

Developing a Robust Municipal Stormwater BMP Maintenance Program

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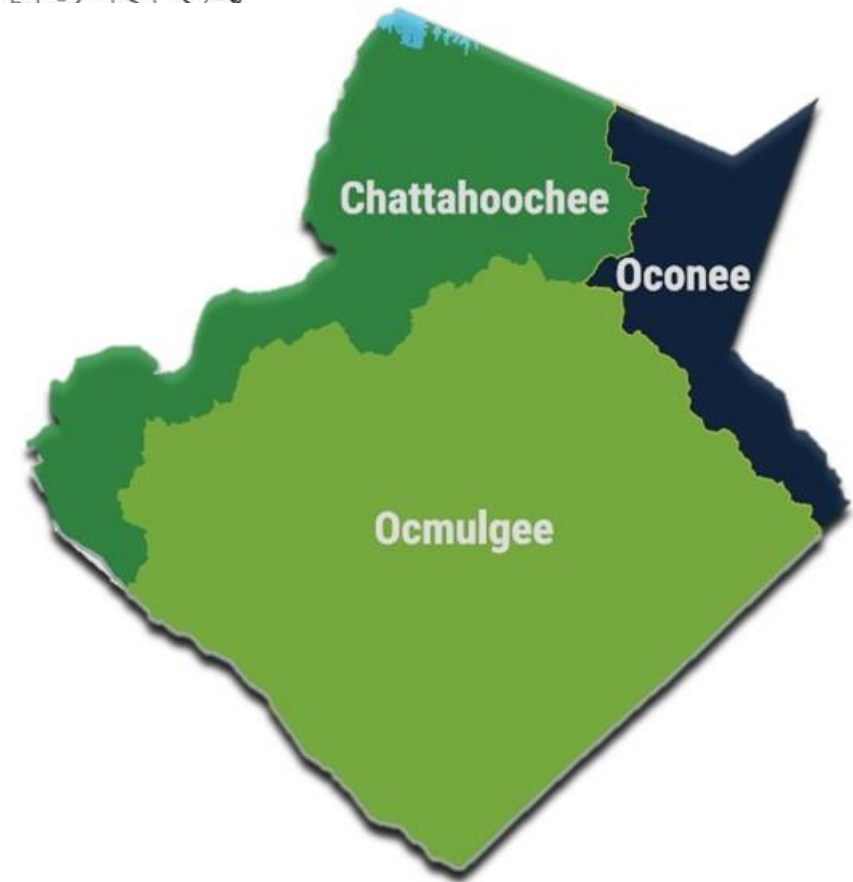
Gwinnett

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Location & Context

- Gwinnett County, GA
 - 440 square miles
 - 2nd most populous county in GA
- GCDWR provides water and wastewater services to over 240,000 customers and maintains the stormwater utility
- NPDES MS4 Phase I Large Permit

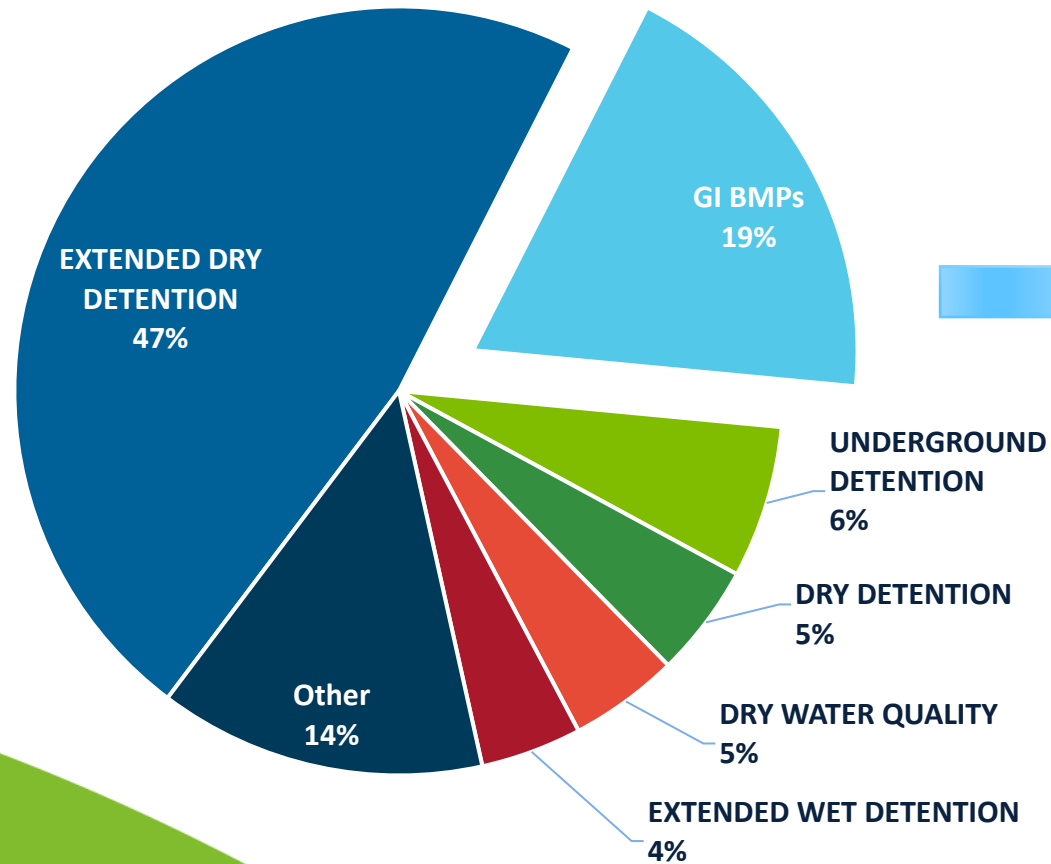


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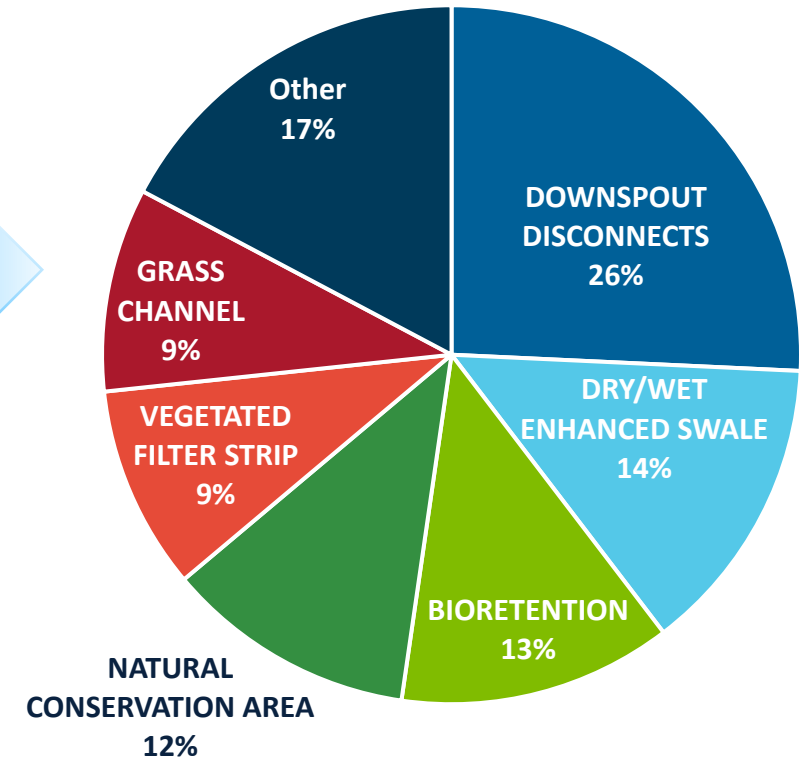
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Stormwater BMPs Inventory

