

wood.

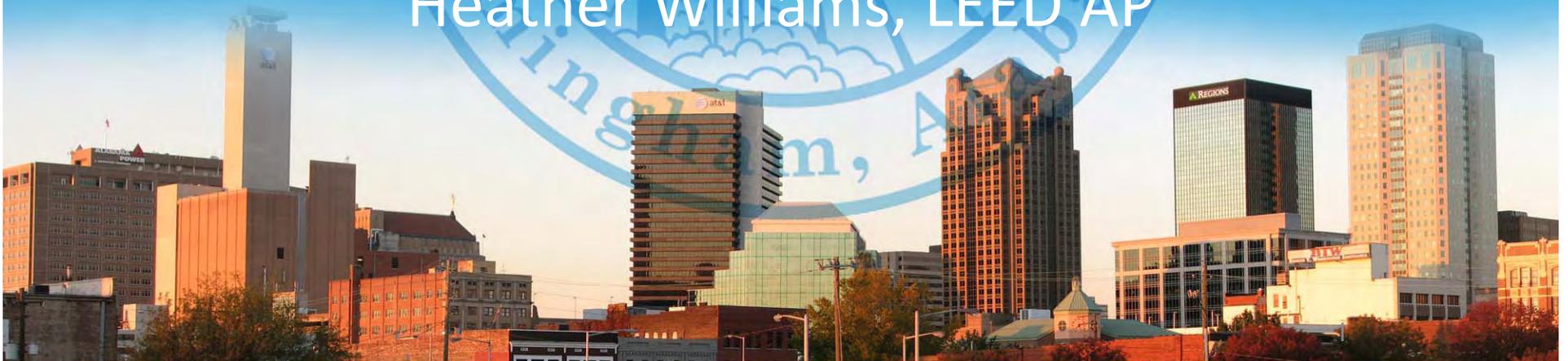


Preventing Maintenance Mayhem:

Case Study Birmingham, AL

SESWA– October 11, 2019

Heather Williams, LEED AP



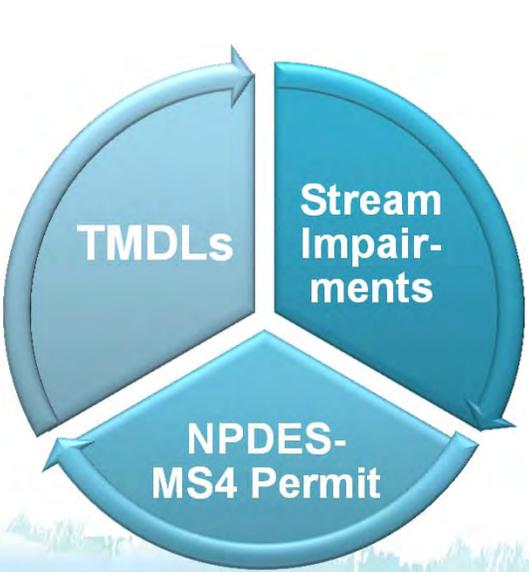
Birmingham, AL

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Like many communities....

wood.



UAB Campus, Birmingham AL, June 27, 2016



Developing a Post Construction Stormwater Program

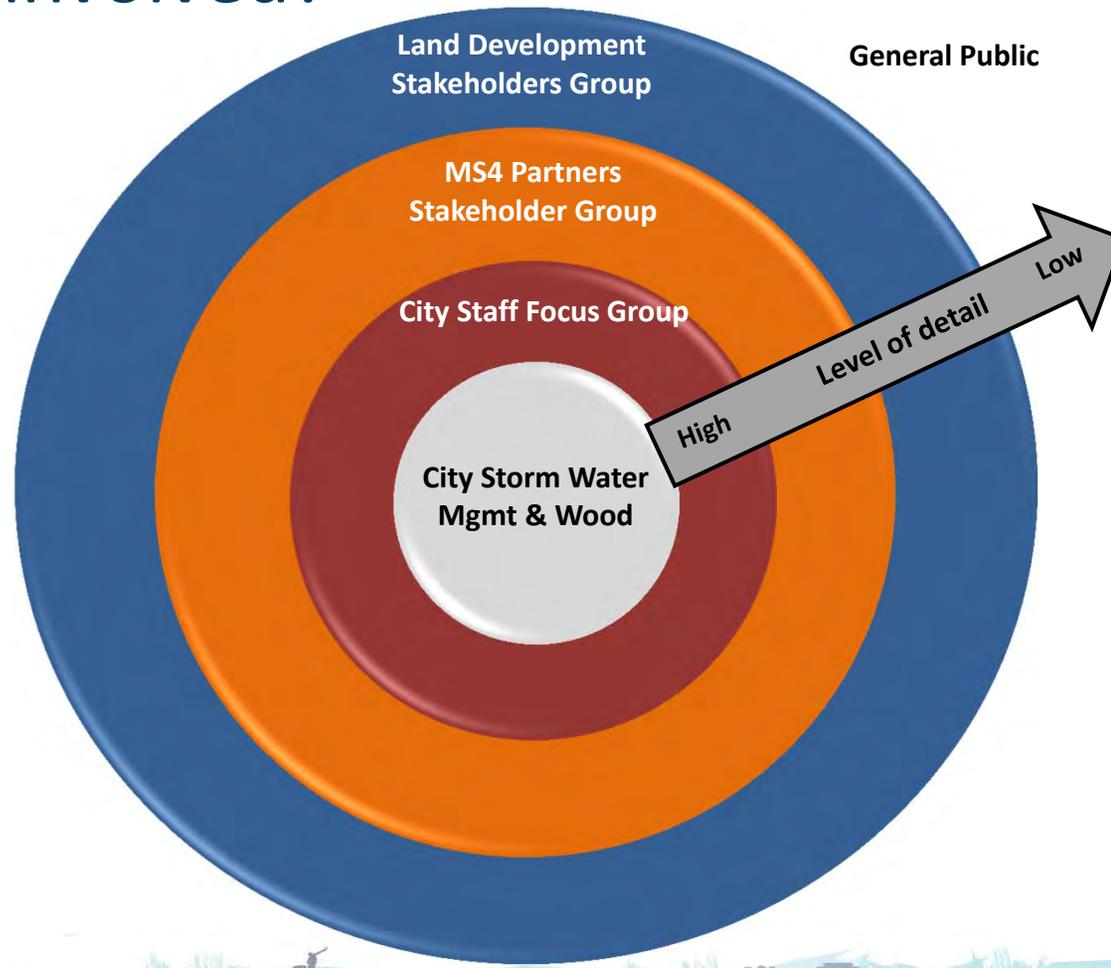
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Developing a Post Construction Stormwater Program



- Who was involved?
- Timeline?

