Green Infrastructure Working Group:

Beneficial Use of Stormwater

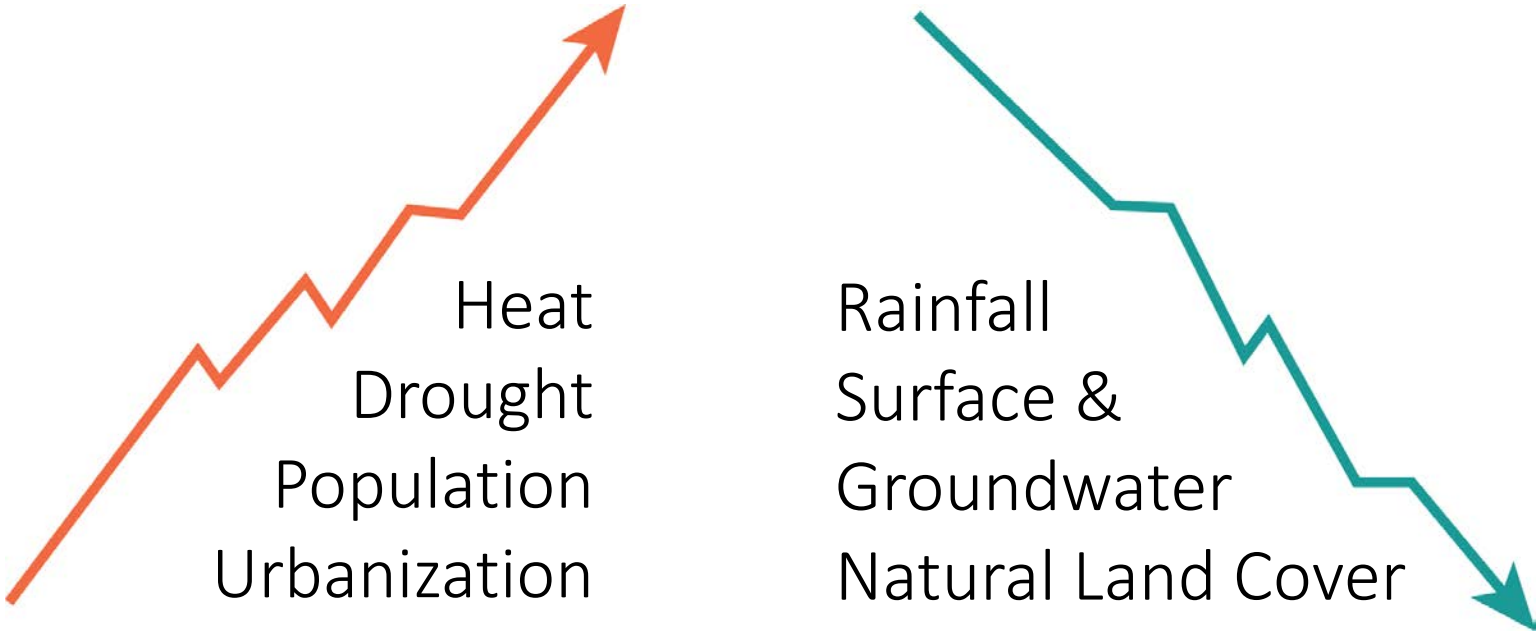
April 10, 2015

Agenda

Arrivals & Introductions	11:00
Staff presentation	11:15
Recap of WPO Phase 2	
National models	
Retain stormwater on-site	
• How much stormwater to retain?	
• Redevelopment & high impervious cover	
• On-site best practices	
Small group discussion	12:15
Large group summary & recap	1:15

Note: There will be short breaks both before and after the small group discussion

Challenges & Opportunities: Connecting the Dots…



BUT…

1. Can incorporate natural systems & rainwater storage in designs to offset water use, preserve quality of life
2. Practical methods & models have already been implemented in other cities

Recap of WPO Phase 2 Work

- 9 public stakeholder meetings in 2014 to discuss topics related to green stormwater infrastructure
  - How to optimize use of stormwater runoff volume (e.g., conservation & infiltration)
  - Reviewed best practices to incorporate into the Environmental Criteria Manual
  - Stakeholder conclusion: require beneficial retention and/or re-use on-site for new & re-development
  - Staff to expand research on national models

What Does Austin Do Now?

- **Water Quality Requirement**
  - Must capture and treat a portion of a site's stormwater runoff (based on impervious cover)
  - Payment-in-lieu option in Urban Watersheds
- **Innovative Water Management**
  - 2010 amendment to the Landscape Ordinance
  - Must direct stormwater runoff to 50 percent of required landscape area
  - Option to protect undisturbed natural area instead

➢ **Integration of two provisions not required**

Two Overall National Models

1. **Focus on infiltration and baseflow**
   - Required to infiltrate amount equal to average annual recharge volume for an undeveloped site
2. **Focus on keeping stormwater on-site**
   - Keep stormwater runoff from leaving the site
   - Use a combination of infiltration, harvesting, reuse, evaporation, and/or evapotranspiration
   - Reduce the effective impervious cover

