# Bioretention
# Beyond Rain Gardens

Seattle Public Utilities

# Presentation Outline

- Bioretention components
  - -Conveyance Ideas
  - - Overflow Ideas
- Bioretention Design Examples
  - - Stormwater Planters
  - - Linear Bioretention in Parking Lots
  - - Linear Bioretention in the Street
- Rules in the Rights-of-Way
- Design Notes

Tracy Tackett, PE

Low Impact Development Program Manager

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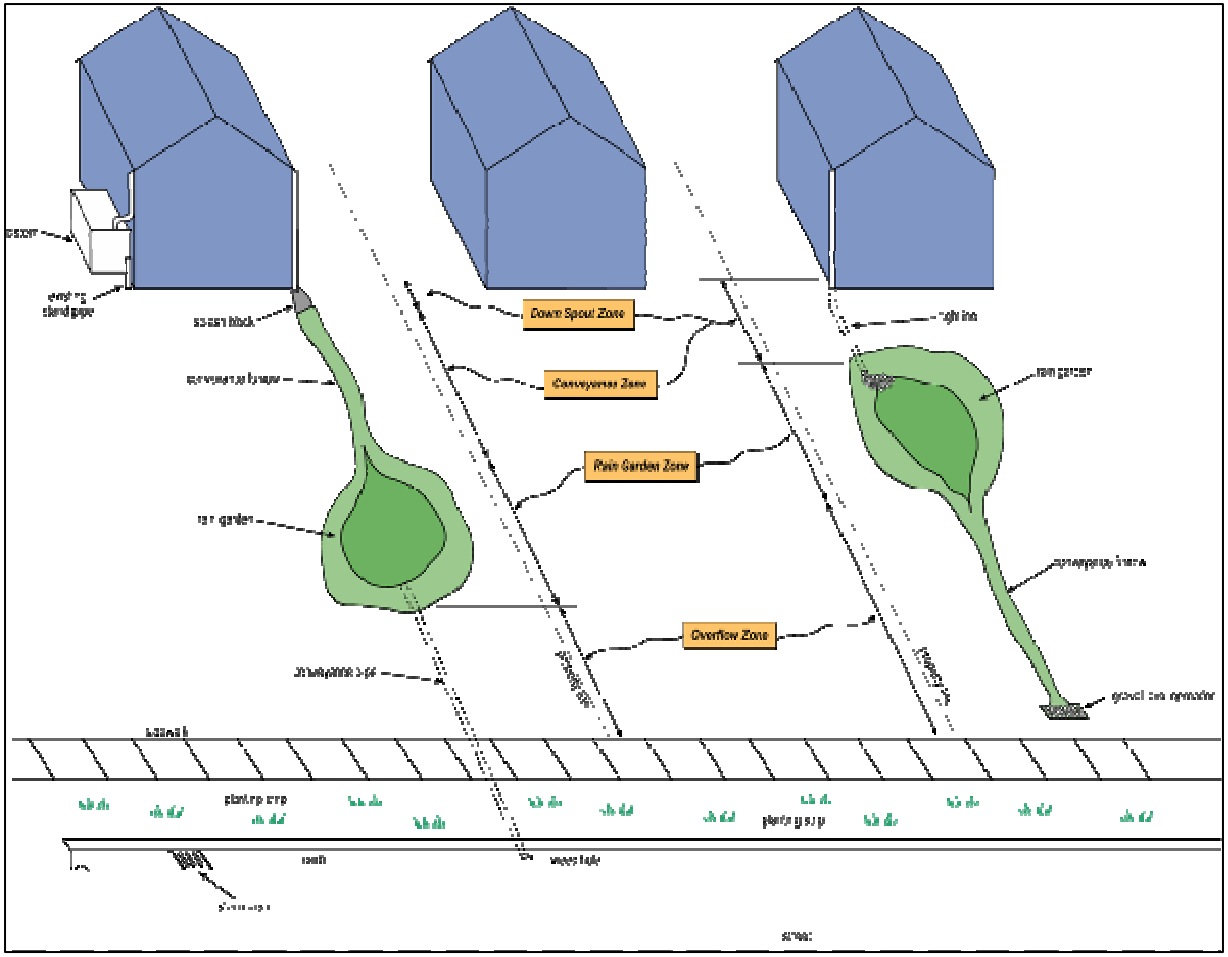
# Design Components –same as raingarden