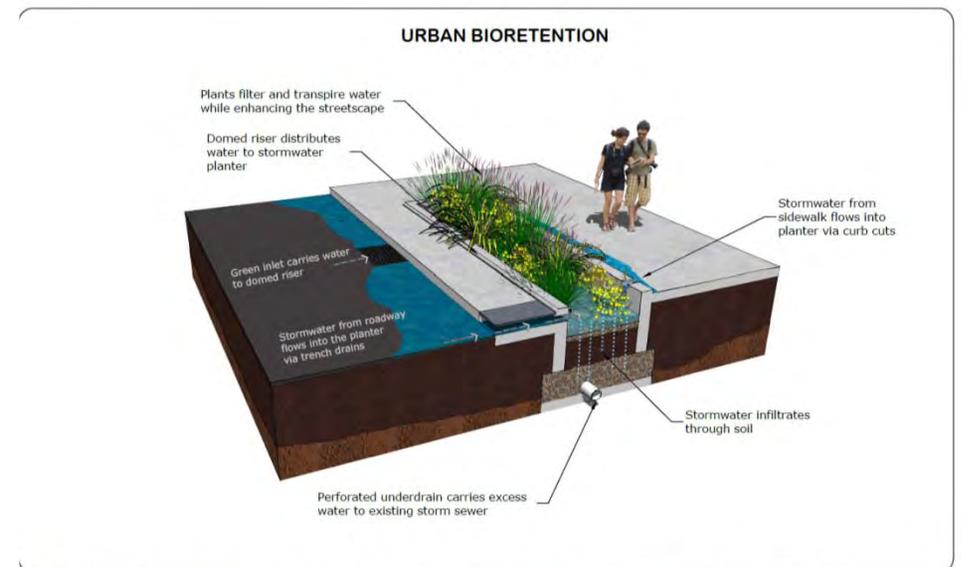


Program Content and Materials



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- Stormwater Ordinance
- Stormwater Manual
- Typical Details
- Owner's Guide to Maintenance
- Training
- Web Resource Center
- Off Site Mitigation Program



