Citizens Guide for Maintenance of Best Management Practices

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MONTGOMERY COUNTY
TENNESSEE

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1. Purpose

This guide has been prepared to:

- help you identify stormwater systems in your neighborhood,
- describe stormwater inspection and maintenance requirements,
- provide inspection and maintenance guidelines for your stormwater systems, and
- Identify resources available to provide assistance.

2. What is Stormwater?

Stormwater is the runoff that flows over land during and immediately after a rain event. When stormwater flows over urbanized areas, pollutants such as petroleum products, antifreeze, fertilizers, pesticides, animal wastes, and trash are carried to local streams and rivers. These pollutants can stay in the environment for long periods of time. Stormwater runoff is the most common cause of water pollution

3. How Montgomery County is Managing Stormwater

On February 11, 2013, the Montgomery County Commission adopted The Montgomery County Stormwater Resolution (#13-2-2). This resolution set the County Stormwater Regulations for:

- Construction site stormwater runoff control in areas of new development and re-development
- Post-construction stormwater management in areas of new development and re-development

- An illicit discharge detection and elimination (IDDE) program
- County operation pollution prevention and good housekeeping procedures
- Public education and outreach on stormwater impacts
- Public Involvement / Participation

It is important to note that effective stormwater management is a partnership between landowners, Homeowner Associations and the Montgomery County Stormwater Program.

4. Importance of Stormwater Best Management Practices

Best Management Practices (BMPs) are schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to surface waters or groundwater. Best management practices include treatment systems, operating procedures, and practices to control pollution from area runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Common treatment systems include stormwater detention ponds, vegetated swales, water quality buffers, Bioretention areas and porous pavements. Each of these BMPs are designed to filter or separate pollutants from stormwater runoff. In some cases, BMPs are designed to also protect property from flooding.

All BMPs require regular maintenance. For example, ponds become repositories for sediment, litter and oil. Vegetated areas used to filter out pollutants can become overrun with invasive, non-native plants that prevent long rooted native vegetation from flourishing. Eroded slopes and banks increase the amount of sediment in our waterways, adversely affecting fish and plant life.

It is important to remember, routine inspections and maintenance is vital to ensure stormwater BMPS remain effective and function as designed. These BMPs, properly maintained reduces flooding potential and improves water quality.

5. Requirements and Responsibilities

Proper maintenance of stormwater facilities and Best Management Practices is one of the most important factors in long term performance and effectiveness of a stormwater management plan. Montgomery County requires property owners or homeowners associations (HOA) to properly maintain the stormwater system and BMPs associated with private property.

Routine inspection and maintenance of stormwater BMPs protects you, the homeowner, from property damage caused by flooding. In addition, the costs associated with regular maintenance are far less than those required to replace a failed system.

Homeowners and HOAs are bound by the requirements set forth by Section 6 of the Montgomery County Stormwater Regulations. The Stormwater Regulations state that property owners have the responsibility to ensure that stormwater BMPs are maintained as designed. These requirements are also stipulated in the Stormwater Maintenance Agreement associated with development since 2008.

The Stormwater Maintenance Agreement (SWMA) is recorded with the property deed, and is a covenant to maintain permanent stormwater facilities and BMPs. This agreement assigns responsibility for BMP maintenance to the property owner(s).

> If your development or facility does not have a SWMA, call the Montgomery County Building & Codes Department at 931-648-5718 for assistance in determining your responsibilities.

All homeowners and HOAs should be familiar with the requirements set forth in your SWMA. Homeowners should also maintain inspection and maintenance records. All BMPs and stormwater facilities must be inspected by a licensed engineer or landscape architect every five years. *Property owners are still required to inspect BMPs and stormwater facilities periodically, and document those inspections and any maintenance performed.*

Who's Responsible?

Homeowners must:	**Montgomery County must:**
Inspect BMPs in accordance with maintenance agreement or as set forth in the Stormwater Regulations	Enforce provisions of maintenance agreements and Stormwater Regulations
Provide necessary maintenance	Periodically inspect BMPs on private property
Keep inspection and maintenance records	Issue Notices of Violation if required and ensure corrective actions are taken
Ensure BMPs are inspected by a licensed engineer or landscape architect every 5 years	Maintain stormwater structures in the public right-of-ways

Drainage problems in your neighborhood can be prevented by regular BMP inspection and maintenance. If a problem arises however, it may be necessary to contact a professional with expertise in drainage engineering.

6. Maintenance Plans

A maintenance plan should be developed to ensure responsibilities are assigned, inspection frequencies established, and efforts documented.

Regulatory and Legal Requirements

BMPs on private property must be maintained by the property owner. Consult your maintenance plan to determine inspection and maintenance requirements. If you don't have a maintenance plan, refer to the Montgomery County Stormwater Resolution. It is important to understand the legal implications of failing to maintain drainage systems on your property or in your neighborhood.