➢ **Different approaches for redevelopment**

1. Infiltration & Baseflow

- Pioneered by Massachusetts and Maryland
  - Also used by Connecticut, Vermont, New Jersey, Wisconsin
- Portion of water quality volume infiltrated on-site with structural or non-structural controls
- Based on Hydrologic Soil Group (HSG)
  - Multiply water quality volume by soil specific recharge factor for A, B, C, & D soils
  - Maryland: A = 0.38; B = 0.26; C = 0.13; D = 0.07
- Exceptions for pollution hotspots, karst, areas with shallow water table, redevelopment

2. Retain Stormwater On-Site

- Used by multiple jurisdictions across the country
  - New York, Washington D.C., West Virginia, Delaware, Tennessee, Kentucky, Minnesota, Montana, New Mexico, California
- Based on a certain size/frequency of storm event
- Same basic concept as requiring an effective impervious cover limit
  - How runoff from impervious cover is reduced to levels of runoff from an undeveloped site
- Exceptions for redevelopment, unique conditions

"the Cityscape as a Water Supply"

- LCRA: Current drought is the most severe in the history of the Highland Lakes (link)
- Austin Water Resource Planning Task Force
  - Cityscape can be designed and retrofitted to function as a water supply source (demand reduction)
  - Capture, store, & treat rainwater for beneficial use
- WPO Phase 2 Stakeholder support for same
- Given these challenges & goals, we need to focus on more than just infiltration & baseflow
  - **Retain stormwater on-site for beneficial use**

Retain Stormwater On-Site: Questions to Answer

- How much stormwater to retain on-site?
- How to handle redevelopment and high levels of impervious cover?
- Are there best practices we would always want to see implemented on-site?

How much to retain?
National Benchmarking

- Percentile of rainfall events
  - Ranges from 80th percentile to 95th percentile (e.g., 90% of rainfall events are less than one inch)
  - Equates to a required depth in inches (e.g., first inch of rainfall will be retained on site)
  - Retention volume is based on required depth, site area, and impervious cover
  - Some jurisdictions factor in runoff coefficients for different types of land covers on the site (e.g., impervious cover, disturbed pervious cover)

How much to retain?
National Benchmarking

- Other options for methodology
  - Percentage of average annual runoff volume (e.g., capture 80% of the annual runoff volume)
  - Match the runoff volume to undeveloped condition for a certain design storm (e.g., 1 year, 24 hour storm)
  - Set amount to retain on-site equivalent to the required water quality volume

How much to retain?
Data from Austin

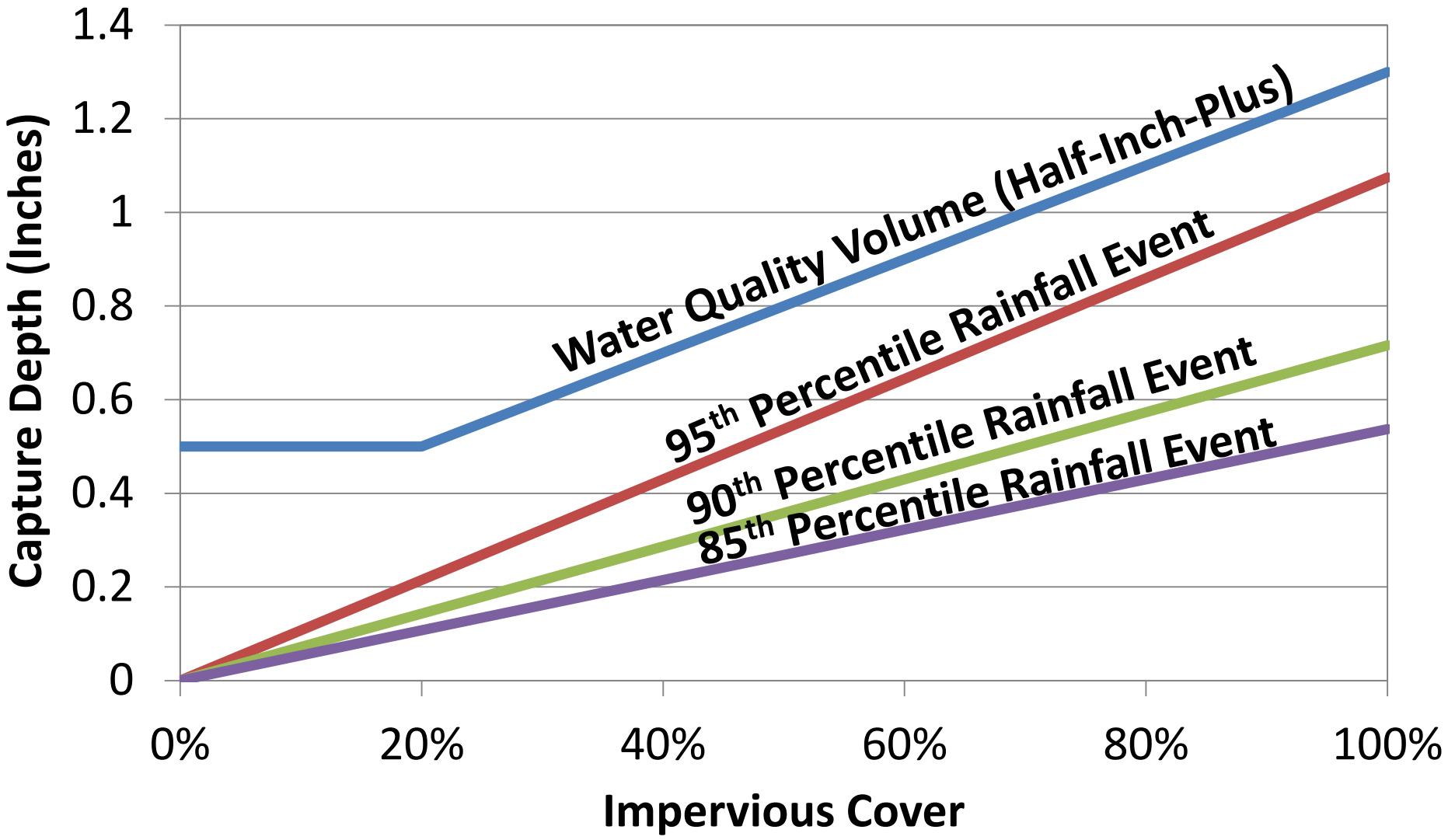
- Austin percentiles for rainfall events (24-hour)

