Green Infrastructure Champions Program

This program is partially funded by the Rutgers New Jersey Agricultural Experiment Station, The Geraldine R. Dodge Foundation, NJ Sea Grant Consortium, The William Penn Foundation and is a collaboration of the Rutgers Cooperative Extension Water Resources Program and the Green Infrastructure Subcommittee of Jersey Water Works.

RUTGERS
New Jersey Agricultural Experiment Station

Sea Grant
NJ Sea Grant Consortium

Please enter your full name and affiliation in the chat. This is how will take attendance.

The Geraldine R. DODGE FOUNDATION
IMAGINE A BETTER NEW JERSEY

JERSEY WATER WORKS
Smart infrastructure. Strong communities.

WILLIAM PENN FOUNDATION

Green Infrastructure Champion Training: Part 1

"How to identify green infrastructure projects in your town"

January 15, 2021
Virtual Workshop

RUTGERS
New Jersey Agricultural Experiment Station

Water Resources Program

water.rutgers.edu

Welcome and Introduction

Christopher C. Obropta, Ph.D., P.E.
Phone: 908-229-0210
Email: obropta@envsci.rutgers.edu

www.water.rutgers.edu

Rutgers Cooperative Extension

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.

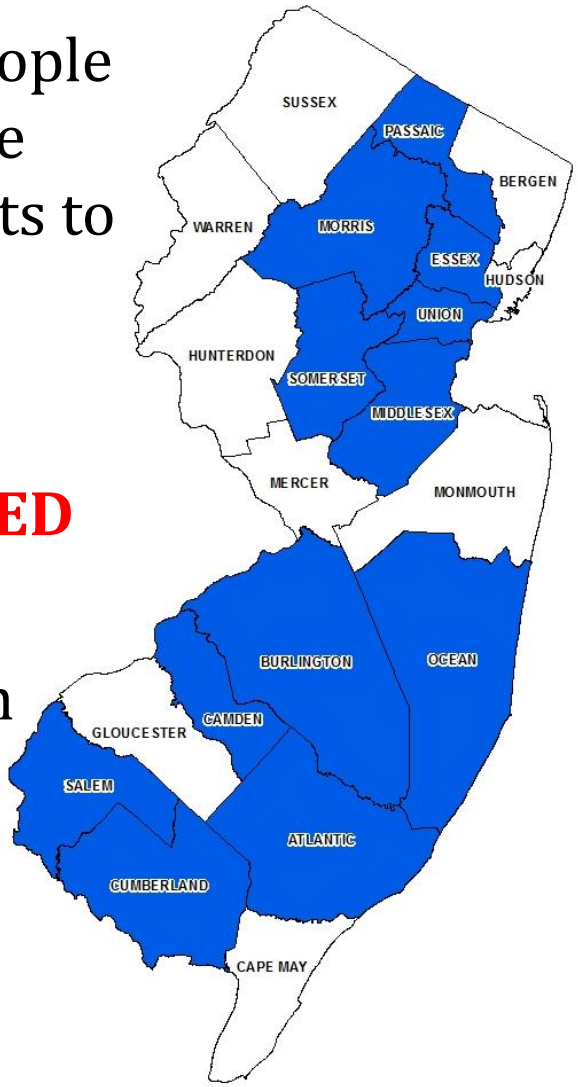
Water Resources Program

Our mission is to identify and address water resources issues by engaging and empowering communities to employ practical science-based solutions to help create a more equitable and sustainable New Jersey.

Environmental County Agents

The Environmental County Agents teach people new skills and information so they can make better informed decisions and improvements to their businesses and personal lives.

- Michele Bakacs, Middlesex and Union
- Pat Rector, Morris and Somerset, **RETIRED**
- Amy Rowe, Essex and Passaic
- Mike Haberland, Camden and Burlington
- Sal Mangiafico, Salem and Cumberland
- Steve Yergeau, Ocean and Atlantic



Green Infrastructure Champion

Green Infrastructure Champions are key players in implementing green infrastructure as a stormwater management approach in their community.

Rutgers inputs to the Green Infrastructure Champion Program

- Training classes on various aspects of green infrastructure planning and implementation
- Professional staff to provide technical support to develop a design for a green infrastructure demonstration project
- Networking opportunities with other Green Infrastructure Champions for mutual support
- Assistance with grant writing and submission

Short-term Results/Impacts
GI Champions will:

- Increase their knowledge and awareness about green infrastructure practices, planning, and implementation
- Gain a skill set to allow them to engage community leaders, schools, and non-governmental organizations (NGOs) and advocate for green infrastructure as a stormwater management solution
- Identify funding opportunities and secure funding for green infrastructure

Long-term Results/Impacts

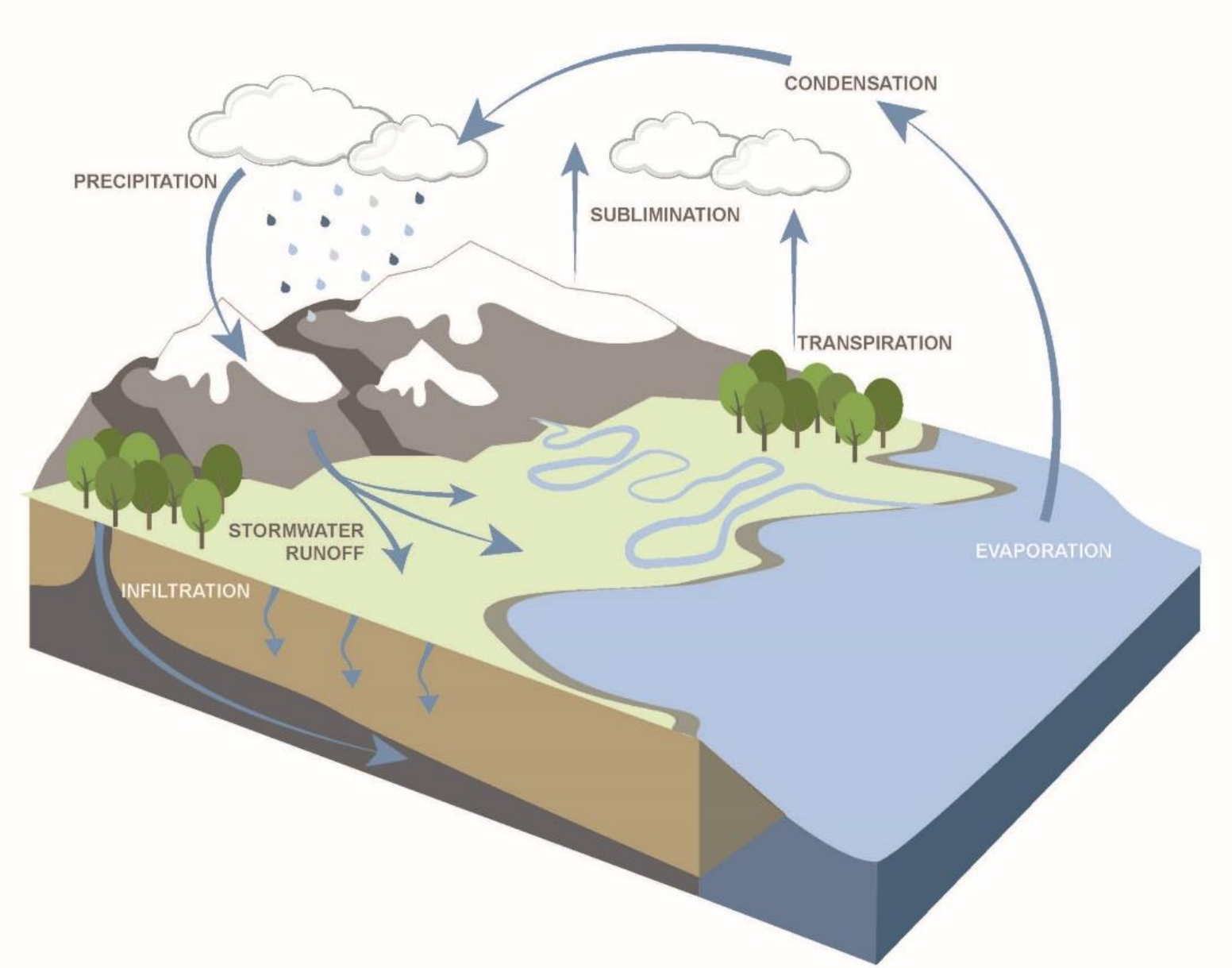
- Green infrastructure practices are installed throughout the community
- Green infrastructure becomes a standard in the community for addressing stormwater problems
- Localized flooding is reduced
- Water quality improves
- Community become more resilient to extreme weather events

STORMWATER BASICS

What is stormwater?

Stormwater is the water from rain or melting snows that can become “runoff,” flowing over the ground surface and returning to lakes and streams.

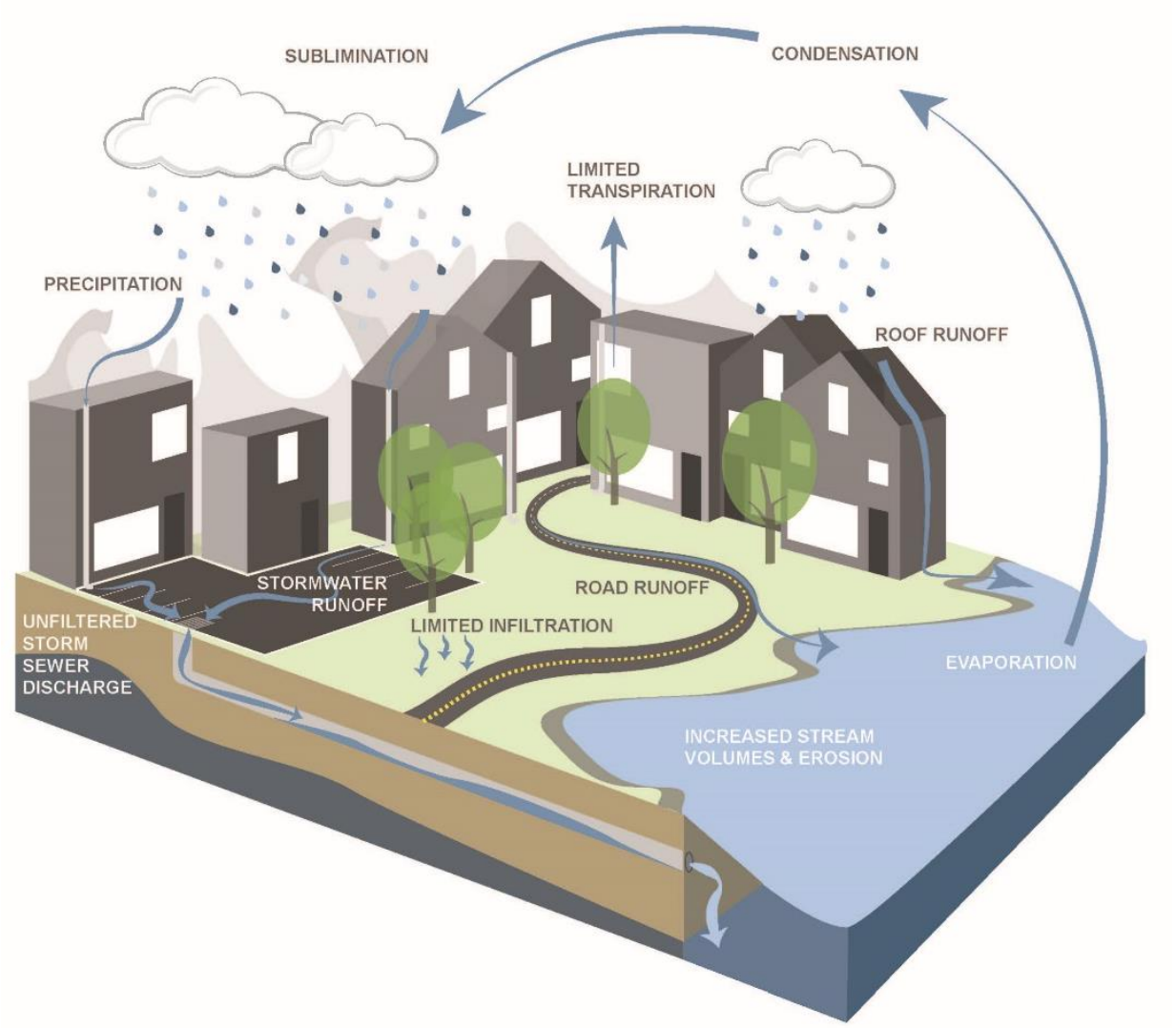
The Natural Hydrologic Cycle



The Impact of Development on Stormwater Runoff

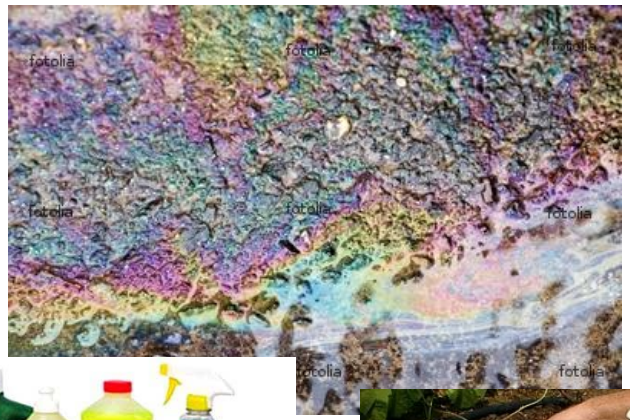
More development → *More impervious surfaces* → *More stormwater runoff*

The Urban Hydrologic Cycle



EXAMPLES OF NPS

- Oil and grease from cars
- Fertilizers
- Animal waste
- Grass clippings
- Septic systems
- Sewage leaks
- Household cleaning products
- Litter
- Agriculture
- Sediment



History of Stormwater Management

1st Attempt at Stormwater Management

Capture all runoff, pipe it, and send it directly to the river . . .prior to mid 1970's

2nd Iteration of Stormwater Management

Capture runoff, detain it, release it slowly to the river…mid 1970's to 2004

- Detain peak flow during large storm events for 18 hours (residential) or 36 hours (commercial)
- Reduce downstream flooding during major storms
- Use concrete low flow channels to minimize erosion, reduce standing water, quickly discharge low flows
- Does not manage runoff from smaller storms allowing stormwater to pass through the system
- Directly discharges stormwater runoff to nearby stream, waterway, or municipal storm sewer system (at a controlled/managed rate)

3rd Generation of Stormwater Management

- Reduce stormwater runoff volume
- Reduce peak flows and flooding

…and….

- Maintain infiltration and groundwater recharge
- Reduce pollution discharged to local waterways

abc Action News, August 27, 2012

4th Generation of Stormwater Management (Starting March 2, 2021)

- All major development must use green infrastructure to comply with the New Jersey Stormwater Regulations

Green Infrastructure

…an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly.