BMP Inventory

Use the plat to locate your BMPs and associated easements. Walk the site and note the condition of each. If the site contains older or complex BMPs, you may want to contact a professional with expertise in stormwater drainage for assistance.

Responsibilities

Designate a responsible person to ensure BMPs are inspected on a routine basis and maintenance is performed as required. Choose a person interested in the task who is detail-oriented, reliable, and willing to train others. Document inspector responsibilities as part of the maintenance plan. The services of a professional engineer or landscape architect may be required, depending on the condition and complexity of your stormwater systems.

Inspection Frequency

Your plan should specify an inspection frequency for each BMP. This will be determined by BMP complexity and the requirements set forth in the maintenance agreements. If a maintenance agreement doesn't exist for your neighborhood, follow the guidelines set forth in *Appendix 1*.

Inspection Checklists & Maintenance Activities

Inspection checklists, specific for each BMP, are important to ensure thoroughness and for documentation purposes. Inspection checklists are included in *Appendix 1*. Maintenance activities for each BMP are also found in *Appendix 1.*

Record Keeping

The plan should specify how completed inspection checklists and BMP maintenance records will be retained. Also include your neighborhood site map, which identifies and locates all stormwater BMPs. (The map can be obtained from your operation and maintenance plan or from Montgomery County Stormwater Management. See *Appendix A2.*) Your records should include identification

numbers for each BMP, BMP type and location, data from previous inspections, special maintenance needs and photos of your BMPs.

Resource Allocation

Identify costs and funding mechanisms. How will funds be collected and distributed? Work with drainage professionals to estimate the costs of complex maintenance needs.

Education

Use HOA meetings or newsletters to ensure homeowners, particularly those living adjacent to a BMP, understand the function of their stormwater systems. For example, vegetated buffers shouldn't be mowed to make them more aesthetically pleasing, and ponds should be kept free of invasive vegetation. Review the simple and effective steps provided in *Good Housekeeping Practices* (Section 12) with all homeowners.

Annual Program Reviews

Review your inspection and maintenance program on an annual basis.

☒Are inspection and maintenance activities being conducted at the appropriate frequency and documented as required?

☒Are the checklists appropriate for your BMPs? Is modification required?

☒Are you satisfied with the services of your landscaping or inspection and maintenance contractors?

☒Are appropriate resources allocated to the program? Do you need to adjust HOA fees?

7. Easements

Easements are required for BMPs located on your property and in your neighborhood. These legally binding agreements, noted on your plat, allow Montgomery County to access stormwater BMPs. Property owners are required to maintain easements and associated access points.

Do not erect structures that prevent access or obstruct the flow of water, such as fences, walls, sheds, or buildings. Avoid planting woody vegetation within the easement area. Be aware that maintenance activities may require removal of structures, such as fencing, paving, or woody vegetation at the homeowner's expense.

8. Who Should Perform Maintenance?

Consider cost, safety and effectiveness when determining who should perform BMP maintenance. Routine tasks, such as litter removal and landscaping, can be carried out by homeowners.

For more difficult work (mowing or working on sloped embankments, stabilizing eroded areas, removing sediment from ponds, or repairing/cleaning inlets and outlets) consider using the services of a professional landscaper.

Extensive maintenance work may require the services of a professional engineer or landscape architect. Erosion, sinkholes, a rusty, broken, or crushed pipe, odor, or algae blooms are all clear indications to call a consulting engineer.

> ***Montgomery County's Stormwater Regulations require that structural BMPs be inspected by an engineer or landscape architect at least once every 5 years. This is addition to the routine inspection and maintenance that is required by the landowner.***

When working with lawn care companies for simple maintenance, be sure to communicate:

- That BMP facilities are water quality devices;

- That different mowing practices may be required (mowing at a higher level, not as frequently, or not at all in buffer areas);
- The need to keep the BPM facility clear of grass clippings and leaf piles;
- The need to use minimal or no pesticides and to have a policy of not applying chemicals when there is rain in the forecast.

9. Common BMPs

This section describes the most common structural BMPs found in Montgomery County neighborhoods, and summarizes basic maintenance requirements. Homeowners are encouraged to use the inspection checklists and detailed maintenance guidelines provided in *Appendix 1*. These checklists, specific for each type of BMP, will help ensure the maintenance needs of each BMP are thoroughly addressed. They are also convenient for tracking and documenting your stormwater management efforts.

Wet Retention Ponds

Wet ponds may appear to be natural ponds, but they are specially *designed to* control stormwater runoff volume and quality. Excess runoff is stored above a permanent pool of water and discharged at a controlled rate through an outlet. Water quality is controlled through pollutant settling and absorption.

Dry Detention Ponds

Although dry ponds are sometimes viewed as a waste of space, they are specifically designed to collect and temporarily hold stormwater runoff. Montgomery County generally requires extended dry detention basins. In this case, settling rather than filtration is the pollutant removal mechanism.