Percentile	Depth (inches)
85	0.75
90	1.00
95	1.50

- Austin's water quality volume = "half-inch-plus"
  - Capture and treat first half inch of runoff plus an additional 1/10 inch of runoff for each 10 percent increase in impervious cover over 20 percent
  - Half-inch-plus captures about 94 percent of the average annual runoff volume

How much to retain?

Data from Austin



How much to retain?

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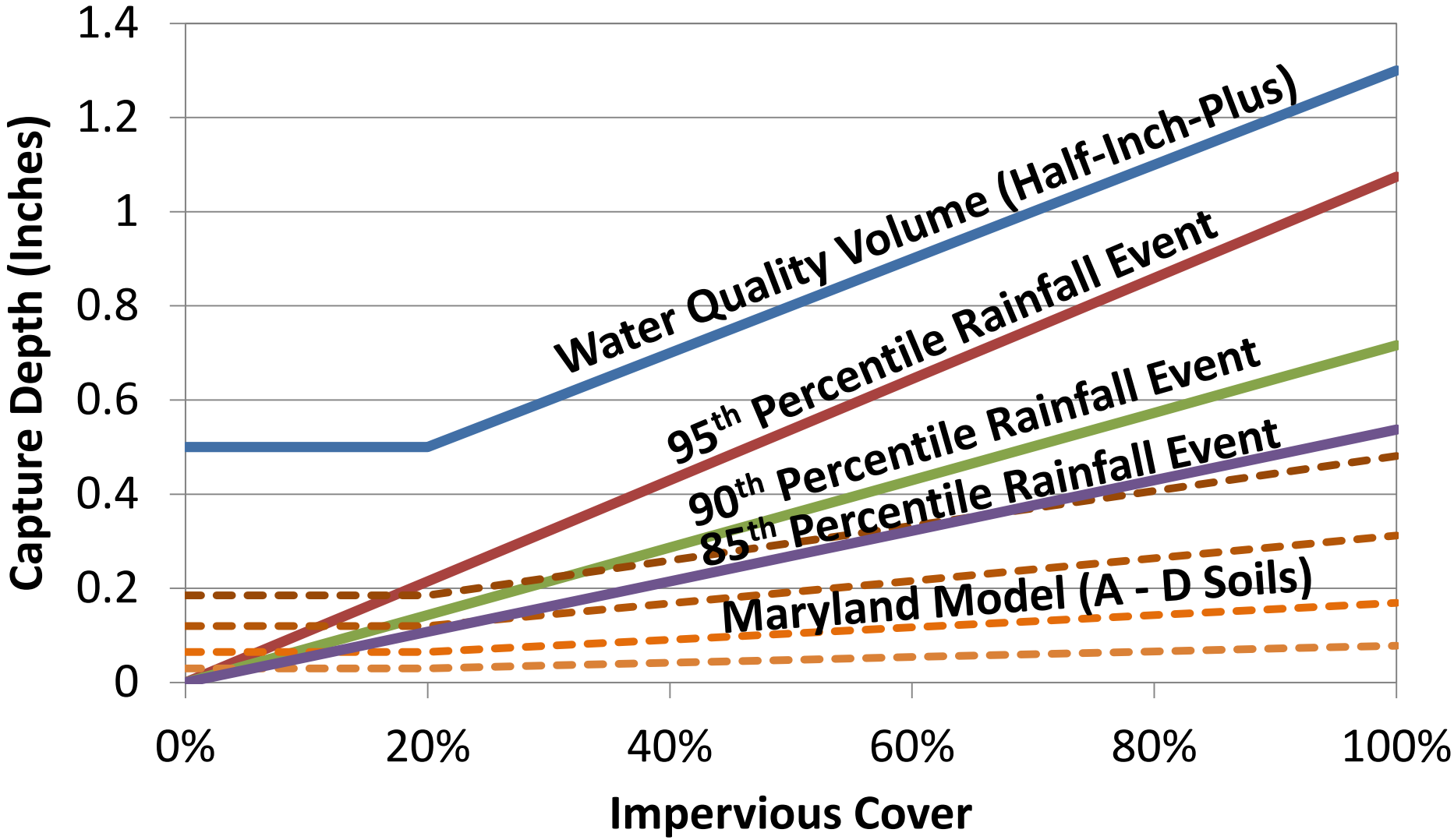
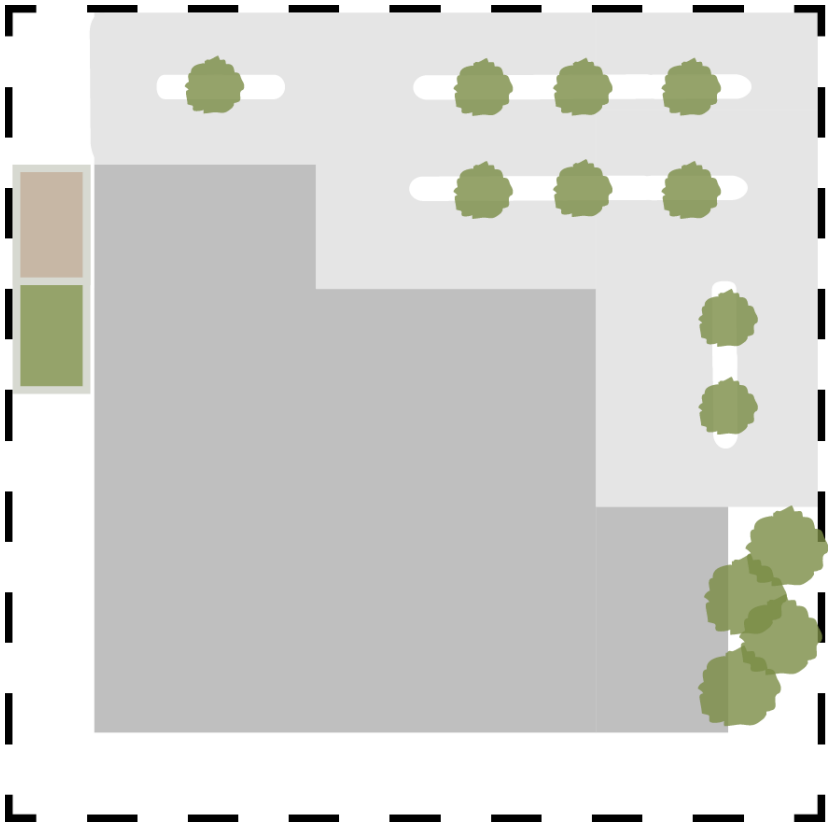