CLIENT
AMEC Foster Wheeler

PROJECT
Stormwater Best Management Practices

PROJECT NO.
PEP2017.020

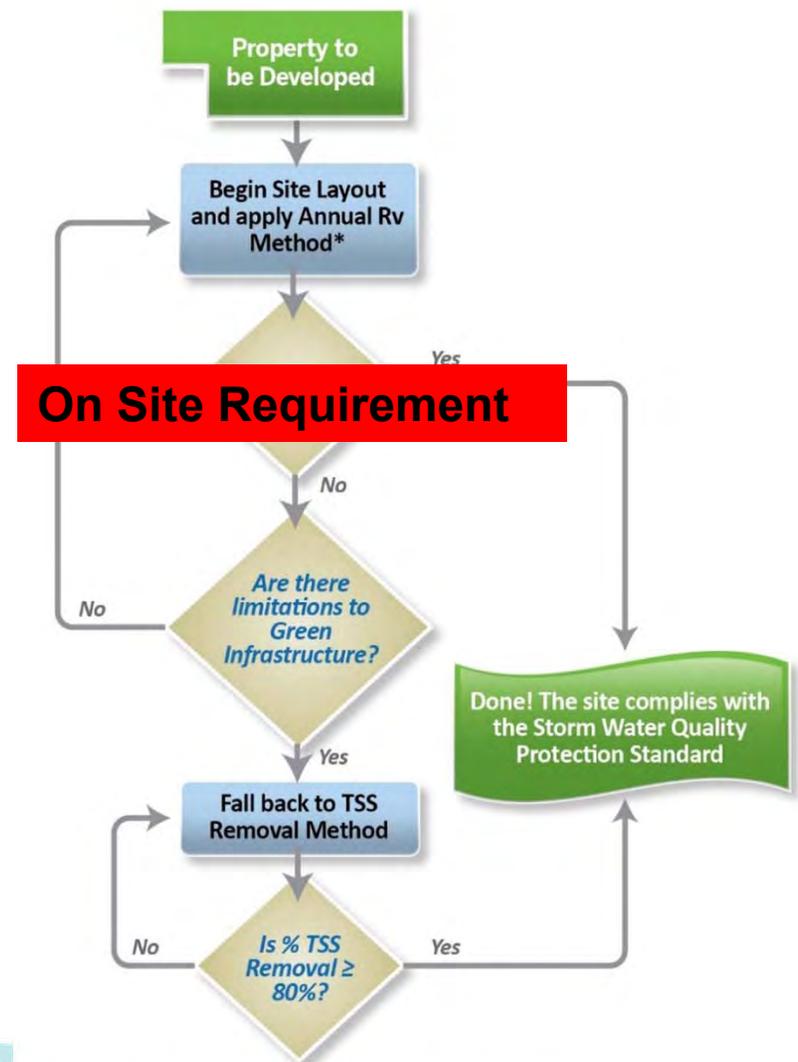
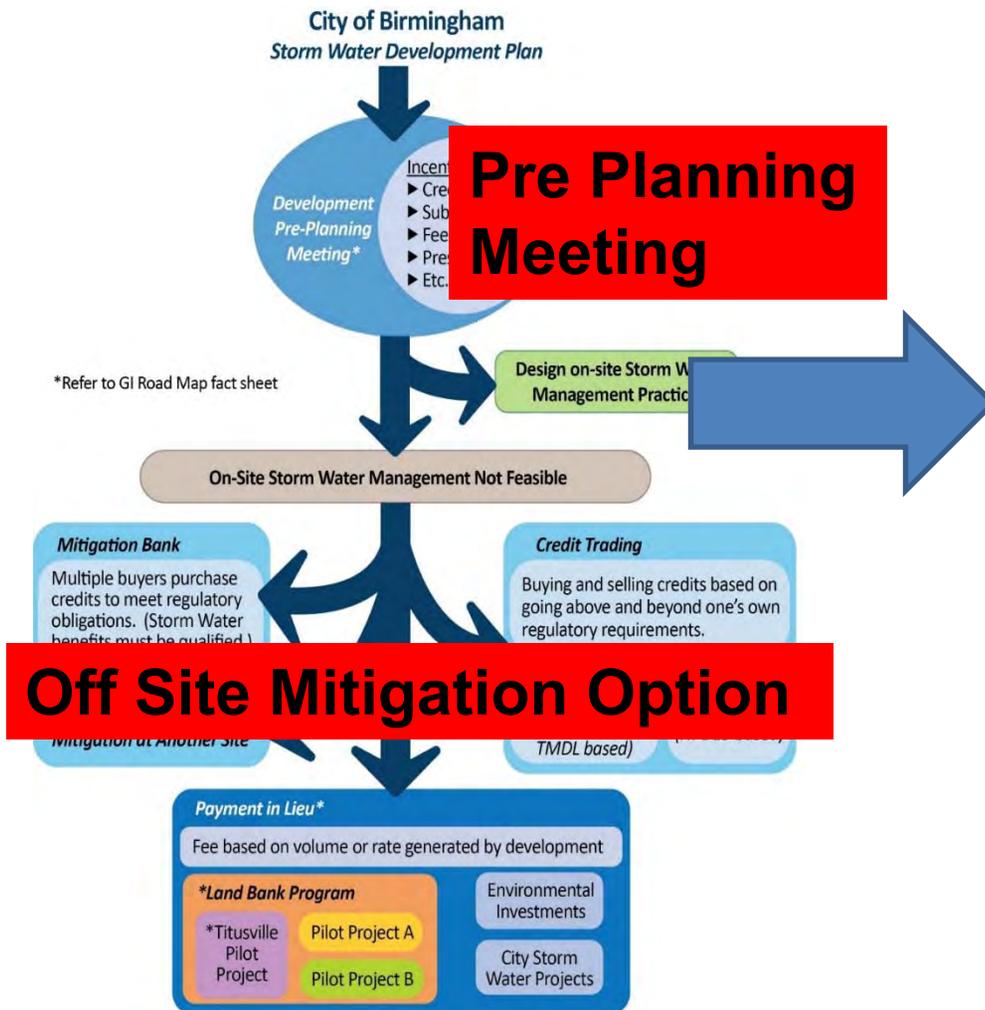
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ISSUE DATE
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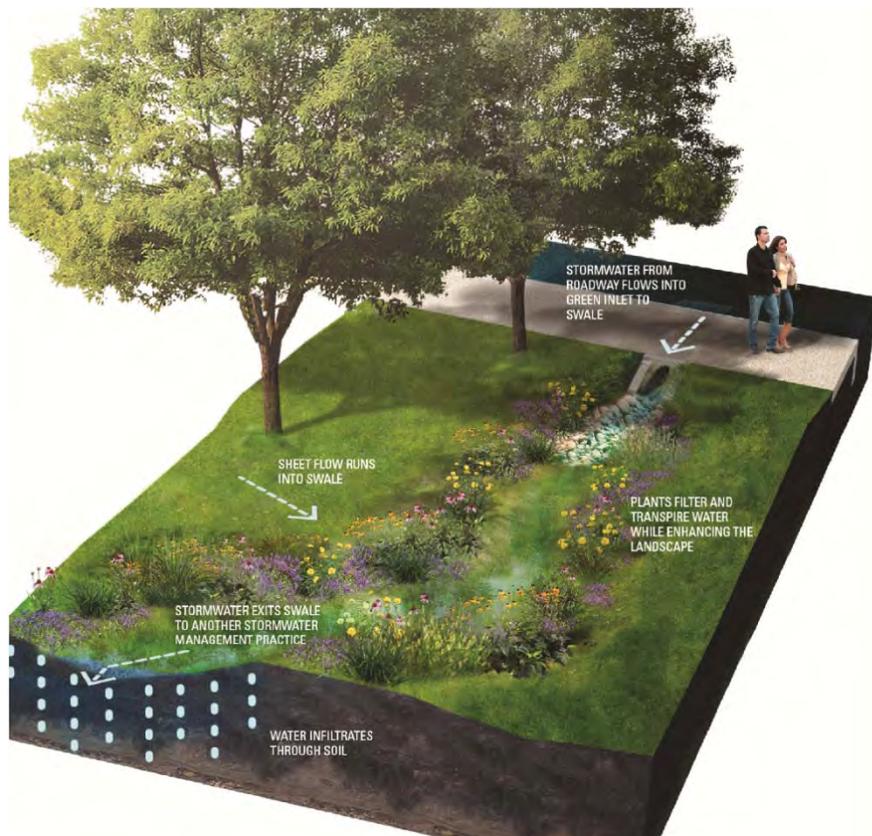
Developing a Post Construction Stormwater Program...w/ Options **WOOD.**



* The use of Credits and Incentives is not included in this graphic.



Ultimately will lead to more BMPs...



BMPs Fails

wood.



How to prevent BMP fails....



- Set up a **STRONG** and **ENFORCABLE** ordinance
- Link Maintenance Agreement to property deed
- Have funding and staff dedicated to **ENFORCEMENT**
- Develop checklists and material **TARGETED** toward the **OWNER** not the Engineer.
- Determine who is responsible for inspection and maintenance.
- Provide **TRAINING, OUTREACH, and ASSISTANCE**



Strong and Enforceable Ordinance



CHAPTER 6 – INSPECTION, OPERATION, AND MAINTENANCE

- 600 Responsibilities for Operation and Maintenance
- 601 Prohibited Conditions for Post Construction Storm Water Practices
- 602 Maintenance and Integrity during Construction
- 603 Owner Inspection after Construction
- 604 Maintenance of Records after Construction
- 606 Right of Entry: Inspections by the City
- 607 Search Warrants

CHAPTER 7 – VIOLATIONS, ENFORCEMENT, AND PENALTIES

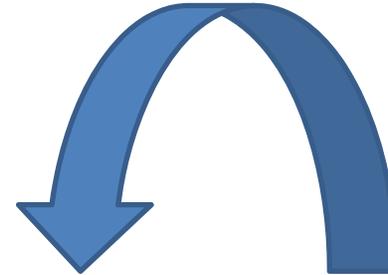
- 700 Violations
- 701 Warning Notice
- 702 Notice of Violation



Maintenance Agreement



- Corporate
- Individual



**CITY OF BIRMINGHAM, ALABAMA
DEPARTMENT OF PLANNING, ENGINEERING AND PERMITS
STORM WATER PRACTICES MAINTENANCE AGREEMENT
AND RESTRICTIVE COVENANT**

STATE OF ALABAMA

Corporate Form

COUNTY OF JEFFERSON

THIS CONVENANT, made and entered into this ___ day of _____, 20___, by (Insert Full Name of Owner) _____ hereinafter called the "Landowner",

