SvR DESIGN COMPANY

Civil Engineering
Landscape Architecture
Environmental Restoration
Planning

King County Green Building Summit

LID: Site Design, Infrastructure, Drainage, and Landscaping

Peg Staeheli, ASLA, LEED® AP

Contributors:

Tom von Schrader, PE, LEED® AP, Greg Giraldo, PE, LEED® AP

Why Urban LID?

- Growing Realization of Unsustainable Growth
- *Green Urbanism: Learning from European Cities*, Timothy Beatley, pgs 6-8
  - Strive to live within their ecological limits
  - Strive to achieve a circular rather than a linear metabolism, function in ways analogous to nature
  - Strive toward local and regional self sufficiency
  - Facilitate more sustainable, healthy lifestyles
  - Emphasize highly livable communities

Ecology and the Urban Environment

"Nature holds the key to our aesthetic, intellectual, cognitive and even spiritual satisfaction." - E.O. Wilson

- Reconnecting Infrastructure
- Returning Ecological Function to Neighborhoods
- Enhancing the Human Connection

Safety and Accessibility for All

Lets reconsider our right of ways. We own them, they do not belong to cars or utilities. We need to share.

Concept vs. Permitting

On the edge of a new thing… some challenges of permitting

- Right of Way widths
- Still Have Multiple Users and Uses
- Drainage and the Street
- Raised Planters in the ROW
- Pedestrian Widths
- Landscape Widths
- Bike Lanes
- Intersections and Crossings
- Seating and Other Pedestrian Elements (vs Amenities)

After Jumping the Hurdles

- Improve the Urban Environment
- Restore some Natural Balance through Habitat Restoration
- Calm Traffic
- Create Gathering Places
- Create Neighborhood Character and Cohesion

Urban Retrofit Opportunities

- Civic Centers
- Street Improvements
- Drainage / Stormwater Management Possibilities
- Private-Sector Collaboration
- New Housing

"We need to fix what is already here; repair and regenerate. Purchase and Transfer of Development Rights" Buddy Miliken – North Carolina Developer

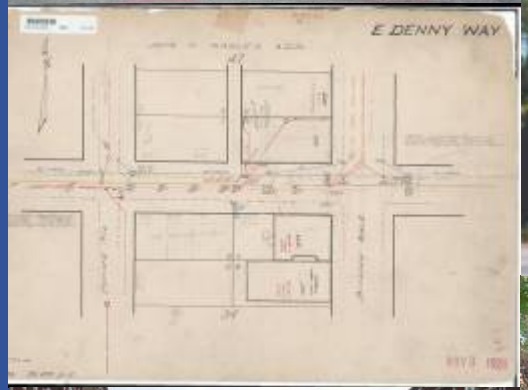
Urban LID Issues

- Critical Urban LID Issues
  - Educate the Community
  - *Carpe Project*
  - Understand the Implications
    - Planning
    - Maintenance
    - Technical Standards
    - Construction Administration
  - Communicate, Collaborate, Facilitate
  - Bring in Outside Examples as Illustrations of what can be achieved

SPU SeaStreet Project

Project Case Studies

- Growing Vine Street
- Denny Park Apartments
- Euclid Ave. Corridor
- Northgate Parking
- Corson Avenue
- High Point Redevelopment
- Kitsap County Administration Building
- Tregaron Housing Development