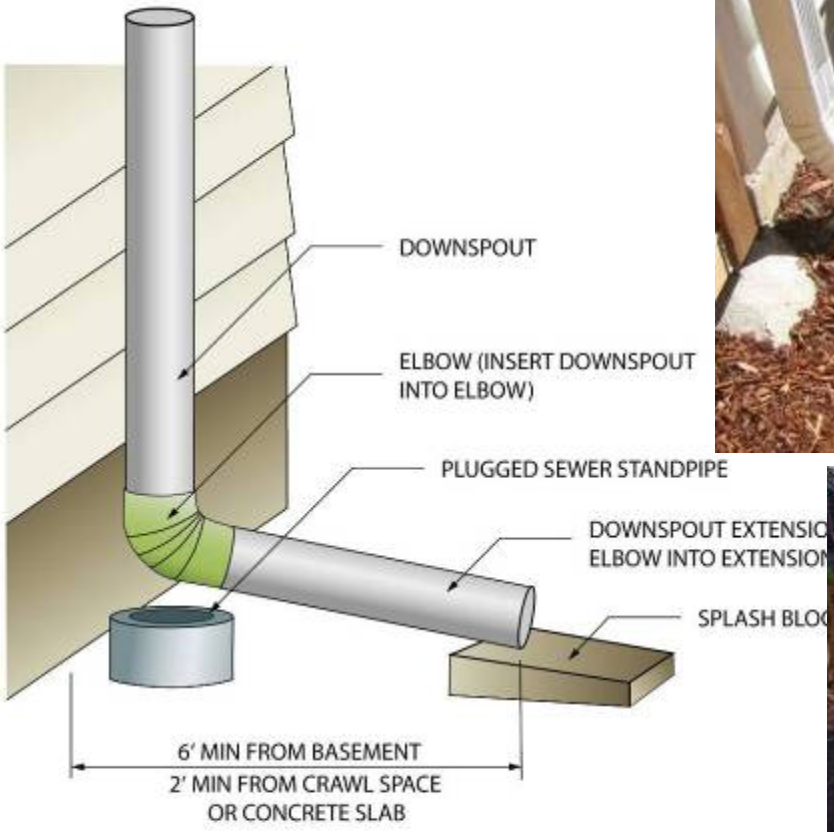



-Conveyance Zone

-Bioretention

-Overflow Zone

# Design Components –Conveyance Zone




DOWNSPOUT DISCONNECT

# Design Components –Conveyance Zone

Pipes

Sheet Flow

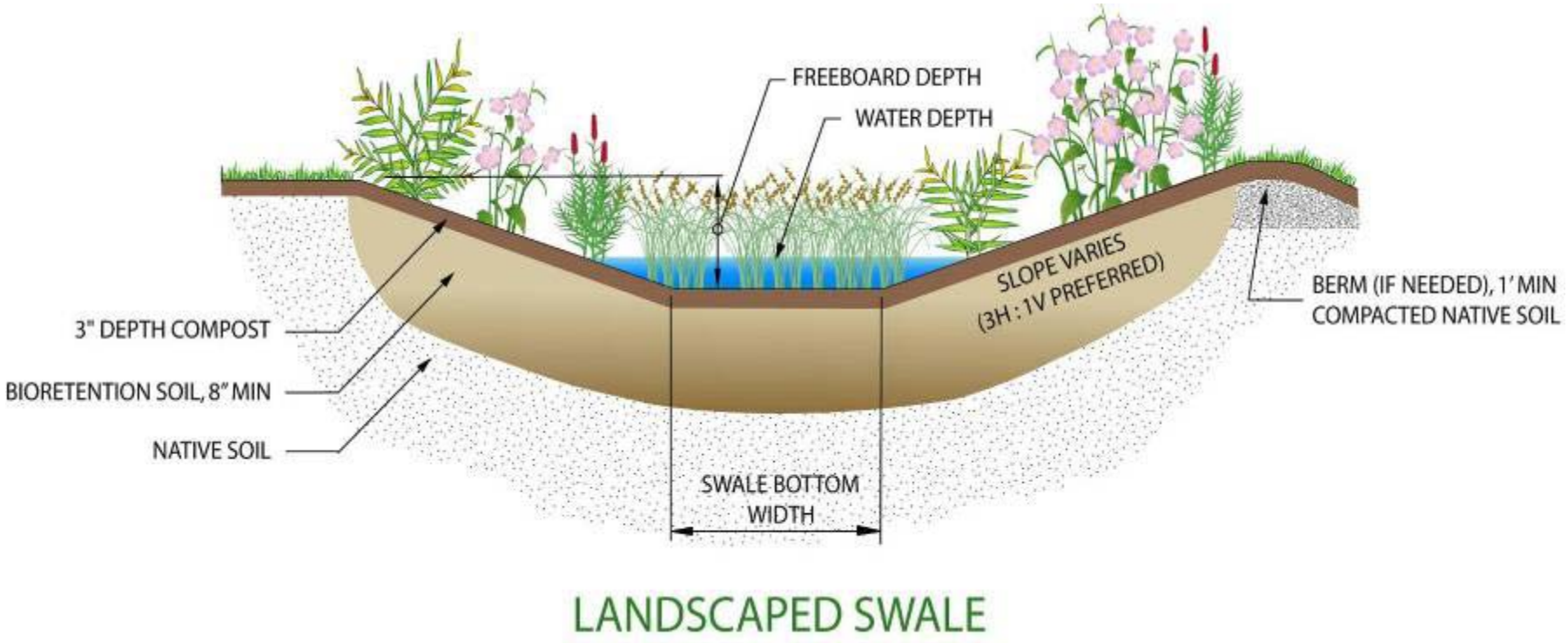
# Design Components –Conveyance Zone

Trench Drains

Photos courtesy of Portland BES

Portland's SW 12th Avenue Green Street

# Design Components - Bioretention




Vegetation, Mulch/compost, Surface Storage, and Infiltration area, Soil Storage, sometimes subsurface pipe