Redevelopment and High Impervious Cover

- Can be challenging to retain stormwater on-site for highly impervious sites
- Other jurisdictions offer a wide variety of alternative standards
  - Reductions in required volume
  - Payment-in-lieu options
  - Complete exemption

Example: 80% Impervious Cover Site



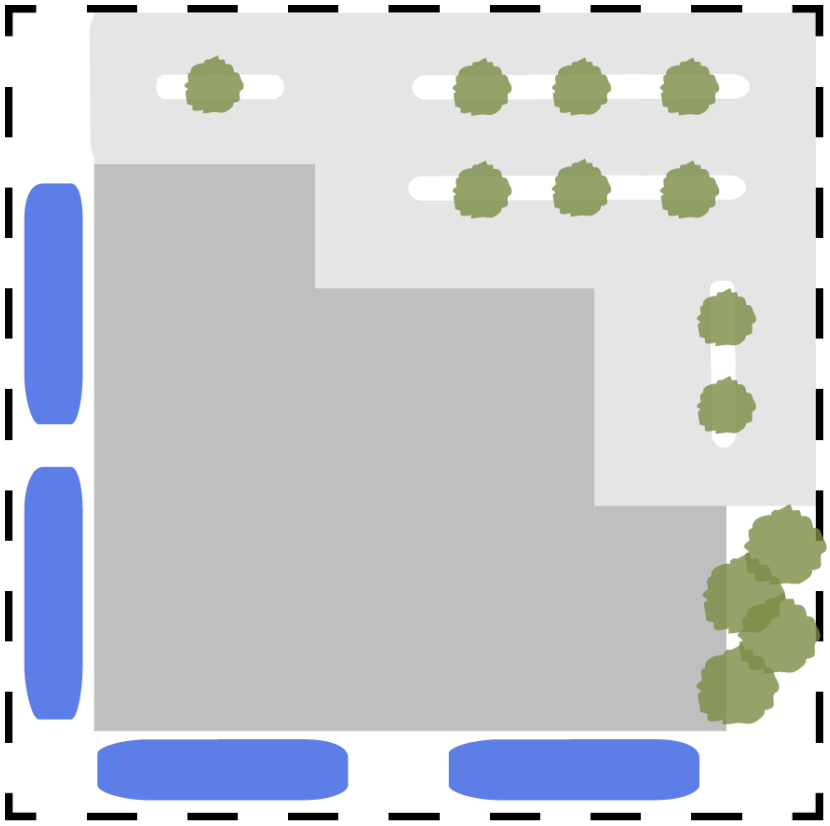
Conventional Sand Filter

2.3% of Site Area

4 feet deep

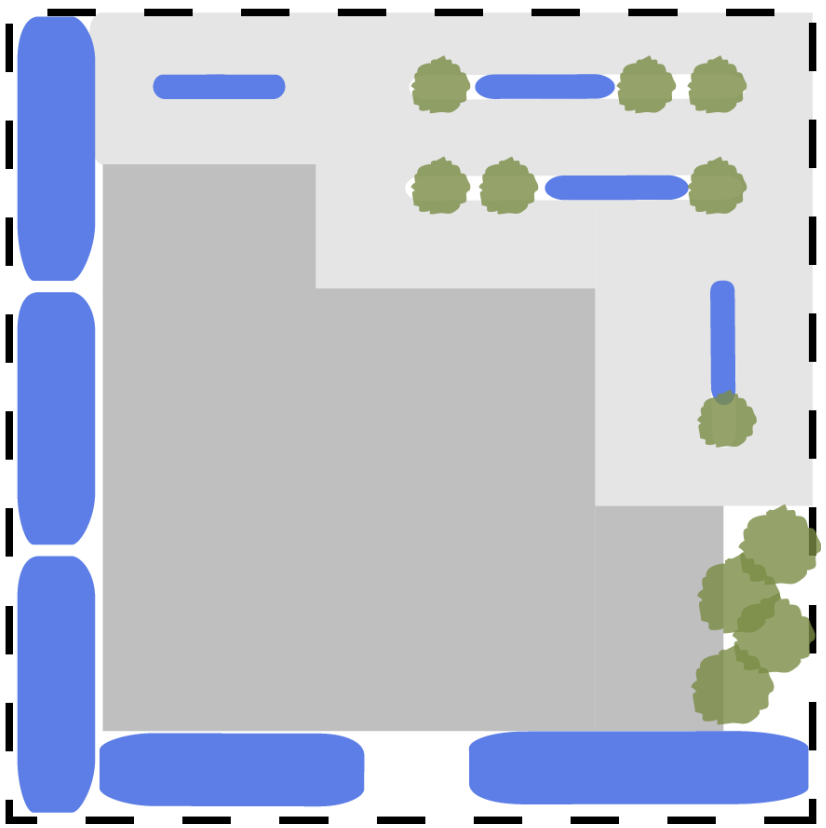
**Assumes half-inch-plus capture depth and criteria manual design standards