WITNESSETH, that WHEREAS, the Landowner is the owner of certain real property described as (Tax Map/Parcel Identification Number) _____ as more particularly described in the warranty deed recorded in Deed Book _____, at page _____, public records of Jefferson County, Alabama, hereinafter called the "Property", and as designated by the City of



BMP Maintenance Program Tools **wood.**



■ **BMP Owner's Manual**

- Provides general education on BMPs and explains Owner responsibilities
- Establishes maintenance “performance standards”
- Provides inspection and maintenance guidance and checklists
- Provides additional resource information

■ **City Stormwater Web Resources**

- Provides Owner's Manual in engaging “storybook” format
- Provides Compliance Inspection Checklist templates





Section 1: Introduction and Storm Water BMPs 101

Section 2: BMP Operational and Success Criteria

Section 3: BMP Inspection

Section 4: BMP Maintenance

Section 5: Individual BMP Inspection Requirements

Section 6: Helpful Resources

Target Audience:

NOT written for engineer or designer

IS written for **property owners**

Messaging:

- ✓ Simple
- ✓ Educational
- ✓ Visual
- ✓ Themed



Simple and Educational

wood.



Some properties have multiple BMPs, which all require maintenance. This building has cisterns, green roofs, porous pavers, and a small bioretention area.



Simple and Educational

wood.



OWNER RESPONSIBILITIES

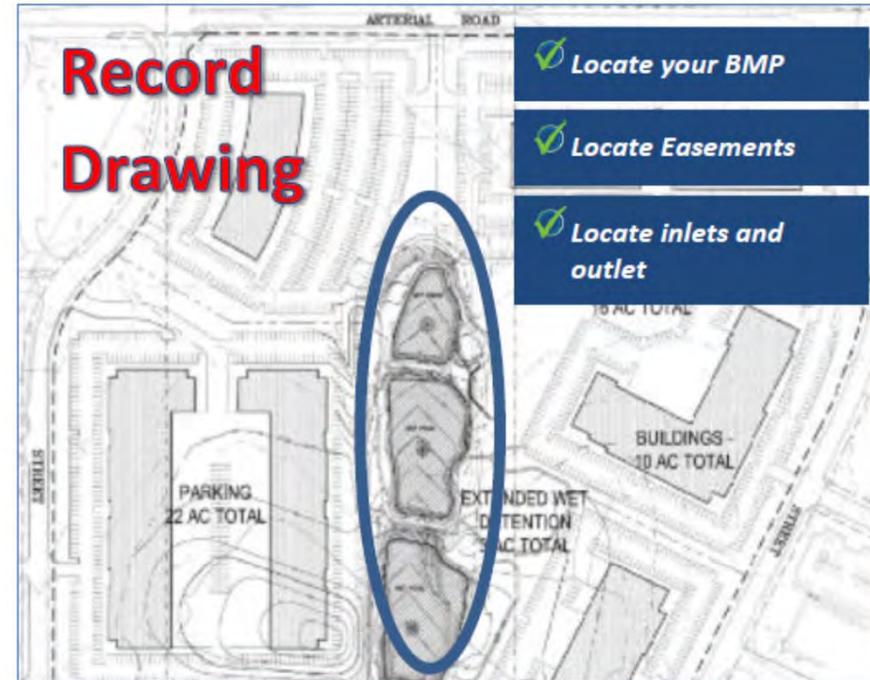
- ✓ Protection of the BMP, related components and access routes from a public roadway from development, encroachment, and damage
- ✓ Conduct and document inspections and maintenance
- ✓ Submit required information to the City
- ✓ Provide for the perpetual and proper operation of the BMP

CITY RESPONSIBILITIES

- ✓ Enforce the provisions for inspection and maintenance.

We are here to help! The City of Birmingham's Storm Water Management Department can answer questions about your BMP!

Record Drawing



Once you have your as-built, locate your specific BMPs. They may be called by other names, such as:

- | | |
|---------------------------|---------------------------------|
| ✓ Rain Garden | ✓ Infiltration Trench |
| ✓ Swale | ✓ Rain Barrel |
| ✓ Downspout Disconnection | ✓ Pond |
| ✓ Green Roof | ✓ Underground Detention |
| ✓ Sheet Flow | ✓ Oil/Grit Separator |
| ✓ Reforestation | ✓ Manufactured Treatment Device |
| ✓ Permeable Pavement | |