Percent of Stormwater BMPs by Type (All Types)

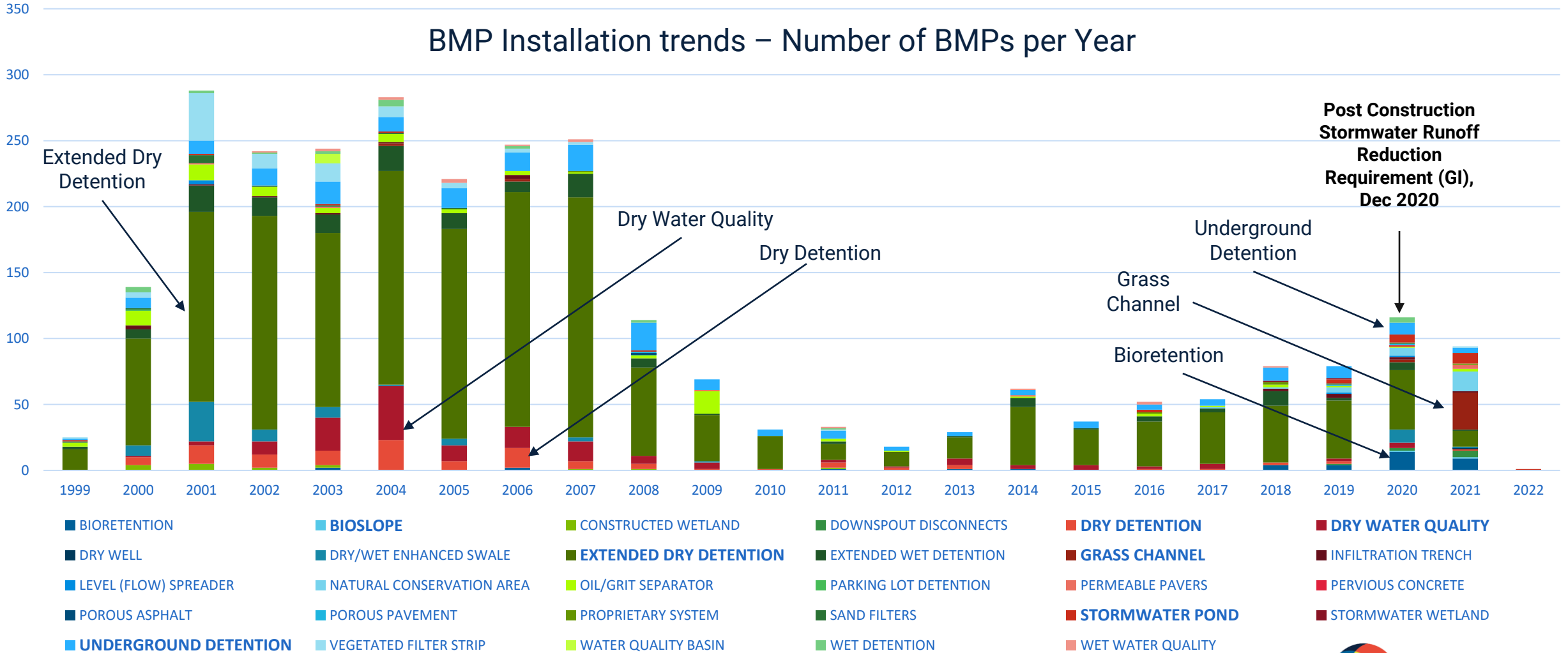


Percent of Green Infrastructure BMPs by Type



BMP Installation Summary

BMP Installation trends – Number of BMPs per Year



Stormwater BMP Inspection

- DWR inspects BMPs at varying frequency (typically once every five years for private BMPs) once As-Built has been approved
- BMP owners are provided an information packet in the mail with copy of Maintenance Agreement, BMP fact sheet, and inspection form upon purchase/as-built approval
- Inspections are logged into Lucy (CMMS) and a report is sent to the owner noting any deficiencies for correction

DOWNSPOUT DISCONNECTS

WHAT IS A DOWNSPOUT DISCONNECT, AND WHY DO WE HAVE ONE?
A downspout disconnect is a type of stormwater best management practice (BMP) in which roof downspouts are directed to lawns and landscaped areas instead of to impervious surfaces. Roofing runoff is slowed and filtered by vegetation, then infiltrated into soil to reduce runoff volume and improve water quality. This guidance specifically refers to the use of downspout disconnects in a single-family residential setting.

Key features of downspout disconnects:

- The connecting roof and gutter system, when installed, and grade must be at least 12 to 18 inches from the downspout.
- The downspout, which serves as a roof drain, must be at least 12 inches from the building.
- The downspout should be located in a lawn area or other vegetated area.
- The downspout should be located in a lawn area or other vegetated area.

DOWNSPOUT DISCONNECT EXAMPLE MAINTENANCE LOG

Schedule	Activity	Maintenance Tasks	Performed By*	Date Performed
As needed (following construction)	Concrete setting	Final inspection of concrete setting. Disconnect to ground level. Once approved, disconnect to ground level. Once approved, disconnect to ground level.	0 1	
Monthly or quarterly with routine regular maintenance	Visual inspection	Inspect for debris, leaks, and ensure proper operation. Check for proper operation.	0 1	
After large rainfall events (1" or more)	Visual inspection	Inspect for debris, leaks, and ensure proper operation. Check for proper operation.	0 1	
Annual	Visual inspection	Inspect for debris, leaks, and ensure proper operation. Check for proper operation.	0 1	

UNDERGROUND DETENTION

WHAT IS UNDERGROUND DETENTION, AND WHY DO WE HAVE IT?
Underground detention is a type of stormwater best management practice (BMP) that temporarily stores stormwater runoff underground and then slowly releases it to provide downstream flood protection. Underground detention BMPs typically consist of one or more underground tanks or basins. This type of BMP is commonly used in urban areas where there is limited space for managing stormwater above ground.

Key features of underground detention:

- The inlet structure may consist of a curb cut, pipe or manhole to connect to the stormwater system.
- A high flow bypass is installed to allow excess flood flows to safely pass.
- Stormwater is cleaned (pre-treated) prior to entering the structure to remove sediment, trash, and debris. This reduces maintenance and ensures full capacity is available.
- Pre-treatment may be accomplished with a sediment trap or sand filter to be flow backflow and debris to be able to be removed.
- The inlet is where stormwater runoff enters the BMP through pipes, junction boxes, or catch basins.
- The outlet structure may consist of a curb cut, pipe or manhole to connect to the stormwater system.
- A high flow bypass is installed to allow excess flood flows to safely pass.
- Stormwater is cleaned (pre-treated) prior to entering the structure to remove sediment, trash, and debris. This reduces maintenance and ensures full capacity is available.
- Maintenance access points (such as manholes) equipped with ladders provide access to the inlet pipe and outlet structure to facilitate maintenance and repair activities.
- Maintenance right-of-way or drainage easement allows ready access to the BMP for maintenance.

IMPORTANT: Only personnel with OSHA training, confined space entry permits, and personal protective equipment are allowed to enter the underground areas.

