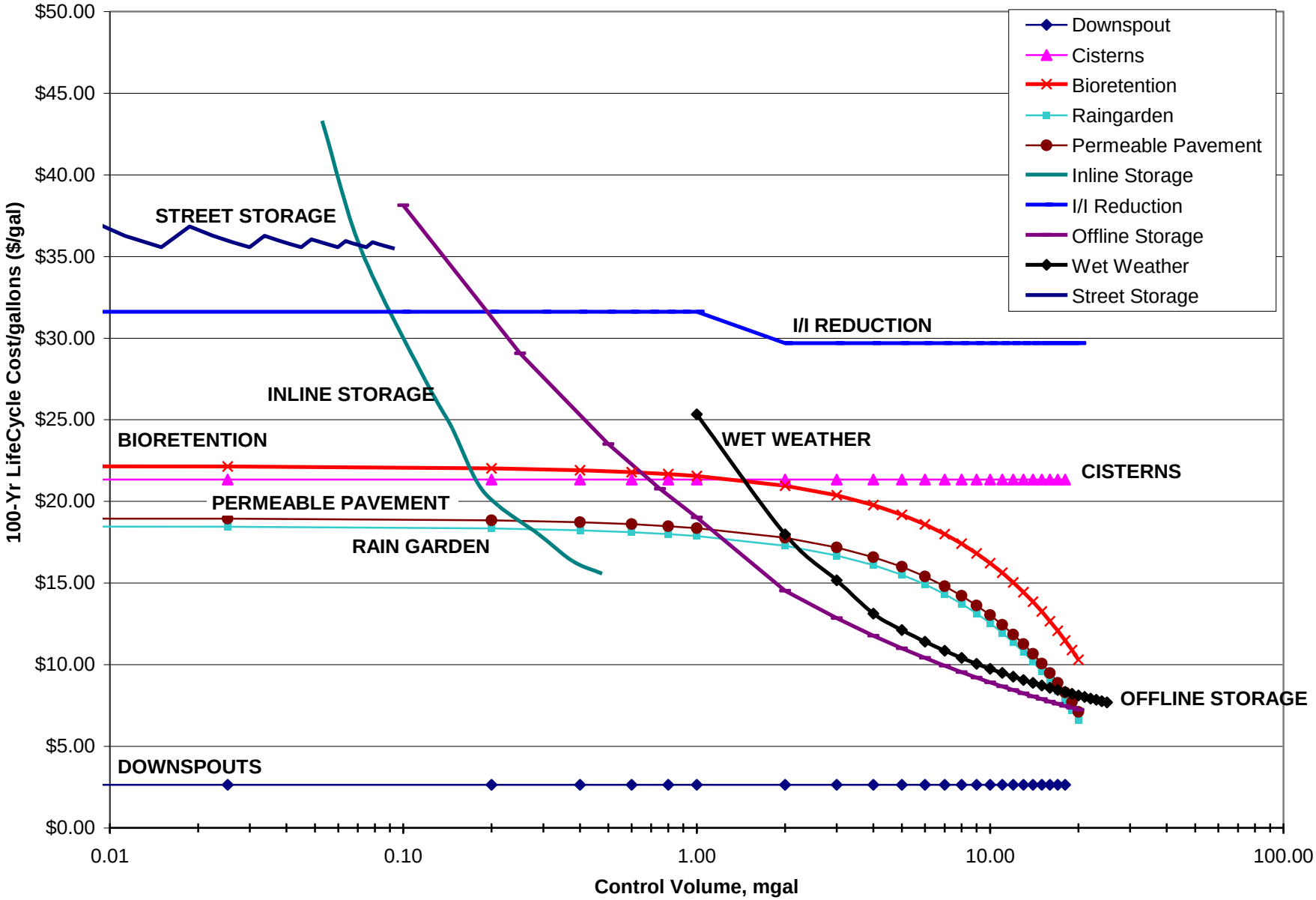
Triple Bottom Line Analysis (Cost per area mitigated)

- Cost per area installed, based on the performance area
- Allied costs
- Life
- Replacement
- O&M
- Area Ratio