Green Infrastructure projects:

- capture,
- filter,
- absorb, and
- reuse

stormwater to maintain or mimic natural systems and treat runoff as a resource.

Green Infrastructure

Stormwater management practices that protect, restore, and mimic the native hydrologic condition by providing the following functions:

- Infiltration
- Filtration
- Storage
- Evaporation
- Transpiration

Green Infrastructure Practices

Bioretention Systems

- Rain Gardens
- Bioswales
- Stormwater Planters
- Curb Extensions
- Tree Filter Boxes

Permeable Pavements

Rainwater Harvesting

- Rain barrels
- Cisterns

Dry Wells

Rooftop Systems

- Green Roofs
- Blue Roofs








TYPES OF BIORETENTION

Bioretention Cells

- Single-family lots
- Commercial areas
- Parking lots

Planters & Planter Boxes

- Highly urban areas
- Right-of-way and adjacent to buildings

Rain Gardens

- Single-family lots
- Small commercial areas

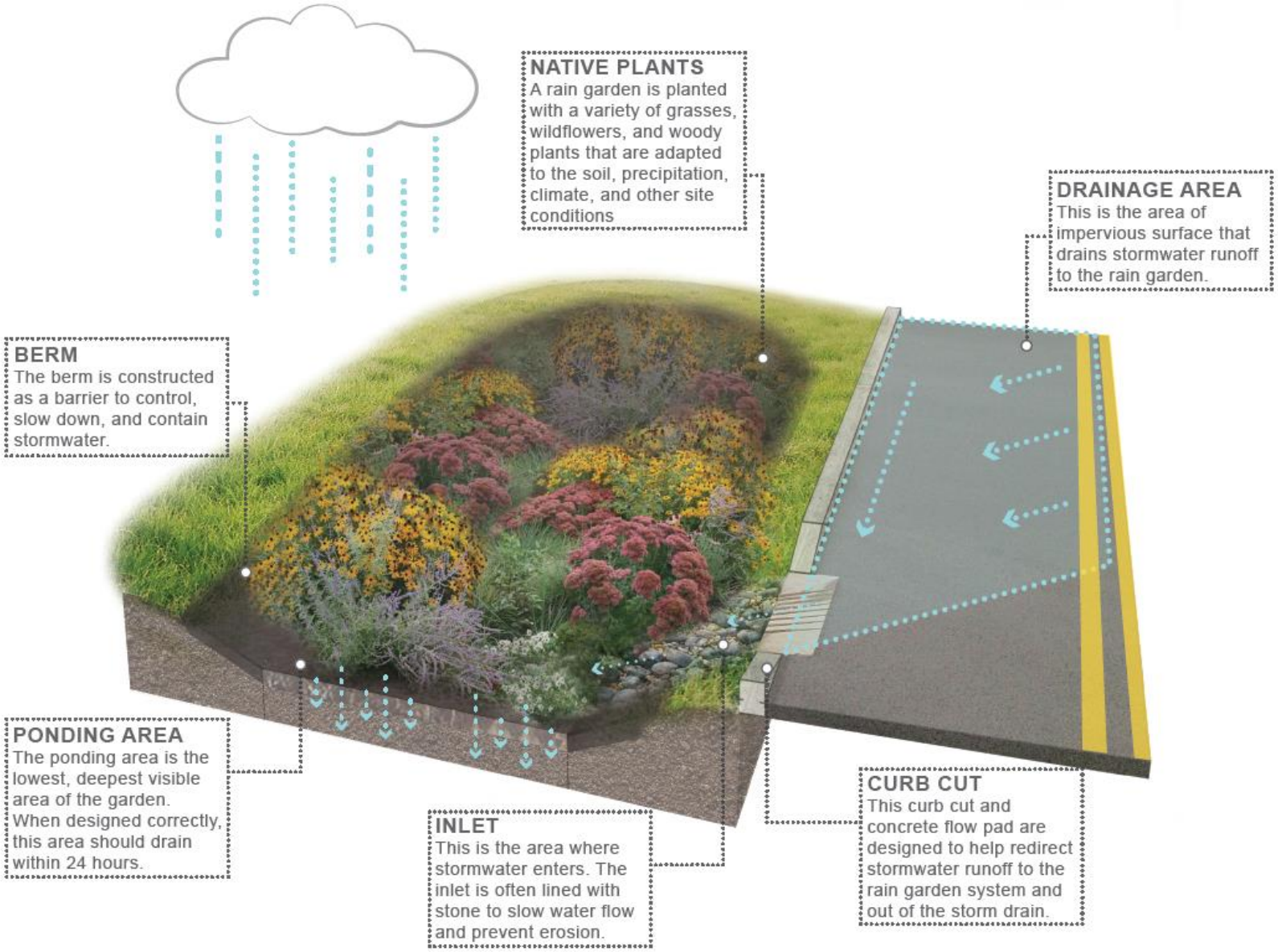
Bioretention Swales/ Bioswales/Vegetated Swales

- Typically in right-of-way

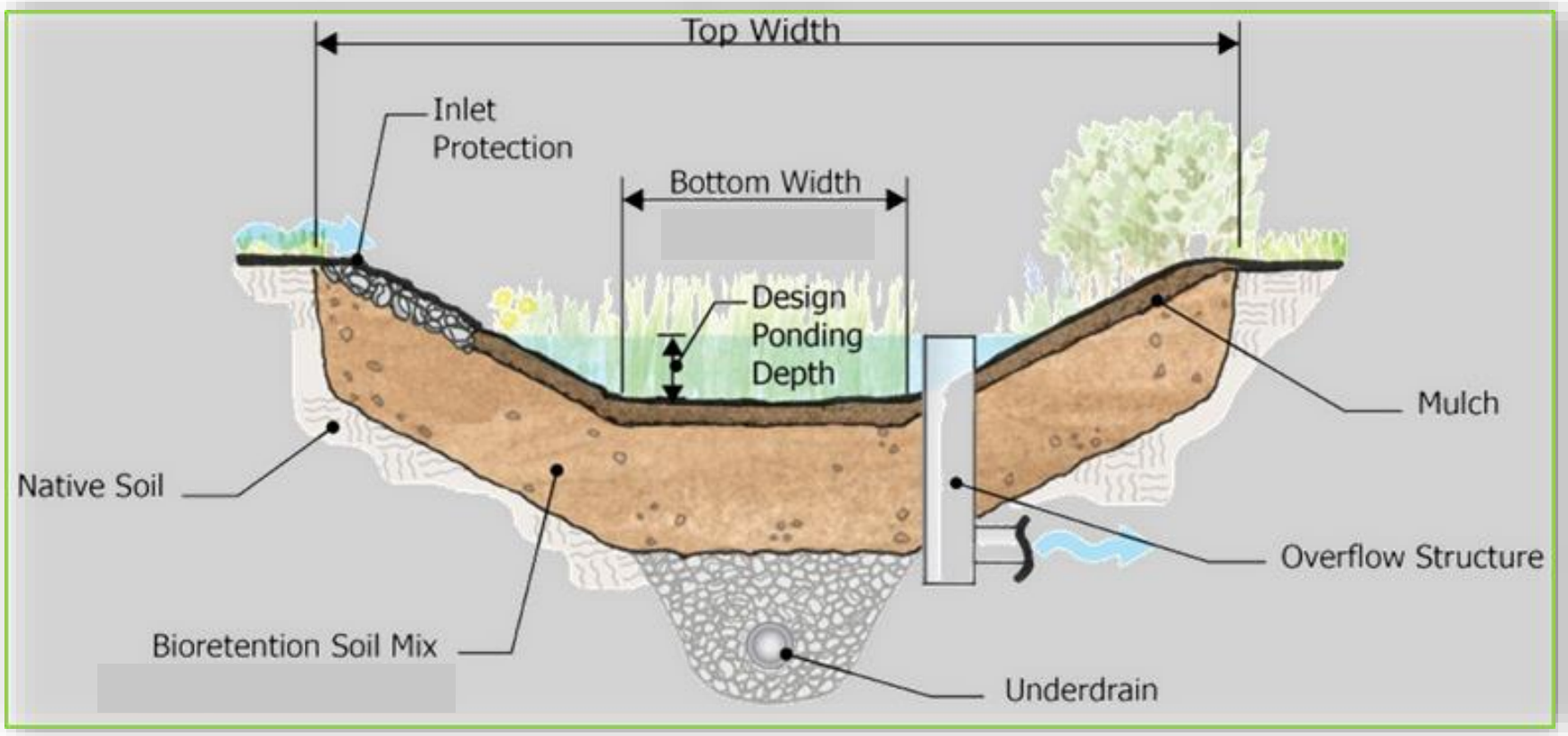
Vegetated Curb Extensions

- Bioretention incorporated into right-of-way in urban and suburban areas

Rain Gardens



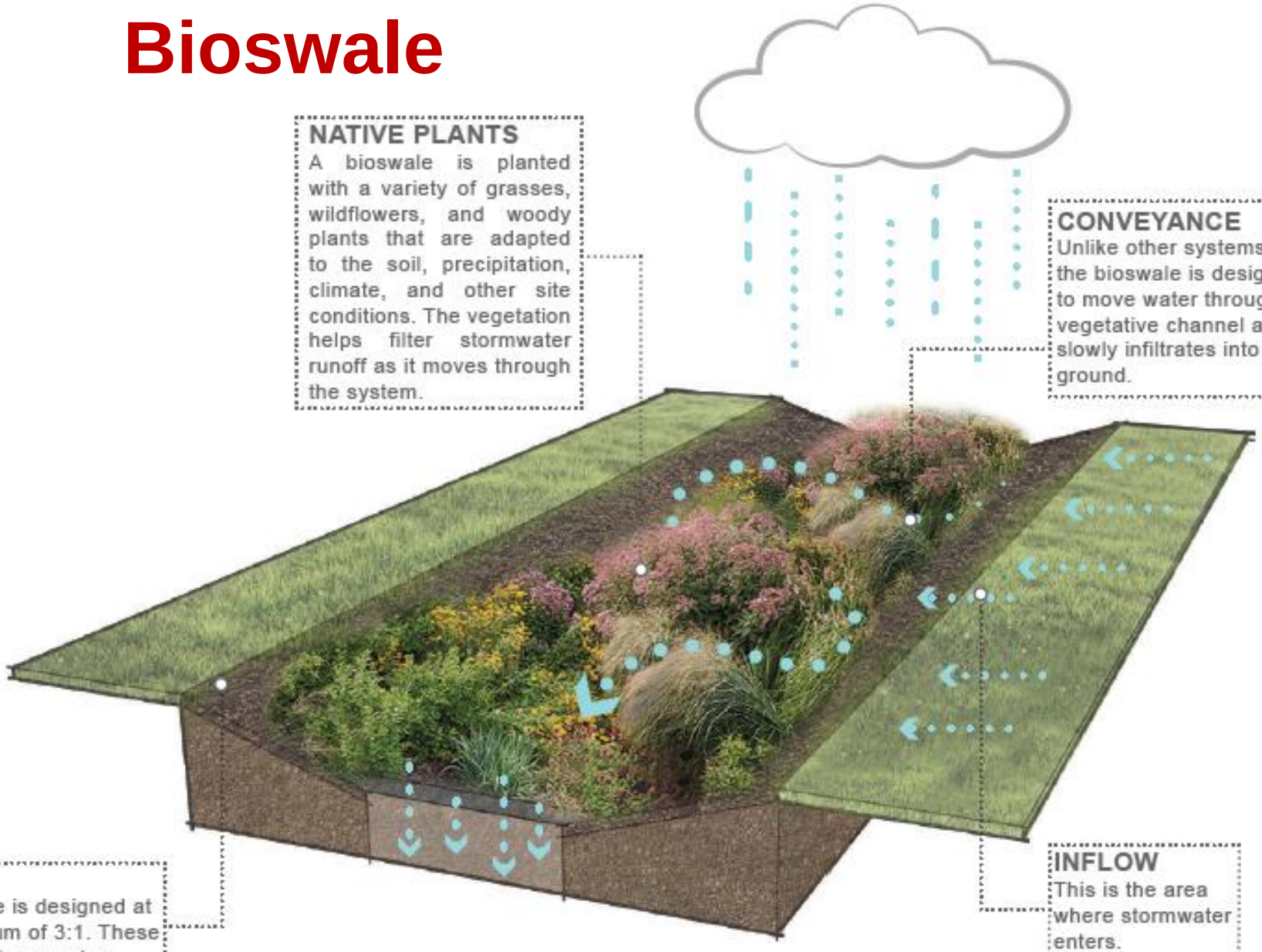
Rain Garden Cross-Section



Lots of Rain Gardens


116

Bioswale



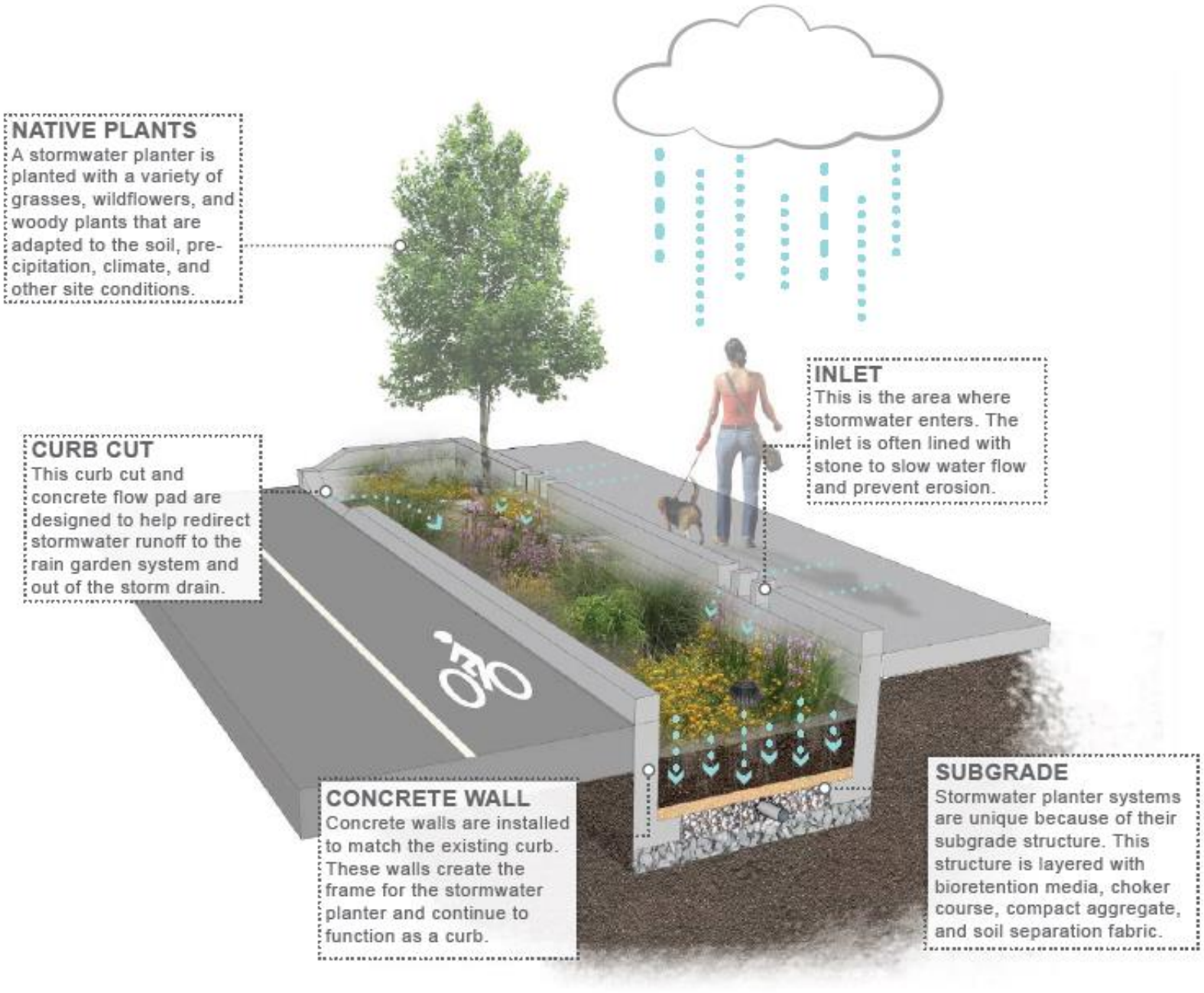
NATIVE PLANTS
A bioswale is planted with a variety of grasses, wildflowers, and woody plants that are adapted to the soil, precipitation, climate, and other site conditions. The vegetation helps filter stormwater runoff as it moves through the system.