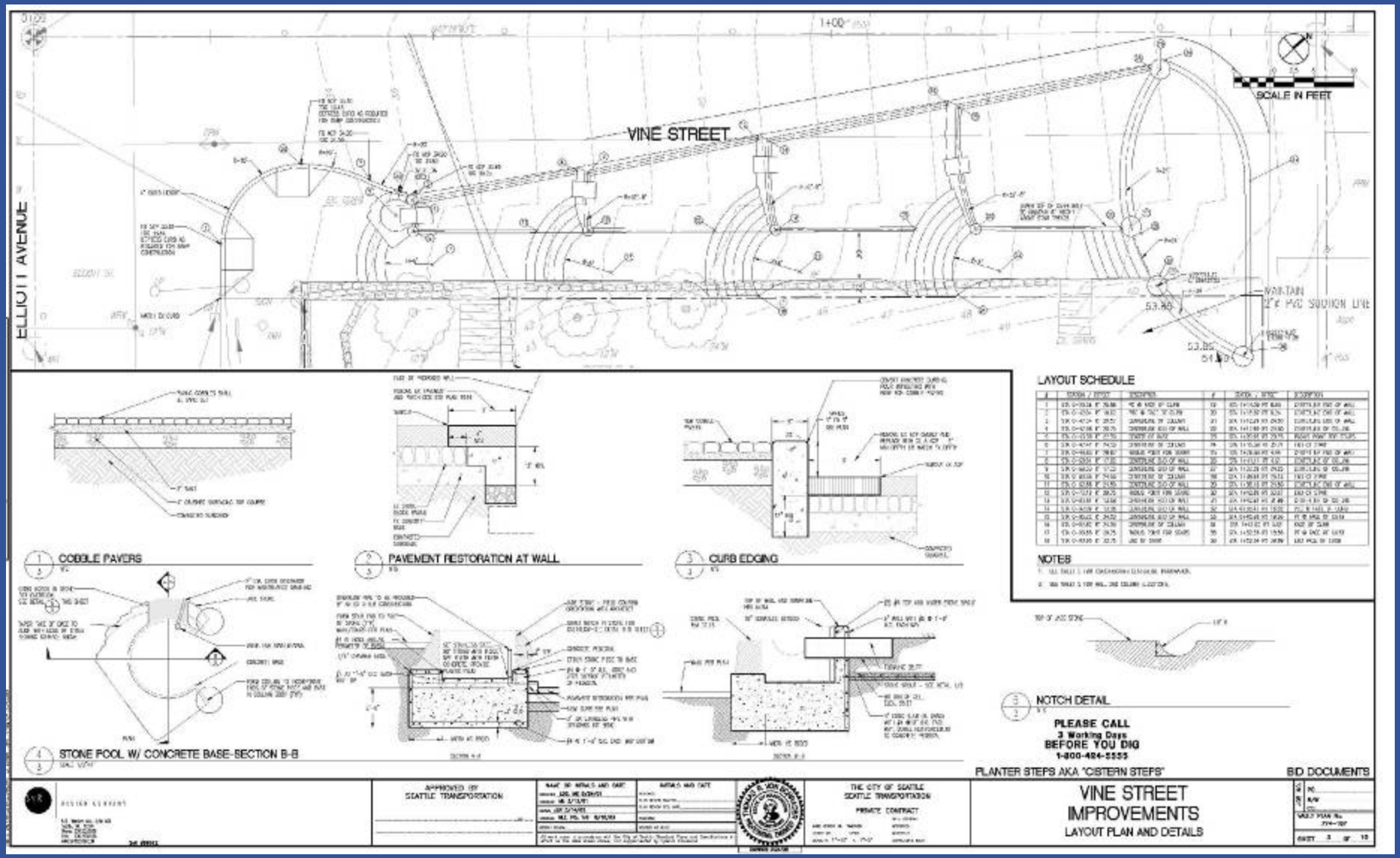
Vine Street, Downtown Seattle

- Urban Revitalization
- Community Support
- Hard Urban Environment
- Preconceived Concepts of Right of Way Usage
- ADA Accessibility Issues

Growing Vine Street, Downtown Seattle

- Multi-Year Master Planning Effort
- Multi-Year Permitting Effort
- Close Collaboration w/Department of Transportation
- New Right-of-Way Usage