Triple Bottom Line Analysis

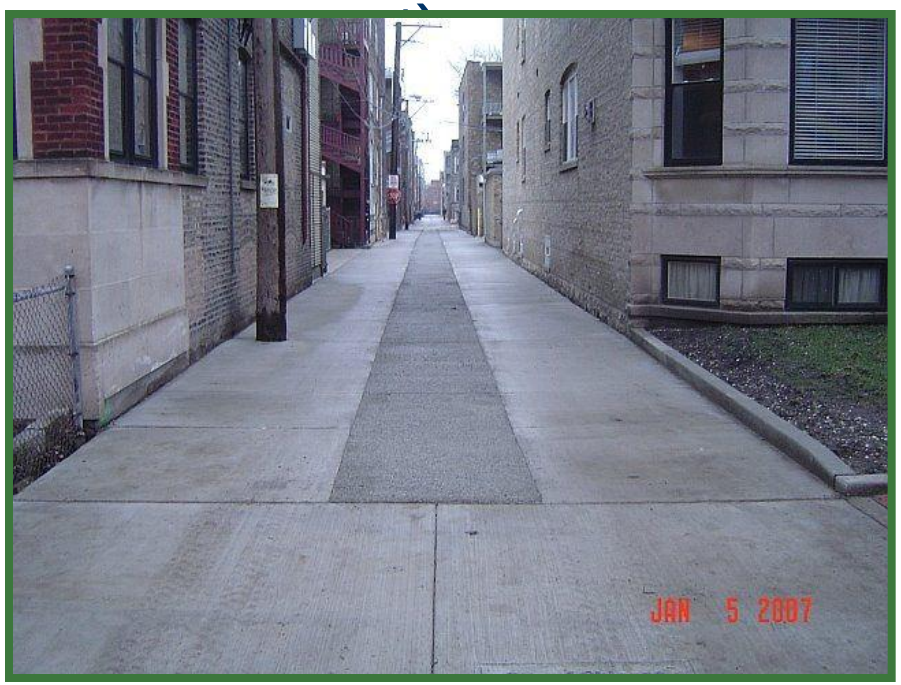
Real Discount Rate:	5%	Lifecycle 1, yrs:	50					
Full Series LCA?	1	Lifecycle 2, yrs:	100					
	Parcel	Parcel	ROW	ROW	ROW	Parcel	Parcel	ROW
Cost Calculation Assumption or Parameter	Residential Downspout Disconnect	Residential Rain Harvest Cistern	ROW Bioretention NDS	ROW Bioretention Rain Garden	Alley/Sidewalk Perm Paving Retrofit	Remove Impervious Areas	Commercial Green Roof, New Roof	Alley/Sidewalk Perm Paving New Project
Construction Cost	$0.85	$55.60	$85.88	$32.39	$8.00	$2.04	$10.25	$1.85
Allied Costs	35%	35%	140%	110%	140%	35%	35%	140%
Measure Life	100	20	50	50	28	100	40	28
Replacement	1%	6.7%	5.25%	5.25%	5%	5%	5%	5%
O&M, Early	$0.25	$3.54	$1.45	$1.45	$0.05	$0.00	$2.15	$0.05
O&M, Mature	$0.00	$3.54	$0.70	$0.70	$0.05	$0.00	$1.62	$0.05
Area Ratio	100%	2.0%	3.8%	3.8%	33.3%	100%	100%	33%
Ancillary Benefit %	2%	5%	15%	10%	10%	5%	10%	10%
Capital Cost per SF Managed	$1.15	$1.50	$7.83	$2.58	$6.39	$2.75	$13.84	$1.48
50-yr Lifecycle Cost per SF Managed	$1.74	$4.06	$10.98	$4.10	$8.85	$4.39	$51.74	$2.27
50-yr Lifecycle Cost per SF, Triple BL	$1.71	$3.85	$9.33	$3.69	$7.96	$4.17	$46.57	$2.04