Example: 80% Impervious Cover Site



Rain gardens = 9.2% site area

Moderate infiltration rate

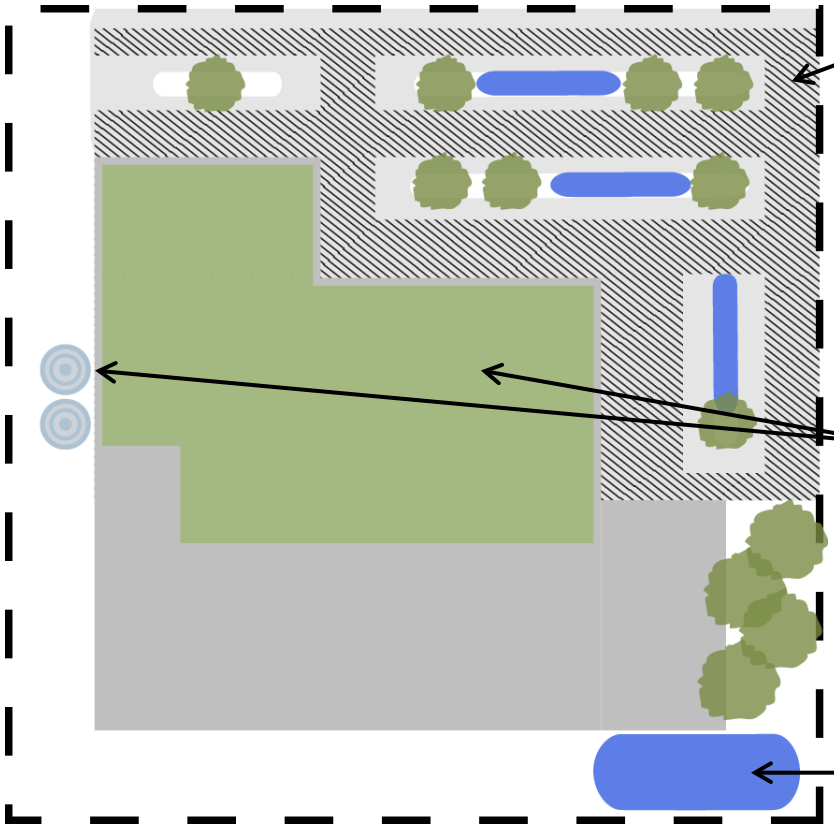


Rain gardens = 18.3% site area

Slower infiltration rate

**Assumes half-inch-plus capture depth and criteria manual design standards

Example: 80% Impervious Cover Site