STORMWATER BMP MAINTENANCE FOR HOMEOWNERS' ASSOCIATIONS & PROPERTY MANAGERS

UNDERGROUND DETENTION EXAMPLE MAINTENANCE LOG

Schedule	Activity	Maintenance Tasks	To Be Performed By*	Date Performed
As needed with regular quarterly maintenance	Visual inspection	Inspect for debris, leaks, and other debris to reduce the risk of clogging and/or failure.	0 1	
Annually	Visual inspection	Inspect for debris, leaks, and other debris to reduce the risk of clogging and/or failure.	0 1	

Example Underground Detention profile (not to scale)

Deficiency Found.... What's Next?



- Notice to Comply letter is sent to the BMP Owner
- Most BMP Owners are responsive and address deficiencies quickly
- BMP Owners must submit photo documentation illustrating how each of the deficiencies have been addressed.
- Reinspection is performed if photo documentation isn't clear
- Plan of Action developed if Owner is unable to address deficiencies all at once.

BMP Inspection Form		
Type of Inspection: PERIODIC	Facility ID: 3839636	BMP Identifier: POND B- EXTENDED DRY DETENTION
Type of Violation: <input checked="" type="checkbox"/> Notice to Comply	<input type="checkbox"/> Notice of Violation	
BMP Inspection Deficiencies		
Code and Deficiency Description	D	Deficiency Notes
Cut/remove woody vegetative overgrowth throughout pond & along embankments.	Yes	
Clean/remove trash & debris throughout pond & along embankments.	Yes	
Remove sediment build-up at inlet headwall forebay.	Yes	
Clean/turn rip rap at inlet headwall forebay.	Yes	
Remove sediment build-up throughout pond to ensure water flow is directed towards OCS.		
Clean/turn filter stones at OCS to allow pond to drain.		
Grout around pipes inside half-round.		
Clean pipes & orifices inside half-round.		
Repair erosion around OCS.		
Add rip rap to armor exposed outfall pipe inside pond.		
Grout all holes & joints inside & outside outfall pipe.		
Clean pipes & orifices inside OCS.		
Provide tape measured pics of orifice (hole) sizes in end caps inside OCS.		
Water quality end cap (bottom) orifice should measure 2.00".		
Channel protection end cap (top) orifice should measure 2.50".		
Grout around all pipes & joints inside OCS.		
Grout around outfall headwall.		
Repair/grout inside outfall pipe.		
Cut/remove vegetative overgrowth throughout outfall area.		
Clean/remove trash & debris throughout outfall area.		
Remove sediment build-up throughout outfall area.		
Clean/turn rip rap throughout outfall area.		



Fac ID# 3839636

Please submit pictures documenting all completed work.



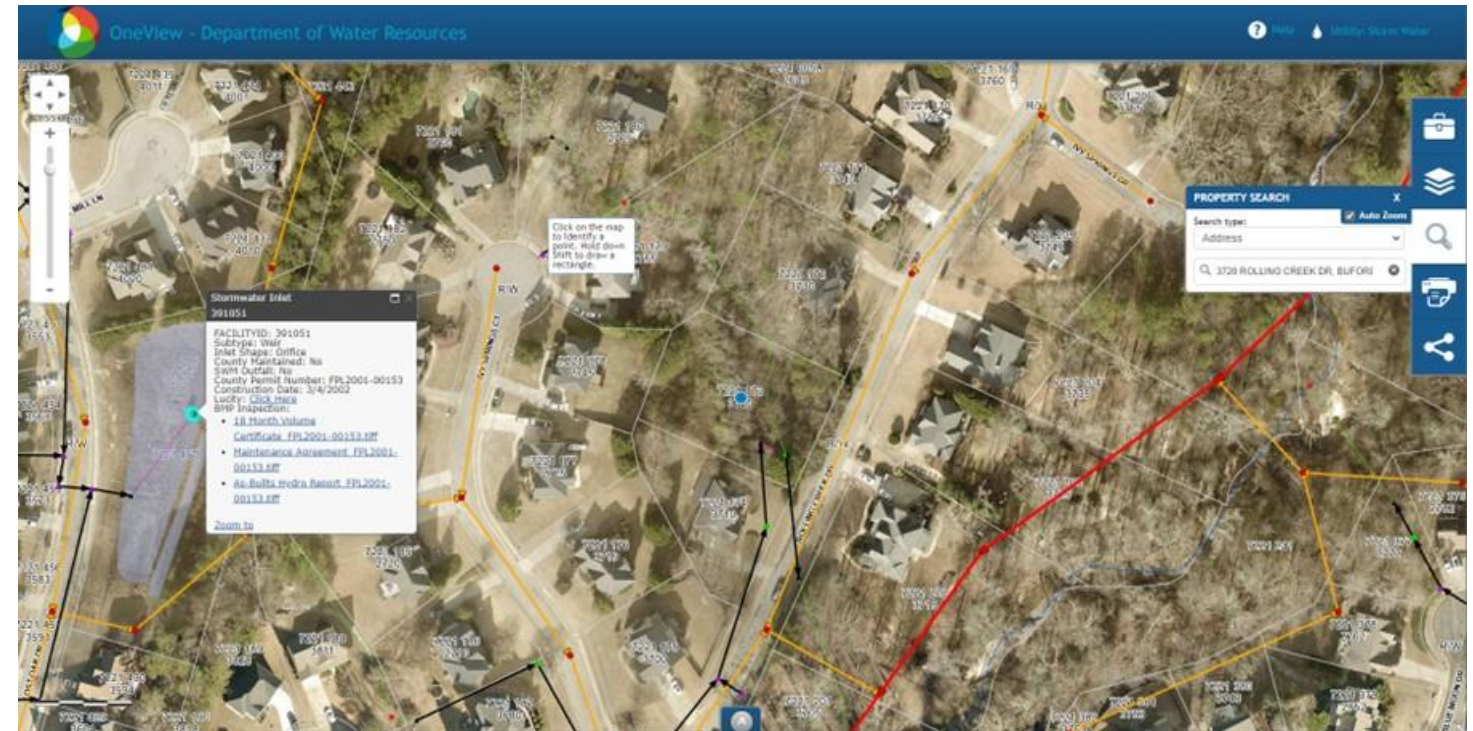
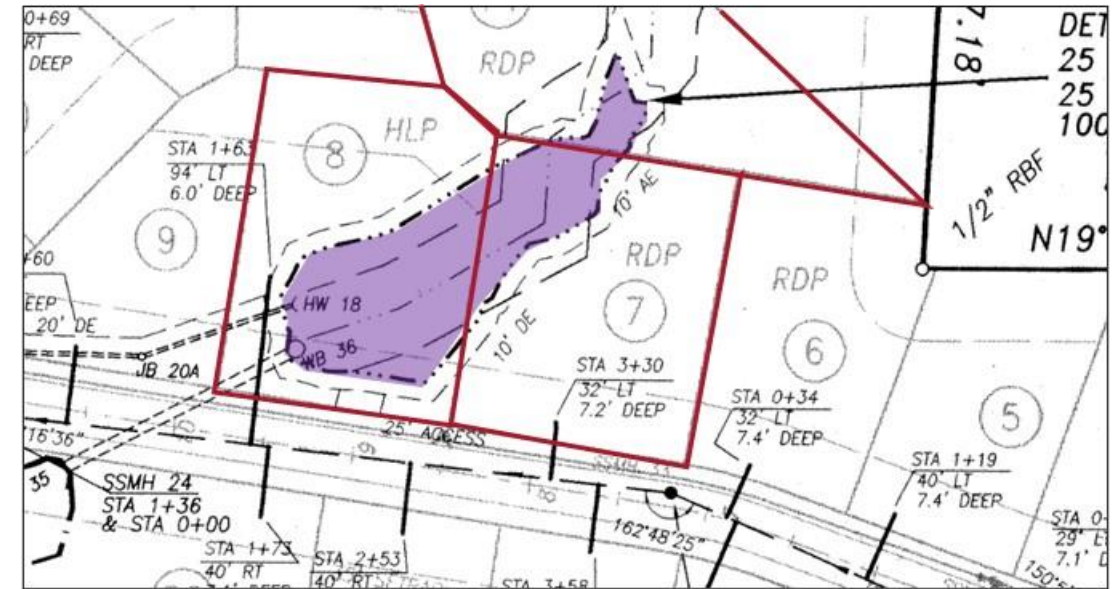
Remove sediment build-up at inlet headwall forebay.
Clean/turn rip rap at inlet headwall forebay.