CSO Plan Updates- cost curves



Green Infrastructure CIP Projects

- Roadside Raingardens
- Green Alleys (permeable

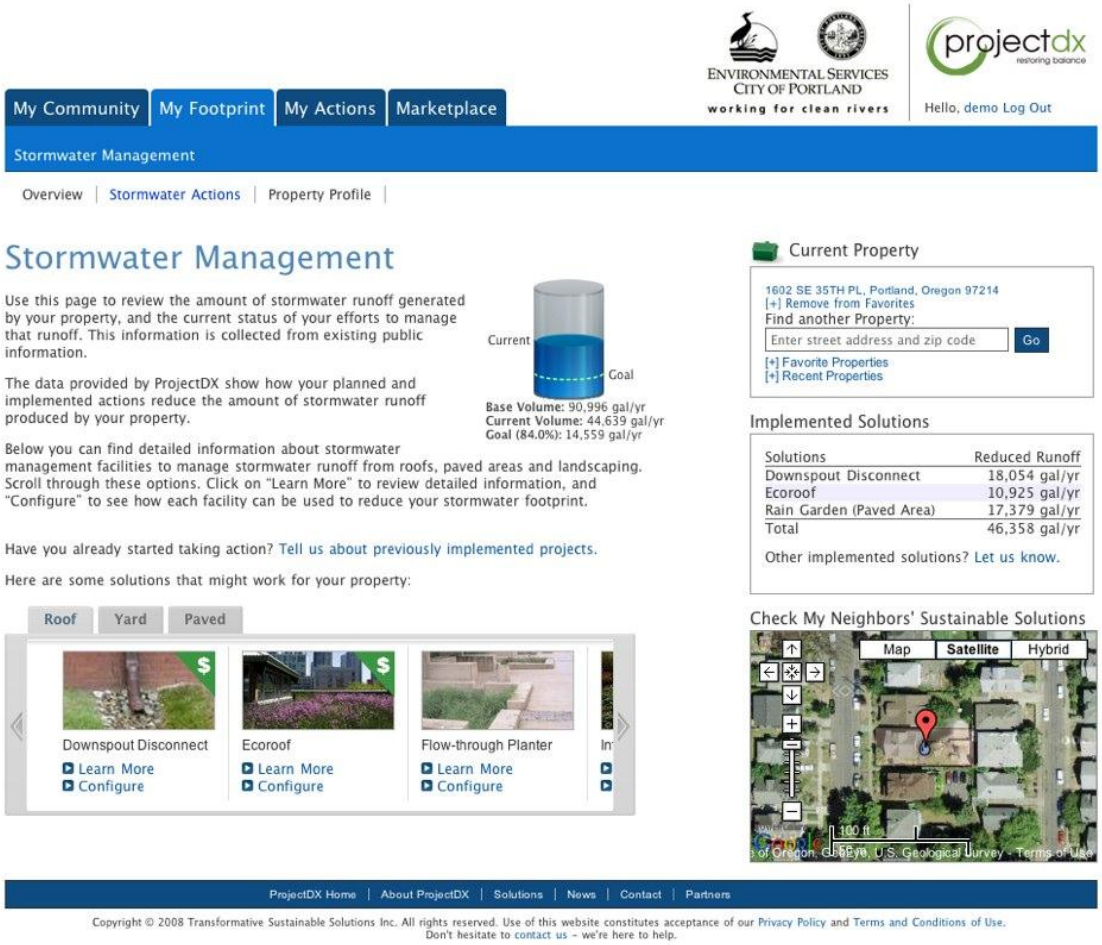


➲Appx. $100K per acre mitigated

Residential Rainwise

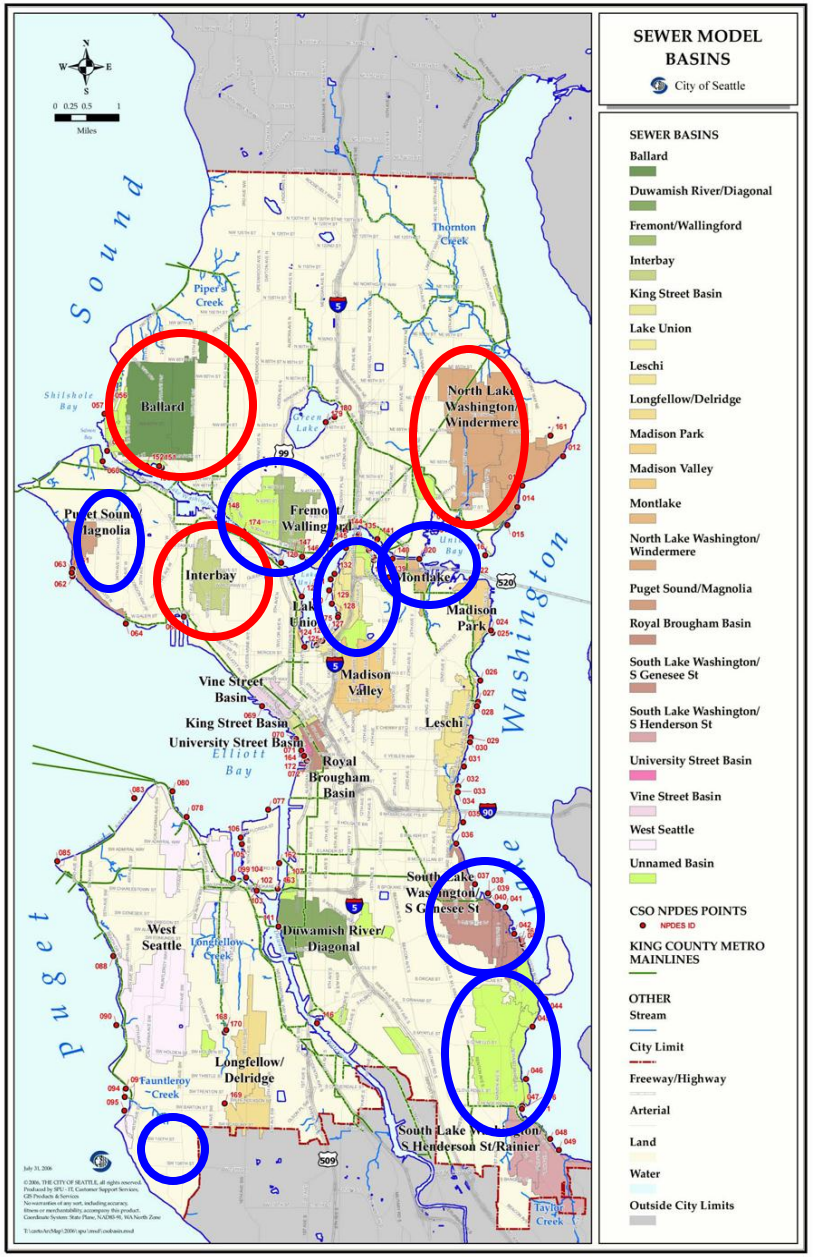
- Financial Incentive Program for Single Family Residential Properties Owners