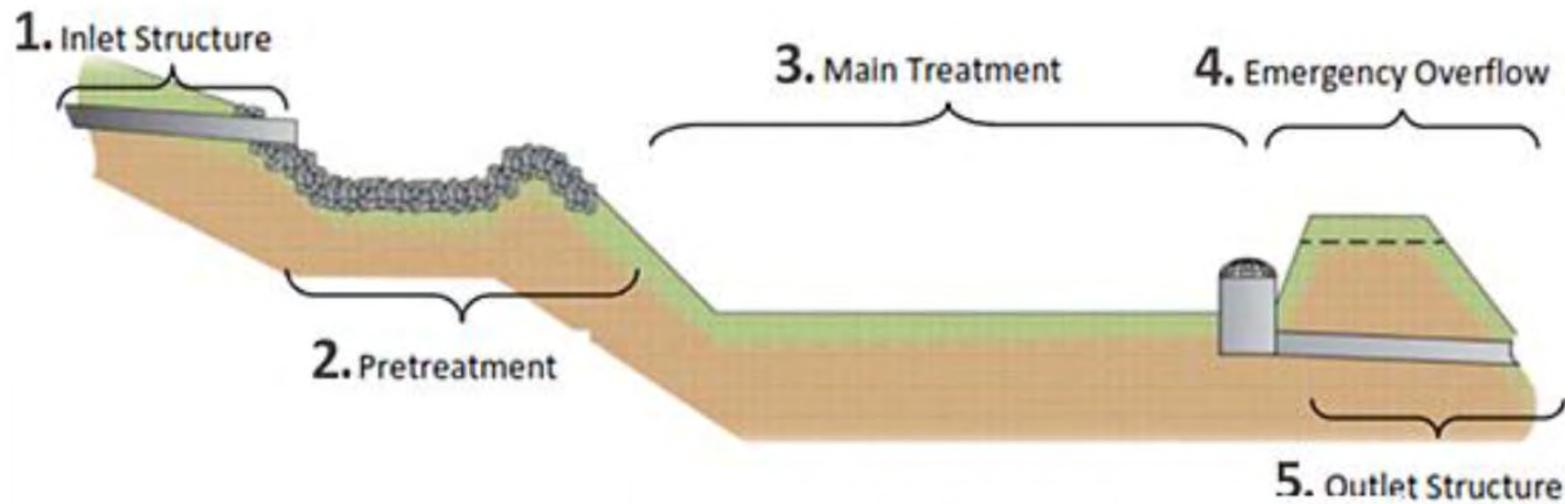
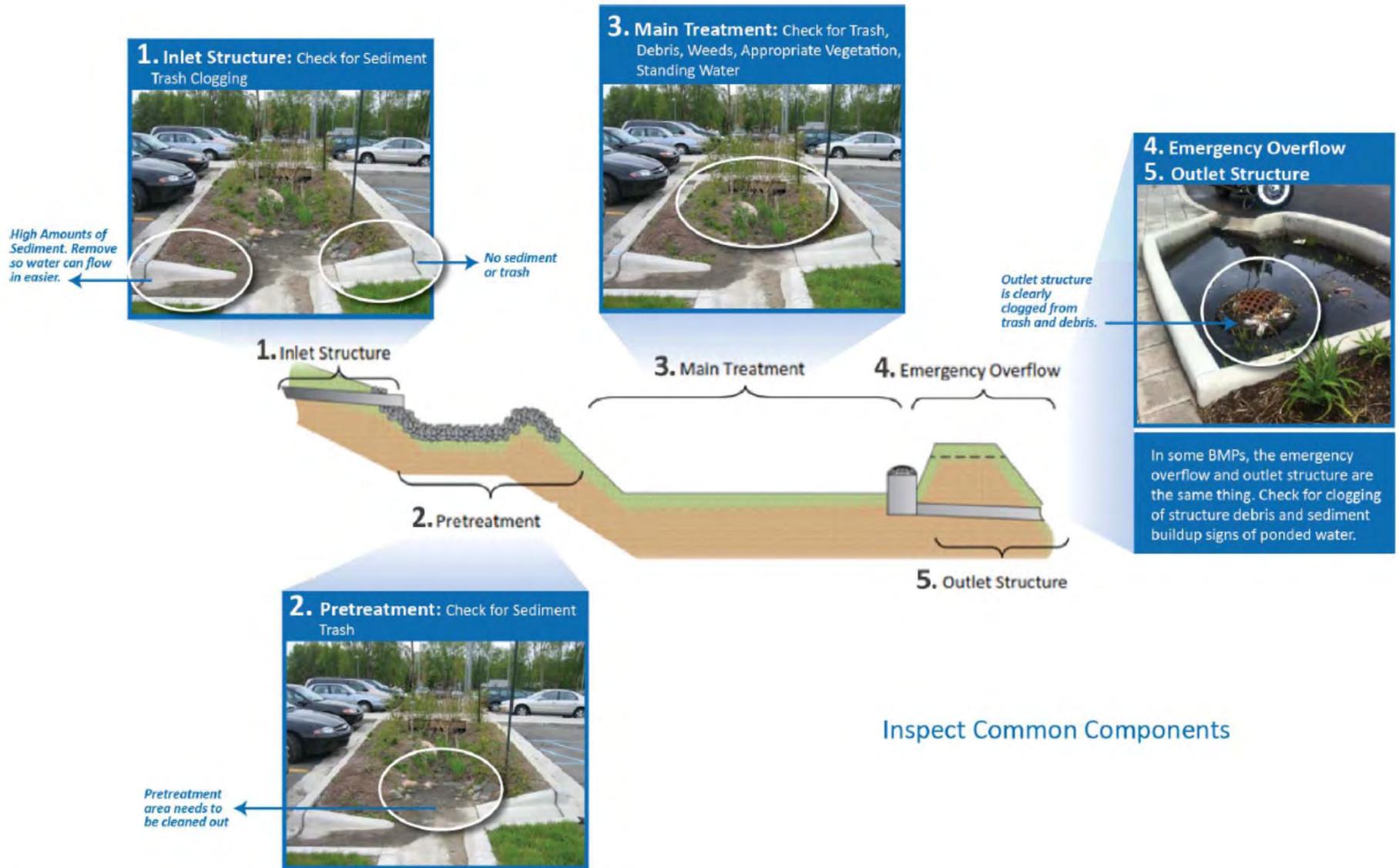


Figure 1: Detention Basin







WHAT DOES SUCCESS LOOK LIKE?

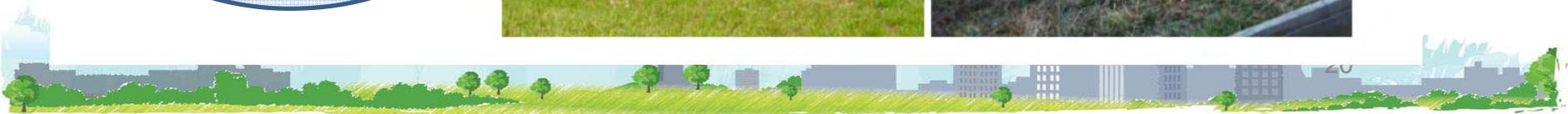
Inlet structures bring water into the BMP. They should be free of sediment, trash, and debris. Erosion, scour, and damage should be evaluated.



WHAT DOES FAILURE LOOK LIKE?



Pretreatment is the first layer of protection for the main treatment area. Debris and coarse sediment are removed, which reduces clogging in the main treatment area. The pretreatment area can be cleaned more easily than the main treatment area. It should be free of sediment, trash, and debris. Erosion, scour, and damage should be evaluated.





Themed: Success Factors

Success Factor 1: Vegetation



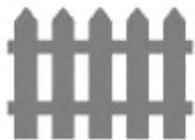
Vegetation should be healthy and maintained. Bare soil should not be visible in vegetated areas, nor should vegetation be overgrown.

Success Factor 2: Draindown



After rainfall, storm water should generally recede within 48 hours. There should not be regular, prolonged flooding. This can indicate a clog or other problem with filter media, underdrains, inlets, or outlets.

Success Factor 3: Protection



Pedestrian, vehicles, and heavy equipment can damage BMPs. There should not be signs of encroachment, such as compacted soil, pet waste or crushed vegetation

Success Factor 4: Cleanliness



The area around a BMP needs to be kept clean to reduce the chance that objectionable materials enter the BMP. There should not be sediment, litter, or stored pollutants in the BMP or its drainage area.



