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
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Design Components – same as raingarden

- Conveyance Zone
- Bioretention
- Overflow Zone
Design Components – Conveyance Zone

- Downspout
- Elbow (insert downspout into elbow)
- Plugged sewer standpipe
- Downspout extension elbow into extension
- Splash block

6' min from basement
2’ min from crawl space or concrete slab

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

Trench Drain

Pipe
Overflows/Surface Storage

Beehive Grate
Overflows/Surface Storage

Weir
Overflows/Surface Storage

Cast In-Place Concrete Weir
Surface Storage

Photos courtesy of SvR

Earth Berms
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
Curb Cut Inflow

Beehive Structure Overflow
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 stormwater 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
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

Photos courtesy of Kevin Perry, BES

NE Siskiyou Green Street

SW 12th Avenue Green Street

Others… April 27, 2005
Seattle’s Natural Drainage System Streets
Offset Template
Block Scale Template Cost/Benefit Comparison

Template I: Curvalinear
- Potential Infiltration Surface Area: 863 SF
- Construction Cost per Block: $141,000

Template II: Offset
- Potential Infiltration Surface Area: 1465 SF
- Construction Cost per Block: $139,000

Template III: Existing
- Potential Infiltration Surface Area: 440 SF
- Construction Cost per Block: $109,000
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
Raingardens in the Right of Way
SPU LID Information:

www.seattle.gov/util/naturalsystems