Residential Rainwise



Green Stormwater Infrastructure Target Basins

- Ballard
- North Union Bay
- Interbay
- Evaluating additional basins
  - Barton (lead by King County)
  - Genesee
  - Henderson
  - Montlake
  - Lake Union
  - West Seattle
  - Fremont/Wallingford



Green Stormwater Infrastructure: Ballard

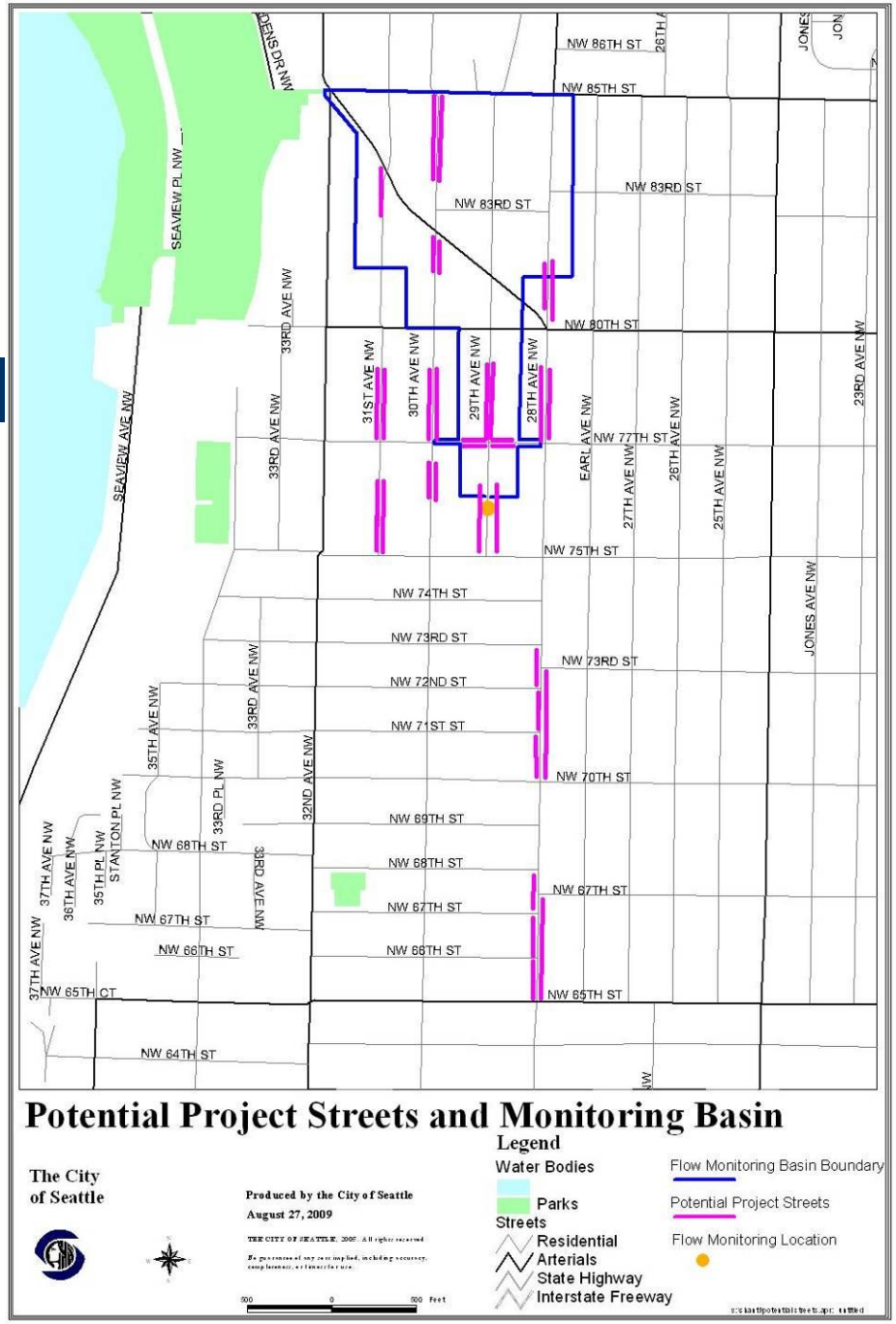
- Ballard Roadside Raingardens Phase 1
  - Design 2009, Construction 2010, Monitoring 2011
- Ballard Green Alleys and Roadside Raingardens
  - Ongoing design and construction 2010-2014
- Residential Rainwise in Ballard
  - Ongoing design and construction 2010- 2014
- Monitoring 2015