CONVEYANCE
Unlike other systems, the bioswale is designed to move water through a vegetative channel as it slowly infiltrates into the ground.

SLOPE
The slope is designed at a maximum of 3:1. These slopes often require erosion control materials for stabilization.

INFLOW
This is the area where stormwater enters.

Stormwater Planters



OTES:

3 AND OTHER
CTIONS (E.G. SCUPPER,
RUNNEL) FROM BUILDING
GN PONDING ELEVATION.
E SAN FRANCISCO DBI
NCE CONNECTION

F EXISTING SUBGRADE
INFILTRATION FACILITIES.

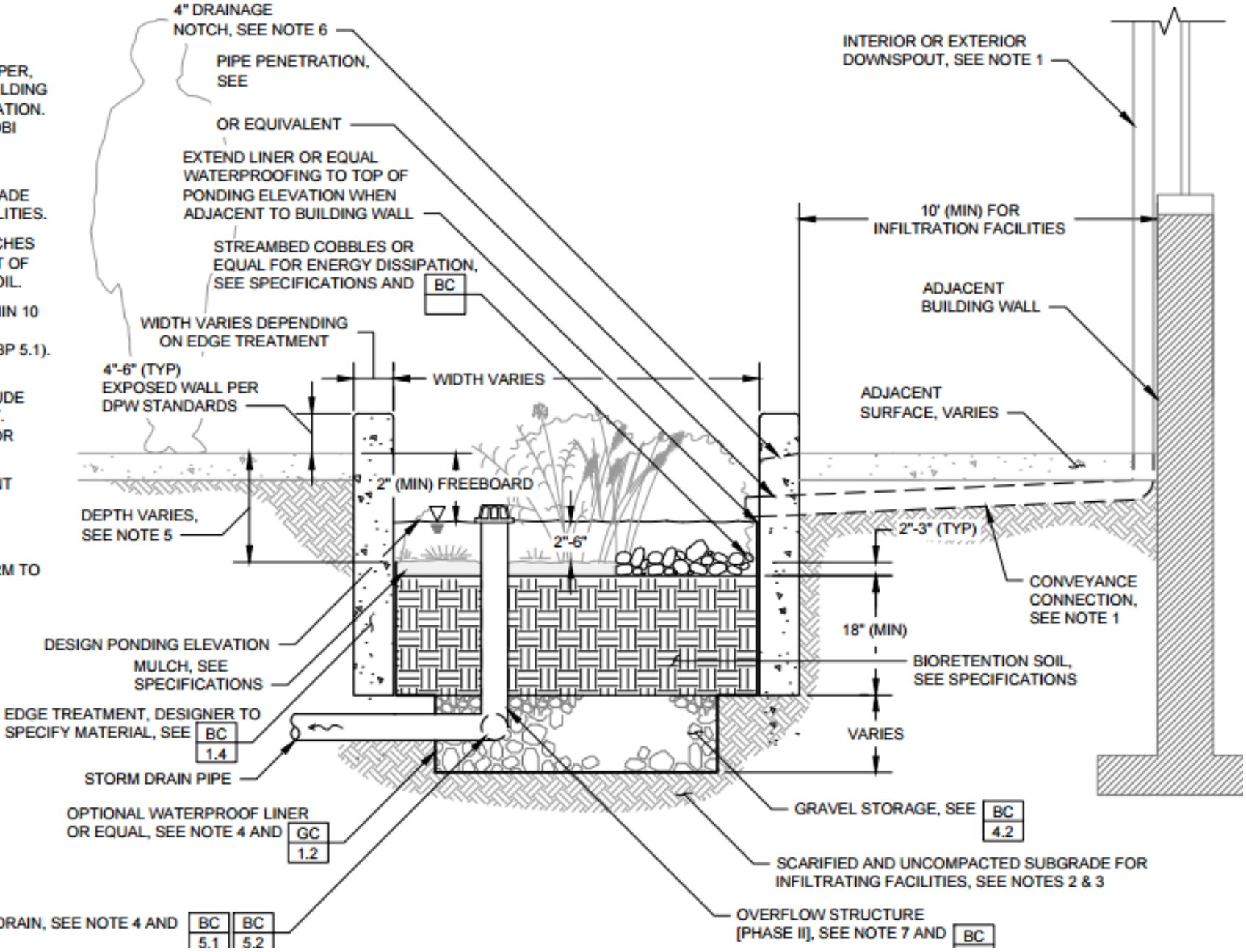
O A DEPTH OF 6 INCHES
IOR TO PLACEMENT OF
O BIORETENTION SOIL.

ER REQUIRED WITHIN 10
/ELOPE UNLESS
INER NOTE 8 (SEE BP 5.1).

TOP OF WALKING
MULCH SHALL INCLUDE
SOIL SETTLEMENT.
ISCO DBI CODES FOR
REQUIREMENTS.

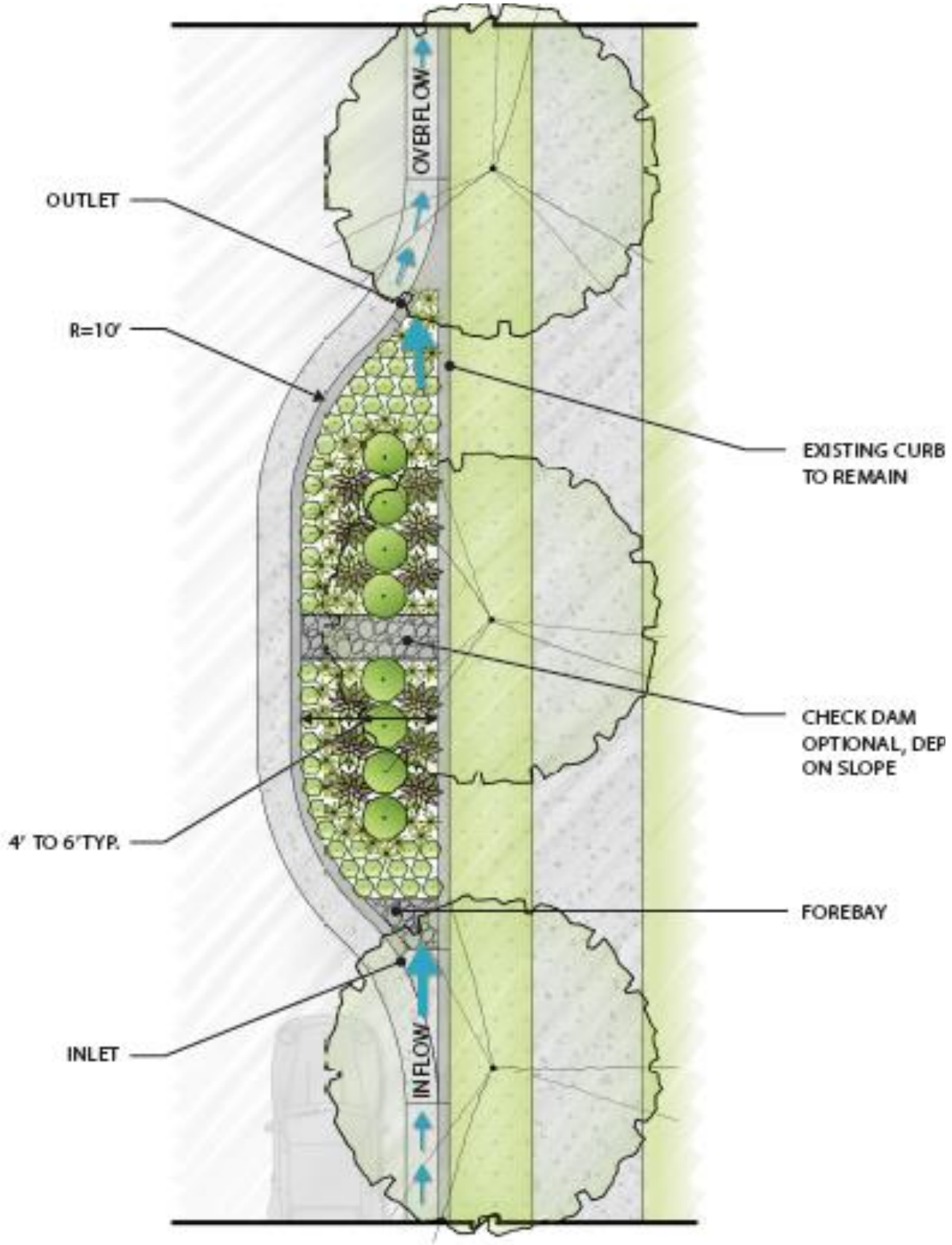
OTCHES TO PREVENT
NTER WALL. SLOPE
O PLANTER.

ORKMANSHIP FOR
RES SHALL CONFORM TO
NCISCO DBI CODES.