Growing Vine Street, Downtown Seattle

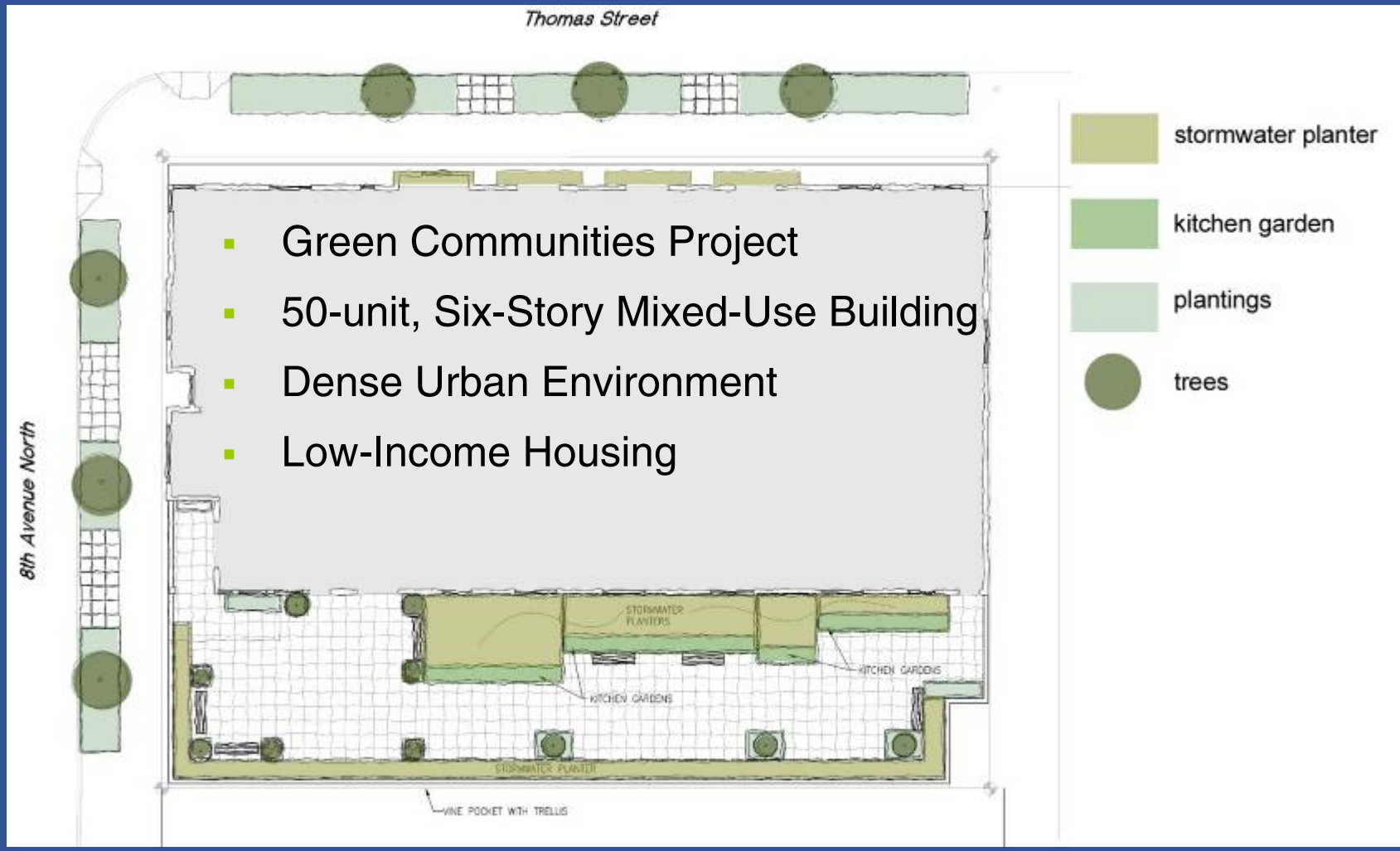


Growing Vine Street - Construction

Growing Vine Street

- Urban Drainage
- Cascade of Pools
- Cleans Stormwater Runoff
- Art Integration
- Pea Patch

Denny Park Apartments



- Green Communities Project
- 50-unit, Six-Story Mixed-Use Building
- Dense Urban Environment
- Low-Income Housing

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Denny Park Apartments - Construction

- Client Champion
- Maximize Space
- Give Reason

Denny Park Apartments

- Collection and Conservation of stormwater
- Irrigation of Landscaping
- Low-Maintenance Landscaping
- Drought-Resistant Plantings

Euclid Street, St. Louis, MO

- Existing Client Champion
- NPDES Phase 2
- Corridor Revitalization Project
- Goals:
  - Attract quality development
  - Enhance the neighborhood
  - Strengthen Connections

Euclid Street, St. Louis, MO

- Sustainability Goals
  - Incorporate green infrastructure
  - Look at various options
  - Conduct a drainage basin analysis
  - Develop options
  - Incorporate options into schematic design

The design team used photos of other relevant projects from across the country to convey possibilities.

Euclid Street, St. Louis, MO

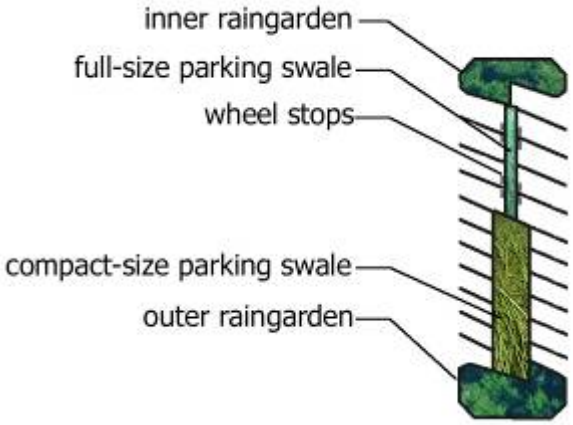
- Options Evaluated / Included
  - Porous Pavements
  - Rain Gardens
  - Rainwater Harvesting
  - Habitat Patches