Themed: Success Factors



Success Factor 1: Vegetation

Vegetation is healthy and free from weeds



Success Factor 2: Drawdown

BMP is not holding water long after rain event



Success Factor 3: Protection

No signs of vehicle, equipment, or pedestrian damage.



Success Factor 4: Cleanliness

No signs of litter, erosion, pollution, or debris



3.0

Check for the following:

Sediment/debris in main treatment areas and at inlet and outlet structures

Success Factor: Cleanliness



Sediment has accumulated on this inlet grate and needs to be cleaned off.



Sediment has accumulated in the infiltration area and needs to be cleaned out. Clogged media may require replacement

Erosion, settlement, or slope failures

Success Factor: Cleanliness



The slope of this berm has failed and eroded, requiring regrading and replanting



The slope near the outlet has eroded and requires repair

Clogging, as evidenced by frequent standing water for more than 2 or 3 days after storms

Success Factor: Drawdown



The outlet has clogged, which has led to flooding of the BMP and nearby property.



The outlet screen was filled with debris. After removal and cleaning, water can flow again





Successful Bioretention



No encroachment 

Clear outlet structures and overflows 

Clear inlet structures 

Healthy vegetation 

Pervious pavers are free from debris, ponding, and sediment 

Well-maintained bioretention area within a pervious paver parking lot

Unsuccessful Bioretention



Encroachment into BMP 

Outlets and overflows NOT clear 

Vegetation NOT healthy 

Pavement NOT free of debris and sediment 

Inlets NOT clear 

Poorly-maintained bioretention area within an asphalt parking lot

INSPECTION STEPS

1. Review your record drawing. Know the locations of your BMPs and their inlets, outlets, easements, and access routes
2. Inspect all the BMPs on your property, including all components
3. Assess any drainage issues or debris on your property that might be a result of a failed BMP
4. Complete the City inspection checklist
5. Make a plan for addressing any maintenance items and note follow-up items on the checklist
6. Provide your inspection checklist to the City
7. Maintain copies of your inspection records



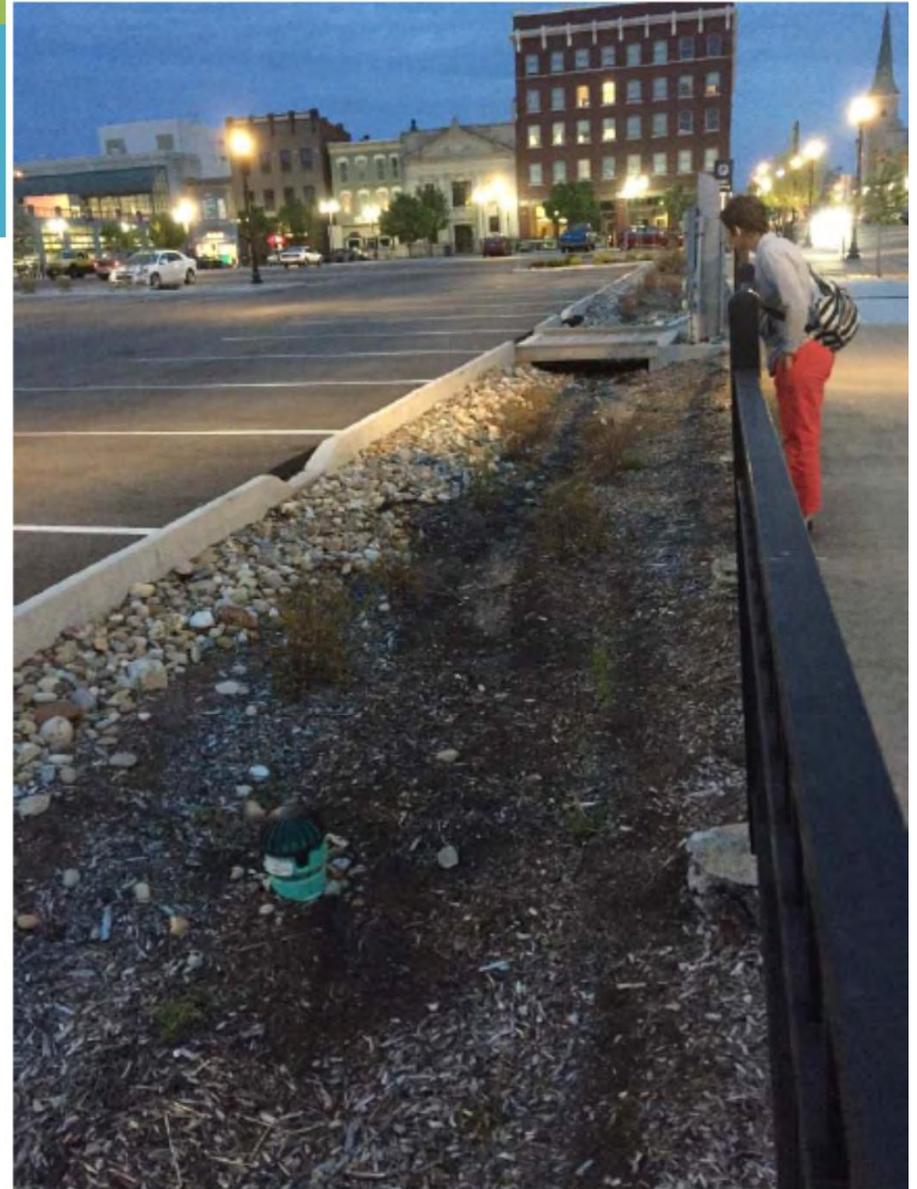
BMP Maintenance

■ Routine Maintenance

- Trash, debris, leaf, litter and minor sediment removal
- Inlet and outlet cleaning
- Mowing and pruning vegetation
- Erosion prevention and sediment control for bare soil or eroding surfaces
- Repair or replacement of signage

■ Large Maintenance

- Repairs of structural components
- Major sediment removal
- Addressing areas where soil has been compacted by heavy equipment
- Removal or replacement of BMP filters or filter media
- Large scale removal and replacement of dead, damaged or unhealthy vegetation



This bioretention area is being completely replanted as part of a large-scale maintenance effort.