# Design Components – Overflows/Surface Storage

# Overflows/Surface Storage

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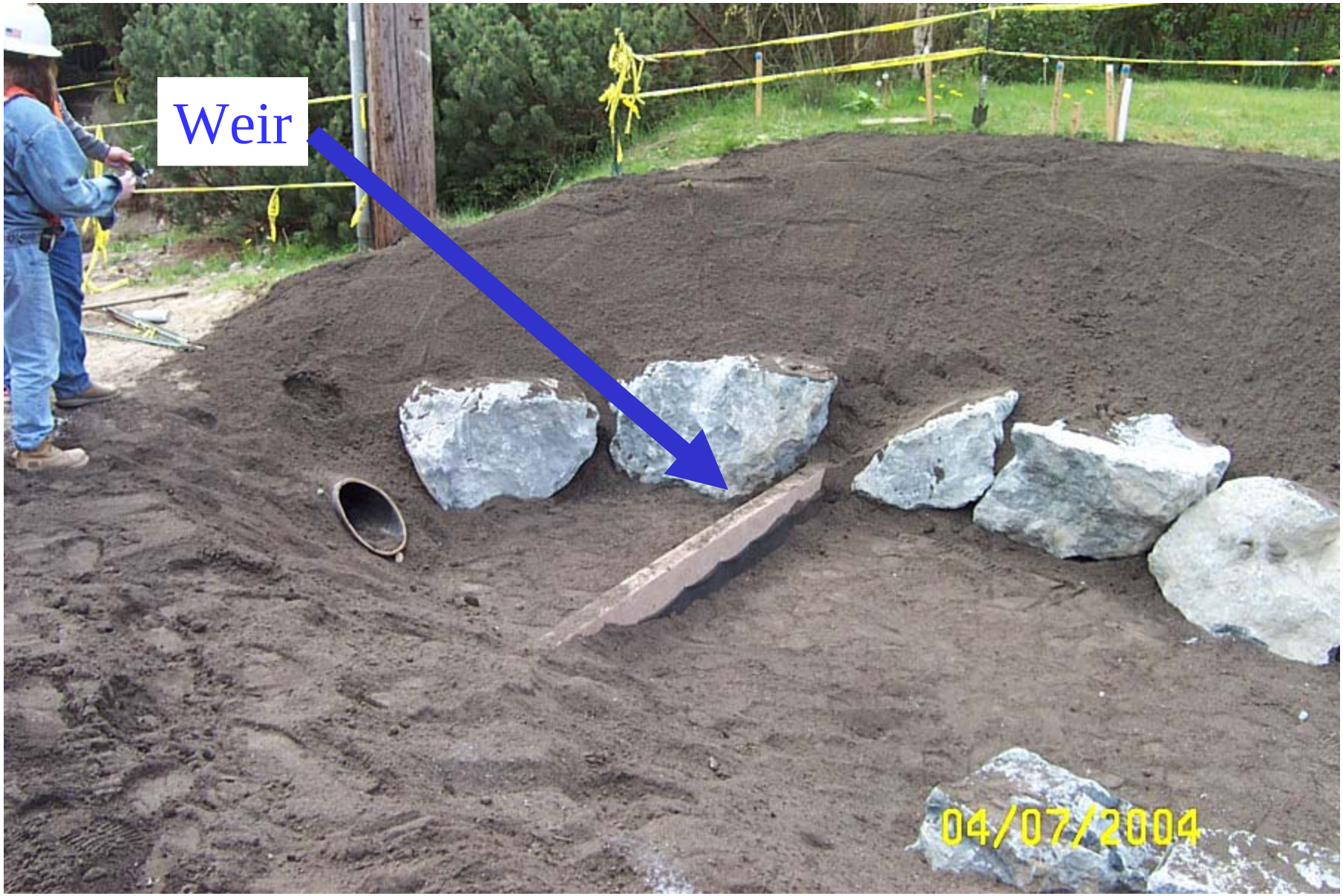

# Overflows/ Surface Storage

Cast In-Place Concrete Weir

# Surface Storage

Earth Berms

Photos courtesy of SvR

# Overflows/Surface Storage

Grading – overflow by directing of Sheet flow

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# Design Ideas: Stormwater Planters