Remove sediment build-up throughout pond to ensure water flow is directed towards OCS.

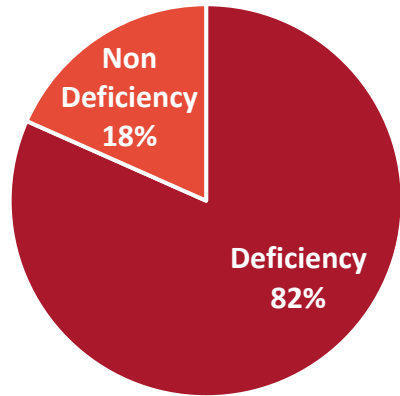
Complicated Ownership

- Determining ownership or who is responsible for addressing deficiencies can be difficult
- For example, a BMP may be owned by:
 - A defunct corporation
 - Multiple property owners
 - Property under foreclosure
 - Ownership changes hands once an NTC is issued

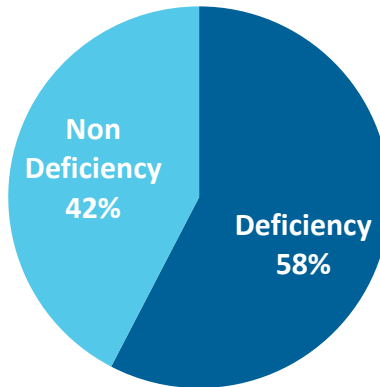


BMP Condition by Owner

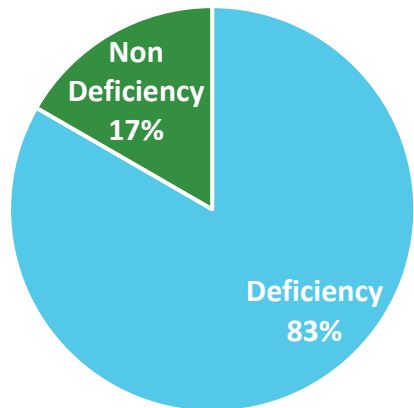
County Owned



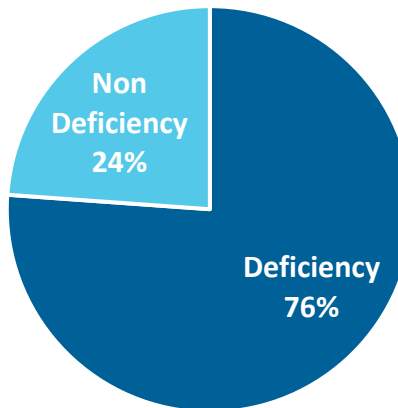
Privately Owned



Facility Acceptance

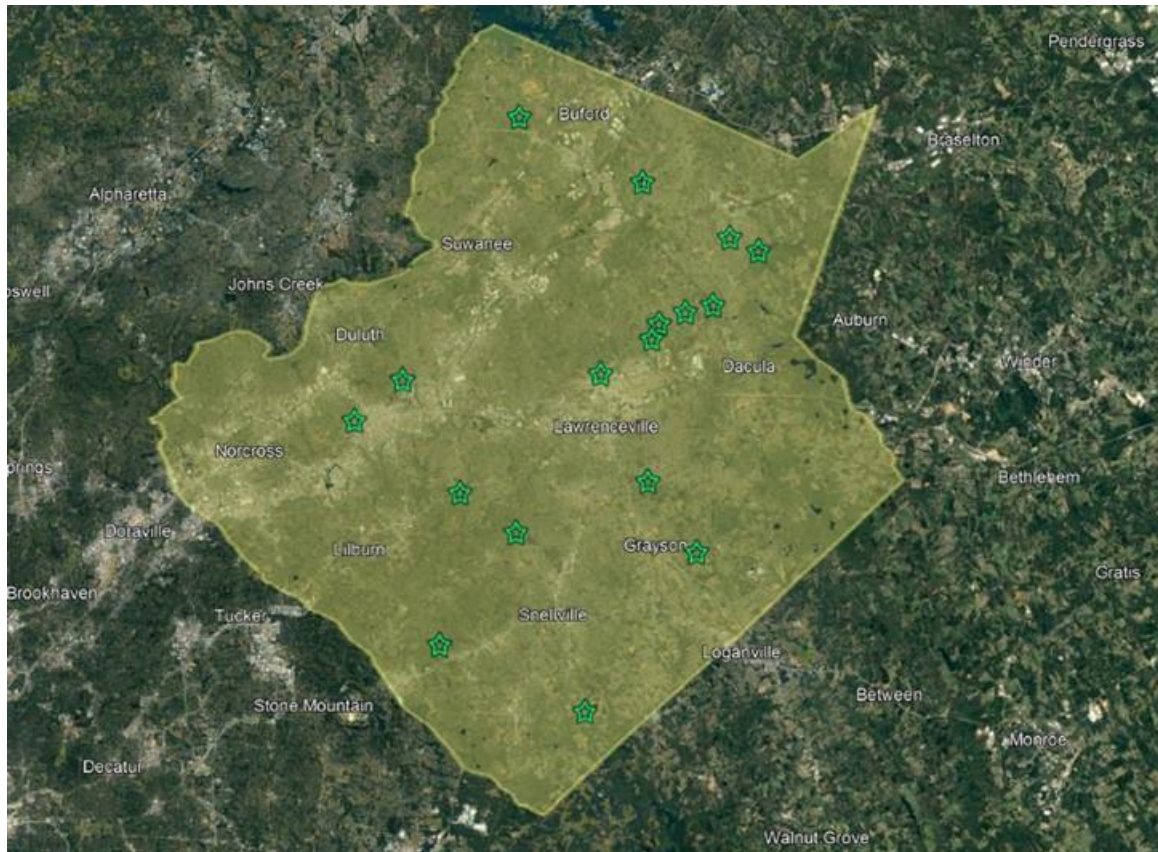


Green Infrastructure



Project Locations

The Facility Acceptance Program (FAP) includes 18 Best Management Practices (BMPs) throughout the County at 17 locations on private property for which the County is jointly responsible for maintenance.