Porous pavement on 60% of parking lot

Rain gardens for remaining 40%

Green roof and 7,500 gal. cistern

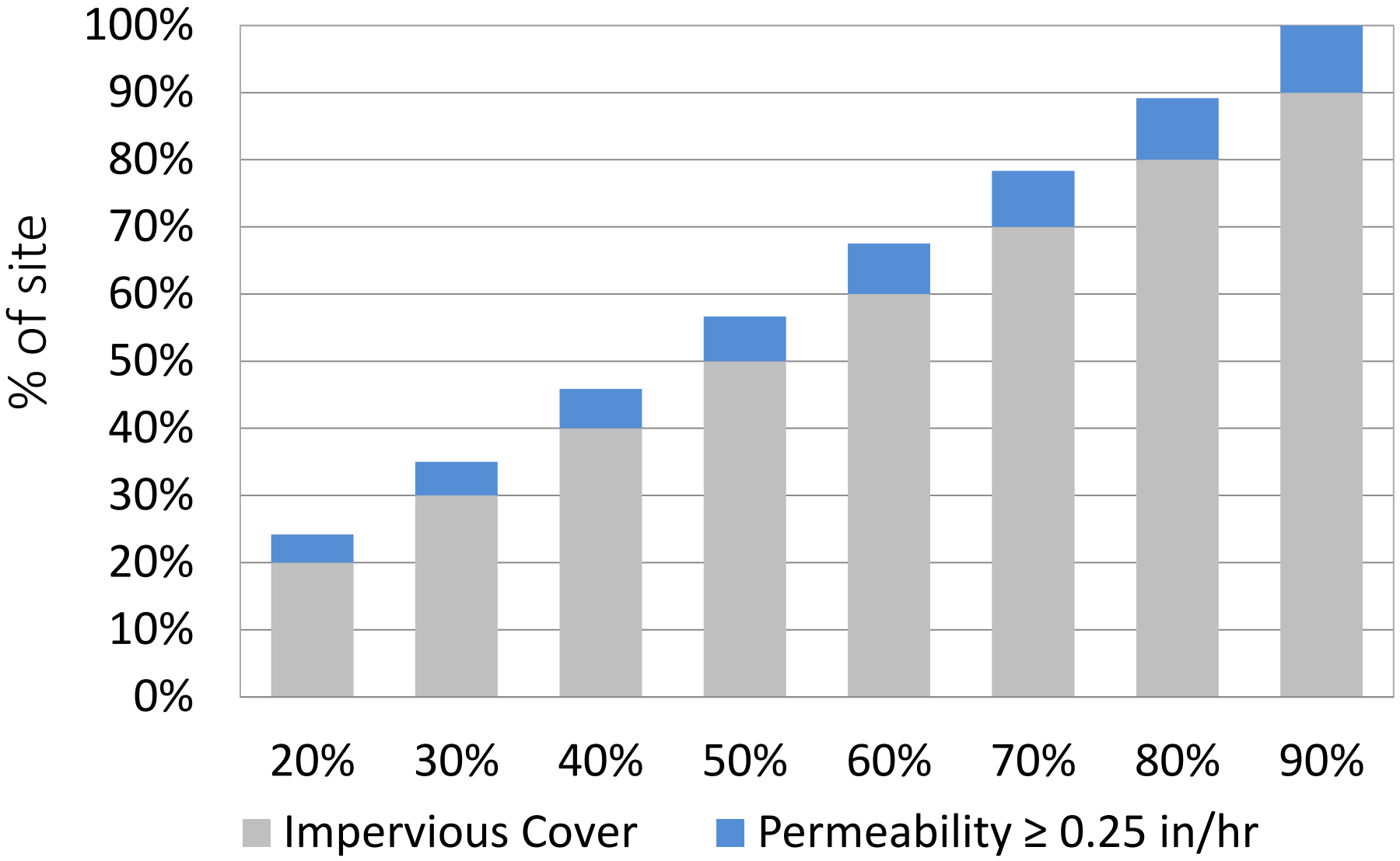
Extra cistern for long-term storage

Rain garden for remaining 50% of roof

**Assumes half-inch-plus capture depth and criteria manual design standards

Rain garden size by percent IC:

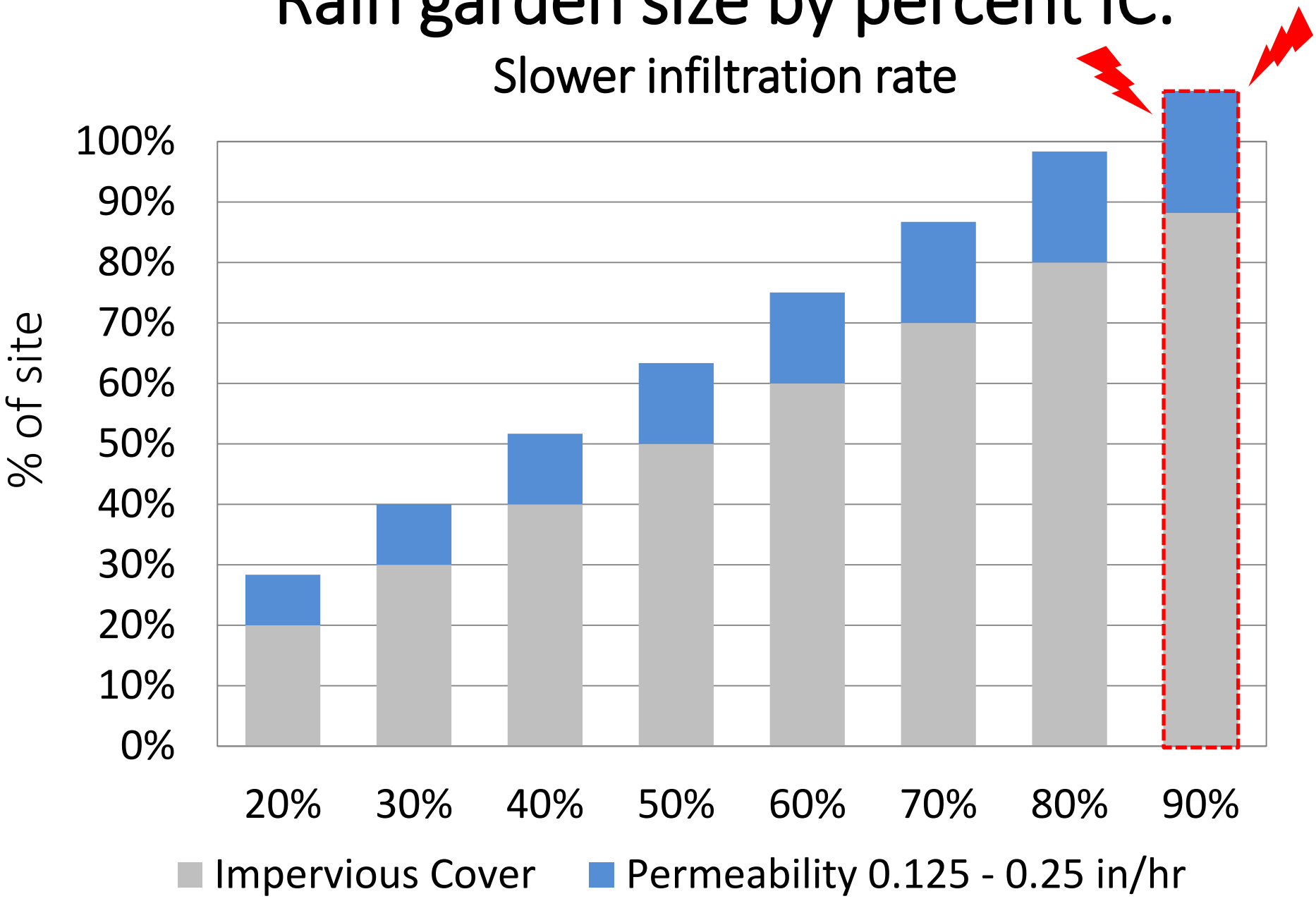
Moderate infiltration rate



**Assumes half-inch-plus capture depth and criteria manual design standards

Rain garden size by percent IC:

Slower infiltration rate



**Assumes half-inch-plus capture depth and criteria manual design standards

Washington, D.C.

- Requires 1.2 inches (90th percentile event) to be retained on-site for new development
- Reduces to 0.8 inches (80th percentile event) for "major substantial improvement activity"
- Where on-site retention proves infeasible, may reduce volume retained on-site by up to 50%
  - Achieve off-site through payment-in-lieu to D.C. or through purchase of credits from market

Tennessee

- Requires 1 inch to be retained on-site
- Incentive standards allow a site to reduce the 1 inch standard by 10%, up to a maximum of 50% (0.5 inches always retained)
  - Redevelopment projects
  - Brownfield redevelopment
  - High density (>7 units per acre)
  - Vertical density (Floor-to-Area Ratio of 2:1 or >18 units/acre)
  - Mixed use and transit oriented development
- W. Virginia: similar program (0.2” reduction each)

Required Best Practices?

- Regardless of the retention requirement, are there best practices we would always want to see implemented on-site?
  - Disconnected downspouts
  - Recessed landscape islands
  - Prevent compaction of pervious areas
  - Green stormwater controls

Disconnected Downspouts

- Must discharge to landscaping or rainwater cisterns
- Must design to avoid erosion and drainage problems
- Requirement included in Colony Park Design Guidelines

Recessed Landscape Islands

- Parking lot islands must be designed to accept and infiltrate stormwater
- Requirement in New Orleans Code
- Must design to avoid erosion, drainage, and tree protection problems