Vegetated Swales

Swales are open, channel-like systems used to convey stormwater runoff. Although swales may look like typical ditches, they are designed to slow water flow and absorb pollutants. They may be used to convey water to another BMP, such as a detention pond. Swales are often located along roadsides or parking lots.

Vegetated Buffers

Buffers are areas of vegetation established adjacent to waterways to slow stormwater runoff, provide an area where runoff can permeate the soil, and filter pollutants.

Bioretention

Porous Pavement

An alternative to traditional asphalt or concrete, porous pavement is a permeable pavement surface with a stone reservoir underneath. The reservoir temporarily stores surface runoff before infiltrating it into the soil, thereby providing some water quality treatment.

10. Basic Maintenance

The basic maintenance guidelines that follow provide a glimpse of the efforts required to keep stormwater systems functioning properly. Homeowners are advised to use the checklists provided in *Appendix 1*, however, to ensure BMP specific maintenance needs are addressed. Note that it may be necessary to consult with a professional who has expertise in drainage engineering for repeated or complex problems.

Basic BMP Maintenance

- Remove debris from inlet/outlet structures.
- Thick and healthy native vegetation is desirable, but keep stormwater ponds free of invasive vegetation. Proper vegetation may be addressed in the maintenance plan, or refer to Appendix A2.
- Repair eroded slopes.
- Don't fill ponds or swales with dirt. Remove sediment from ponds when it becomes noticeable.
- Keep trash, debris and grass clippings out of swales and ponds and away from storm drains.

- Inspect BMPs following any major rain event.

Indicators for Maintenance

Following are some common conditions that indicate a need for stormwater system maintenance.

Erosion

Finding the source of erosion and stabilizing it can improve the effectiveness of a wet basin or swale. Left unchecked, an erosion problem can necessitate dredging, replacement of an entire embankment or slope, or even an inlet structure. A prime cause of erosion is lack of deep-rooted vegetation that holds soil in place.

Mosquitos

Mosquito's breeding grounds can be created in shallow ponds of standing water. It is likely the infiltration capacity of the BMP needs to be increased, or sediment needs to be removed. An insect control option for larger wet basins is to maintain a stock of fish to feed on mosquito larvae. In addition, natural vegetated buffers can provide shelter for mosquito predators.

Algae Growth

A healthy wet basin should require little maintenance. A good indicator of an unhealthy ecosystem is excessive algae growth. This could be caused by nutrients from fertilization practices by a landscape company or surrounding neighbors, upstream activities, or excess sediment.

*Without proper maintenance, any system will fail. Costs associated with BMP repair can **far exceed** the cost of preventive maintenance.*

11. Poorly Maintained BMPS

A clogged storm drain creates flooding problems by not allowing runoff water to drain properly. If clogged with trash, leachate from the trash can pollute the water.

Poorly vegetated swales can lead to erosion damage and property value loss. Water can be polluted by sediment released in the erosion process

Blocked inlets and area drains can result in area flooding.

12. Good Housekeeping Practices

- Dispose of household chemicals, paint, cleaning products, fertilizers, and pesticides properly. Pouring these hazardous substances down a storm drain, onto the ground or into a stream creates a danger to all the citizens of the county, as well as the environment. The Bi-County Solid Waste Management regularly sets collection dates and times for household hazardous waste. For more information call 931-648-5751.
- When using fertilizers, pesticides and herbicides, mixing instructions should be carefully followed. The application of these chemicals should follow manufacturer recommendations for safe use and should be based on actual need as determined by testing. Use the least toxic product possible for each application. Avoid over-application, application to impervious areas, or application to irrigated or automatically watered areas to prevent these products from washing into stormwater drains, groundwater or surface water. Never mix products to save time.
- Pet waste left on the ground gets carried away by stormwater, contributing harmful bacteria, parasites, and viruses to our rivers and streams. Please clean up after your pet.
- Vehicle fluids such as oil, gas, and antifreeze are the #1 surface water quality problems nationwide. All vehicle fluids are toxic and extremely harmful to the environment. Recycle used oil in a clean, sealed, plastic container.
- Yard waste such as grass clippings, tree trimmings, and leaves can be composted and used for fertilizer around the yard. Do not dump yard waste in a storm drain or store it where stormwater can wash it into the storm drain system.
- Street litter such as styrofoam, plastic, and paper can be kept out of our streams and rivers by keeping trash bins covered and by not littering.
- SWEEP! Hosing off pavements washes pollutants into storm drains that lead straight to the river.

13. STORMWATER BMP MAINTENANCE GUIDELINES

The required maintenance interval for stormwater Best Management Practices (BMPs) are often dependent upon the degree of pollutant loading from a particular drainage basin. BMP maintenance can best be broken into three categories: **inspection, routine maintenance, and major maintenance**.