BMP Type Breakdown

- 9 Dry Detention Ponds
 - 5 Extended Dry Detention Ponds
 - 2 Dry Water Quality Ponds
 - 1 Constructed Wetland
 - 1 Extended Wet Detention Pond
-
- Ranging from 17 to 49 years of service
 - All 18 located in residential areas
 - Accepted into the program at the request of the homeowner or HOA

BMP Investigation Project Goals

- Conduct a desktop and field review of each BMP and associated components
- Develop a comprehensive cost estimate for associated maintenance activities for the BMPs using Watershed Improvement Program (WIP) Annual Contractor 2022-23-unit costs
- Develop a BMP maintenance prioritization plan and schedule

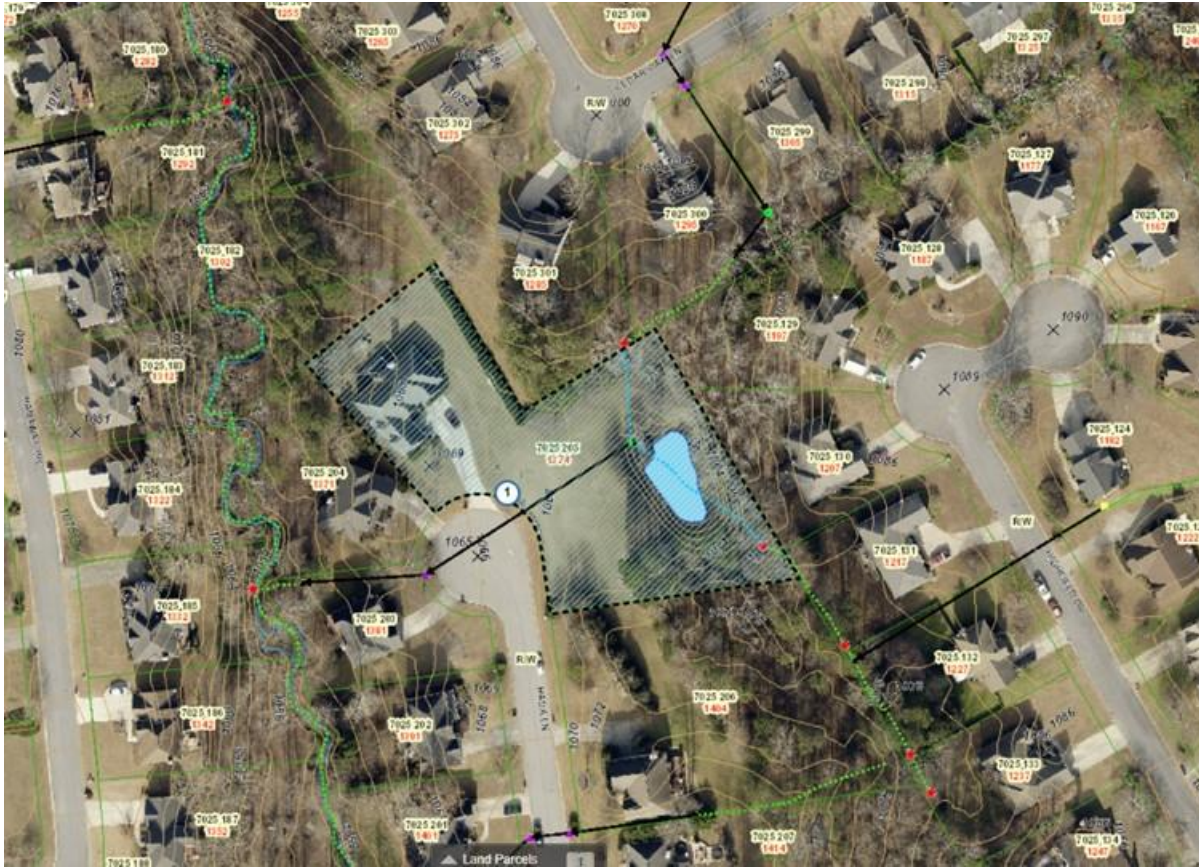


BMP Maintenance Project Goals

- Restore BMPs to their original design conditions so that they can provide their intended level of service
- Reduce risk of infrastructure failure, which would affect adjacent homeowners and environment
- Establish working relationships with new homeowners and HOA points of contact



Desktop Study



- Desktop Study - Reviewed information available through:
- Gwinnett County's GIS Database
- Historical information provided by GCDWR (e.g., as-builts/final plats, past inspection reports)
- Publicly available databases (e.g., USGS, NWI)
- Aerial photography

CCTV Review



CCTV Review focused on the following potential issues:

- Missing or Corroded Inverts
- Dislocations at Pipe Joints
- Cracks or Deformations in Pipe Wall
- Infiltration of Groundwater

Field Investigation

FAP BMP Rating Guide	
Maintenance Item	Condition Rating Explanation
General Inspection	
Access to the site. Is the BMP access point free of barriers, such as dense vegetation, a fence or gate, a poorly defined path, not visible easily from the street?	Can be answered as "Yes – inspector was able to access the site" or "No – inspector was not able to access the site".
Condition of area around site access point.	1 – Area is completely inaccessible. 100% of access point is overgrown or blocked. 2 – Area is severely (50-100%) overgrown or blocked. 3 – Area is moderately (25-50%) overgrown or blocked. 4 – Area is minorly (<25%) overgrown or blocked. 5 – Area is completely free of vegetation and debris.
Inlet Structure	
Condition of vegetation around the inlet structure(s). Is mowing needed?	1 – Inlet structure is inaccessible, and vegetation is completely overgrown. Trees are observed growing directly on top of inlet structure. 2 – Vegetation around inlet structure is severely (50-100%) overgrown. 3 – Vegetation around inlet structure is moderately (25-50%) overgrown. 4 – Vegetation around inlet structure is minorly (<25%) overgrown. 5 – Area around inlet structure is completely free of vegetation taller than 3-4 inches.
Are gullies, rills, or excessive erosion present around the inlet structure(s)?	1 – Area around inlet structure is entirely eroded away and pipe has been exposed. 2 – Severe (i.e., greater than one foot) gullies, rills, or excessive erosion are present. 3 – Moderate gullies, rills, or excessive erosion are present. 4 – Minor gullies, rills, or excessive erosion are present. 5 – No gullies, rills, or excessive erosion are present.
Condition of inlet structure(s). Is it operational?	1 – Inlet structure is not functional. Inlet structure has collapsed, or pipe has separated from headwall. 2 – Inlet structure is in poor condition. Moderate to severe signs of wear and damage, such as cracking or missing pieces of concrete, but structure is functional. 3 – Inlet structure is in fair condition. Minor signs of wear. Signs of minor damage, but structure is functional. 4 – Inlet structure is in good condition. Minor signs of wear; no signs of damage, i.e., cracking. 5 – Inlet structure is in excellent condition. No signs of wear or damage.
Condition of inlet pipe(s). Is it operational?	1 – Inlet pipe is not functional. Pipe is collapsed. Bottom of pipe is rusted out and/or missing. 2 – Inlet pipe is in poor condition. Moderate to severe signs of wear and damage, i.e., severe corrosion observed, pipe is severely misshapen, severe cracking observed. Pipe is still functional. 3 – Inlet pipe is in fair condition. Minor signs of wear and damage, i.e., minor corrosion observed, pipe is oval-shaped, minor cracking observed. Pipe is still functional. 4 – Inlet pipe is in good condition. Minor signs of wear; no signs of damage, i.e., cracking. 5 – Inlet pipe is in excellent condition. No signs of wear or damage.
Debris (i.e., tree branches, leaves, grass clippings, trash) present?	1 – Inlet structure is inaccessible and completely blocked by debris. 2 – Debris around inlet structure is severe (50-100%). 3 – Debris around inlet structure is moderate (25-50%). 4 – Debris around inlet structure is minor (<25%). 5 – Area around inlet structure is completely free of debris.