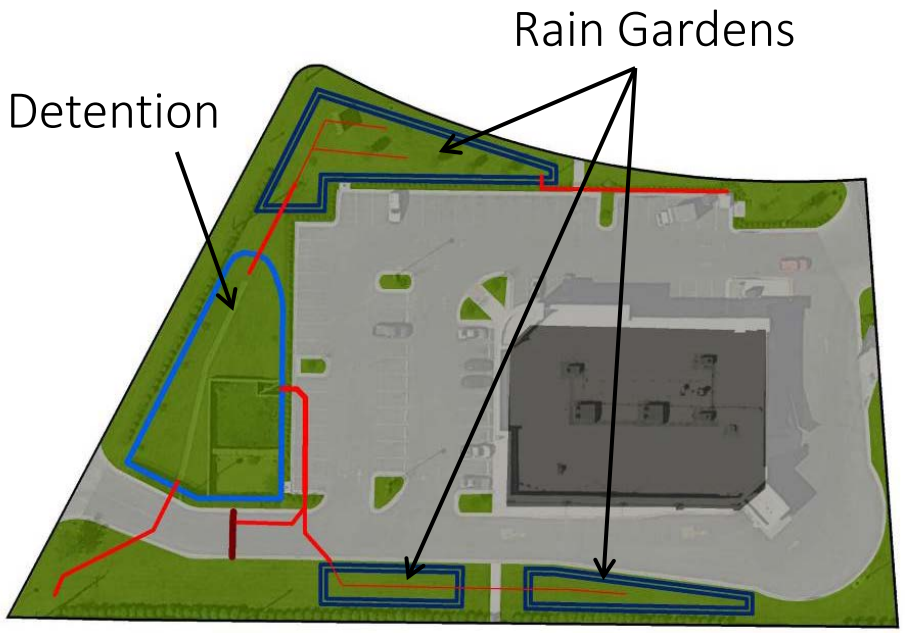
Prevent Compaction of Pervious Areas

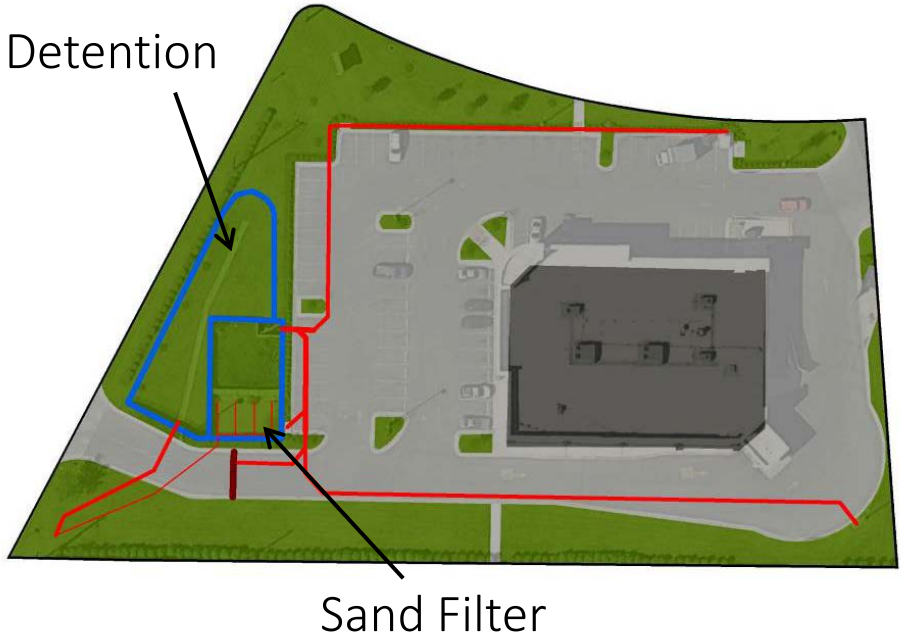
- Improve construction sequencing for parking lots
- Fence off islands from construction vehicles or remove compacted fill before planting

Green Stormwater Controls

- Require portion of water quality volume to be treated using green stormwater controls
  - Part of Transit-Oriented Development (TOD) and Planned United Development (PUD) ordinances
- Require water quality ponds be designed for shallow depths (e.g., 1 foot or less)
- Departure from current practice with sedimentation-sand filter as default control
- Exceptions for special cases (e.g., topography)

CVS Example





Water Quality Control	$20,658
Storm Drainage	$30,702
Landscaping	**$11,463**
Total	$62,823

Water Quality Control	**$45,190**
Storm Drainage	**$72,782**
Landscaping	$2,959
Total	**$120,931**

Small Group Discussion

- How much stormwater to retain on-site?
- How to handle redevelopment and high levels of impervious cover?
- Are there best practices we would always want to see implemented on-site?
- Identify and discuss key considerations if more stormwater is integrated on site.
  - For example: maintenance, inspections, plant selection, retention time, existing trees, soils

Green Infrastructure Working Group Schedule

Kickoff	Jan. 30
Land Cover & Natural Function	Feb. 20
Integrate Nature into the City	Mar. 13
Beneficial Use of Stormwater	**Apr. 10**
Stormwater Options for Redevelopment & Infill	**May 15**
Integration of Green Elements	**June 5**
Wrap-Up	**June 26**

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