Though each BMP type has its own unique characteristics, **inspections** will generally consist of an assessment to assure its functionality and the general condition.

Routine maintenance will generally consist of trash and vegetation removal, unclogging of drains, minor sediment removal and exchange of filter media where applicable.

Major maintenance will be completed as required from inspections and generally consists of ***significant reconstruction due to failures*** in the BMP. Examples of major maintenance include dredging, excavation, removal of existing media, replacing fabric, replacing the under-drain, and reestablishment of vegetation.

The following schedule is offered as a guideline for performing ***inspection and routine maintenance*** for a range of BMP categories.

BMP	Inspection Frequency	Routine Maintenance Frequency
	Inspection Frequency key: A = annual; M=monthly; S=after major storms; Q=Quarterly; SA=Semi Annually	
Bio-retention Systems	A, S	2 x /year
Cartridge or Module Media Filtration Structures	SA	1 – 2 x /year
Dry Pond	M	3 – 4 x /year
Dry Wells	A	1 x /year
Filter Strips or Swales	M	2 – 3 x /year
Green Roofs	SA; S	2 – 3 x /year
Hydrodynamic or Gravity Separators	SA	1 – 2 x /year
Infiltration Trenches	A; S	2 – 3 x /year
Permeable Pavement	A	2 – 3 x /year
Rainwater Gardens	SA; S	2 – 3 x /year
Rainwater Harvesting	SA; S	2 – 3 x /year
Sand Filter	Q first year; SA after	1 – 2 x/ year
Trash & Debris Screens	SA; S	2 – 3 x /year
Underground Storage Facilities	SA	1 x /year
Wetlands	SA	2 x /year
Wet Pond	Q	2 – 3 x /year
Headwalls	A	1x/ year
Injection Well	Q	3 – 4 x /year

All BMPs must be inspected and certified by a licensed engineer or landscape architect every 5 years.
Questions about BMP maintenance and repair can be directed to the Office of the Stormwater Coordinator
For more information and inspection sheets go to: https://mcgtn.org/stormwater/best-practices

Appendix 1 – Inspection Checklists

Bioretention Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Pre-Treatment Area				
Area free of debris?	*A/M*			
Standing water longer than 24 hours after a storm event?	*A/S*			
Bare soil or erosion?	*M/S*			
Excessive landscape waste/yard clippings?	*A/M*			
Inlet/Outlet Structures				
Inlets provide stable conveyance into the facility?	*A*			
Evidence of erosion at or around inlet?	*A*			
If connected to extended detention, is outlet to pond functioning properly?	*A*			
Other	*A*			
Basin				
Adjacent area fully stabilized (no evidence of eroding material into Bioretention area)?	*A*			
Plant height not less than design ponding depth?	*A*			
Adequate media layer present?	*A*			
Plant composition according to approved plan?	*A*			
Grass height not more than 6 inches?	*A/M*			
Vegetation overgrown?	*A*			
Invasive species/weeds present?	*A*			
Dead vegetation or exposed soil present?	*A*			

Maintenance access to facility?	*A*			
Excessive trash/debris/sediment?	*A*			
Evidence of erosion?	*A*			
Evidence of standing water (Ponding, Noticeable Odors, Water Stains, Algae)?	*A/M*			
If underdrain system, is it broken or clogged?	*A/M*			
Overflow structure free of blockage and operating properly?	*A*			
Other	*A*			
Hazards				
Have there been complaints from residents?	*A/M*			
Public hazards noted?	*A/M*			
Mosquito proliferation?	*A/M*			
Is there encroachment on pervious area or easement by buildings or other structures?	*A/S*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Buffers Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into buffer)	*A/M*			
Undisturbed?	*A/M*			
Vegetation healthy?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____
Inspected by: (printed) _____

Constructed Wetlands Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Constructed Wetland Type: ED Wetland ☐ Pocket Wetland ☐ Wetland ☐

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	**Comments/Description**
Embankment and Emergency Spillway				
Vegetation healthy?	*A/S*			
Erosion on embankment?	*A/S*			
Animal burrows in embankment?	*A/S*			
Cracking, sliding, bulging of dam?	*A/S*			
Drains blocked or not functioning?	*A/S*			
Leaks or seeps on embankment?	*A/S*			
Slope protection failure functional?	*A/S*			
Emergency spillway obstructed?	*A/S*			
Erosion in/around emergency spillway?	*A/S*			
Other (describe)	*A/S*			
Riser and Principal Spillway				(Describe type: concrete pipe, slotted weir, channel, etc.)
Low-flow orifice functional?	*A/S*			
Trash rack (Debris removal needed? Corrosion noted?)	*A/S*			
Sediment buildup in riser?	*A*			
Concrete/masonry condition (Cracks or displacement? Spalling?)	*A*			
Metal pipe in good condition?	*A*			
Control valve operation?	*A*			
Pond drain valve operation?	*A*			
Outfall channels function, not eroding?	*A*			
Other (describe)	*A*			
Sediment Forebays				