FAP BMP Rating Guide Examples	
Maintenance Item	Condition Rating Explanation
General Inspection	
Condition of area around site access point (i.e., trash, debris, grass clippings).	 <p>1 – Area is completely inaccessible. 100% of access point is overgrown or blocked.</p>
	 <p>5 – Area is completely free of vegetation and debris.</p>

Field Inspection Components

- Access
- Inlet Structure(s)
- Forebay
- Main Treatment Area
- Embankment
- Emergency Overflow
- Outlet Structure

Photo Management

GEOSYNTEC CONSULTANTS Photographic Record		
Client: GCDWR	Project Number: GK9163	
Site Name: SWU-CTY-00002 (Roses Bluff)	Site Location: Lawrenceville, GA	

- Software named Filio
- Photo date, location, orientation, ID number
- Photo comments on observations
- Web Interface for viewers
- Creates overall maps and photo logs

Photograph 24	
Date: 14 October 2022	
Direction: W	
Comments: Bottom of the outlet pipe was completely corroded at the downstream end. Bottom of the outlet pipe had fallen out due to severe corrosion.	

Summary Report

- Summarized key findings and recommendations for each BMP
 - Evaluation Checklists with ratings
 - Figures prepared in ArcGIS with locations of observations
 - Inspection Photolog

Table 16: Ratings for SWU-CTY-00014

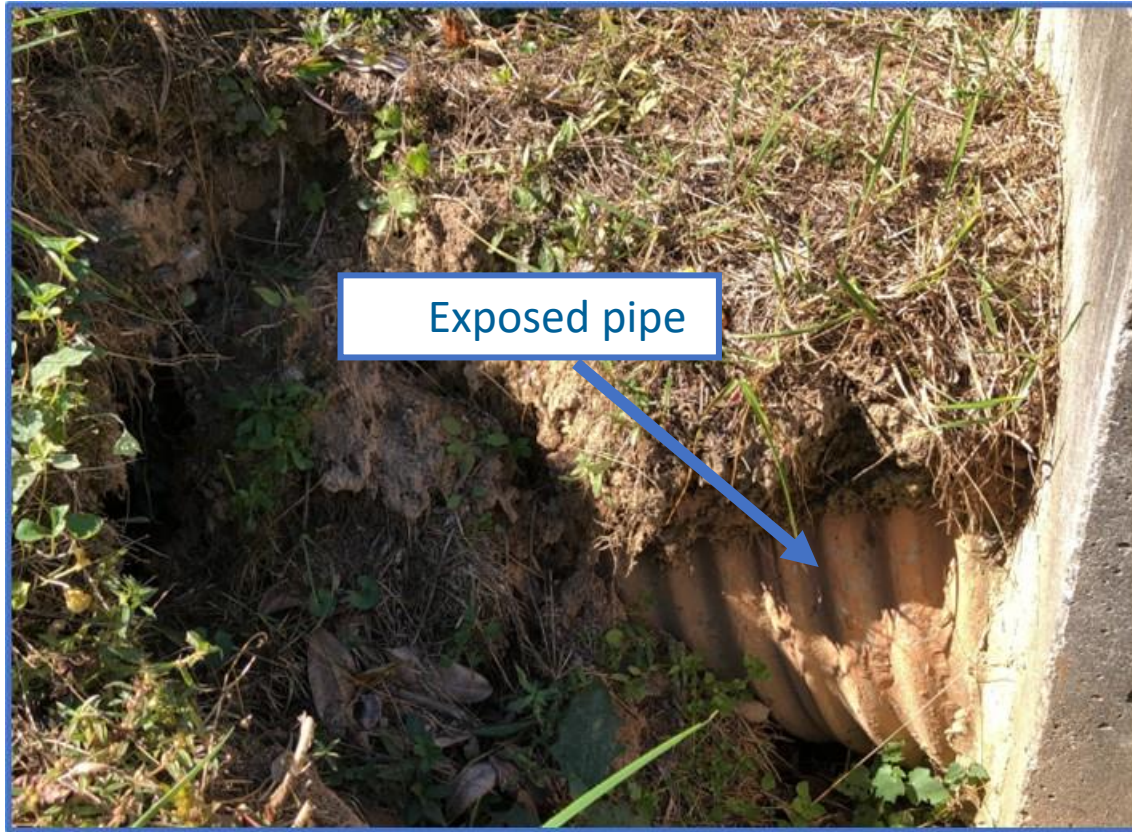
Maintenance Item	Overall Rating (1 [lowest] – 5 [highest])
Inlet Structure (Inspection Form Sections 2.5-2.8 and 2.10-2.11)	3.9
Forebay (Inspection Form Sections 3.1-3.4)	N/A
Main Treatment Area (Inspection Form Sections 4.1-4.4, 4.8, and 4.11)	2.8
Embankment (Inspection Form Sections 5.2-5.6, 5.8, and 5.9)	2.7
Outlet Structure (Inspection Form Sections 6.6, 6.8-6.11, and 6.13-6.15)	3.1
BMP OVERALL RATING	3.2