Conveyance

Overflow

# Design Ideas: Parking Lots

Combining Conveyance with Bioretention

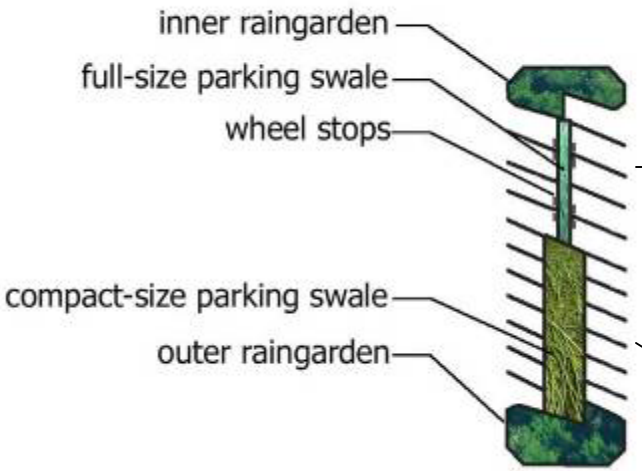
Greenlake? Elementary, Seattle

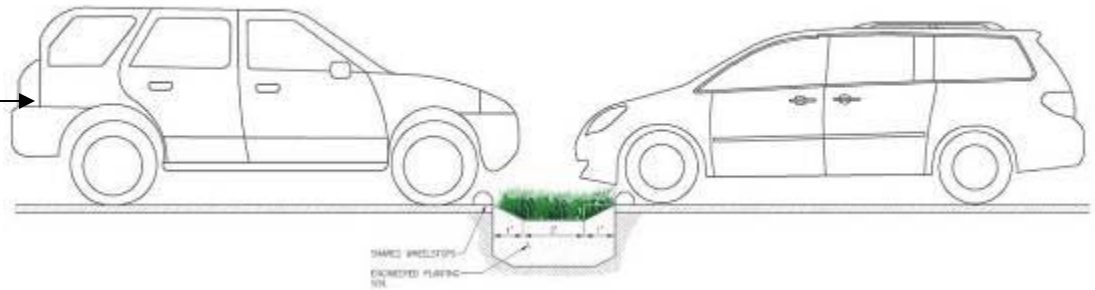
# Design Ideas: Parking Lots

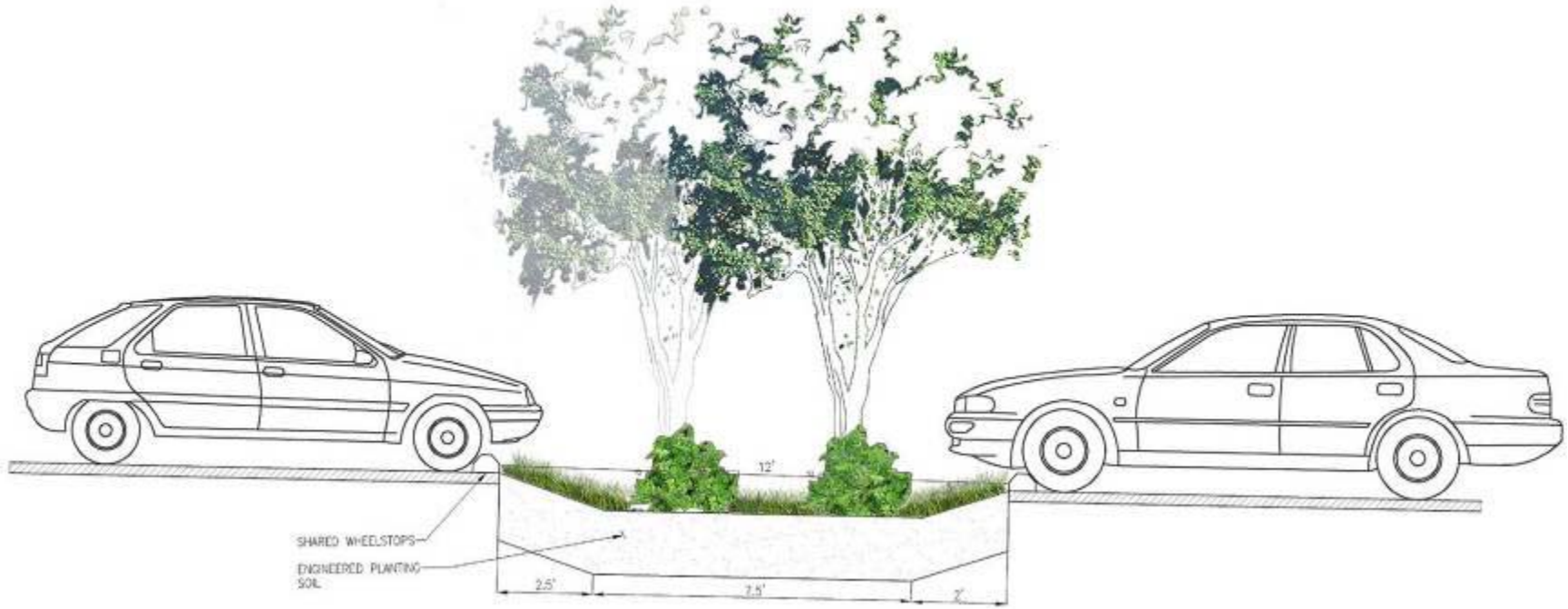
Space optimization at Northgate Mall, Seattle

Telescope Swale Details

# Design Ideas: Parking Lots





Curb Cut Inflow

Beehive Structure Overflow

# Private Property: parking lots

Department of Planning and Development

CAM Client Assistance Memo 515

**Seattle Permits**

*— part of a multi-departmental City of Seattle series on getting a permit*

## Green Parking Lots

*September 30, 2005*

### WHO SHOULD CONSIDER GREEN PARKING LOTS?

If you're looking for a cost-effective option for meeting landscaping and water quality requirements when building or redeveloping a parking lot, consider "going green."

### WHAT ARE GREEN PARKING LOTS?

Green parking lots reduce runoff that is discharged into local water bodies by using permeable paving

### Natural Drainage Landscapes

Natural drainage landscapes include bio-swales, rain gardens, and bioengineered planting strips that can improve water quality and reduce runoff.

Bio-swales are open, linear channels that filter storm-water as the water flows through vegetation to the discharge point. Although their width and length vary as needed to achieve function, at a minimum they are two feet wide at the bottom and have a maximum slope of 2.5:1.