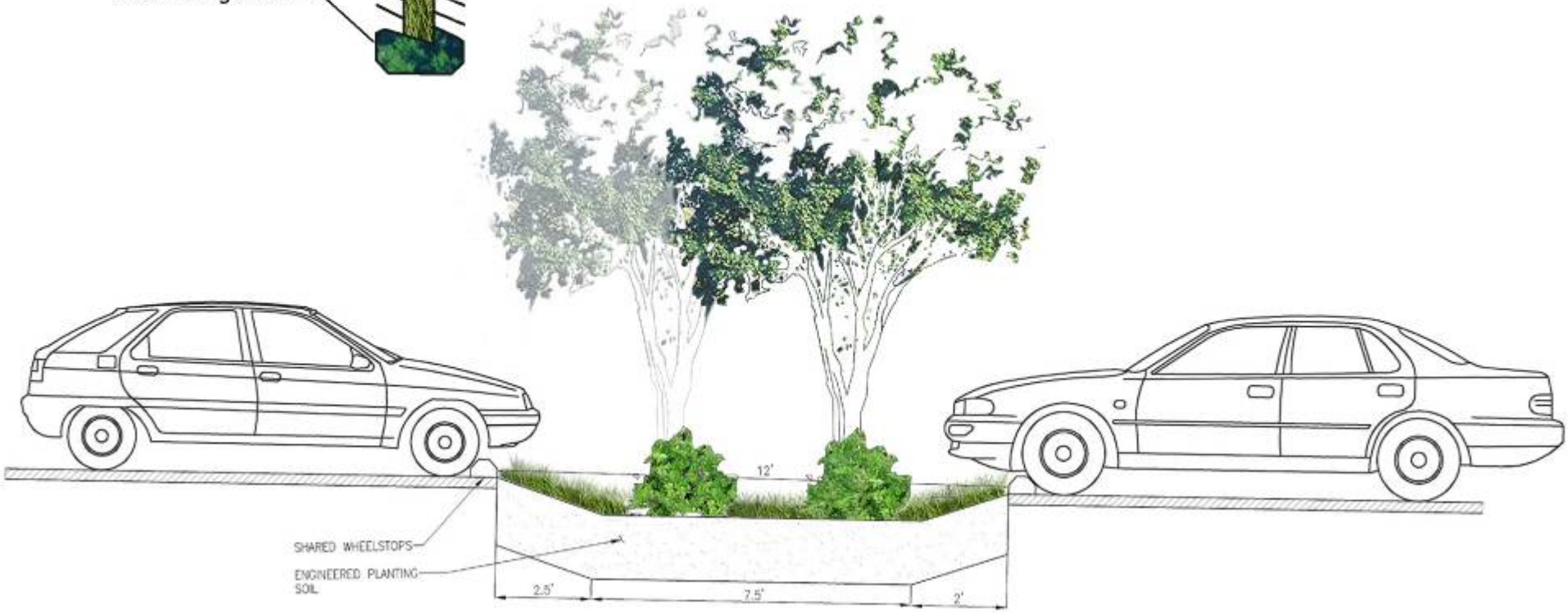
Euclid Street, St. Louis, MO

- Challenges
  - Icy lanes
  - Rain garden maintenance
  - Salt-tolerant plant materials
  - Character issues

Northgate Parking Lot Study

- Nearby Thornton Creek
- Developed/Analyzed three LID approaches
  - Porous Pavement
  - Unit Pavers
  - Telescoping Swales





Northgate Parking Lot Study

- Reduce Costs and Quantity of Underground Water Quality Vaults
- Led to CAM #515 – Green 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 and natural drainage landscapes.

Alone or together, these two strategies can be used to meet water quality and landscape requirements and provide credit toward flow control requirements for parking lots.

Permeable Paving

Permeable pavements include pavers, grid systems, porous asphalt and porous concrete. Pavers may be pre-cast sections or individual units that fit together. They are available in a variety of patterns and colors and can be used to enhance the project's aesthetic. Grid or lattice systems are rigid plastic forms that are filled with gravel or soil and vegetation. Porous asphalt and porous concrete are similar to conventional asphalt and concrete in structure and form except that the fines (sand and finer material) have been removed.

When installed over a drainage storage bed, these permeable pavements allow rain to infiltrate through the voids of the permeable surface. Beneath the permeable surface, runoff storage is achieved and/or infiltration occurs where soil permits. Surfaces that infiltrate 100% of the six-month storm runoff may be eligible to be removed from area calculations for water quality requirements. See attached handout for more information on different types of 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.

Bioengineered planting strips are similar to bio-swales but they include an infiltration component. As with rain gardens, native soil below the swale is excavated and backfilled with gravel and loamy sand and planted with shrubs and groundcover.

All systems include an overflow system such as a perforated pipe or a raised overflow device to convey excess drainage to another system or discharge point. These natural drainage landscapes can help reduce the volume of runoff generated from parking lots and filter, infiltrate and store runoff for slower discharge. Existing landscape features such as planters and landscape strips can be converted to natural drainage landscapes.

HOW DO GREEN PARKING LOTS MEET REQUIREMENTS?

The green parking lot strategies described above may help meet requirements for several City codes, including:

- Seattle Municipal Code (SMC) Ch.22.800, Stormwater, Grading, and Drainage Control Code
- SMC 23.47.016, Screening and Landscape Standards
- DPD Director's Rule (DR) 26-2000, Volume 3, Flow Control Technical Requirements Manual

www.seattle.gov/dpd

City of Seattle
Department of Planning & Development
Gregory J. Nickels, Mayor Diane Sugimura, Director

700 5th Avenue, Suite 2000
P.O. Box 34019
Seattle, WA 98124-4019
(206) 684-8600

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Corson Avenue - Existing

- Brownfield Site
- Feasibility Study for Site Improvements
- LEED Elements

Corson Avenue

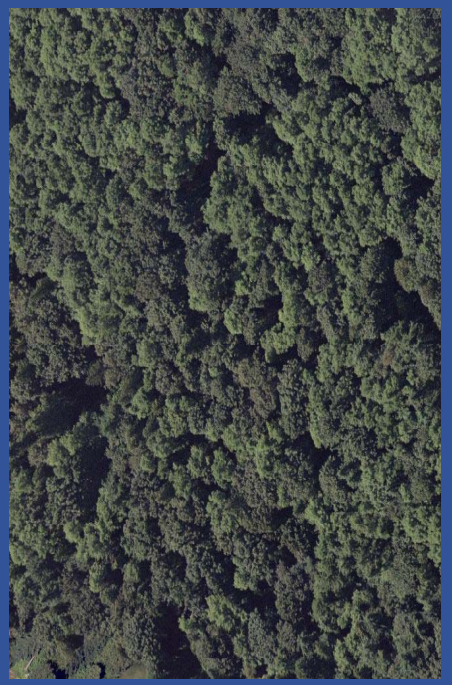
- Rainwater Harvesting – cistern to hold rainwater for on-site use (up to 6,000 gal is used on site per day)
- Raingardens
- Porous Concrete
- Specialty Pavement – pedestrian safety
- Aiming for LEED Silver Rating