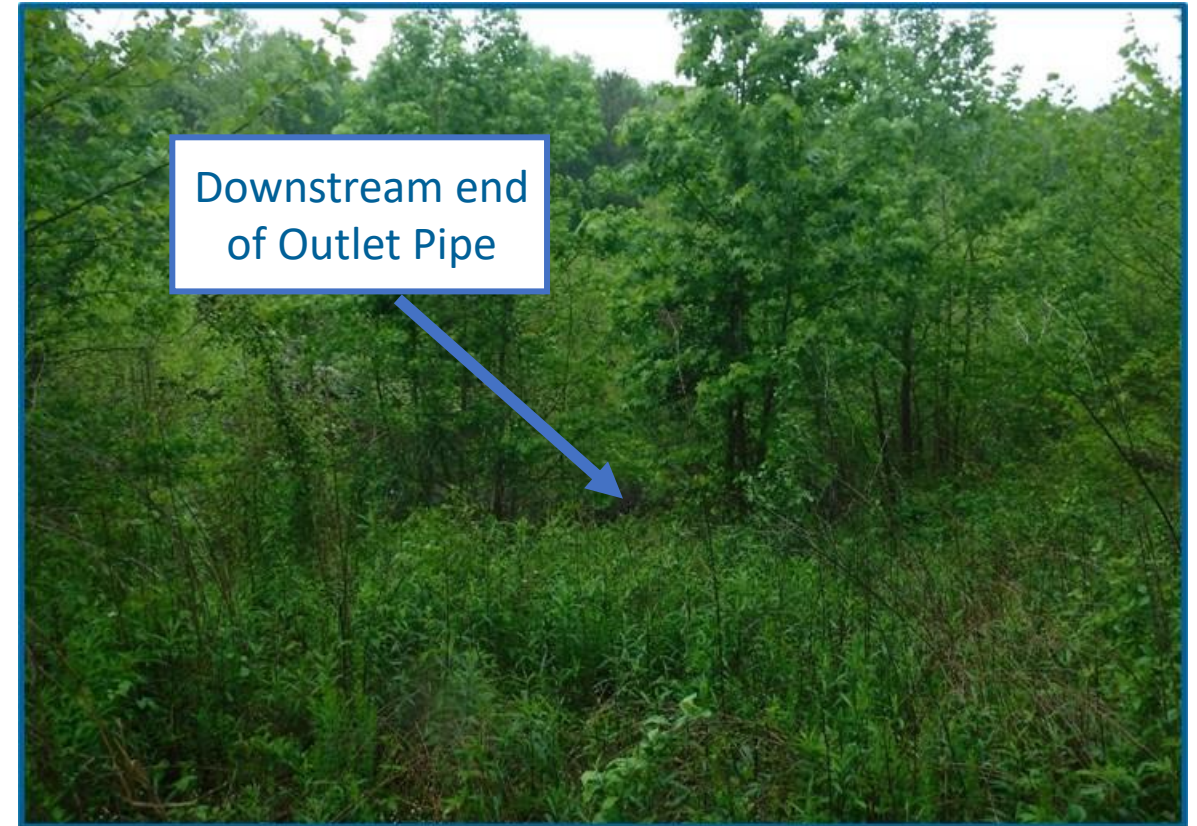
Typical BMP Deficiencies - Erosion



Typical BMP Deficiencies - Erosion



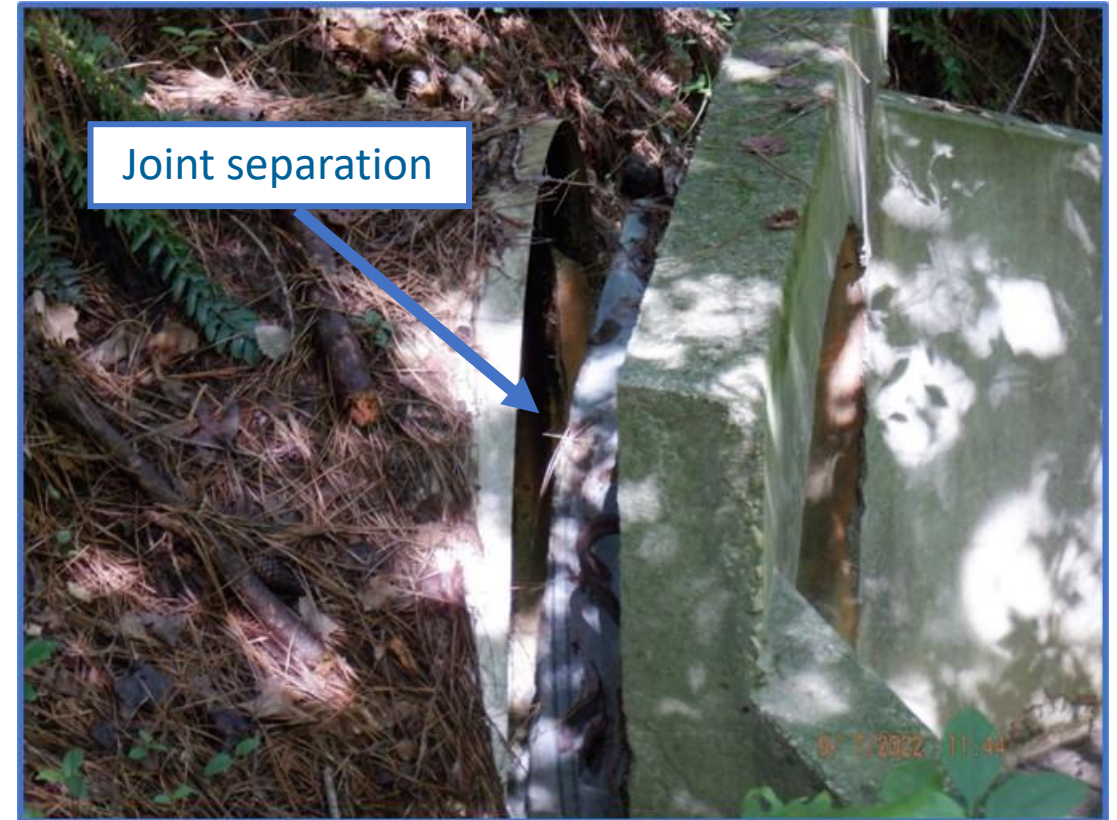
Typical BMP Deficiencies - Vegetation



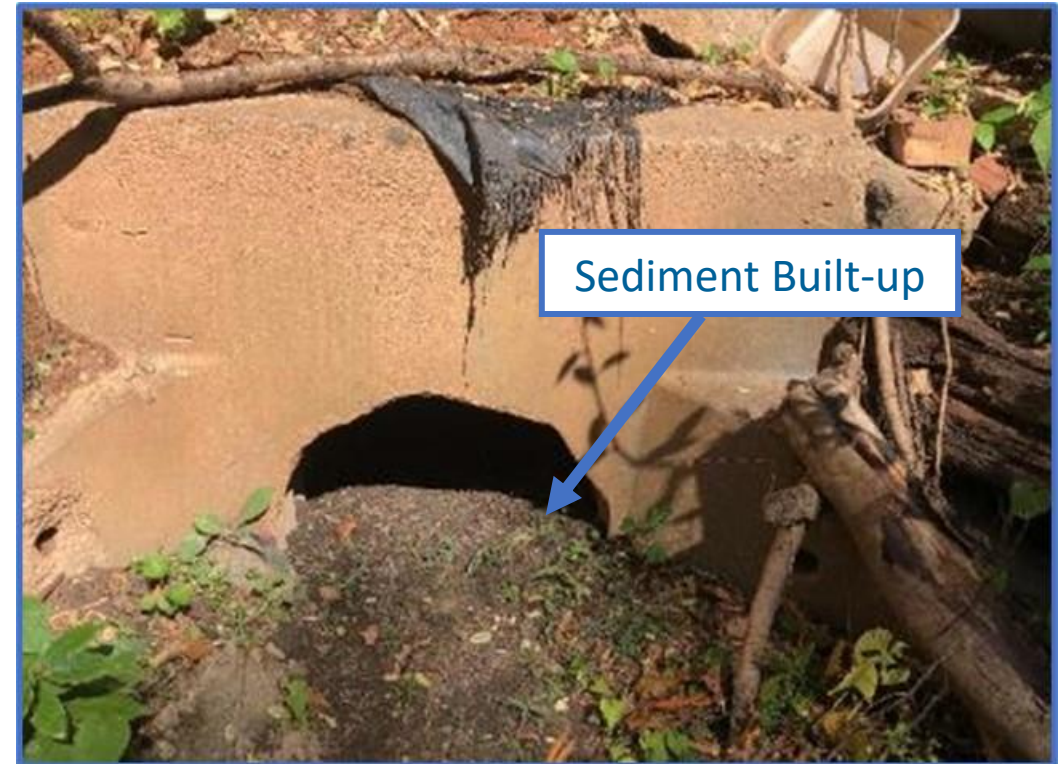
Typical BMP Deficiencies – Sediment & Debris