Rain gardens are shallow depressions in the landscape and are designed to hold and infiltrate runoff. They are amended with bioengineered soil and vegetated with plants that are adapted to both wet and dry conditions.

www.seattle.gov/dpd/GreenBuilding

www.seattle.gov/dpd/publications/cam/CAM515.pdf

# Design Ideas: Parking Lots

## Coupeville High School, Coupeville, WA

Wheel stop curbs allowing sheet flow

Combining Landscape Rqmts with Bioretention

? Park, Bellevue

# Design Ideas: Street Right-of-Way

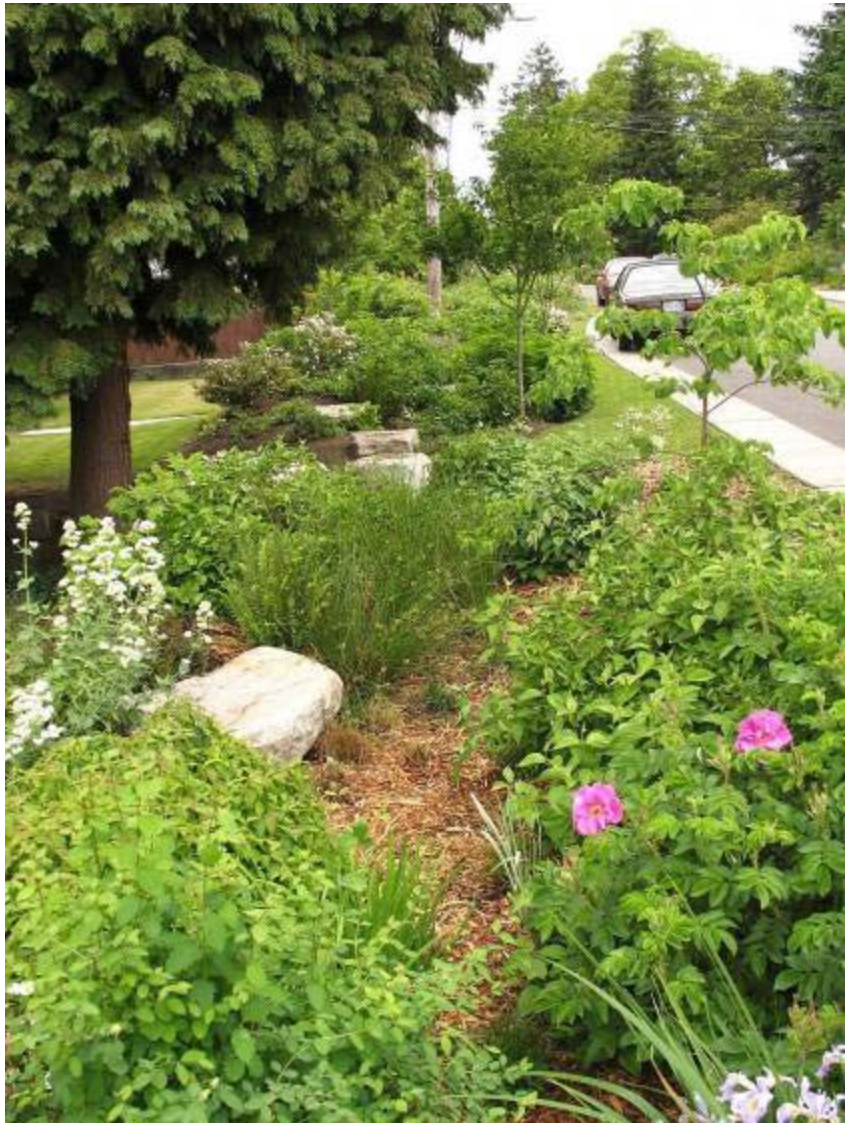
## Portland's Green Streets

SW 12th Avenue Green Street

NE Siskiyou Green Street

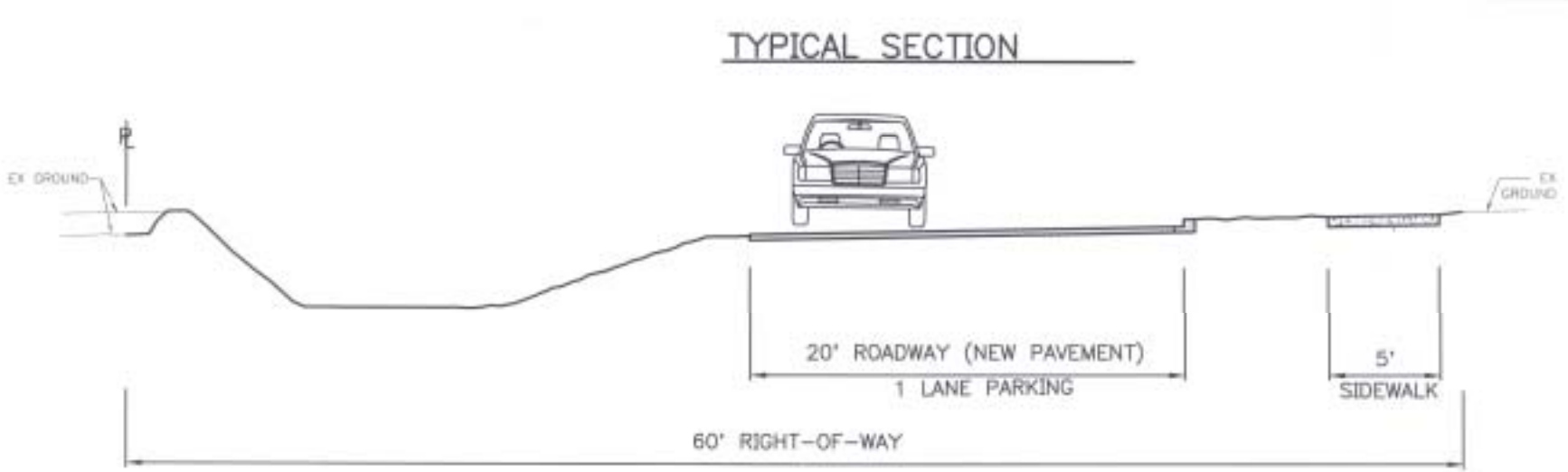
Others…

Photos courtesy of Kevin Perry, BES

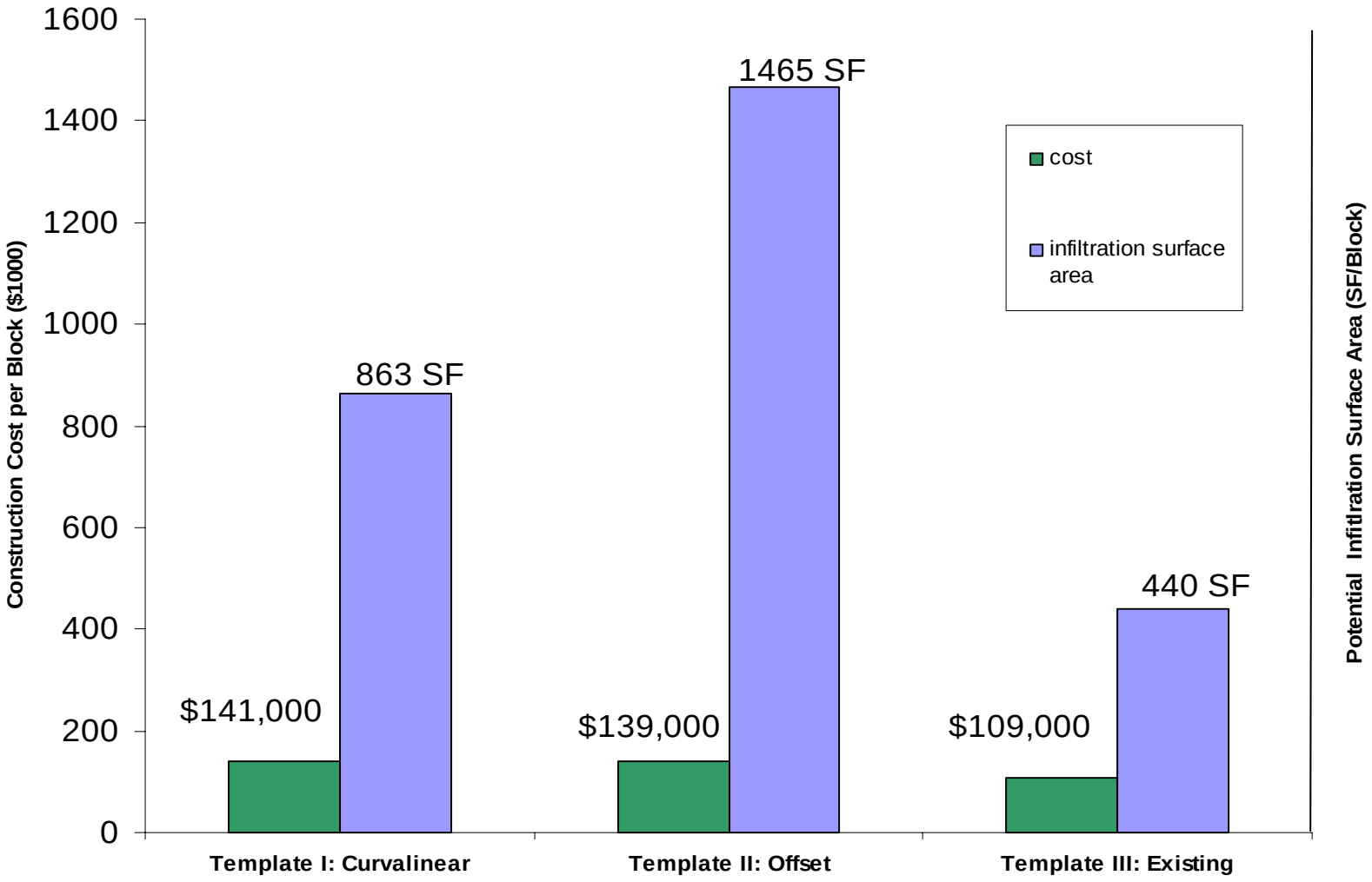


# Seattle's Natural Drainage System Streets

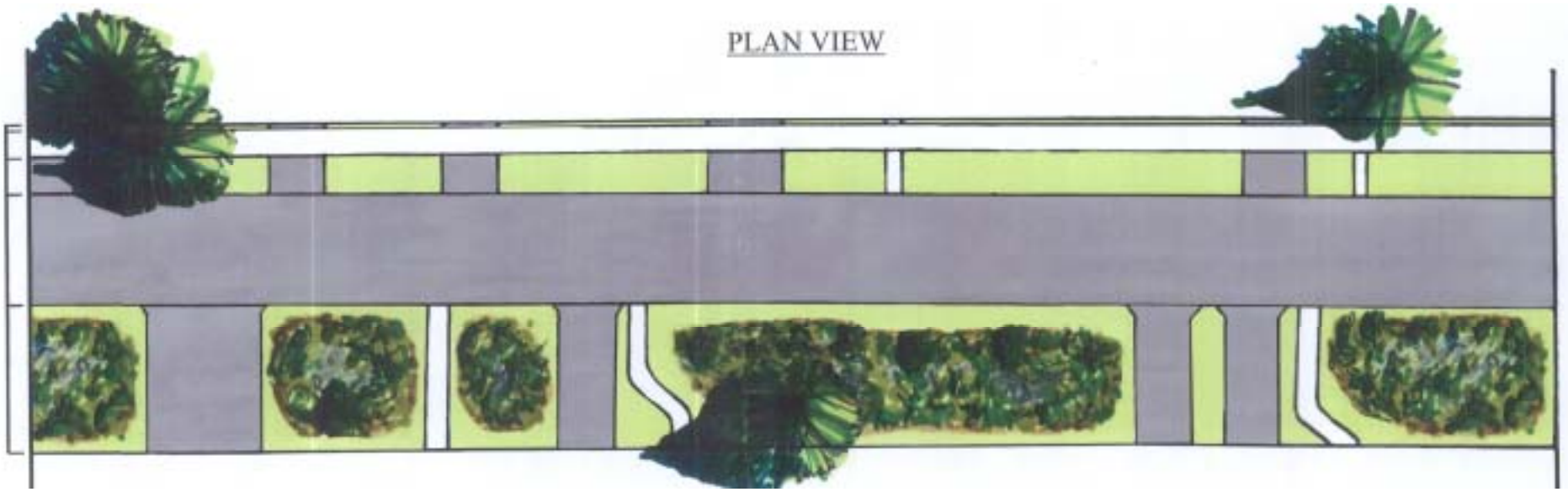