High Point Redevelopment - The Challenge

try to make this…

develop like this and …

function like this

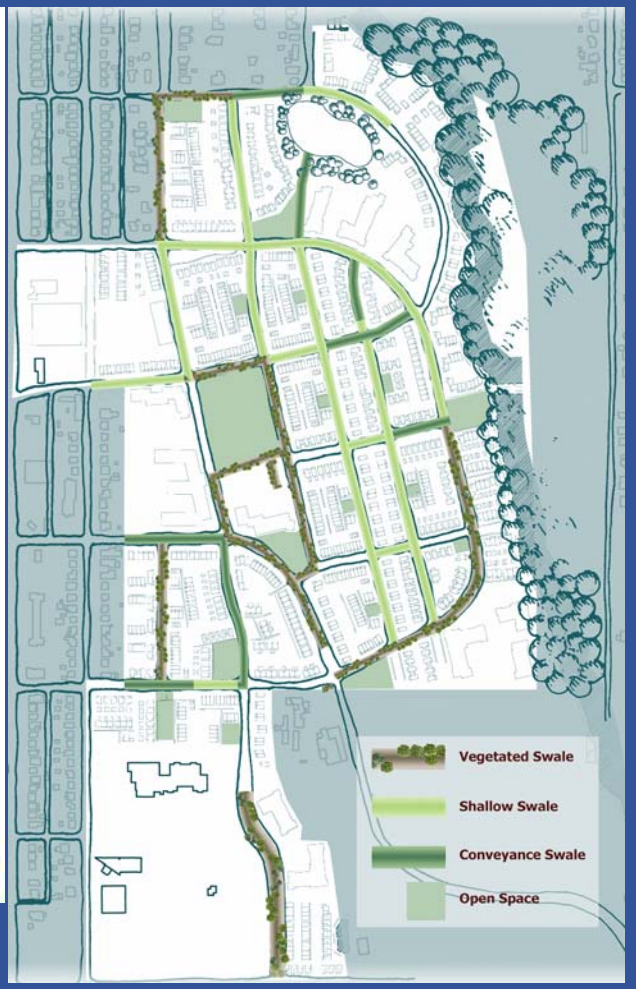


High Point Redevelopment

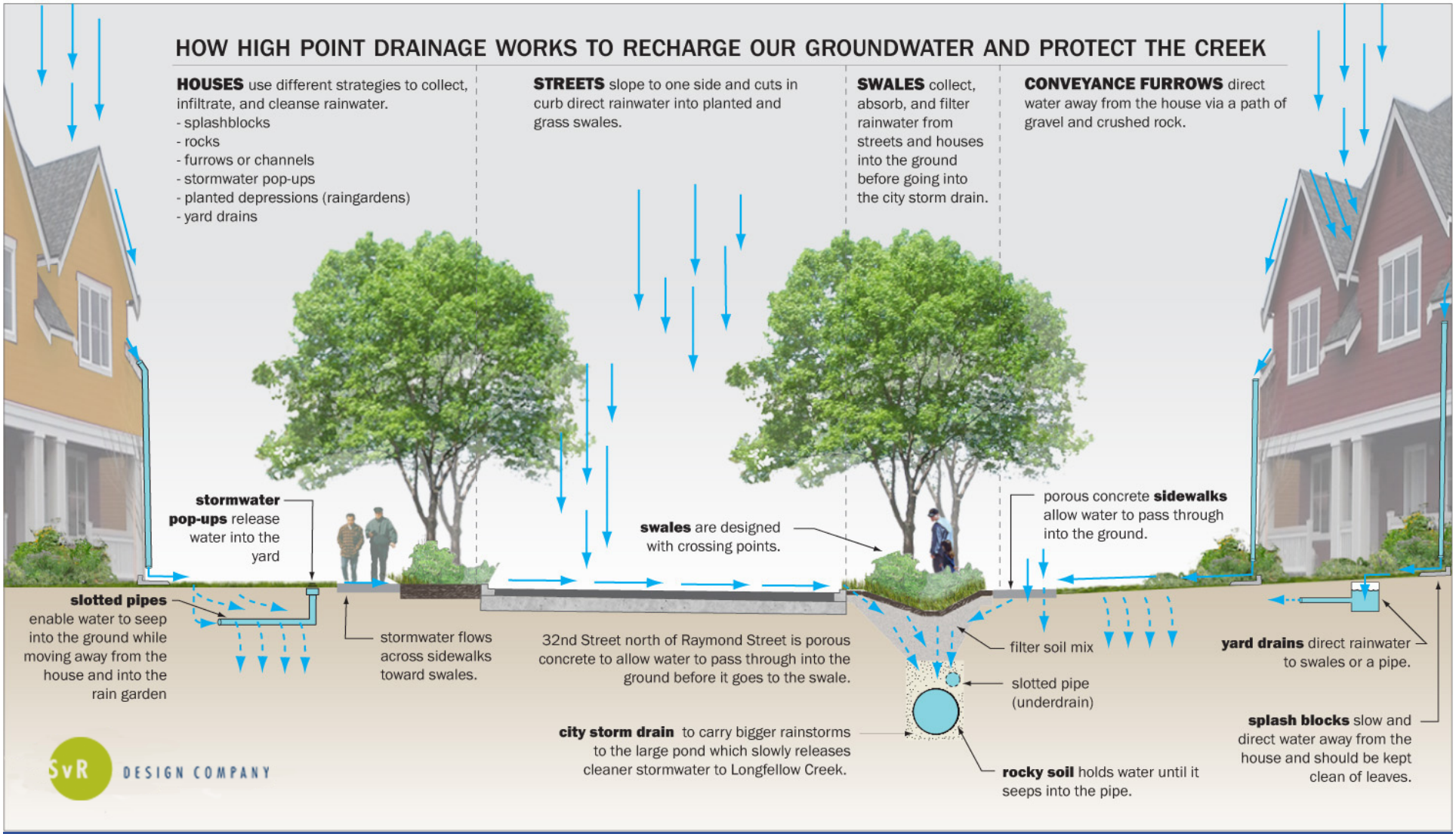
- Redevelopment of 716 1940s era housing units
- Urban revitalization and integration with surrounding West Seattle community
- Goal to create an urban pedestrian-oriented, mixed-use, mixed-income community