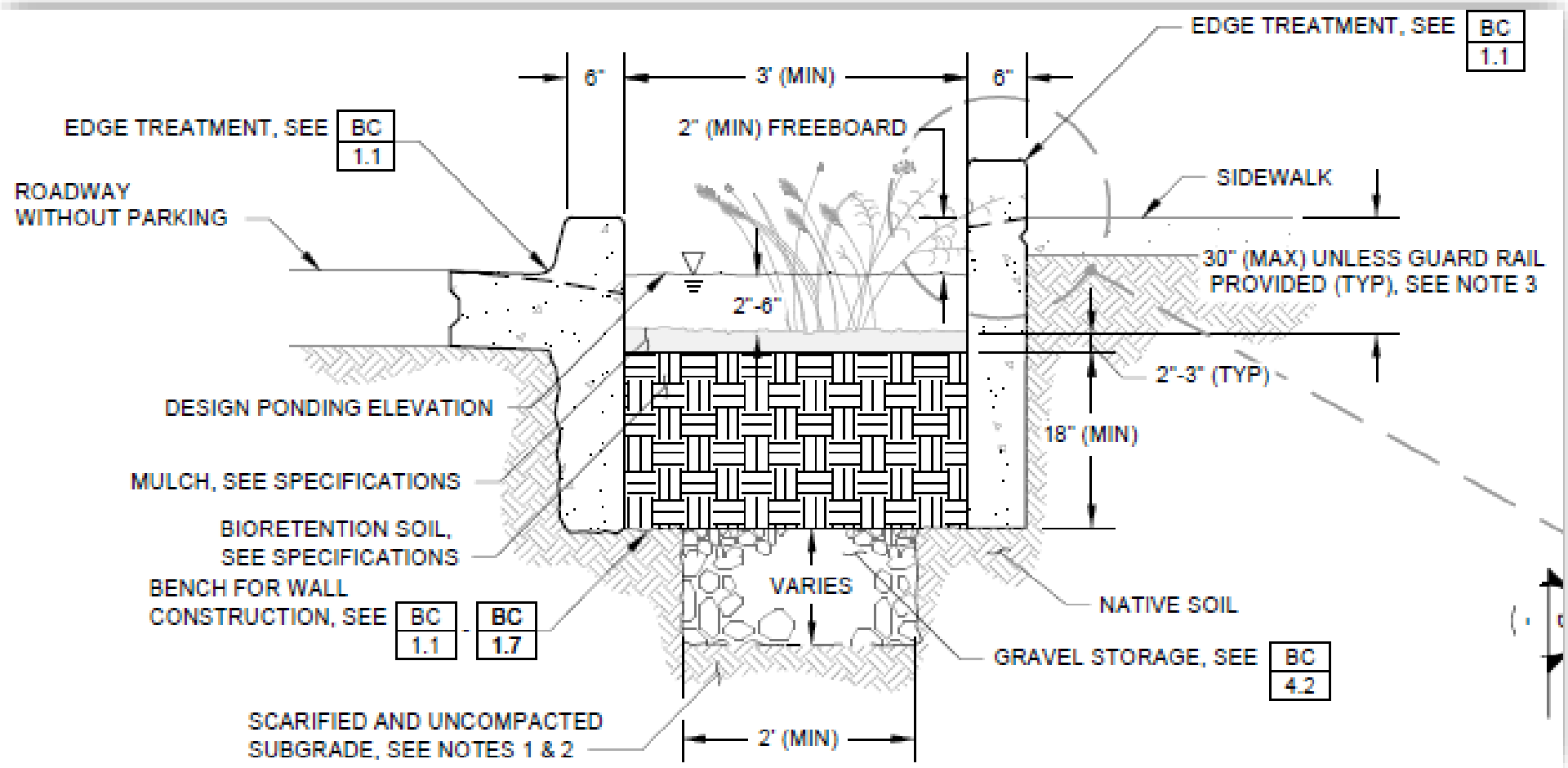


Stormwater Planter Cross-section

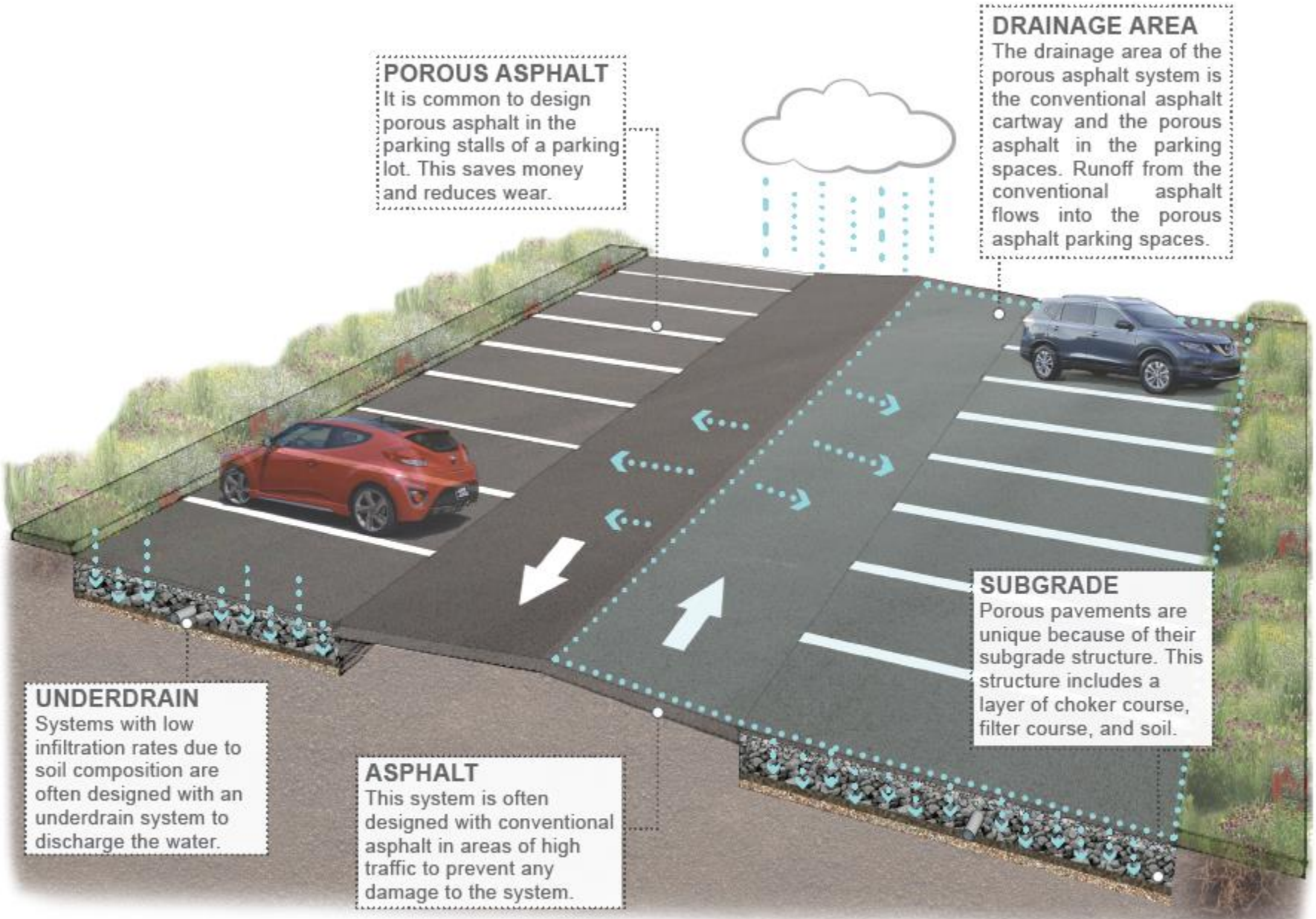
Curb Extensions



NOTE:
Graphic adapted fr
Portland, OR Storm
Manual Details

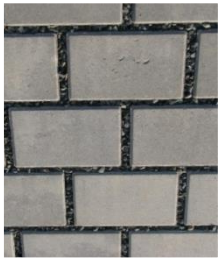

EDGE TREATMENT, SEE BC 1.1
6"
3' (MIN)
6"
EDGE TREATMENT, SEE BC 1.1
2" (MIN) FREEBOARD
SIDEWALK
ROADWAY WITHOUT PARKING
30" (MAX) UNLESS GUARD RAIL PROVIDED (TYP), SEE NOTE 3
2"-6"
2"-3" (TYP)
DESIGN PONDING ELEVATION
18" (MIN)
MULCH, SEE SPECIFICATIONS
BIORETENTION SOIL, SEE SPECIFICATIONS
BENCH FOR WALL CONSTRUCTION, SEE BC 1.1 - BC 1.7
VARIES
NATIVE SOIL
GRAVEL STORAGE, SEE BC 4.2
SCARIFIED AND UNCOMPACTED SUBGRADE, SEE NOTES 1 & 2
2' (MIN)

Permeable Pavement



Permeable Pavements

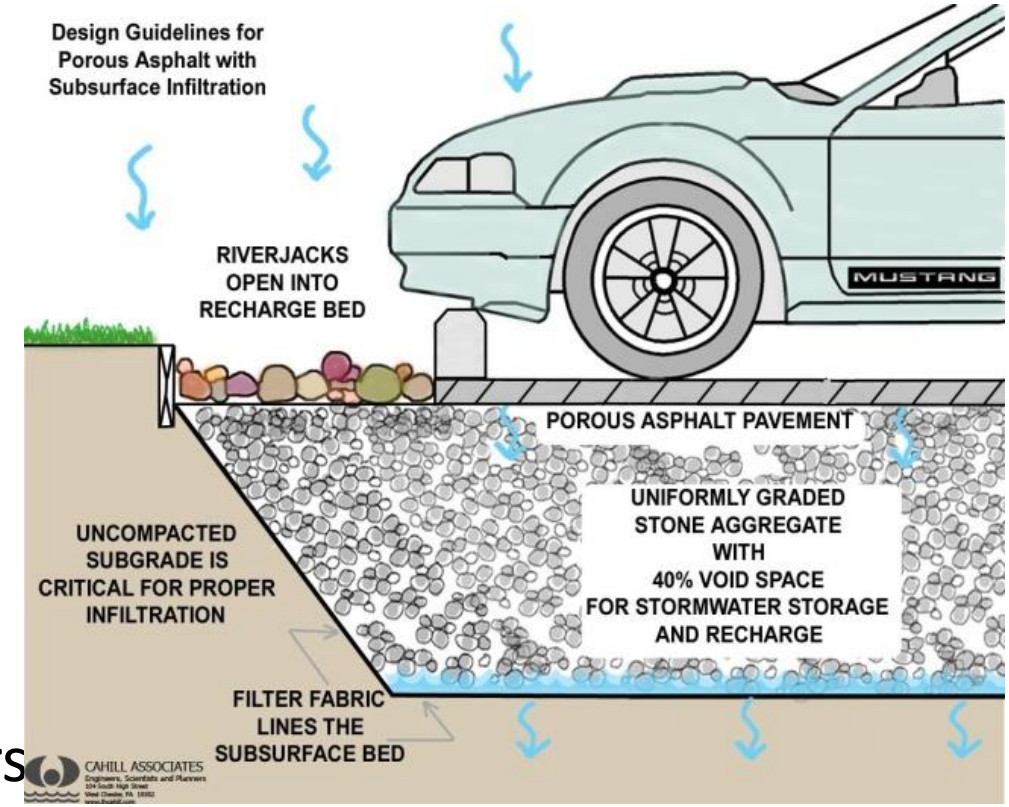
- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without "fine" materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Permeable pavers systems are concrete pavers with infiltration between the spaces of the pavers
- Ideal application for porous pavement is to treat a low traffic or overflow parking area



ADVANTAGES

- Manage stormwater runoff
- Minimize site disturbance
- Promote groundwater recharge
- Low life cycle costs, alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