Sedimentation description				
Sediment cleanout needed (over 50 percent full)?	*A/S*			
Constructed Wetland Ponding Areas				
Wetland vegetation present and healthy?	*M*			
Vegetation removal needed?	*A/M*			
Floatable debris removal needed?	*A/M*			
Visible pollution?	*A/M*			
Shoreline problem?	*A/M*			
Erosion at outfalls into pond?	*A/M*			
Headwalls and end walls in good condition?	*A/M*			
Encroachment into pond or easement area?	*A/M*			
Hazards				
Have there been complaints from residents?	*A/M*			
Public hazards noted?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Filter Strips Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed (Yes/No)	Comments/Description
Debris Removal				
Facility and adjacent area free of debris?	*A/M*			
Inlets and outlets free of debris?	*A/M*			
Any dumping of yard wastes into facility?				
Litter (branches) removed?	*A/M*			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into swale, channel or filter strip)	*A/M*			
Grass mowed?	*A/M*			
Plant height not less than design water depth?	*A/M*			
Fertilized per specifications?	*A/M*			
Plan composition according to approved plan?	*A/M*			
Unauthorized or inappropriate plantings?	*A*			
Plants healthy? (no diseased or dying vegetation)	*A/M*			
Evidence of plants stressed from inadequate watering?	*A/M*			
Filtration Capacity				
Clogging from oil or grease?	*A/M*			
Facility dewaters between storms?	*A/M*			
Check dams and energy dissipaters/sumps				
Any evidence of sedimentation build up	*A/S*			
Are sumps greater than 50% full of sediment?	*A/S*			

Any evidence of erosion and downstream toe of drop structures?	*A/S*			
Sediment Deposition				
Swale clean of sediments	*A*			
Sediment not > 20% of swale design depth	*A*			
Outlet/Overflow Spillway				
In good condition?	*A*			
Any evidence of erosion?	*A*			
Any evidence of blockages?	*A*			
Has facility been filled or blocked inappropriately?	*A*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Grass Channel Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Facility and adjacent area free of debris?	*A/M*			
Inlets and outlets free of debris?	*A/M*			
Any dumping of yard wastes into facility?	*A/M*			
Litter (branches) removed?	*A/M*			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into swale, channel or filter strip)	*A/M*			
Grass mowed?	*A/M*			
Grass height not less than 3 to 4 inches?	*A/M*			
Fertilized per specifications?	*A/M*			
Grasses planted according to approved plan?	*A/M*			
Unauthorized or inappropriate plantings?	*A*			
Grasses healthy? (no diseased or dying vegetation)	*A/M*			
Evidence of grasses stressed from inadequate watering?	*A/M*			
Filtration Capacity				
Clogging from oil or grease?	*A/M*			
Facility dewaters between storms?	*A/M*			
Check dams and energy dissipaters/sumps				
Any evidence of sedimentation buildup?	*A/S*			
Are sumps greater than 50% full of sediment?	*A/S*			

Any evidence of erosion and downstream toe of drop structures?	*A/S*			
Any trash or blockages at weep holes?	*A/S*			
Sediment Deposition				
Swale clean of sediments?	*A*			
Sediment not > 25% of swale design depth?	*A*			
Outlet/Overflow Spillway				
In good condition?	*A*			
Any evidence of erosion?	*A*			
Any evidence of blockages?	*A*			
Has facility been filled or blocked inappropriately?	*A*			
Hazards				
Have there been complaints from residents?	*A/M*			
Public hazards noted?	*A/M*			
Maintenance accesses free of hazards and fully operational?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Infiltration Trench Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Trench surface clear of debris?	*A/M*			
Contributing area free of debris?	*A/M*			
Inlets/Inflow pipes free of debris?	*A/M*			
Overflow spillway clear of debris?	*A/M*			
Vegetation				
Mowing done when necessary?	*A/M*			
Unauthorized or inappropriate plantings?	*A*			
Fertilized per specification?	*A/M*			
Evidence of erosion?	*A/M*			
Contributing drainage area stabilized?	*A/M*			
Trees growing in the trench?	*A*			
Dewatering				
Trench dewaters between storms?	*A/M*			
Sediment traps, Forebays, or Pretreatment Swales				
Adequately trapping sediment?	*A*			
Structural damage?	*A*			
Greater than 50% of original storage volume remaining?	*A*			
Sediment removal of trench				
Any evidence of sedimentation in trench?	*A*			
Are pea gravel/topsoil and top surface filter fabric functioning properly?	*A/M*			