High Point Redevelopment

- 34 blocks of new streets complete with new utilities, street trees and sidewalks, and 1,600 new housing units on 120 acres
- 20 acres of land for parks, open spaces and playgrounds



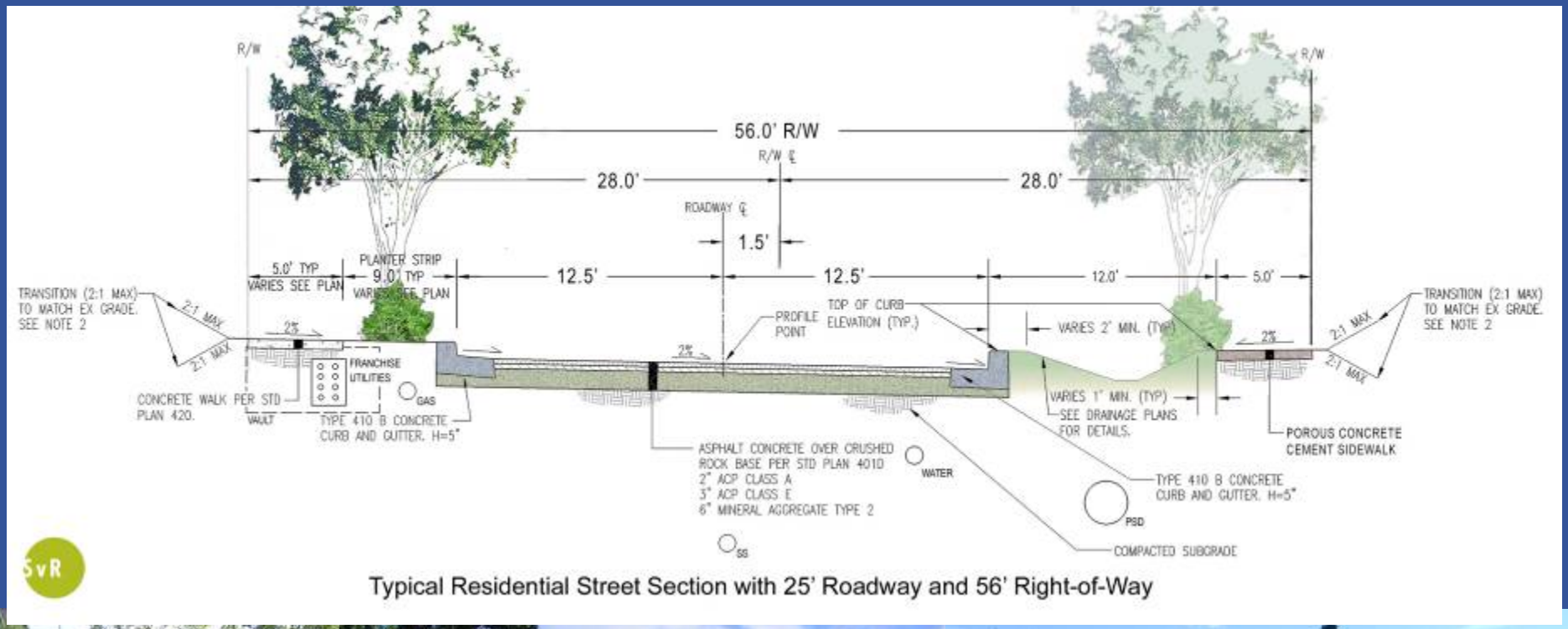
High Point Redevelopment



High Point Redevelopment

- First Public Porous Street in Washington State
- Porous Sidewalks
- Pervious Parking
- Swales with Amended Soils
- Raingardens
- Tree Preservation
- Stormwater Pond