COMPONENTS



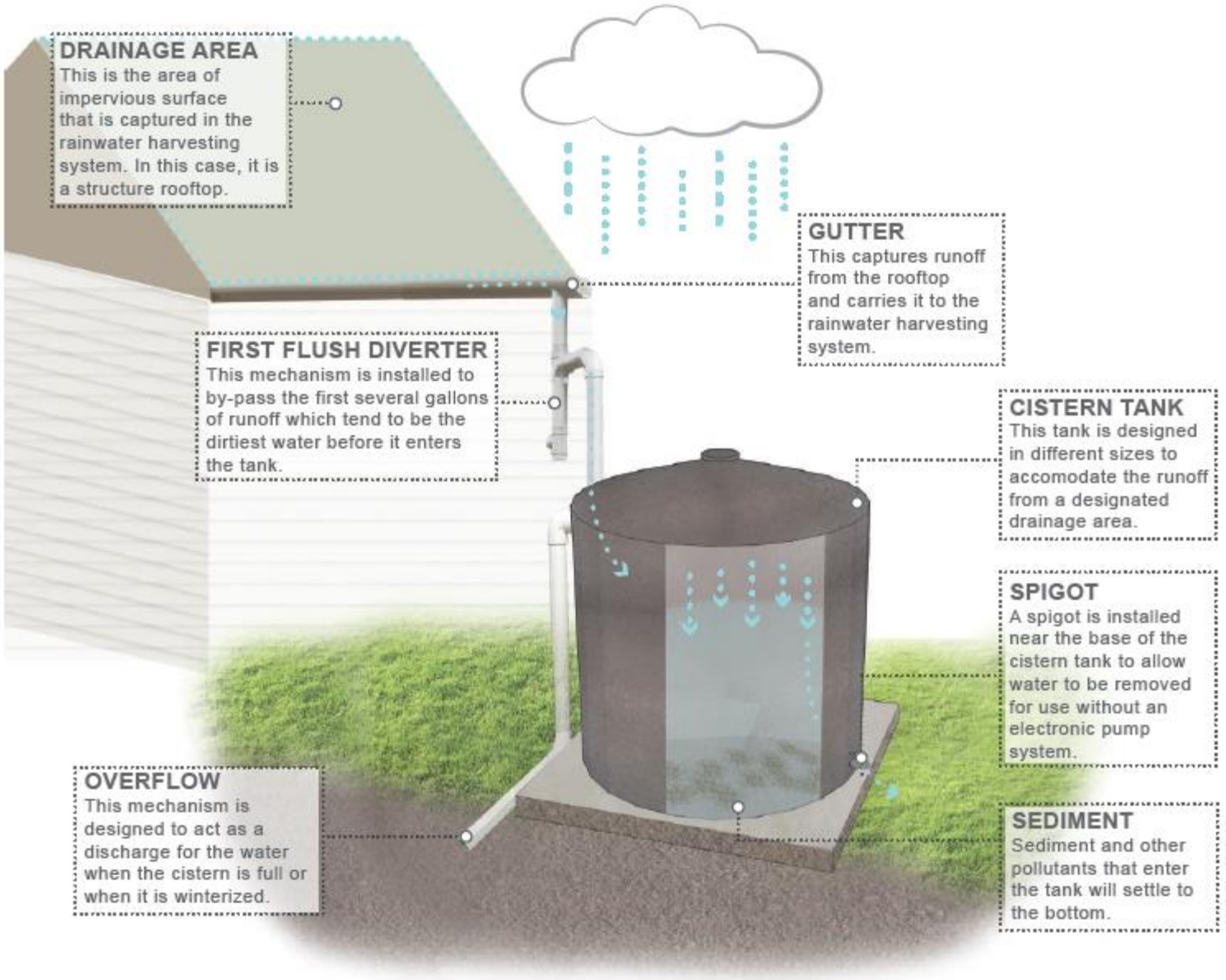
Porous Asphalt


Pervious Concrete


Permeable Pavers


Grass Pavers

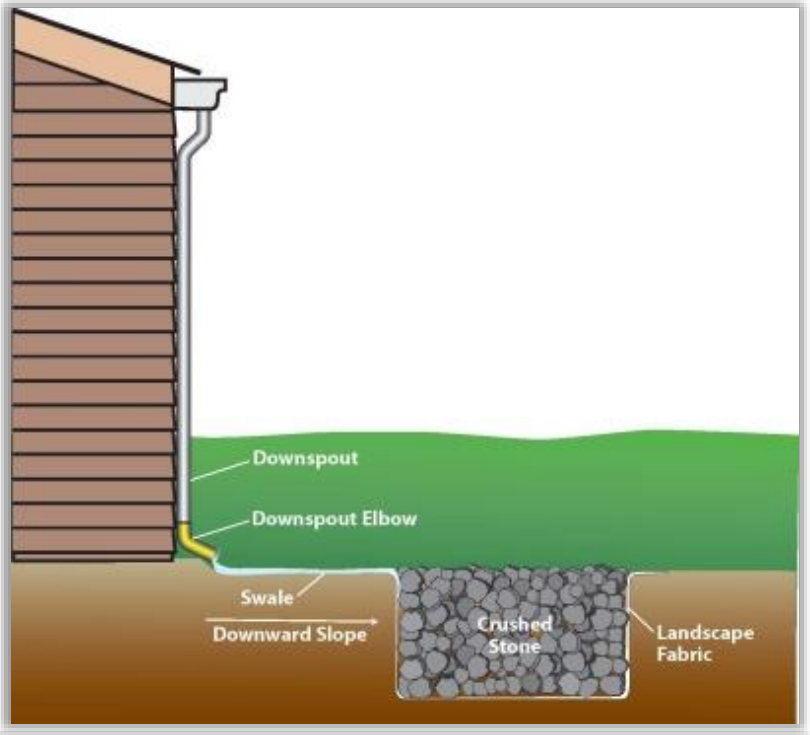
Rainwater Harvesting Systems

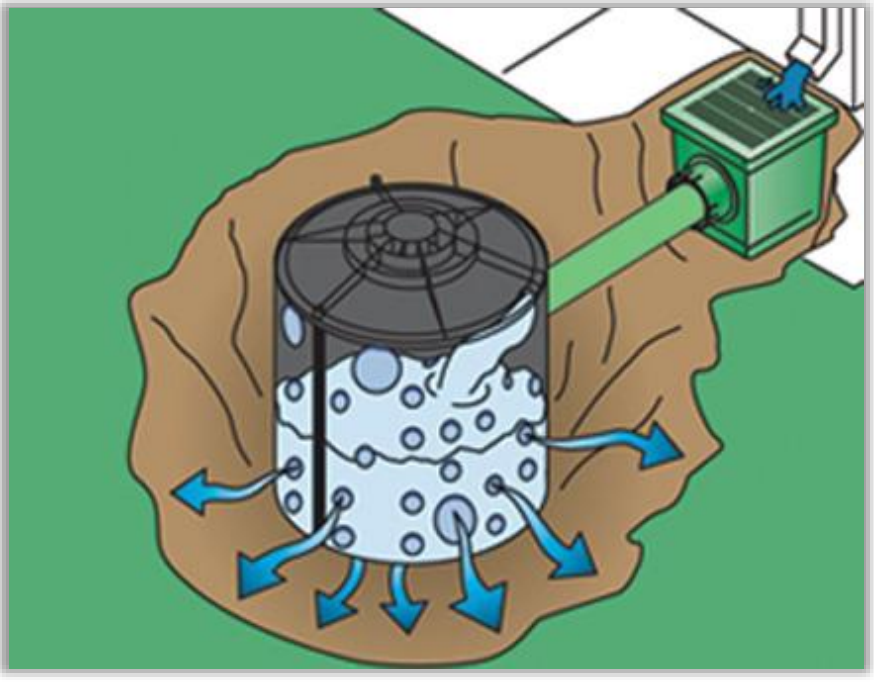


Rain Barrels

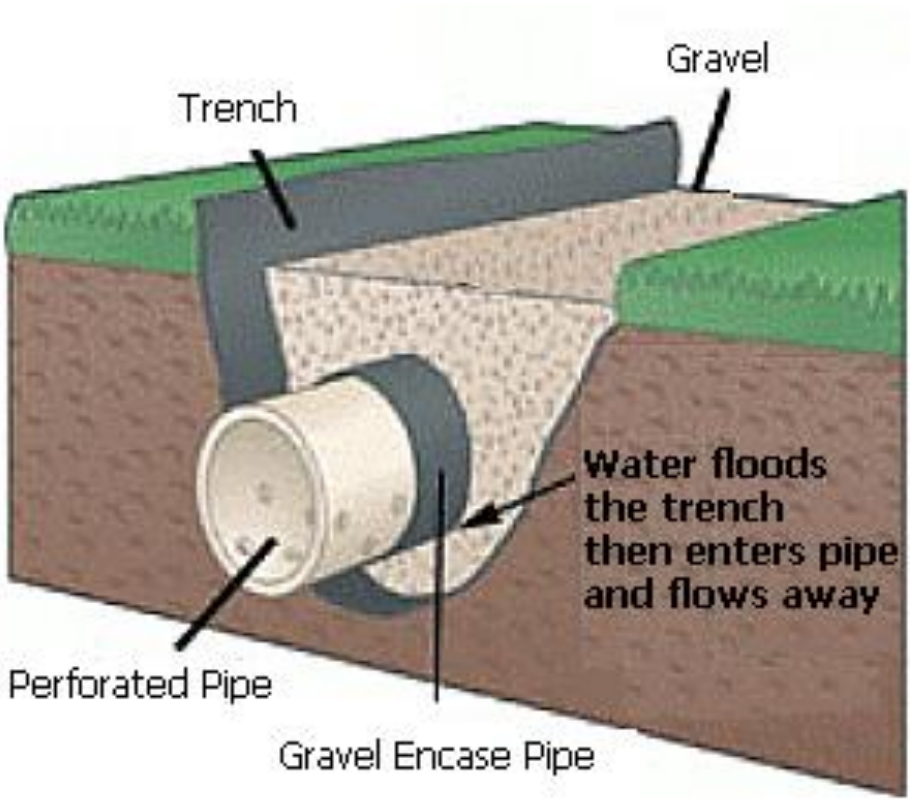
Cisterns

Dry Wells


Downspout
Downspout Elbow
Swale
Downward Slope
Crushed Stone
Landscape Fabric

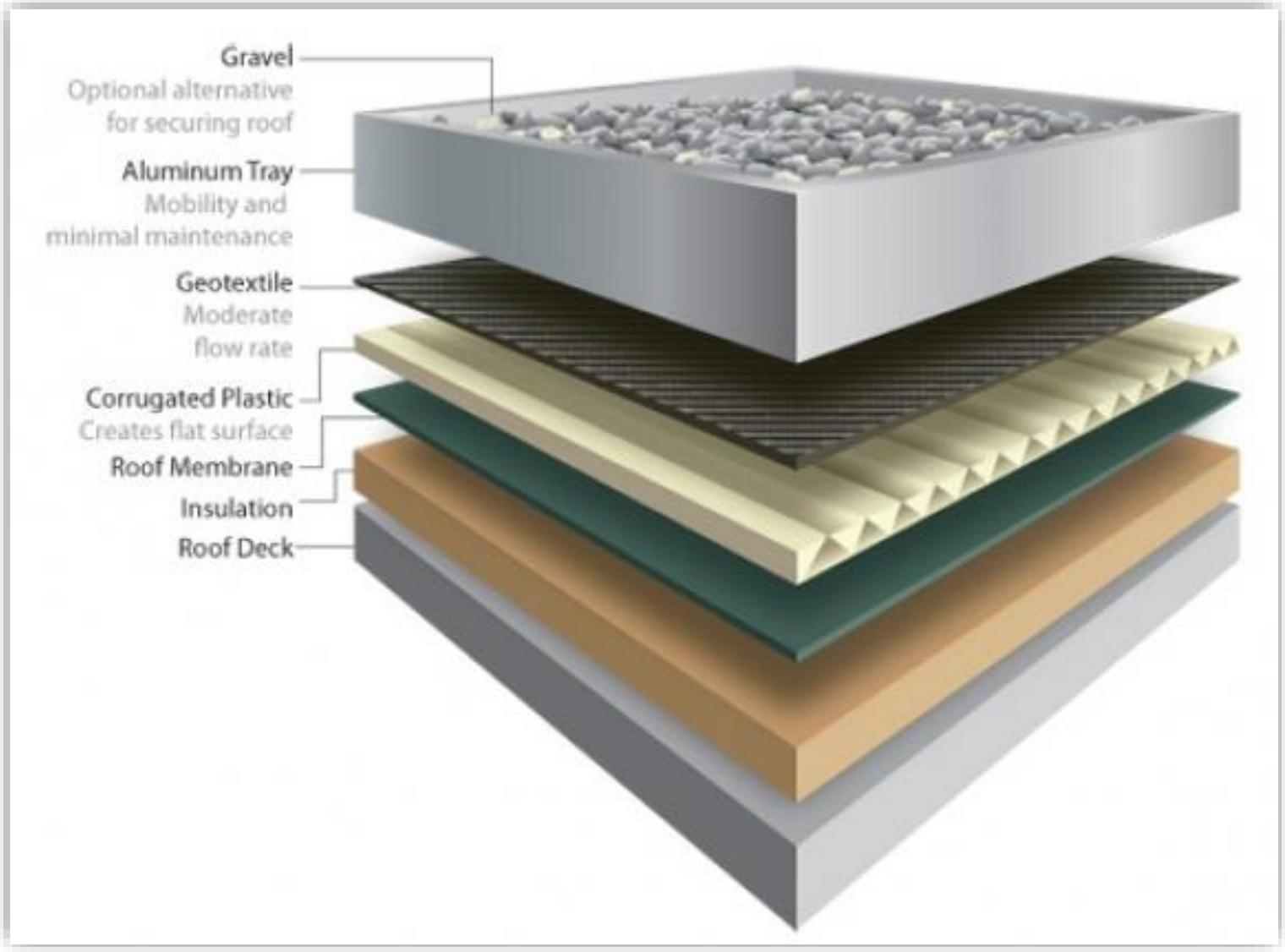


Infiltration Trench



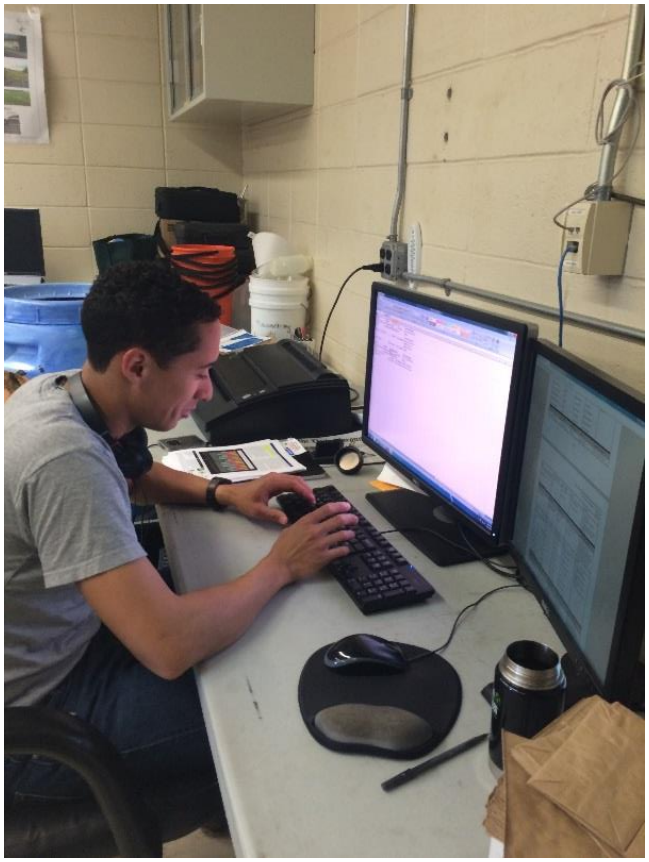
Rooftop Practices – Green Roof

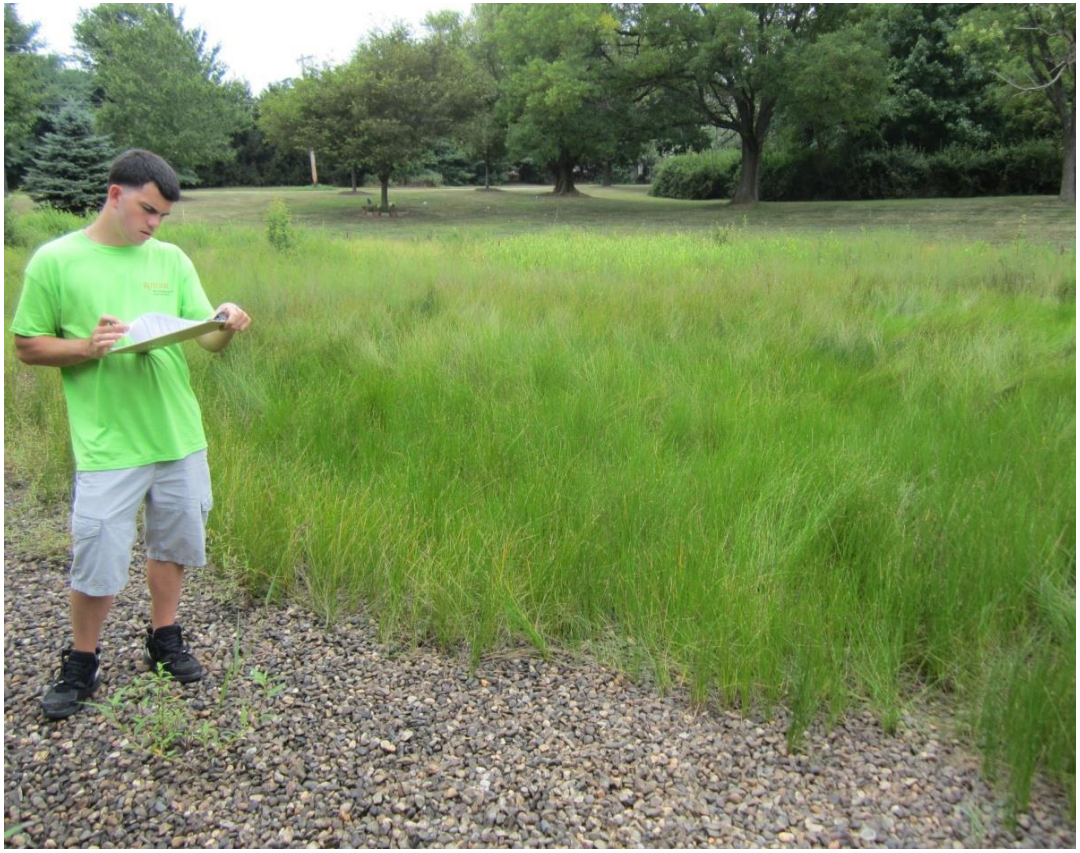
Rooftop Practices – Blue Roof




Stormwater Wetlands

Identifying Sites for Green Infrastructure





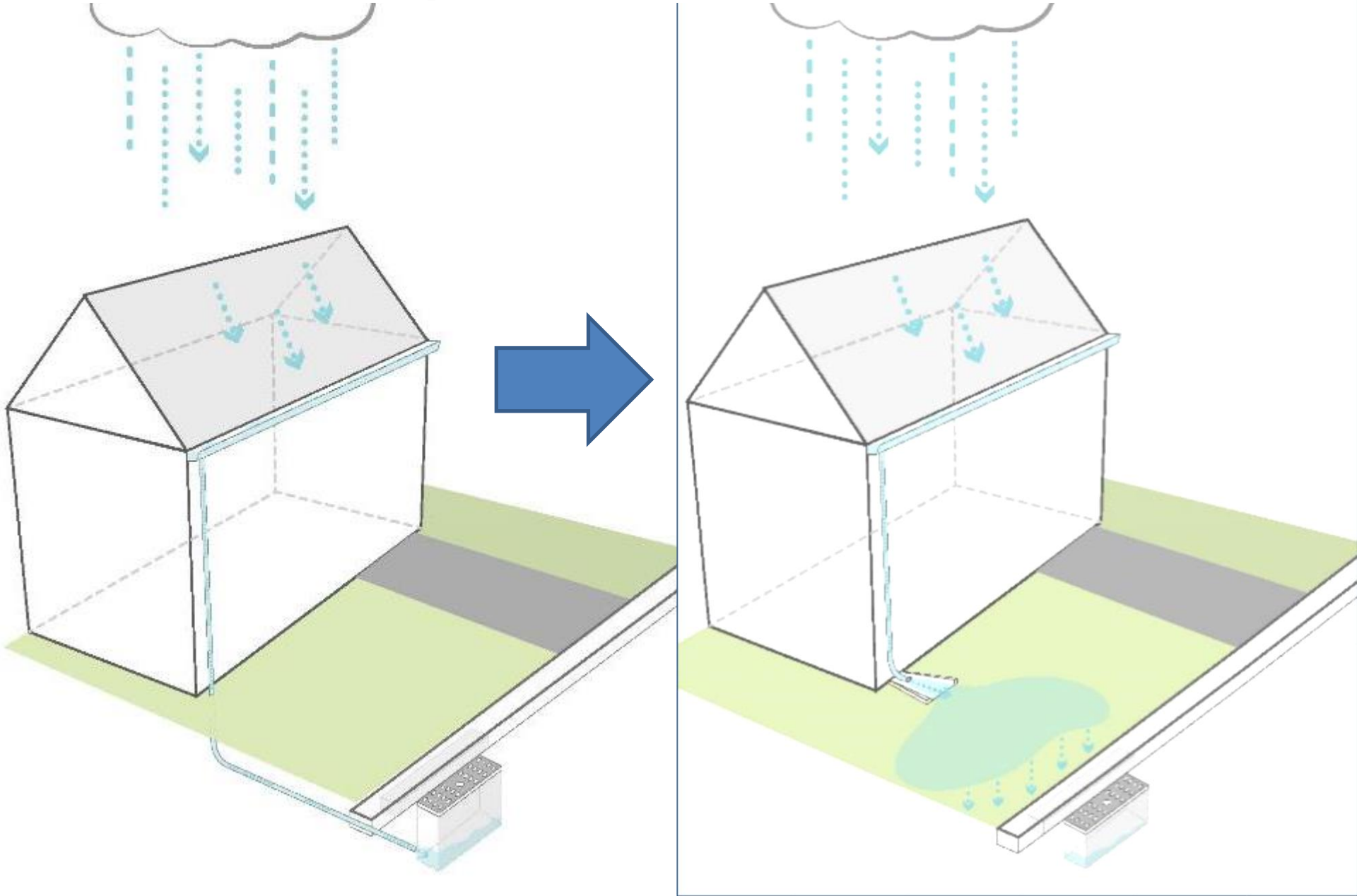
RUTGERS
New Jersey Agricultural Experiment Station