Why Here?


NW 87TH ST
NW 86TH ST
NW 85TH ST
NW 83RD ST
NW 80TH ST
NW 77TH ST
NW 75TH ST
NW 74TH ST
NW 73RD ST
NW 72ND ST
NW 71ST ST
NW 70TH ST
NW 69TH ST
NW 68TH ST
NW 67TH ST
NW 66TH ST
NW 65TH ST
NW 64TH ST
NW 63RD ST
NW 62ND ST
NW 61ST ST
NW 60TH ST
NW 59TH ST
NW 58TH ST
NW 57TH ST
NW 56TH ST
NW 54TH ST
NW MARKET ST
NW BRYGGER PL
SEAVIEW AVE NW
SEAVIEW PL NW
SYLVAN WAY NW
32ND AVE NW
29TH AVE NW
33RD AVE NW
EARL AVE NW
27TH AVE NW
26TH AVE NW
25TH AVE NW
24TH AVE NW
23RD AVE NW
22ND AVE NW
21ST AVE NW
20TH AVE NW
19TH AVE NW
18TH AVE NW
17TH AVE NW
16TH AVE NW
15TH AVE NW
MARY AVE NW
ALONZO AVE NW
BNRR
28TH AVE NW
30TH AVE NW
35TH AVE NW
36TH AVE NW
37TH AVE NW
JONES AVE NW
35TH PL NW
34TH AVE NW
34TH PL NW
BURKE GILMAN TRL
BALLARD TERMINAL RR
W COMMODORE WAY
SHILSHOLE AVE NW
RUSSELL AVE NW
LEARY AVE NW
BALLARD AVE NW
TALLMAN AVE NW
NW 49TH ST