High Point Redevelopment



Typical Residential Street Section with 25' Roadway and 56' Right-of-Way

Natural Drainage Swales in ROW

- Reduce Pollutants from Streets and Lawns
- Allow for Sediment to Settle Out
- Amend soils for increased infiltration
- Attenuate Flows
- Reduce Storm Runoff Peaks from Small Storm Events
- Improve Habitat

Key Construction Elements

- Traffic Control
- Tree Protection
- Erosion Control
- Franchise and Electrical Utilities Installation
- Sanitary and Water
- Porous Pavement Installation
- Natural Drainage System (NDS soils & landscaping)

32nd Ave SW - Design Goals

- Pilot Porous Pavement Street for City of Seattle
- Integration of Redevelopment into Existing Neighborhood
- Traffic Calming
- Provide Service for Residential Street Loading Condition
- Infiltrate the 6-month Storm Event for the Roadway Section only
- Reduce the Existing Developed Peak Flow Rate up to the 2-year Storm Event

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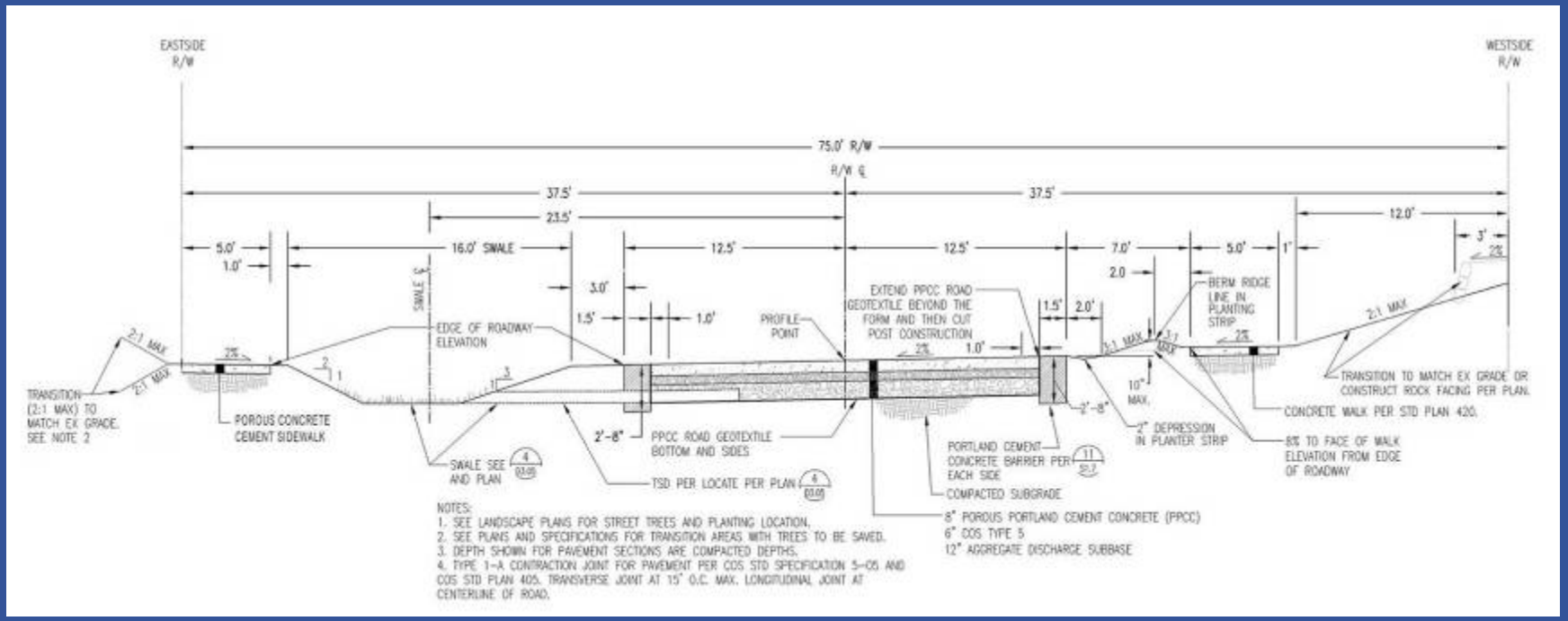
Design Parameters for 32nd Roadway Section



- Sloped subgrade with roadway in order minimize amount of excavation
- Gravel storage subbase set above other underground utilities
- Back up system (CB and Swale) for overflow during large storm events
- Depression on upslope side for collection of fines
- Coordination with other underground utilities (Electrical and Franchise Duct Bank extending 14'+ in width at some locations, new sewer and water)