Does sediment accumulation currently require removal?	*A*			
Inlets				
Good condition (no need for repair)?	*A*			
Evidence of erosion?	*A*			
Outlets/overflow spillway				
Good condition (no need for repair)?	*A*			
Evidence of erosion?	*A*			
Aggregate repairs				
Surface of aggregate clean?	*A*			
Top layer of stone in need of replacement?	*A*			
Trench in need of rehabilitation?	*A*			
Observation wells				
Evidence of clogging/failure to percolate? (Should percolate within 3 days.)	*A/M*			
Has drawdown rate been measured at observation well and is well capped?	*A*			
Hazards				
Have there been complaints from residents?	*A/M*			
Public hazards noted?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Permeable Pavement Inspection and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

*****Conduct maintenance inspection in the spring of each year.

Pavement Type: Pervious Concrete/Asphalt ☐ Modular Pavers ☐ Grass/Gravel Pavers ☐

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Pavement Area				
Pavement area free of debris?	*A/M*			
Staining or sediment?	*A/M*			
Inlets and outlets unobstructed and sediment free?	*A/M*			
All contributing drainage area free of erosion and sources of sediment?	*A/M*			
Water standing after a storm event?	*S*			
Any evidence of clogged pores that require vacuum-sweeping?	*A/M*			
Has area been vacuum swept in the past 12 months?	*A/M*			
Access to pervious pavement (egress and ingress routes) safe and efficient?	*A/M*			
Has drawdown rate been measured at observation well and is well capped?	*A*			
Structural integrity of the pavement intact? Look for deterioration such as: slumping, cracking, spalling, or broken pavers.	*A/M*			
Grass Pavers				
Adjacent area fully stabilized (no evidence of eroding material into or from pervious pavement area)?	*A*			
Any noticeable irrigation needs?	*A/M*			
Fallen leaves/plant debris collecting in paving area?	*A/M*			

Grass height over 4 inches?	*A/M*			
Vegetation health affected by oil/grease from vehicles?	*A*			
Other	*A*			
Hazards				
Obstructions or debris affecting overflows/emergency spillways?	*A/M*			
Load-bearing capability of pavement intact?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Proprietary BMP Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	*A/M*			
Inlets and Outlets free of debris?	*A/M*			
Facility (internally) free of debris?	*A/M*			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into proprietary BMP)	*A/M*			
Grass mowed?	*A/M*			
Water retention where required				
Water holding chambers at normal pool?	*A/M*			
Evidence of erosion?				
Sediment Deposition				
Filtration Chamber free of sediments?	*A*			
Sedimentation and/or trash below manufacturer's recommended cleanout?	*A*			
Structural Components				
Any evidence of structural deterioration?	*A*			
Grates in good condition?	*A*			
Spalling or cracking of structural parts?	*A*			
Outlet/Overflow Spillway	*A*			
Other				
Noticeable odors?	*A*			
Any evidence of filter(s) clogging?	*A/M*			
Evidence of flow bypassing facility?	*A*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Stormwater Pond Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____
Stormwater Pond Type: Wet Pond ☐ Wet ED Pond ☐ Micropool Pond ☐ Multiple Pond System ☐
Dry Pond ☐

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No	Comments/Description
Embankment and Emergency Spillway				
Vegetation healthy?	*A/S*			
Erosion on embankment?	*A/S*			
Animal burrows in embankment?	*A/S*			
Cracking, sliding, bulging of dam?	*A/S*			
Drains blocked or not functioning?	*A/S*			
Leaks or seeps on embankment?	*A/S*			
Slope protection failure functional?	*A/S*			
Emergency spillway obstructed?	*A/S*			
Erosion in/around emergency spillway?	*A/S*			
Other (describe)	*A/S*			
Riser and Principal Spillway				(Describe type: concrete pipe, slotted weir, channel, etc.)
Low-flow orifice functional?	*A/S*			
Trash rack (Debris removal needed? Corrosion noted?)	*A/S*			
Sediment buildup in riser?	*A*			
Concrete/masonry condition (Cracks or displacement? Spalling?)	*A*			
Metal pipe in good condition?	*A*			
Control valve operation?	*A*			
Pond drain valve operation?	*A*			
Outfall channels function, not eroding?	*A*			
Other (describe)	*A*			

Sediment Forebays				
Sedimentation description				
Sediment cleanout needed (over 50	*A/S*			
Percent full)?				
Permanent Pool Areas (if applicable)				
Undesirable vegetation growth?	*A/M*			
Visible pollution?	*A/M*			
Shoreline erosion?	*A/M*			
Erosion at outfalls into pond?	*A/M*			
Headwalls and end walls in good condition?	*A/M*			
Encroachment into pond or easement area by other activities?	*A/M*			
Evidence of sediment accumulation?	*A*			
Dry Pond Areas (if applicable)				
Vegetation adequate?	*A/M*			
Undesirable vegetation or woody plant growth?	*A/M*			
Excessive sedimentation?	*A*			
Hazards				
Have there been complaints from residents?	*A/M*			
Public hazards noted?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Water Quality Swale Inspections and Maintenance Checklist