Typical Deficiencies - Structures



Typical Deficiencies – Pipe Aging and Loss of Capacity



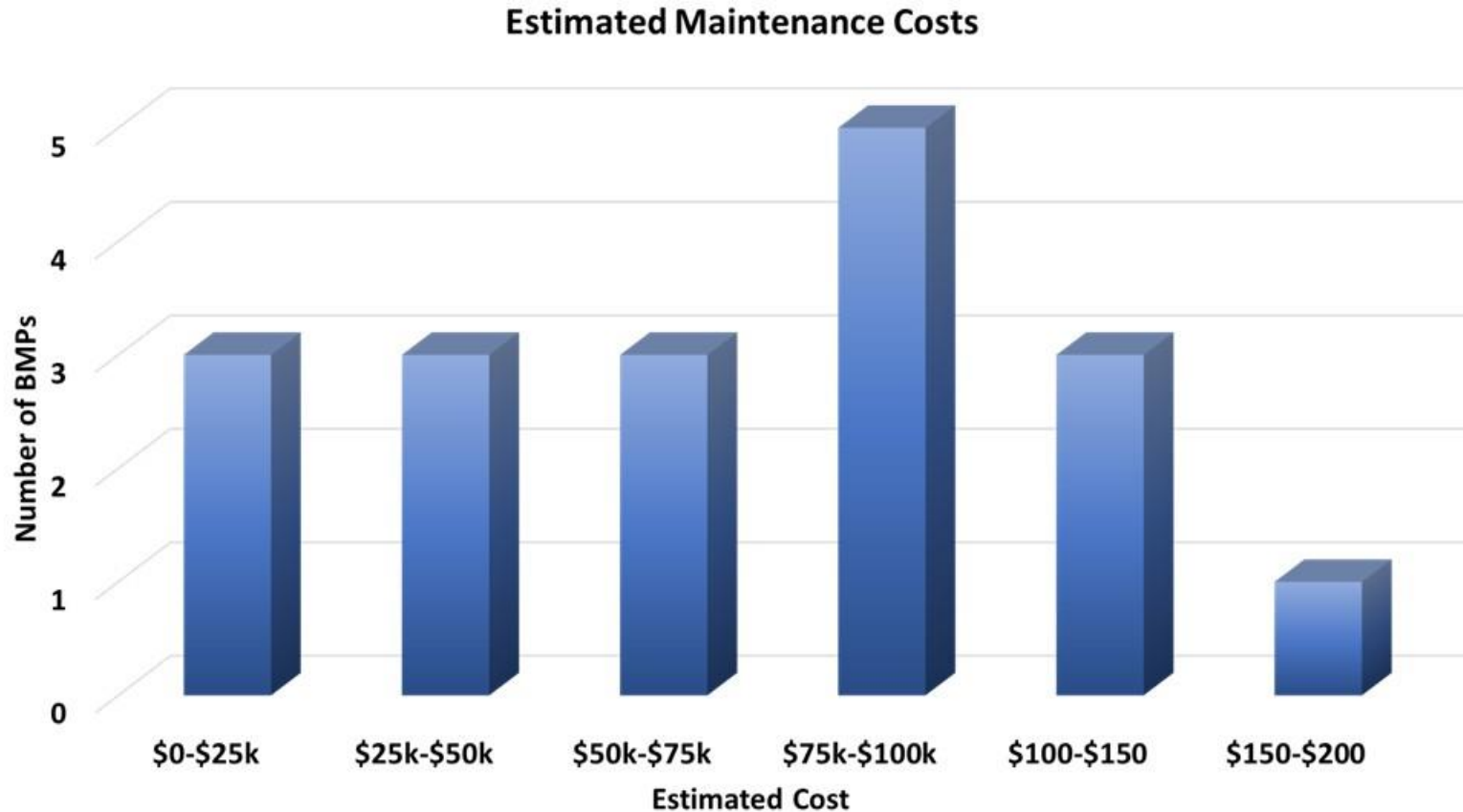
Maintenance Cost Estimate

- Annual contractor rates
- Supplementary RS Means data
- Two different cost estimate scenarios:

Scenario 1: Maintenance with Cured in-place Piping (CIPP)

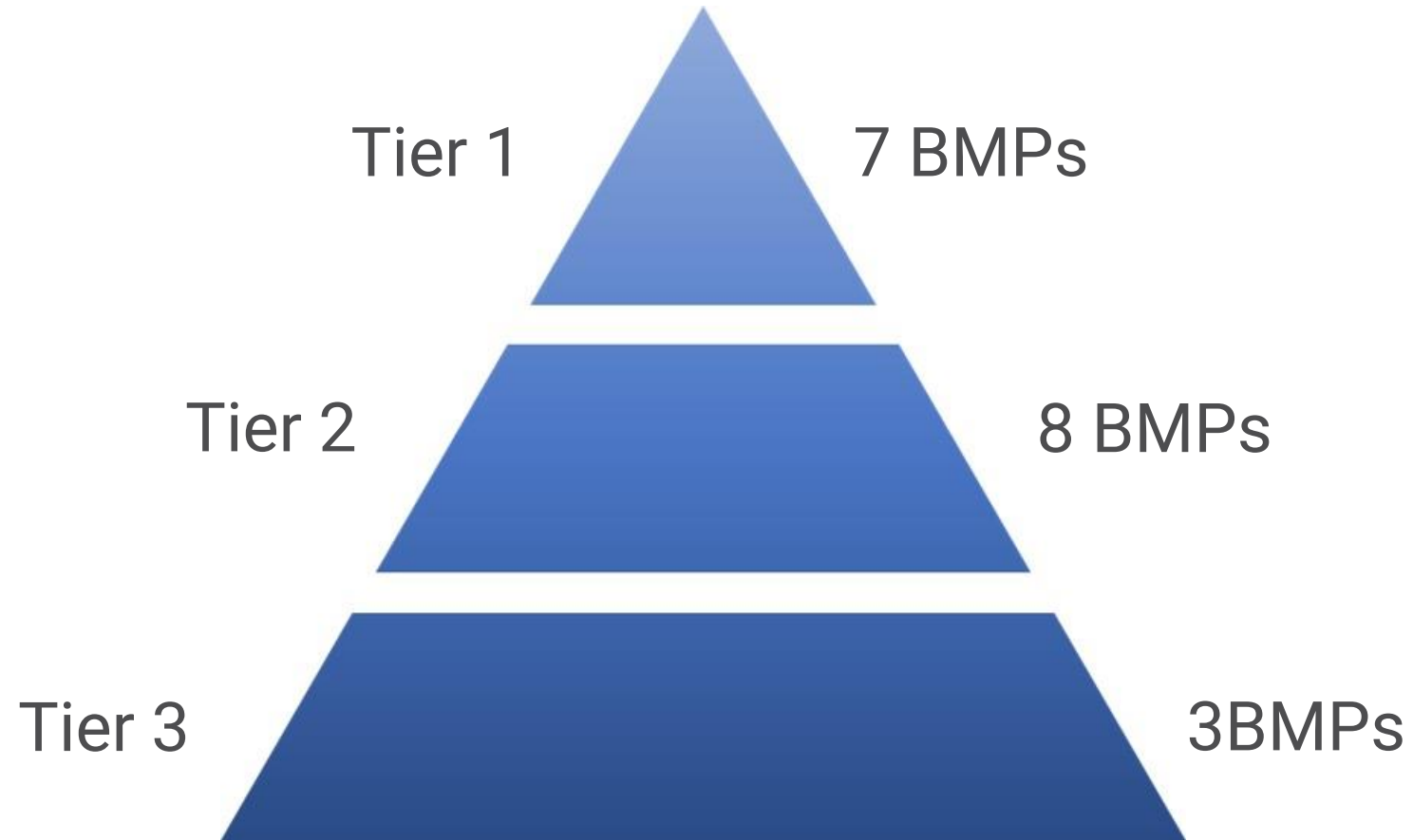
Scenario 2: Maintenance with full replacement of pipes

Maintenance Cost Estimate



Approximately
\$1,350,000 in total

Prioritization Plan



Project Accomplishments

- Desktop Study, Field Inspections, BMP Evaluations, Cost Estimating, and Prioritization Plan have been completed.
- Maintenance costs estimated to be approximately \$1,350,000 total (\$75k per BMP) ranging from \$10k to \$200k.

Next Steps

- **2023** - Communication with homeowners & HOA
- **2024** - Maintenance of Tier 1 (7 BMPs)
- **2025 & 2026** - Maintenance of Tier 2 (8 BMPs) and Tier 3 (3 BMPs)



Conclusion

- Asset and data management are critical
- Ordinances and stormwater BMP Maintenance agreements recorded with property deed enable compliance
- Use interactions with BMP owners as education opportunities
- Look for opportunities to improve



Questions?

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