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Construction of 32nd Ave SW

Before

Side Barriers

Installing Dams for Cells

Fabric at Subgrade

Gravel Storage Subbase

Placement of Porous Cement Concrete for Roadway

Moisten Subbase, Place Mix & Strikeoff

Cut in joints

Roller for compaction

Protect & cover

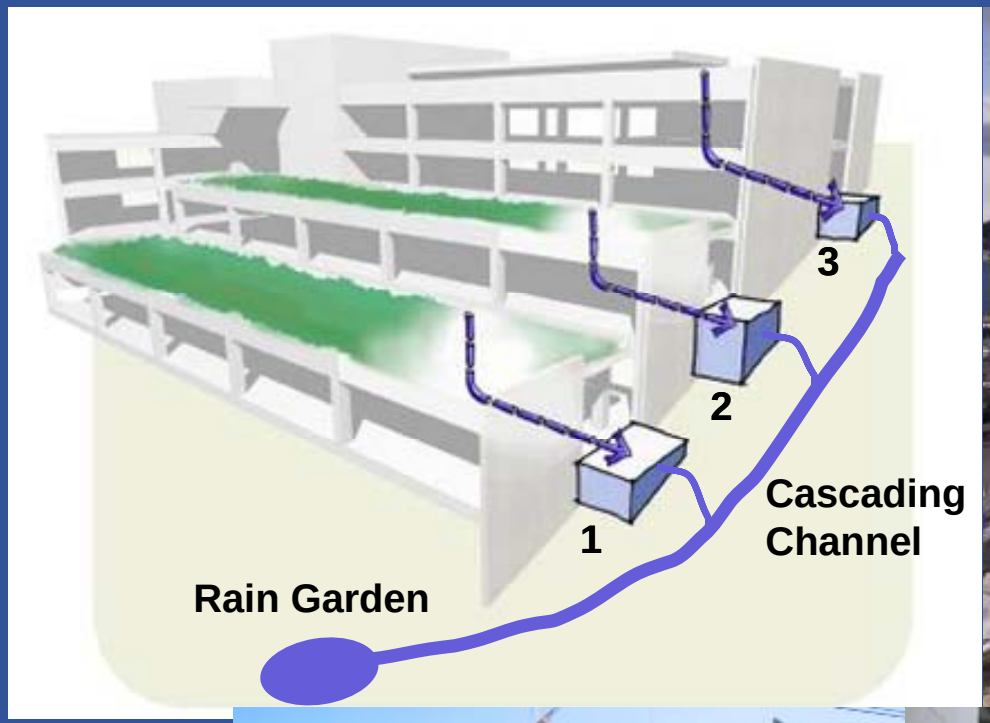
Porous Cement Concrete Sidewalks

- On swale side all streets (decision based on cost, surfacing and that approach is still new)
- 4” to 5” of Porous Cement Concrete Pavement over 6” Gravel Subbase
- Over 1 mile of public porous sidewalk was installed in Phase 1.
- Including both phases, over 2.4 miles of porous public sidewalk to be installed at High Point.

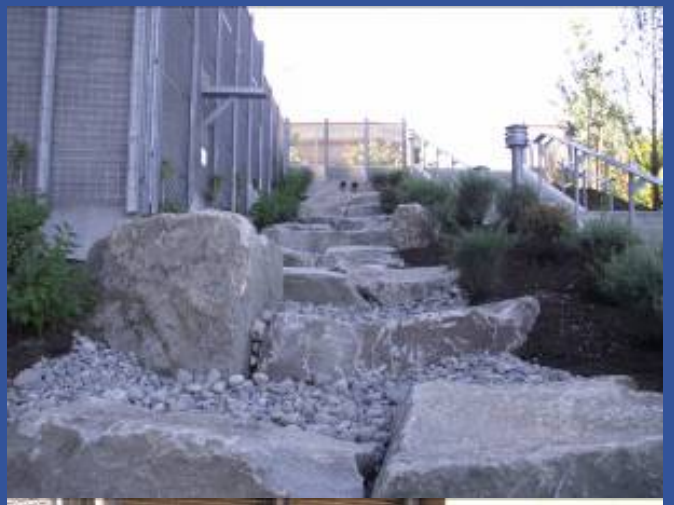
Kitsap County Administration Building, Port Orchard, WA

- Steep Slopes
- New Construction Project
- Low Impact Development Champion

Kitsap County Administration Building, Port Orchard, WA



Kitsap County Administration Building, Port Orchard, WA



Tregaron, Washington, D.C.

- Historic Site
- Restore Site to 1911 – 1941 Character
- Improve Habitat, Vegetation, Water Quality
- Issues
  - Compact dimensions
  - A/E community reservations

Implementation of Strategies

- Plan Early
  - Current status of the watershed/water bodies
- Adopt Design Guidelines
  - Non-standard approach
- Coordination
  - Public works, streets, developers, agencies
- Integrate Design Flexibility
- Understand and Anticipate
  - Space, constructability, costs, maintenance
- Provide Public Information and Education

Lessons-Learned

- Create Community Advocates
- Own Your Project
  - Think of your project's community context
  - Understand the LID's complete integration
- Involve Planners
- Collaborate with Your Agencies
- Draw Upon Outside Agencies
- Draw Upon Outside Examples
  - High Point Technical Standards

It is time that low impact development moves from alternative to mainstream.

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Lessons-Learned

- Develop Standards and Guidelines
- Clear Submittal Requirements for Permitting
- Checklists for submittals
- LID reviewers
- Standards with flexibility for variance if a site's specific conditions offer another solution.
- Make compromises – multiple stakeholders of the ROW
- Understanding of expectations and design intent with installer, supplier, designer and inspectors.
- When staff changes occur (from Installers to Inspectors) inform them of expectations and design intent.
- Construction – TESC
- Construction – Fine Grading

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