Water Resources Program

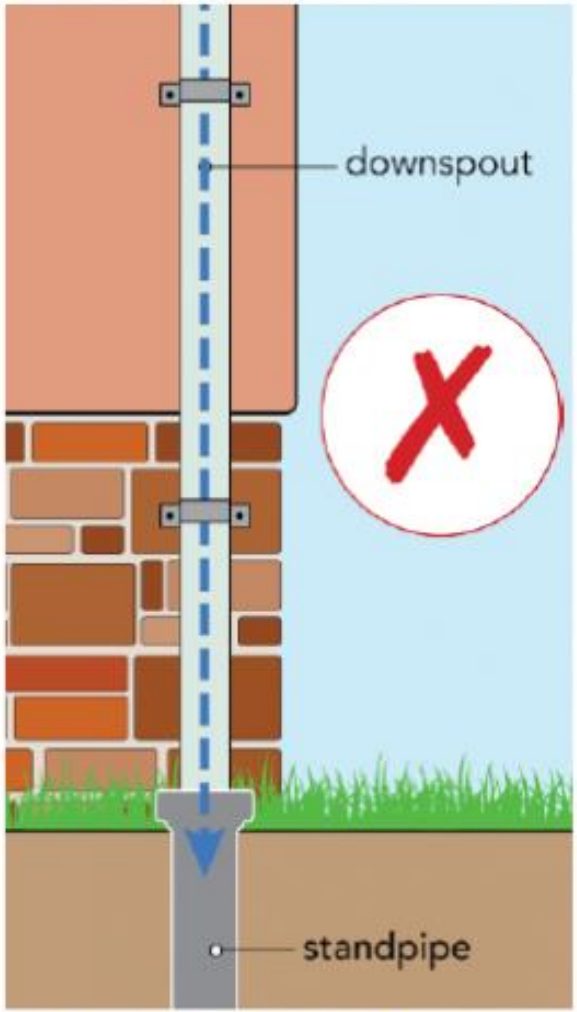
It is all about controlling runoff from impervious surfaces

Connected or Disconnected?

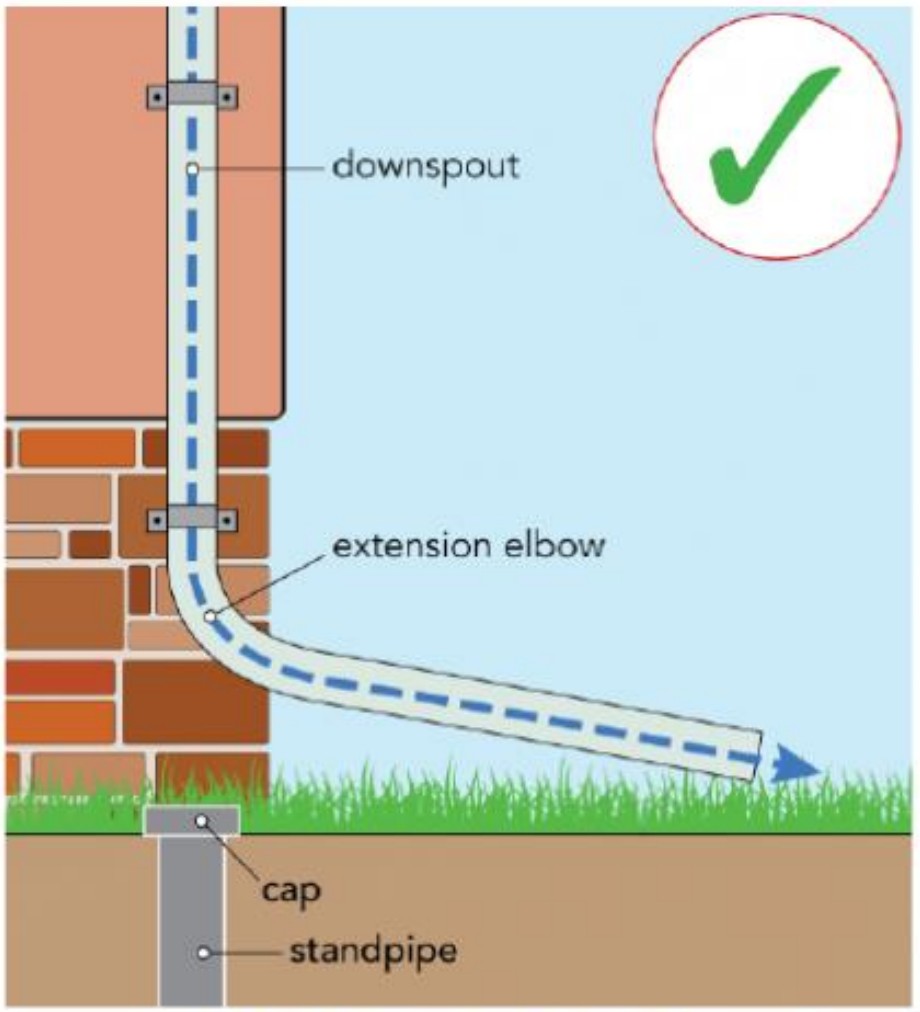
Simple Disconnection



Downspout Disconnection



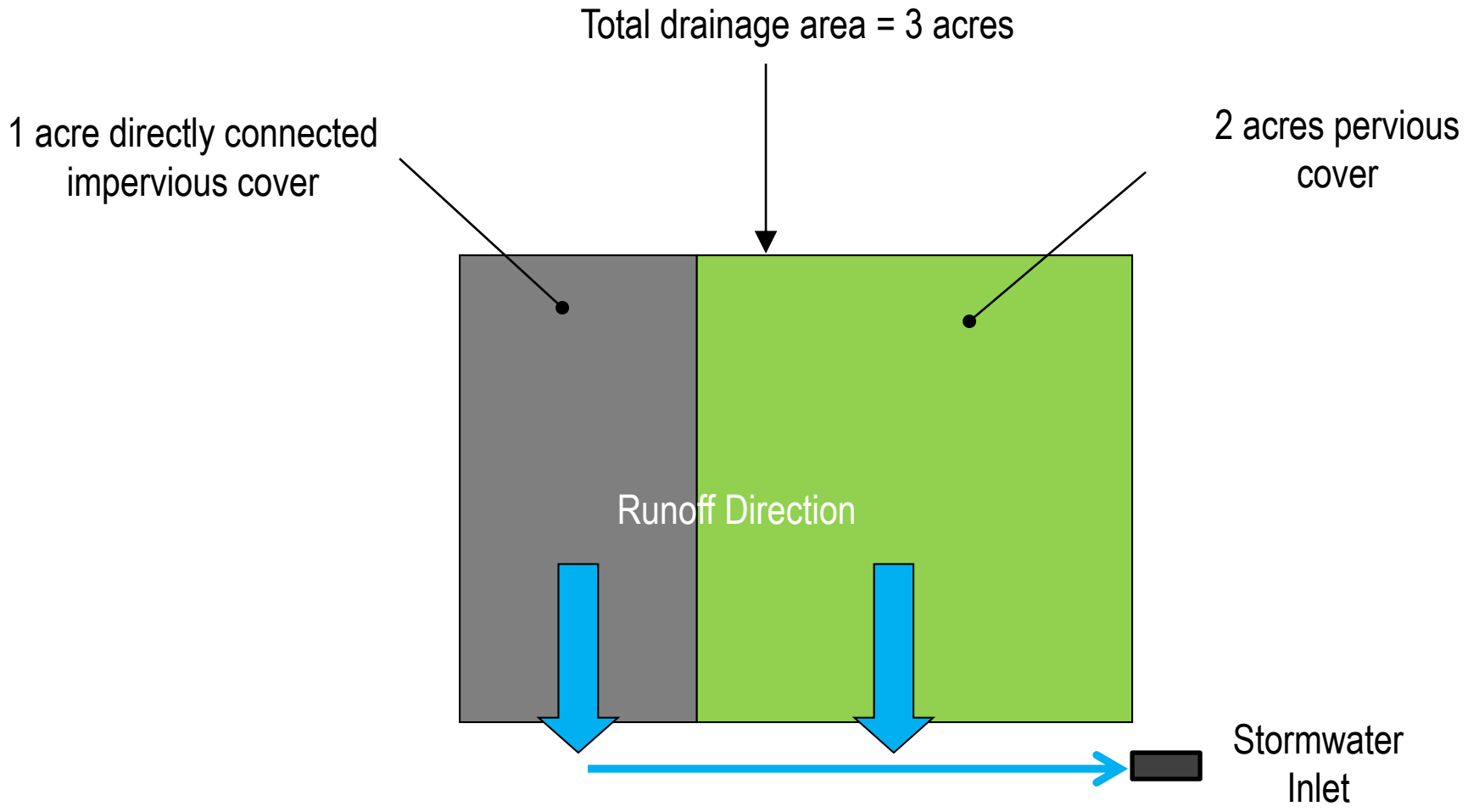
DOWNSPOUT CONNECTED TO SEWER SYSTEM



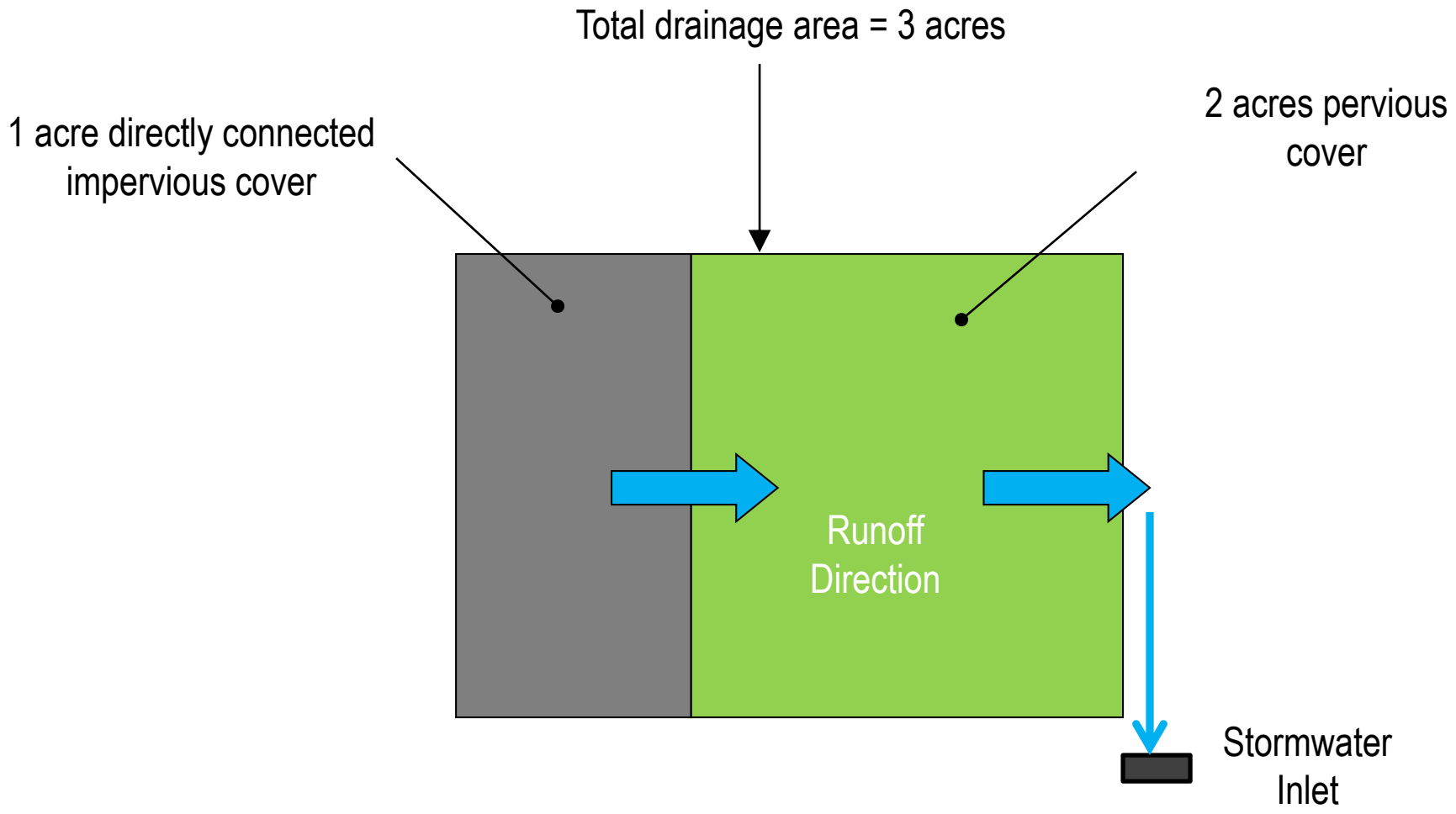
DOWNSPOUT DISCONNECTED FROM SEWER SYSTEM