# Offset Template



# Block Scale Template Cost/Benefit Comparison



# **Construction** Costs




$280,000 for 660’ block

42% Stormwater elements (including soil)

45% Street improvements (road, curb, sidewalk)

13% Landscaping

Note: correlates to approximate $200/ LF for stormwater elements

# Offset with Cascade Design

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# Working in the Street ROW

- 2-foot shoulder

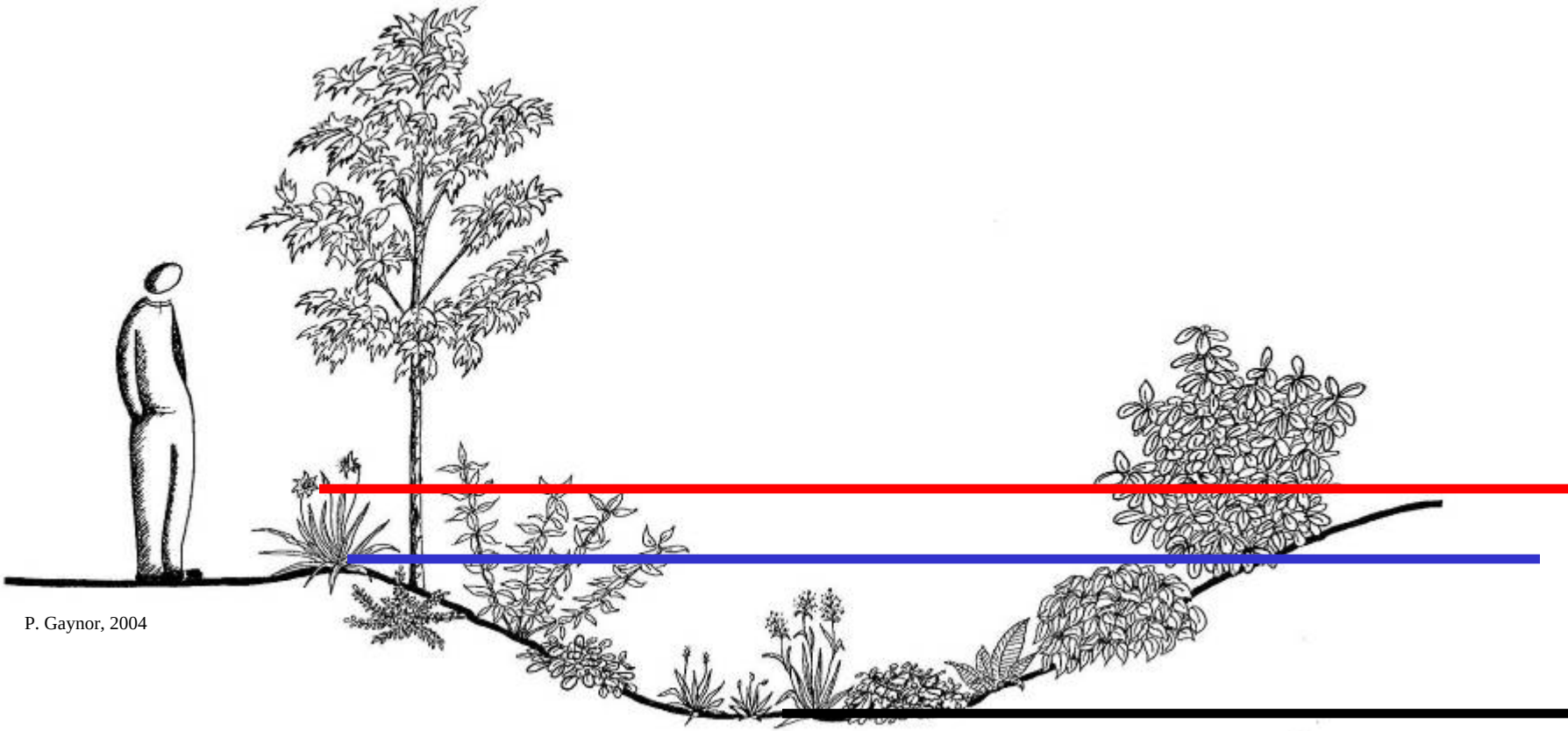
- Grade down 3H:1V (4:1 at intersections)