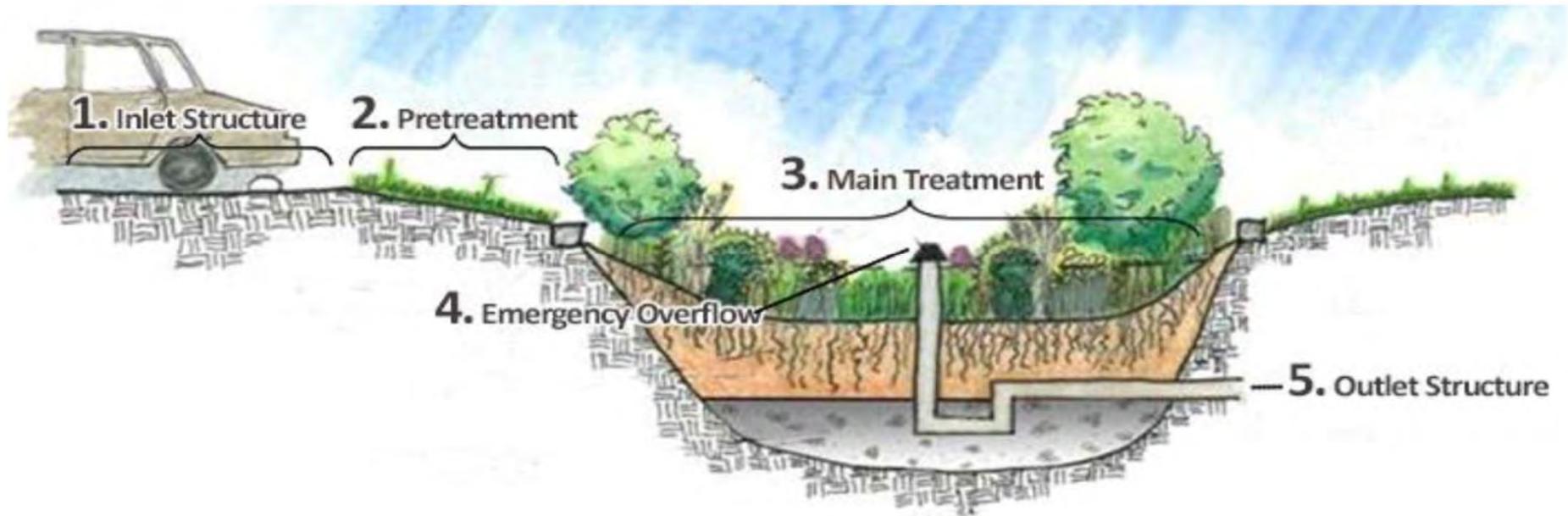


Individual BMP Inspection and Maintenance Requirements

wood.



■ General Description and Definition

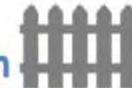


Individual BMP Inspection and Maintenance Requirements



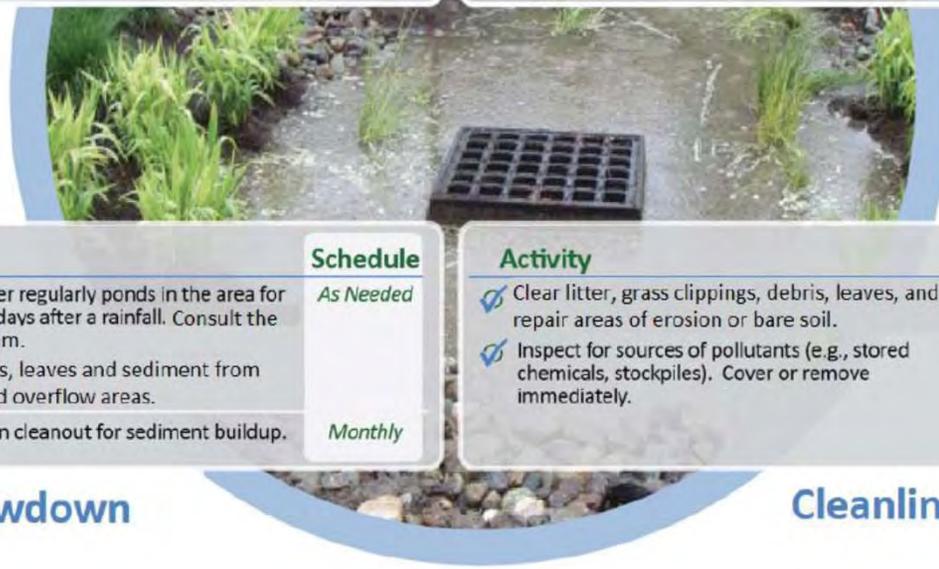
Vegetation

Activity	Schedule
<ul style="list-style-type: none"> ✓ Check for stressed, dying or dead plants. Treat or replace if necessary. ✓ Check for signs of encroachment (broken or flattened plants). Adjust protective measures if needed. 	As Needed
<ul style="list-style-type: none"> ✓ Remove large stands of weeds or other invasive plant species. 	Monthly
<ul style="list-style-type: none"> ✓ Perform seasonal vegetative maintenance to ensure vegetation coverage and survivability. 	Seasonally



Protection

Activity	Schedule
<ul style="list-style-type: none"> ✓ Inspect for signs of pedestrian, vehicle or heavy equipment damage. ✓ Inspect for compacted soil, pet waste or crushed vegetation. 	As Needed
<ul style="list-style-type: none"> ✓ Inspect for areas of bare soil. Cover, vegetate or repair immediately. 	Monthly
<ul style="list-style-type: none"> ✓ Inspect protective measures. Repair fencing, signage, pathways and other measures quickly. 	



Activity	Schedule
<ul style="list-style-type: none"> ✓ Take notice if water regularly ponds in the area for more than 3 to 4 days after a rainfall. Consult the City of Birmingham. 	As Needed
<ul style="list-style-type: none"> ✓ Clear litter, debris, leaves and sediment from inlets, outlets and overflow areas. 	
<ul style="list-style-type: none"> ✓ Inspect underdrain cleanout for sediment buildup. 	Monthly

Activity	Schedule
<ul style="list-style-type: none"> ✓ Clear litter, grass clippings, debris, leaves, and repair areas of erosion or bare soil. ✓ Inspect for sources of pollutants (e.g., stored chemicals, stockpiles). Cover or remove immediately. 	As Needed



Drawdown



Cleanliness



Individual BMP Inspection and Maintenance Requirements

wood.



Check the property frequently for bare soil, erosion, litter, plant health and soil compaction.

Do



Remove weeds and invasive plants. Re-stock with healthy vegetation and ensure that basic requirements for plant health are met.



Perform informal inspections and routine maintenance on a regular basis. Make repairs as soon as problems are noticed.



Perform an annual inspection. See the Bioretention Annual Inspection Form at the end of this guidance sheet.