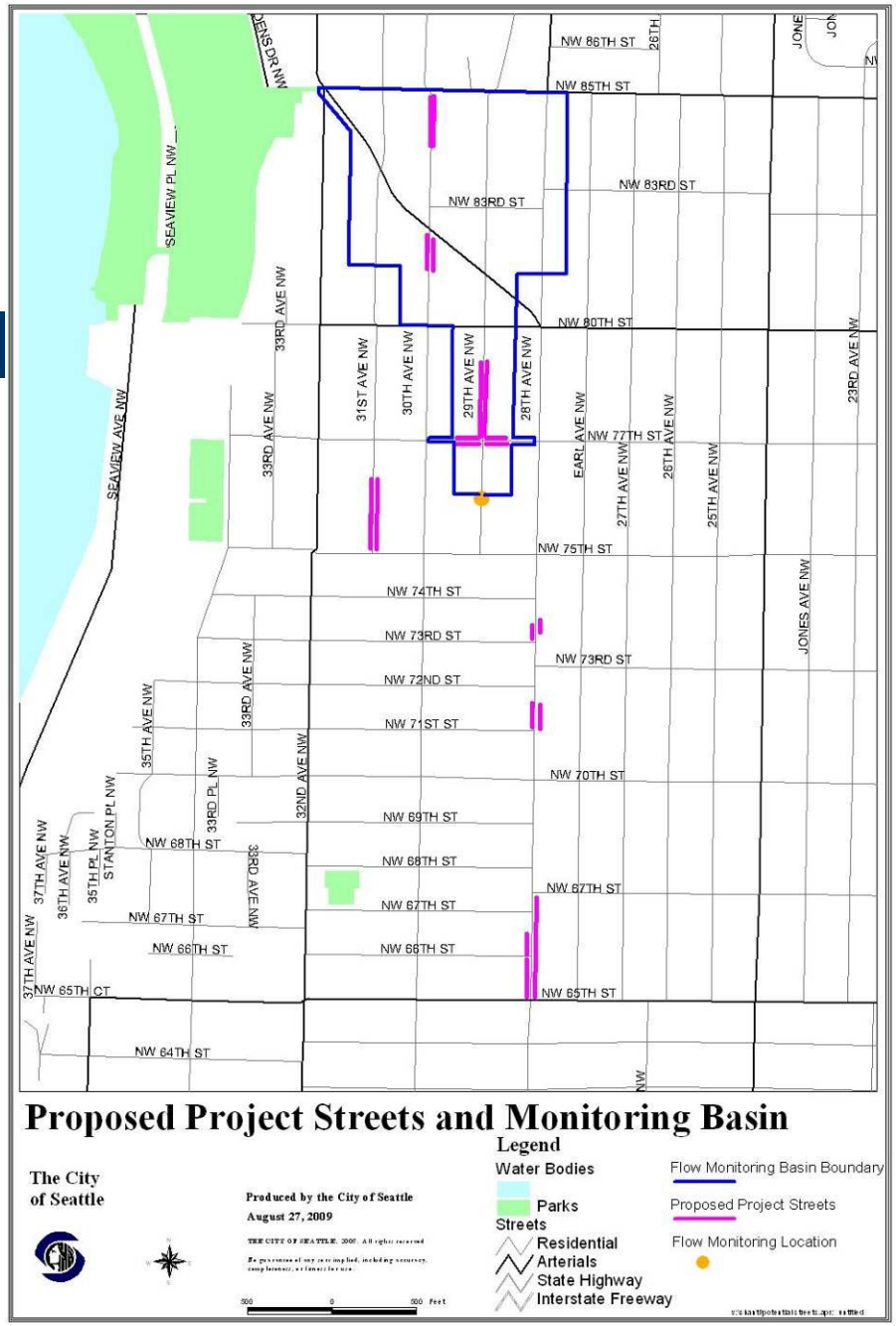
Why Here?

- Flow monitoring station locations
- Right-of-way width
- Slope of street
- Lack of driveways or major plantings in lower half of block
- Overlap with community traffic calming goals



Why Here?

- Alternate parking options (alley access and driveways)
- Soil infiltration rates
- Feasibility of sites
  - trees
  - driveways
  - water meters
  - Planting strip width
- Ability to place multiple design options
- Applicability to other blocks



Roadside Raingardens: Planting Strip Design

Shallow depressions filled with a designed soil mix and plants that capture and infiltrate street runoff