# Working in the Street ROW

-Rockery 10-feet min from curb/edge of road

-1-foot high rockery 5-foot min

# Design note – Space for Grading




Leave room for grading

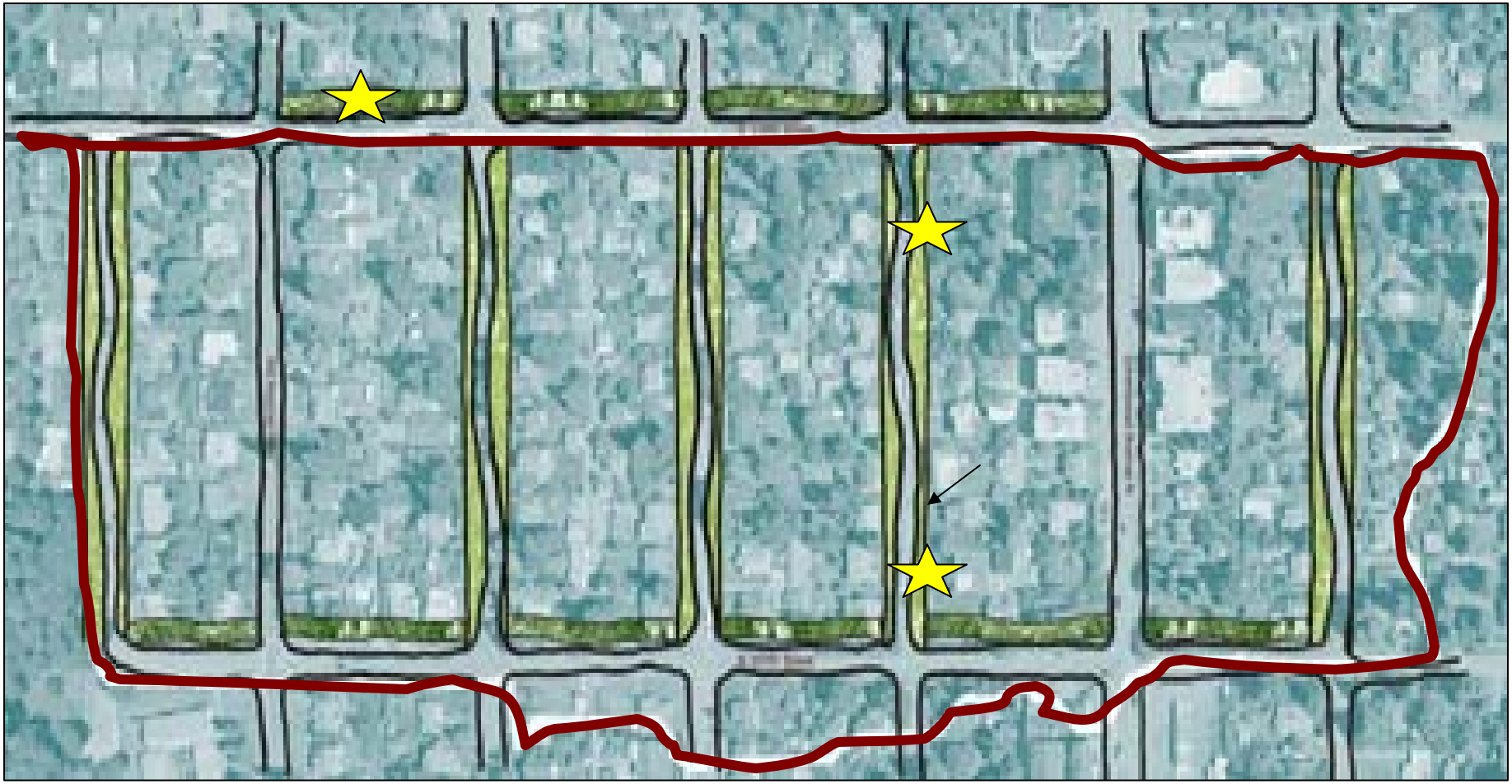
# Design note – Space for Grading

# Design Note:  Soil Compaction

For road (or parking lot) stability, need heavily compacted from road prism (2H:1V from edge)

# Design Note:  Native Soils Variable

# Native Soils in Seattle Vary Widely



Broadview Green Grid, Seattle, WA

# Native Soil Infiltration Rates

Modified Full Scale Field Testing (PIT)

# Subsurface Pipe

Design Note: Large Projects,
if construction will be
through wet season,
likely to need imported soil

# Technical Note: Have TESC Enforcement Procedures in place prior to construction

Seattle Public Utilities

# Raingardens in the Right of Way

# SPU LID Information:

www.seattle.gov/util/naturalsystems