Site Name: _____ Owner Change since last inspection? Y N
Location: _____
Owner Name: _____
Address _____ Phone Number _____
Site Status: _____
Date: _____ Time: _____ Site conditions: _____

Inspection Frequency Key: A=annual (required); M=monthly (recommended); S=after major storms (recommended)

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Facility and adjacent area free of debris?	*A/M*			
Inlets and outlets free of debris?	*A/M*			
Any dumping of yard wastes into facility?	*A/M*			
Litter (branches) removed?	*A/M*			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into swale)	*M*			
Soil media is adequately covering (18 inches) choker stone layer below?	*A/M*			
Grass mowed?	*A/M*			
Plant height not less than design water depth?	*A/M*			
Fertilized per specifications?	*A/M*			
Plant composition according to approved plan?	*A/M*			
Unauthorized or inappropriate plantings?	*A*			
Plants healthy? (no diseased or dying vegetation)	*A/M*			
Evidence of plants stressed from inadequate watering?	*A/M*			
Filtration Capacity				
Clogging from oil or grease?	*A/M*			
Facility dewaters between storms?	*A/M*			
Underdrain functioning properly?	*A/M*			
Check Dams and Energy Dissipaters/Sumps				

Any evidence of sedimentation buildup?	*A/S*			
Are sumps greater than 50% full of sediment?	*A/S*			
Any evidence of erosion and downstream toe of drop structures?	*A/S*			
Sediment Deposition				
Swale clean of sediments?	*A*			
Sediment not > 20% of swale design depth?	*A*			
Outlet/Overflow Spillway				
In good condition?	*A*			
Any evidence of erosion?	*A*			
Any evidence of blockages?	*A*			
Has facility been filled or blocked inappropriately?	*A*			
Hazards				
Have there been complaints from residents?	*A/M*			
Public hazards noted?	*A/M*			
Maintenance accesses free of hazards and fully operational?	*A/M*			

Inspector Comments: _____

_____

_____

Overall Condition of Facility: ☐ Acceptable ☐ Unacceptable

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed," list Maintenance actions and their completion dates below:

Maintenance Action Needed	Due Date

The next routine inspection is scheduled for approximately: _____
(Date)

Inspected by: (signature) _____

Inspected by: (printed) _____

Appendix 2 – Contacts

Montgomery County Building & Codes - Stormwater
350 Pageant Lane, Suite 309
Clarksville, TN 37040
(931) 648-5718
https://mcgtn.org/stormwater
jhdoss@mcgtn.net

Tennessee Department of Environment and Conservation
Nashville Environmental Field Office
711 R.S. Gass Blvd
Nashville, TN 37216
Phone: (615) 687-7000
FAX: (615) 687-7078
https://www.tn.gov/environment/permit-permits/water permits1/npdes-permits.html

Household Hazardous Waste Information
BiCounty Solid Waste Management
3212 Dover Road
Woodlawn, TN 37191
(931) 648-5751
https://mcgtn.org/bi-county

Native plant information:

Landscaping with Native Plants: https://www.se-eppc.org/pubs/middle.pdf

Tennessee Native Plant Society: https://www.tnps.org/

Appendix 3 – References & Credits

Technical Guidance:

Montgomery County Stormwater Management Manual
https://mcgtn.org/stormwater/stormwater-management-program

Nashville Stormwater Management Manual
https://www.nashville.gov/departments/water/developers/stormwater-review/stormwater-management-manual

Knox County Stormwater Compliance Program
https://www.knoxcounty.org/stormwater/dev-manual-ordinance.php

Appendix 4 – Stormwater Maintenance Agreement

Montgomery County, Tennessee

STORMWATER MAINTENANCE AGREEMENT

Plan Name: Permit No.

Map: Group: Parcel:

Deed Book Volume: Page No.:

Project Address:
Landowner(s):
Landowner's Address:
City: State: Zip Code:

WITNESSETH

WHEREAS, Montgomery County, Tennessee ("the County") is required by federal and state surface water quality regulations and its National Pollutant Discharge Elimination System (NPDES) permit to prevent surface water quality degradation from development or redevelopment activities within its jurisdiction, and the County has adopted stormwater quality regulations as required and such regulations are contained in the County Stormwater Management Resolution; and

WHEREAS, Resolution No. 13-2-2 was adopted February 11, 2013 by the Montgomery County Commission, and under said resolution the Building Commissioner shall have the authority to inspect private drainage systems within the County, and to order such corrective actions to said private storm water drainage systems as are necessary to maintain properly the drainage systems within the County; and

WHEREAS, under said resolution it is provided that private storm water drainage systems must be maintained by the property Landowner, and a maintenance agreement must be executed before the development plan is approved; and

WHEREAS, the Landowner is the owner of certain real property identified above; and

WHEREAS, the Landowner is proceeding to build on and develop the property; and

WHEREAS, Site/Subdivision Plan _____, prepared by _____ dated _____, on file at the Building and Codes Department (hereinafter called the "Plan"), which is expressly made a part hereof, as approved or to be approved by the Building and Codes Department, provides for the construction of storm water drainage systems; and

WHEREAS, the County and the Landowner agree that the health, safety, and general welfare of the residents of Montgomery County require that storm water drainage systems be constructed and maintained on the property; and

WHEREAS, the County requires that stormwater drainage systems as shown on the Plan be constructed and adequately maintained by the Landowners;

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The stormwater drainage systems shall be constructed by the Landowner in accordance with the plans and specifications in the Plan.