Change this…

… to this

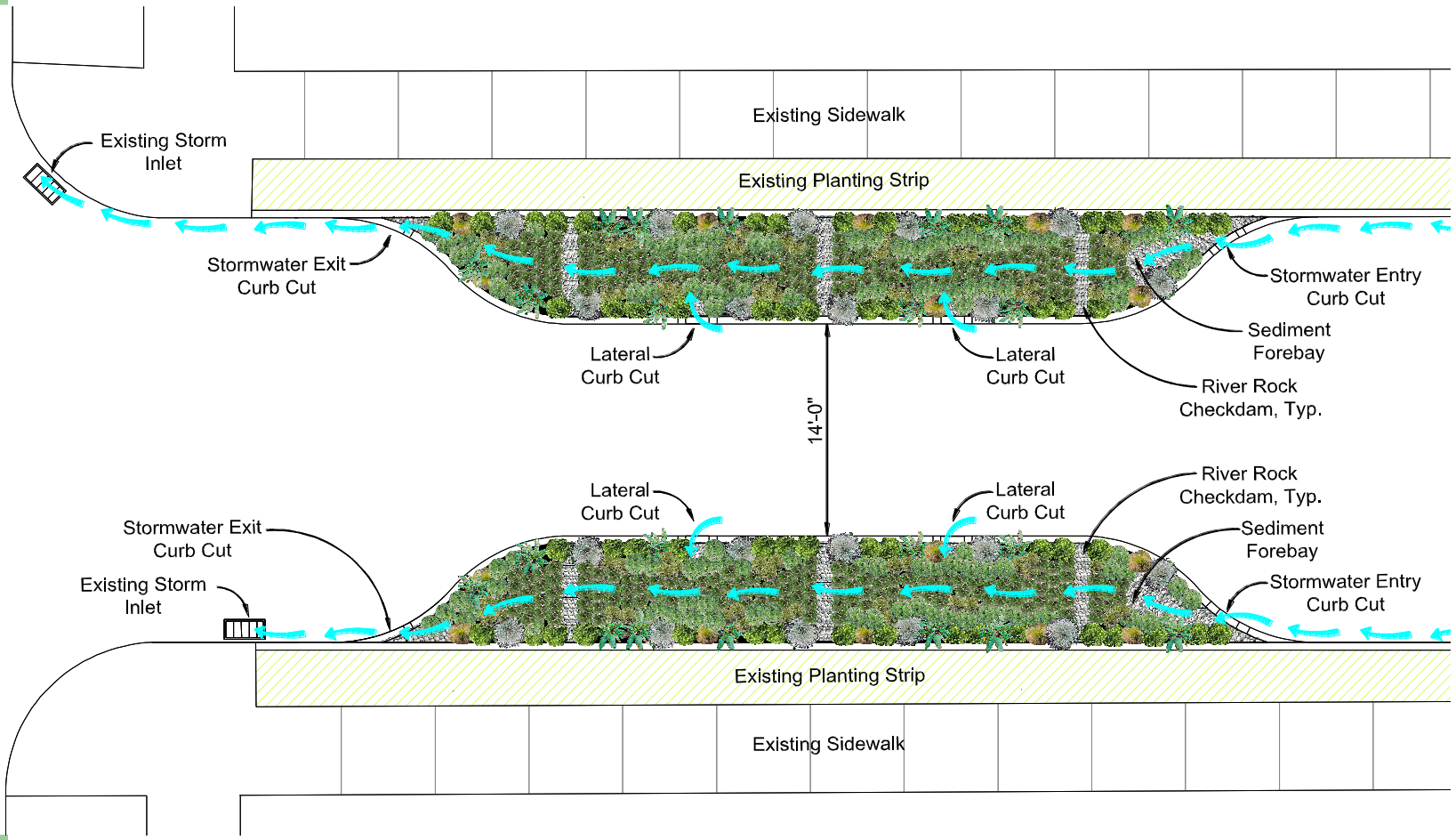
Roadside Raingardens at High Point Natural Drainage System

Roadside Raingardens: Curb Extensions


03.18.2004

Roadside Raingardens: Curb Bulb Design

Design similar to the traffic calming chicanes used by SDOT around city. Shorter and wider than curb extension design. Parking restricted on both sides of street.



Curb Extension Flow Diagram

Drawn by: Kevin Perry, City Of Portland


BALLARD ROADSIDE RAINGARDENS
31st Ave NW - 75th to 77th
NW 77th St.
31st Ave NW
NW 75th St.
0
25
50
100
N

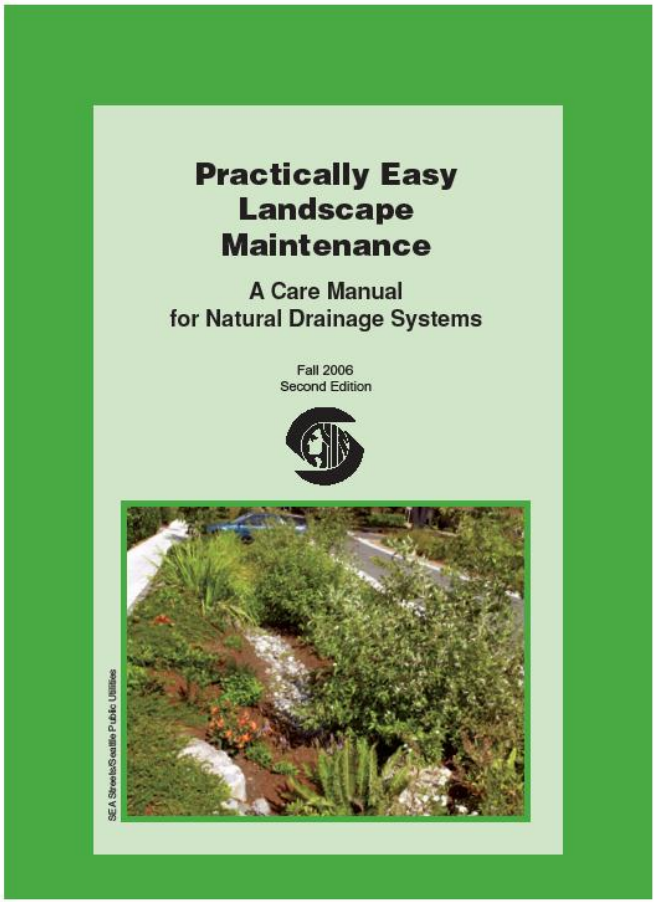

BALLARD ROADSIDE RAINGARDENS
29th Ave NW - 77th to 80th
29th Ave NW
NW 77th St.
0
25
50
100


BALLARD ROADSIDE RAINGARDENS
28th Ave NW - 65th to 67th
NW 67th St.
NW 67th St.
NW 66th St.
28th Ave NW
NW 65th St.
0
25
50
100
N

Roadside Raingarden Maintenance

--SPU O&M for plant establishment and ongoing system function

--Information for homeowners to supplement City's maintenance.