Another Example of Simple Disconnection

For 1.25 inch storm, 3,811 cubic feet of runoff = **28,500 gallons**

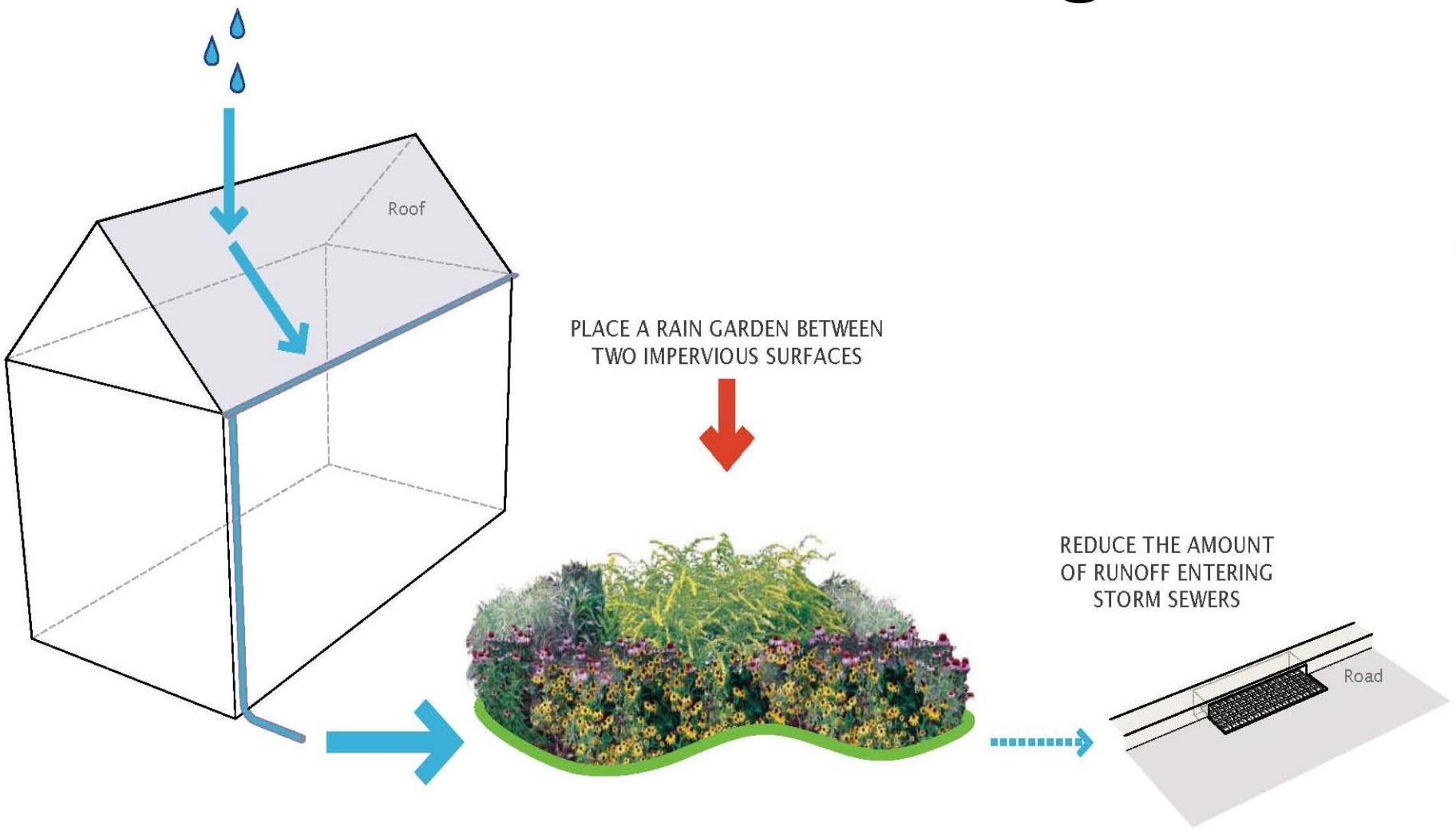


For 1.25 inch storm, 581 cubic feet of runoff = **4,360 gallons**

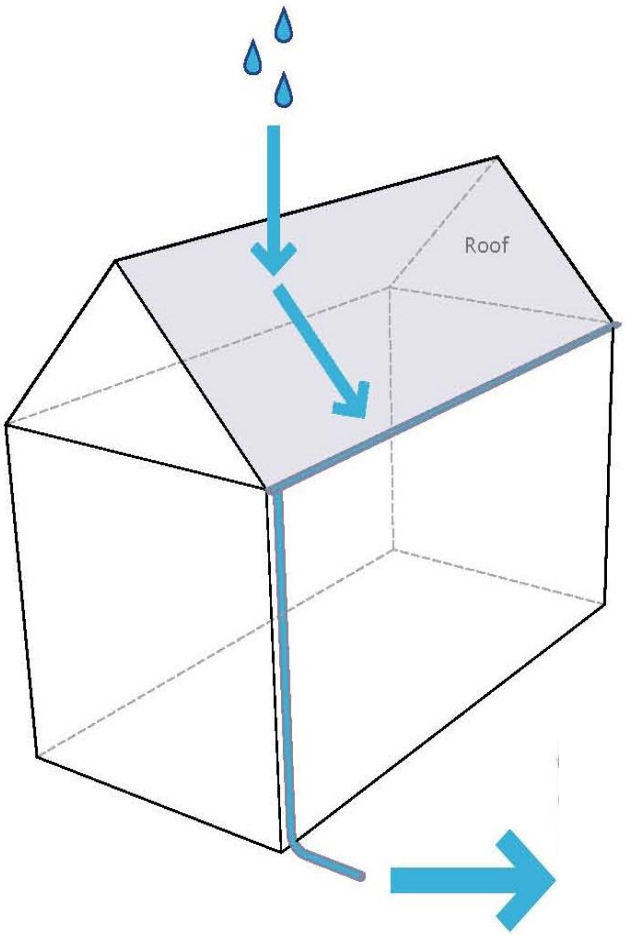


	Volume of Runoff		
Design Storm	**Connected (gallons)**	**Disconnected (gallons)**	**Percent Difference**
1.25 inches (water quality storm)	28,500	4,360	85%

Disconnect with a rain garden

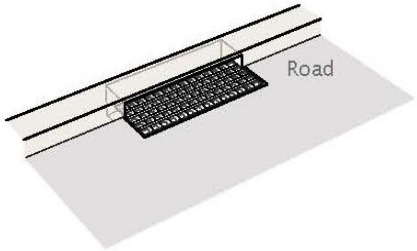


Disconnect to a Rain Barrel or Cistern



Disconnect your downspout by installing a rain barrel

REDUCE THE AMOUNT OF RUNOFF ENTERING STORM SEWERS



Impervious area is now ***"disconnected"*** from flowing directly into the storm sewer system

SITE SELECTION

What are good sites?

- Sites with impervious surfaces that are directly connected
- Sites with a lawn area that can be converts to accept stormwater runoff
- Sites with highly visibility – good educational opportunities
- Sites in impaired watersheds
- Sites on municipal owned land/public land
- Sites that provide partnership opportunities

WE LOOK HERE FIRST:

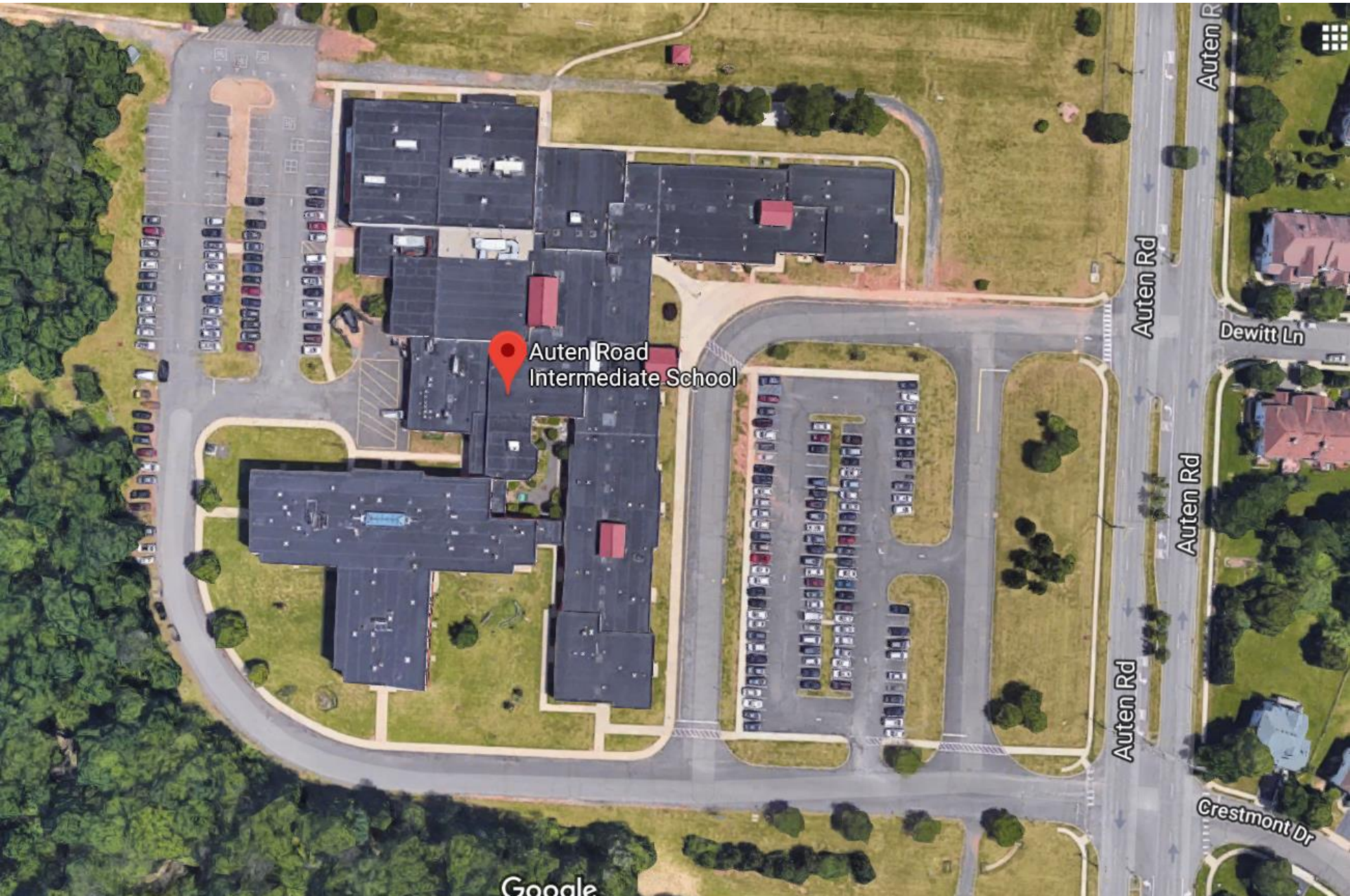
- ✓Schools
- ✓Places of Worship
- ✓Libraries
- ✓Municipal Building
- ✓Public Works
- ✓Firehouses
- ✓Post Offices
- ✓Elks or Moose Lodge
- ✓Parks/ Recreational Fields

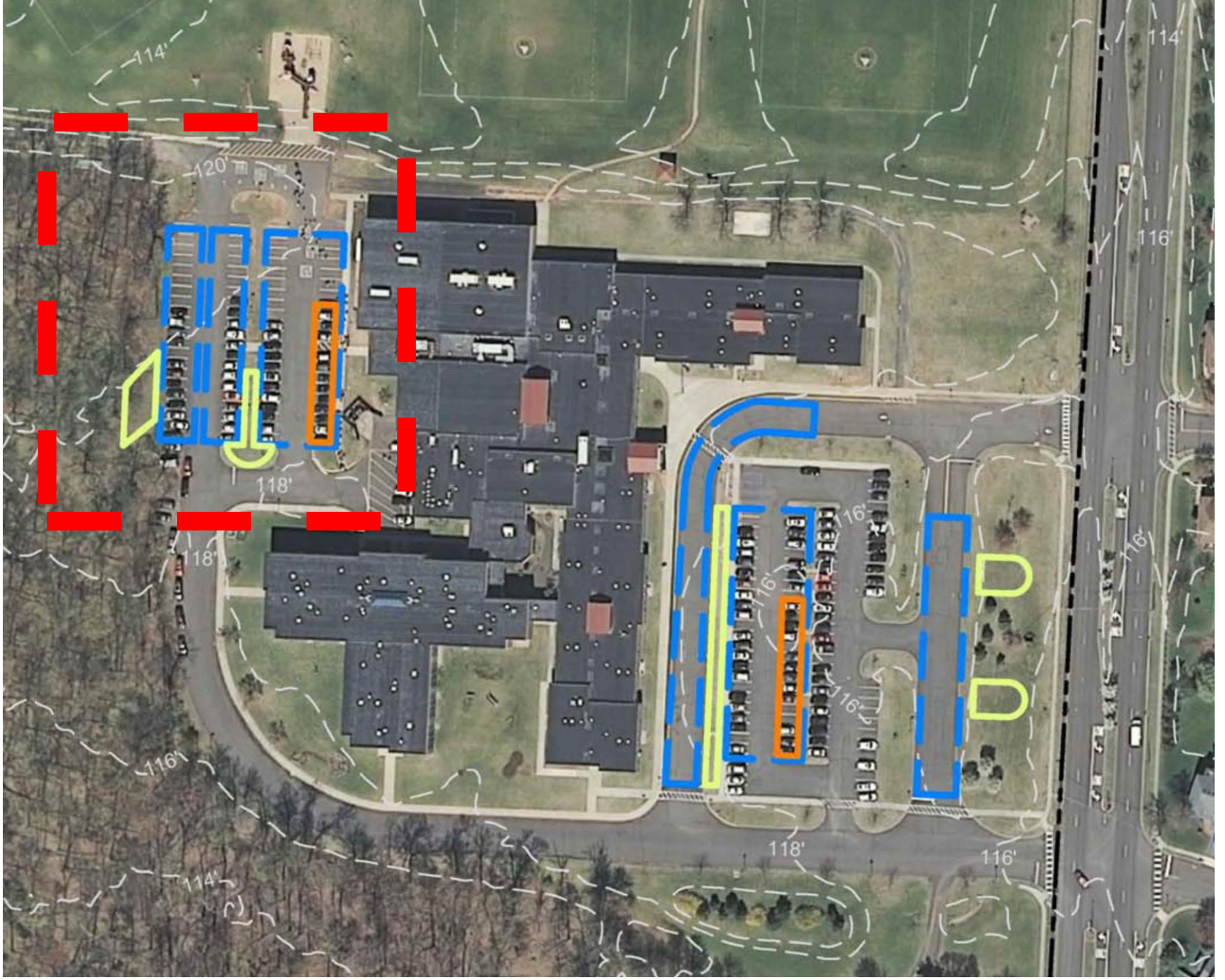
- 20 to 40 sites are entered into a PowerPoint
- Site visits are conducted