X

Don't use excessive amounts of salt and sand around the bioretention area in the winter.

Don't

X

Apply fertilizer, herbicides or pesticides inside the planting area, and use these materials sparingly on your property. Contact a local nursery or landscape professional if your plants aren't thriving.

X

Don't allow heavy equipment in the bioretention areas, or use it as a storage area, even for landscape materials (e.g., leaves, snow, soil mulch etc).



Individual BMP Inspection and Maintenance Requirements



Bioretention Area Inspection Form



Bioretention Name	Note: The bioretention area name will be shown on the BMP location map included with the Platt or Record Drawings for this property. A typical name would be "Bioretention Area 1" or "Bioretention Area A".				Today's Date:	
					Date of Last Inspection:	
Property Info	Street Address:	City:	State:	Zip:		
Who is inspecting the Bioretention?	Name (Owner, Tenant, Property Manager or Landscape Company):			Contact Name (If Different):		
	Street Address (If conducted by a company, use company address):			City:	State:	Zip:
	Phone #:		Email:			
Who Owns the Bioretention?	Name (Person(s) or Company):			Contact Name (If Different):		
	Street Address:		City:	State:	Zip:	
	Phone #:		Email:			

Is a Follow Up Inspection by Staff Required? Circle One:	This Section is for City of Birmingham Use Only	
	Identification Number Name of Staff Approving This Inspection Report: Reason for Follow Up?	Has the City Entered and Approved this Inspection? Yes No Date of Inspection Approval: Yes No
Yes	No	



Completed forms can be submitted by mail or email:
 Storm Water Management • Department of Planning, Engineering & Permits
 710 North 20th Street • Birmingham, AL 35203
Email:



Individual BMP Inspection and Maintenance Requirements

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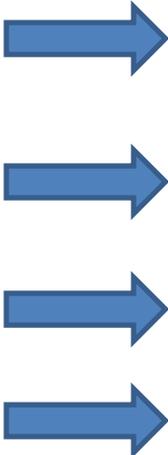
Bioretention Area Inspection Form

All items listed must be inspected unless Not Applicable (NA).

Answering "Yes" indicates a need for maintenance.

Please include an approximate date for repairs for those items that require maintenance.

Inspection Question	Answer			Describe problem(s) and solution(s)
	Y	N	NA	
The Main Treatment Area:				Success Factors: Draindown, Protection and Cleanliness
1. Is trash, sediment, debris, leave, grass clippings or other similar materials present in the main treatment area? <i>Guidance: Remove unwanted materials and correct any other problems that can cause clogging or otherwise prevent percolation of storm water into the soil.</i>				
2. Are there signs of human encroachment in the main treatment area unrelated to maintenance, such as compacted or displaced mulch, damaged plants, tire tracks, or other? <i>Guidance: Repair or replace protection measures if damaged (e.g., fences, hedges, signs, etc.). Increase protection measures if this is a frequent problem. Rake and refresh mulch and soil layers to loosen compacted areas. If standing water has become a problem, see #4 below.</i>				
3. Is there evidence of soil erosion or are there patches of exposed soil? <i>Guidance: Repair the erosion or bare soil areas with vegetation and/or mulch. Identify the cause of erosion and take steps to prevent future occurrences.</i>				
4. Are there signs of soil clogging or underdrain blockage? Signs include frequent standing water, a hard packed planting layer, etc. <i>Guidance: If the underdrain is clogged, contact the City of Birmingham. If the soil is compacted, the entire planting layer may need repair to restore percolation.</i>				
The Main Treatment Area: Vegetation (Trees, shrubs and grasses)				Success Factors: Vegetation, Protection and Cleanliness
1. Is vegetation overgrown and in need of weeding, pruning or clipping? <i>Guidance: Remove overgrown vegetation. Do not dispose of clippings and other wastes in the bioretention area.</i>				
2. Do plants or trees (not including weeds) cover less than 75% of the planting area? <i>Guidance: Supplement vegetation as needed to achieve at least 75% planting area coverage. Native species are preferred.</i>				



Completed forms can be submitted by mail or email:
 Storm Water Management • Department of Planning, Engineering & Permits
 710 North 20th Street • Birmingham, AL 35203
Email:



Additional Resources

wood.



NEED HELP WITH YOUR BMP?

- ✓ The City of Birmingham's Storm Water Management Department can answer questions about your BMP or refer you to additional resources.
- ✓ More technical questions may require the assistance of a professional engineer or landscape architect.
- ✓ Landscape firms can help you maintain your BMP's soil and vegetation.
- ✓ Master Gardeners are volunteers with valuable plant knowledge.
- ✓ Native Plant Nurseries can provide plants and information on keeping them healthy.
- ✓ Additional, online resources are also included in this section.



Training, Outreach, and Assistance



BMP Inspection **BMP Maintenance** **Individual BMPs and Checklist** **Additional Resources** **BMP Annual Checklist Submittal** **Track My BMP**

Introduction/BMP 101

Atlanta City Council's October 2017 adoption of the Green Infrastructure Strategic Action Plan positions Atlanta as a leader in Green Infrastructure for a resilient, sustainable, and equitable future. The Department of Watershed Management's Office of Watershed Protection, charged with protecting water quality and watershed health, has been developing and implementing components of a program over the past two decades to supplement traditional gray stormwater infrastructure systems with innovative green infrastructure solutions that are aesthetically appealing, environmentally friendly, and cost effective.

What is Green Infrastructure

Green Infrastructure (GI) is a collection of natural lands, working landscapes, open spaces, street trees, and appropriate construction interventions that conserves and enhances ecosystem services and provides benefits to human populations, including improving air and water quality, mitigating climate extremes, supporting biodiversity, and enhancing public health and well-being. Applied in stormwater management, GI reduces the volume of polluted runoff entering our streams and pipe systems by preserving or mimicking the hydrology of natural systems, while providing added environmental, economic, and social benefits.

Do you have a Green Infrastructure project you would like to see featured on this page? Submit your project.



Training, Outreach, and Assistance



In Conclusion.....



- Set up a **STRONG** and **ENFORCABLE** ordinance
- Link Maintenance Agreement to property deed
- Have funding and staff dedicated to **ENFORCEMENT**
- Develop checklists and material **TARGETED** toward the **OWNER** not the Engineer.
- Determine who is responsible for inspection and maintenance.
- Provide **TRAINING, OUTREACH, and ASSISTANCE**



Follow Up



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865-671-6774