Roadside Raingarden Phase 1 Schedule

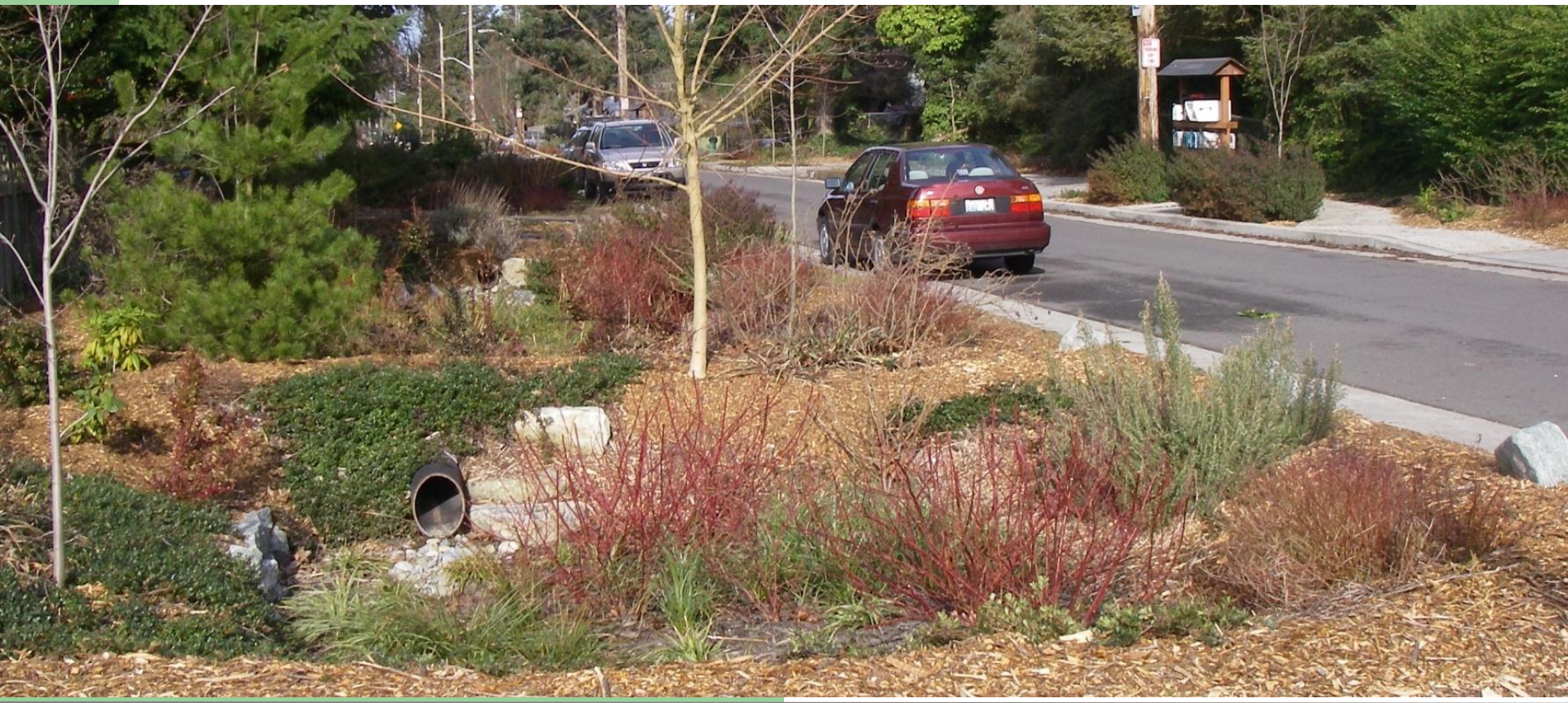
How to use Clean Water State Revolving Fund American Reinvestment and Recovery Act funds for your Green Project

Clean Water State Revolving Fund Team
Office of Wastewater Management
United States Environmental Protection Agency
Washington, DC

May 14, 2009

GSI in Ballard, Phase 2

Tracy Tackett
GSI Program Manager
Tracy.Tackett@seattle.gov



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Ray Hoffman, Acting Director