

Lessons Learned from SEA Streets to High Point – Designing Swales and Other “Natural Drainage System” Projects



Tracy Tackett P.E.
 tracy.tackett@seattle.gov
 Low Impact Development
 Program Manager
 Seattle Public Utilities

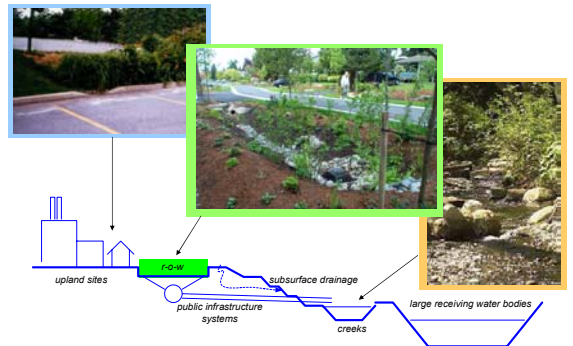
Why Natural Drainage Systems?



Try to make this... ...function like this



Opportunities within the watershed



Detention Vaults

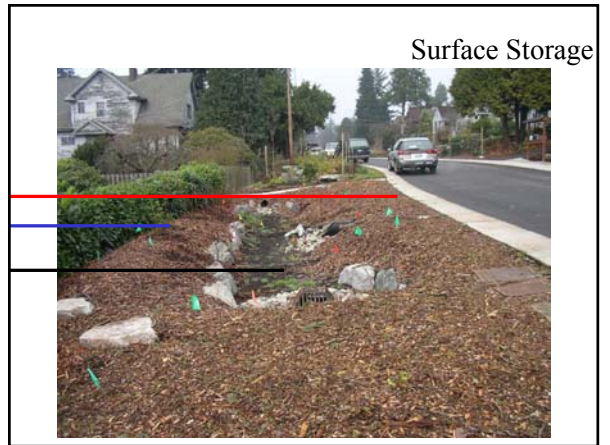
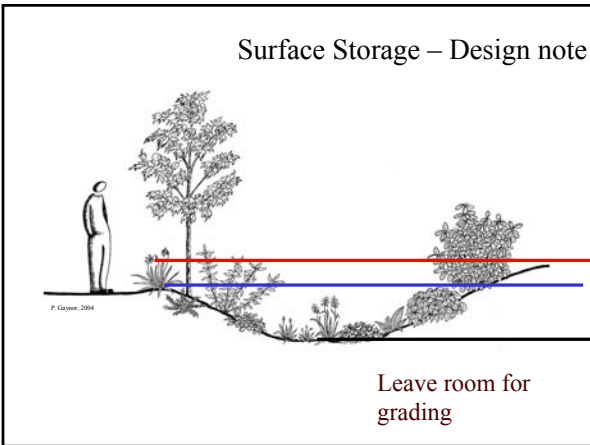


Cannot reduce total volume of stormwater – no infiltration
 Does not serve multiple functions

- Bioretention design parameters
- NDS/LID Case Studies
- Key people to have involved
- ROW policy issues



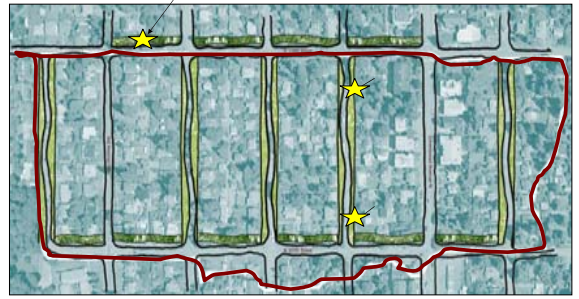
Tracy Tackett, PE
 Low Impact Development
 Program Manager
 Patricia Cortez-Quinones
 NDS Design Engineer
 Seattle Public Utilities



Native Soil



Broadview Green Grid



Sub-basin drainage area = 32 acres

Native Soil Infiltration Rates



Modified Full Scale Field Testing (PIT)



Subsurface Pipe



Soil Storage – Imported soil specs key element



NDS/LID Case Studies

Right of Way

Residential SF- NDS Grids

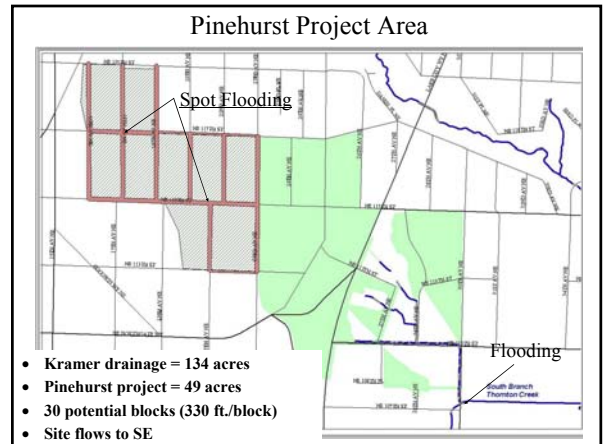
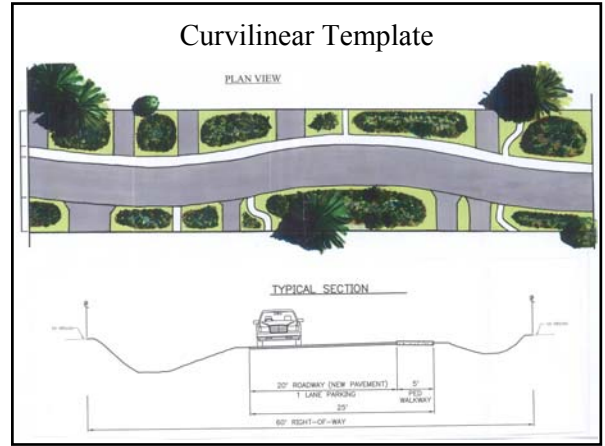
Residential high density – High Point