Google or Bing Maps

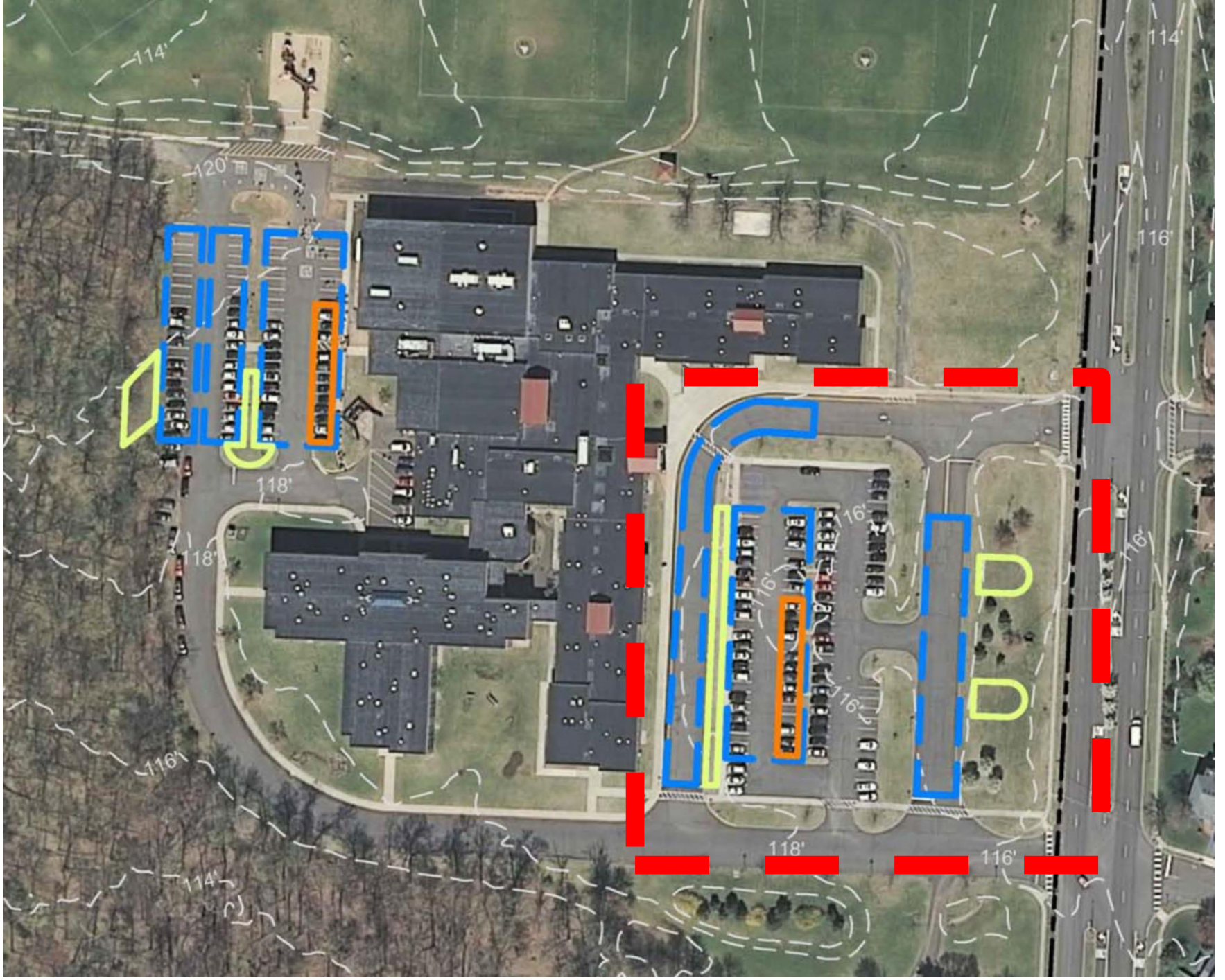
- Go to Google or Bing Maps
- Type in address
- Aerial or birds eye view
- “Snip It” (MS Windows Accessory)
- Insert into Powerpoint
- “Crop It”

Auten Road School in Hillsborough, NJ
281 Auten Rd, Hillsborough Township, NJ 08844




114'
120'
118'
116'
D
D


120'
118'


114'
120'
116'
118'
118'
116'
116'
116'
116'
118'
116'
114'
D
D


©2016 Google


1


4
NO.2
ENGINE 37-103
IN LOVING MEMORY OF
OUR DEPARTED SISTERS


5


8


1


ANY
TIME
NO
ZONE
IT'S THE LAW

6


7
NO
PARKING
ANY
TIME


8


3


4

"Protecting Public Health and the Environment"

RUTGERS
New Jersey Agricultural
Experiment Station

"Protecting Public Health and the Environment"

RUTGERS
New Jersey Agricultural
Experiment Station

Pittsgrove Baptist Church

Subwatershed: Salem River

Site Area: 696,419 sq. ft.

Address: 368 Daretown Road
Elmer, NJ 08318

Block and Lot: Block 59, Lot 14, 17

Rain gardens can be installed in the turfgrass area at the front of the church and behind the church. The gardens would capture, treat, and infiltrate runoff from the roof of the building and the parking area. A preliminary soil assessment suggests that the soils have suitable drainage characteristics for green infrastructure.

Impervious Cover		Existing Loads from Impervious Cover (lbs/yr)			Runoff Volume from Impervious Cover (Mgal)	
%	sq. ft.	TP	TN	TSS	For the 1.25" Water Quality Storm	For an Annual Rainfall of 44"
5	34,224	1.6	17.3	157.1	0.027	0.94

Recommended Green Infrastructure Practices	Recharge Potential (Mgal/yr)	TSS Removal Potential (lbs/yr)	Maximum Volume Reduction Potential (gal/storm)	Peak Discharge Reduction Potential (cu. ft./second)	Estimated Size (sq. ft.)	Estimated Cost
Bioretention systems	0.107	18	7,840	0.29	1,050	$5,250

GREEN INFRASTRUCTURE RECOMMENDATIONS

Pittsgrove Baptist Church

- bioretention system
- drainage area
- property line
- 2015 Aerial: NJOIT, OGIS

0 30' 60'

CURRENT CONDITION

CONCEPT DESIGN

Site Visits

What are we looking for during our site visit?

1. What are sources of stormwater and where does it flow?
2. What is the direction and relative slope of site?
3. Where are impervious surfaces on the site?
4. What is the condition of the paved areas?
5. Are impervious surfaces directly connected?
6. Are there opportunities to disconnect?
7. Are there stormwater catch basins?

What are we looking for during our site visit (cont'd)?

9. Is there evidence of ponding water on site?
10. Where are the utilities on the site?
11. Are there pedestrian safety issues?

Other Questions

- Do the soils infiltrate?
- Who own the property? Will they be open to installing stormwater management measures?
- Are there potential partners to help with the project?
- Do we need permits for altering this site with stormwater best management practices?
- Does the building have a basement?
- Can we lose parking spaces?
- Who will maintain the green infrastructure practices?
- Is the project a high priority?

THINGS YOU SHOULD BRING ON A SITE VISIT

Aerial photo

Pencil

Tape measure and/or measuring wheel

Camera

GI CHECKLIST – GI Manual

Next Class

- ✓ How to identify green infrastructure projects in your town
2. Moving from planning to implementation of green infrastructure – Jan. 29th
3. Maintaining green infrastructure practices/projects – Feb. 12th
4. Stormwater management regulations, policies, and ordinances – Feb. 26th

Resources for You!

HOME PAGE
About the Program
Staff
Projects & Programs
Recent Presentations
Water Pages
Fact Sheets
E-learning Tools
Useful Links

Our green infrastructure initiative in urban centers focuses on capturing stormwater with cost-effective practices before it enters the combined sewer systems.

About Us

Rutgers Cooperative Extension
Water Resources Program

G.H. Cook Campus
14 College Farm Road
New Brunswick, NJ 08901

www.water.rutgers.edu

~Creating Solutions for
Water Resources Issues in New Jersey~

Our mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

News

- In the News - October 3, 2017
- SEBS/NJAES Newsroom

Connect With Us

HOME PAGE
About the Program
Staff
Projects & Programs
Recent Presentations
Water Pages
Fact Sheets
E-learning Tools
Useful Links

Connect With Us

Projects & Programs

Agricultural Watershed Planning & Implementation	Municipal/Community Training
Green Infrastructure Program	Rain Gardens & Rain Barrels
Keep the Rain from the Drain ~ Impervious Cover Reduction Program	Watershed Planning & Implementation
Municipal Stormwater Management	

Agricultural Watershed Planning & Implementation

- Watershed Restoration & Protection Plan for Assiscunk Creek, Burlington County, NJ
- Assiscunk Creek Watershed Agricultural Mini-Grant Program
- Biofilter Wetland at Harrow Run, Water Quality Evaluation of Pollutant Removal Efficiency from a Tailwater Recovery System
- Watershed Restoration Plan for the Upper Cohansey River Watershed
- Upper Cohansey River Watershed Agricultural Mini-Grant Program
- Watershed Restoration Plan for the Upper Salem River Watershed
- Upper Salem River Watershed Agricultural Mini-Grant Program

Top of Page

Green Infrastructure Program

- Camden Green Infrastructure Initiative
- Fixing Flooding: One Community at a Time
  Innovative Solutions using Green Infrastructure Conference
- Green Infrastructure Education and Implementation Program
- Green Infrastructure Guidance Manual for New Jersey
- Green Infrastructure Solutions for New Jersey Conference

Keep the Rain from the Drain ~ Impervious Cover Reduction Program

- Impervious Cover Assessments and Impervious Cover Reduction Action Plans for Coastal Communities
- National Fish and Wildlife Foundation ~ Incorporating Green Infrastructure Resiliency in the Raritan River Basin
- Impervious Cover Assessments, Impervious Cover Reduction Action Plans, and Green Infrastructure Reduction Action Plans for New Jersey Future's Mainstreaming Green Infrastructure Program
- Salem County and Cumberland County, NJ ~ Impervious Cover Assessments and Impervious Cover Reduction Action Plans
- William Penn Foundation - Technical Support Program for Municipalities and Watershed Partners

HUNTERDON COUNTY

Delaware Twp
- *ICA*
- *RAP*
- *RAP web map*

Franklin Twp
- *ICA*
- *RAP*
- *RAP web map*

East Amwell Twp
- *ICA*
- *RAP*
- *RAP web map*

Raritan Twp
- *ICA*
- *RAP*
- *RAP web map*

Flemington Boro
- *ICA*
- *RAP*
- *RAP web map*

Readington Twp
- *ICA*
- *RAP*
- *RAP web map*

MIDDLESEX COUNTY

Dunellen Boro
- *ICA*
- *RAP*
- *RAP web map*

North Brunswick Twp
- *ICA*
- *RAP*
- *RAP web map*

NEW JERSEY HIGHLANDS WATERSHED CLUSTER

Alpha
- *ICA*
- *RAP*
- *RAP web map*
- *Feasibility Study*

Lopatcong
- *ICA*
- *RAP*
- *RAP web map*
- *Feasibility Study*

Branchville
- *ICA*
- *RAP*
- *RAP web map*
- *Feasibility Study*

Mount Arlington
- *ICA*
- *RAP*
- *RAP web map*
- *Feasibility Study*

Greenwich
- *ICA*
- *RAP*
- *RAP web map*
- *Feasibility Study*

Mount Olive
- *ICA*
- *RAP*
- *RAP web map*
- *Feasibility Study*

HOME PAGE
About the Program
Staff
Projects & Programs
Recent Presentations
Water Pages
Fact Sheets
E-learning Tools
Useful Links

Connect With Us

E-learning Tools

- *Inventory and Assessment of Your Stormwater Infrastructure* (January, 2017)
- *Green Infrastructure Overview: Examples and Properties of a Variety of Stormwater Managment Solutions* (November, 2016)
- *Ideas and Resources for Implementing Green Infrastructure in Your Community - Planning documents, programs, and ordinances* (May, 2016)
- *Impervious Cover Assessment (ICA) and Impervious Cover Reduction Action Plan: The Answer to All Your Problems* (December, 2015)
- *Asking the Right Questions in Stormwater Review* (April, 2015)
- *Understanding Your Impervious Cover Assessment (ICA) Report* (March, 2015)

E-learning Tools

- *Inventory and Assessment of Your Stormwater Infrastructure* (January, 2017)
- *Green Infrastructure Overview: Examples and Properties of a Variety of Stormwater Managment Solutions* (November, 2016)
- *Ideas and Resources for Implementing Green Infrastructure in Your Community - Planning documents, programs, and ordinances* (May, 2016)
- *Impervious Cover Assessment (ICA) and Impervious Cover Reduction Action Plan: The Answer to All Your Problems* (December, 2015)
- *Asking the Right Questions in Stormwater Review* (April, 2015)
- *Understanding Your Impervious Cover Assessment (ICA) Report* (March, 2015)

New Development: Adequate Regulations Exist

Inadequate Enforcement

Staff to Contact

Sara Mellor, Program Associate, graduated in May 2010 from Rutgers, The State University of New Jersey, with a B.S. in Environmental Policy, Institutions, and Behaviors. Sara interned with the Water Resources Program from May 2009 to May 2010 and has worked part time as a Program Coordinator with the Water Resources Program from May 2010 to May 2011. During the internship and tenure as a Program Coordinator, Sara has participated in water quality sampling, flow monitoring, and stream visual assessments for watershed restoration and protection plans, assisted in the coordination, construction, and maintenance of rain gardens, helped develop and run rain barrel workshops, organized the "One Barrel at a Time Co-op," created flyers, press releases, and other forms of promotional materials for the program, supported Water Resources Program staff in community educational outreach projects, supervised project volunteers, researched ways to inform the public about the importance of conserving water, and contributed to the development of evaluation tools to measure programmatic impact. As a Program Associate with the Rutgers Cooperative Extension Water Resources Program, Sara will be coordinating and presenting rain barrel workshops throughout New Jersey, designing, constructing, and coordinating the installation of rain gardens and natural landscaped systems throughout New Jersey, and participating in community and youth outreach projects pertaining to water resources.

Room 105, 848-932 6747, saramellor@envsci.rutgers.edu


QUESTIONS?

Green Infrastructure Champions Program

This program is partially funded by the Rutgers New Jersey Agricultural Experiment Station, The Geraldine R. Dodge Foundation, NJ Sea Grant Consortium, The William Penn Foundation and is a collaboration of the Rutgers Cooperative Extension Water Resources Program and the Green Infrastructure Subcommittee of Jersey Water Works.

RUTGERS
New Jersey Agricultural Experiment Station

Sea Grant
NJ Sea Grant Consortium

The Geraldine R. DODGE FOUNDATION
IMAGINE A BETTER NEW JERSEY

JERSEY WATER WORKS
Smart infrastructure. Strong communities.

WILLIAM PENN FOUNDATION