Commercial - SLU Swale on Yale

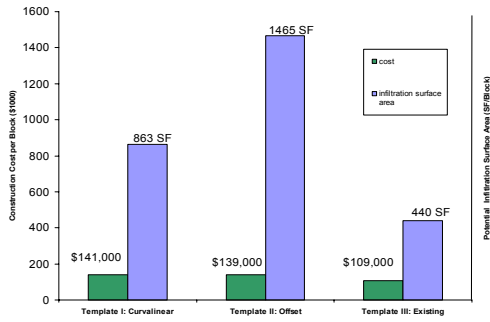
Private Property

Private Property – Northgate Parking lot

Private Redevelopment – Rainwise strategies



Block Scale Template Cost/Benefit Comparison



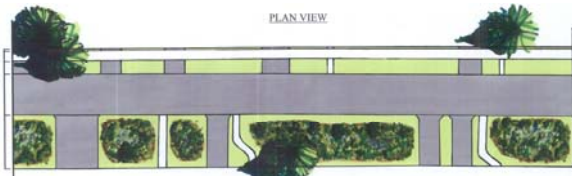
Offset Template



Pinehurst – Offset Template



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



Combined with flow through water quality channel

Offset with Cascade Design



Who to Involve – Street Design Guidelines



Grading – 2-foot shoulder then 3H:1V road side

Street Design Guideline for Venema Natural Drainage – Draft Revised from Pinehurst Guideline. October 2005

Roadway:

Minimum 2-foot road shoulder on each side of the road, with 2% maximum slope toward swales. Shoulder material shall be soil or rock material compacted and capable of supporting vehicle loading and passengers to access the vehicle. Acceptable road shoulder materials should meet the performance criteria in standard specifications. Alternative materials can be considered. Where repaving a full roadway width, cross slope range is between 2% and 4%. The cross slope shall be toward the curb and/ or swale. The roadway that slopes toward the swale may not need curb to allow sheet flow unto the swale.

Who to Involve – Residents



High Point Neighborhood



3-17-05

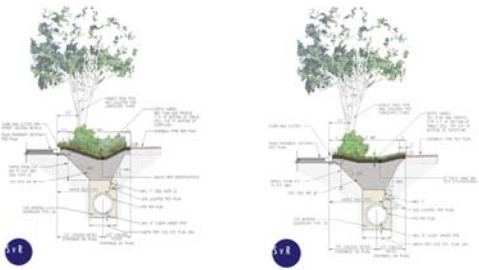
Vertical Mar 17

High Point Neighborhood



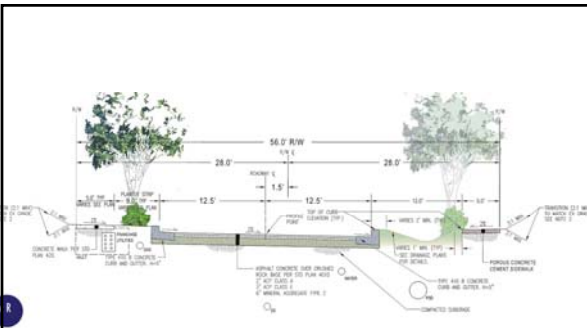
11/11/2005

Swale Cross Sections



- Vegetated swale
 - 10" ponding
 - 18" deep
- Grass-lined swale
 - 2" ponding
 - 8" deep

High Point Neighborhood



Utility Negotiations – Electrical Vaults!

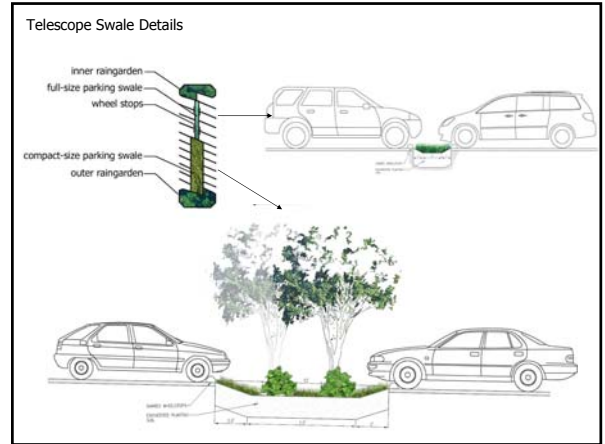


Porous Concrete Roadway Demonstration



Who to work with – Permitting and enforcement procedures in place prior to construction





Private Property: parking lots

Department of Planning and Development **CAM 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 bioretention 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 installed with plants that are adapted to both wet and dry conditions.

http://www.ci.seattle.wa.us/dpd/Sustainable_Building