2. The Landowner shall provide adequate long term maintenance and continuation of the stormwater control measures described in the Plan, to ensure that all stormwater facilities are and remain in proper working condition acceptable to the County. The Landowner shall perform inspection and preventative maintenance activities in accord with the Plan and the County's NPDES Permit and Stormwater Regulations and policies.

3. The Landowner shall maintain a copy of the Plan on site, together with a record of inspections and maintenance actions required by the Plan. The Landowner shall document the times of inspections, remedial actions taken to repair, modify or reconstruct the system, the state of control measures, and notification of any planned change in responsibility for the system. The County may require that the Landowner's records be submitted to the County.

4. If it is later determined that the County's NPDES permit clearly directs Landowners or the County to manage stormwater treatment systems differently than specified in the Plan, the direction of the NPDES permit shall override the provisions of the Plan.

5. The Landowner hereby grants to the County the right of ingress, egress and access to enter the Property for the purpose of inspecting, operating, installing, constructing, reconstructing, maintaining or repairing the facilities. The Landowner hereby grants to the County the right to install and maintain equipment to monitor or test the performance of the stormwater control system for quality and quantity upon reasonable notice to Landowner.

6. In the event the Landowner fails to maintain storm water detention facilities as shown on the Plan in good working order acceptable to the County, the County may enter the property and take whatever steps it may deem necessary to maintain said storm water drainage systems. It is expressly understood and agreed that the County is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the County.

7. In the event the County, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, or materials, the Landowner shall reimburse the County on demand, within a time frame specified by the County for all costs incurred, including reasonable administrative costs and attorney's fees in the event that an action to collect such costs must be instituted.

8. The Landowner and the Landowner's heirs, administrators, executors, assigns, and any other successor in interest shall indemnify and hold the County harmless from any and all damages, accidents, casualties, occurrences, claims or attorney's fees which might arise or be asserted, in whole or in part, against the County from the construction, presence, existence, or maintenance of the stormwater control facilities subject to the Plan and this Agreement. In the event a claim is asserted against the County, its officers, agents or employees, the County shall notify the Landowner, who shall defend at Landowner's expense any suit or other claim. If any judgment or claims against the County shall be allowed, the Landowner shall pay all costs and expenses in connection therewith. The County will not indemnify, defend or hold harmless in any fashion the Landowner from any claims arising from any failure, regardless of any language in any attachment of other document that the Landowner may provide.

9. No waiver of any provision of this Agreement shall affect the right of any party thereafter to enforce such provision or to exercise any right or remedy available to it in the event of any other default.

10. The Landowner shall have the facilities inspected in accordance with the County's stormwater resolution and adopted policies, and certify to the County that the constructed facilities conform and purport substantially to the approved Plan. If the constructed condition of the facility or its performance varies significantly from the approved Plan as determined by the County, appropriately revised calculations shall be provided to the County and the Plan shall be amended accordingly.

11. Landowner agrees that the failure to follow the provisions and requirements of the Plan may result in the revocation of previously approved credits to stormwater user fees, or the imposition of such stormwater user fees or of additional stormwater user fees.

12. The Landowner agrees that for any systems to be maintained by a property Landowner's association, deed restrictions and covenants for the subdivision or other development will include mandatory membership in the Landowner's association. Landowner's association responsible for providing maintenance of the system, will require the association to maintain the stormwater system, will prohibit termination of this covenant by unilateral action of the association, and provide for unpaid dues or assessments to constitute a lien upon the property of a Landowner upon recording a notice of non-payment.

13. This Agreement shall be recorded among the land records of Montgomery County, Tennessee, and shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs, and any other successors in interest.

WITNESS the following signatures and seals:

By _____
Landowner or Authorized Agent

_____
Name (Print)

By _____
Building and Codes Department
John H Doss
Montgomery County
Stormwater Coordinator

STATE OF TENNEESSE)
COUNTY OF MONTGOMERY)

_____ _____ personally appeared before me, a States of Tennessee Notary Public for the said state and county and affirmed the information and executed the instrument here in above for the purposes contained therein.

This the _____ day of _____, 202_

_____
Notary Public

My commission expires: _____

STORMWATER BMP MAINTENANCE GUIDELINES

The required maintenance interval for stormwater Best Management Practices (BMPs) are often dependent upon the degree of pollutant loading from a particular drainage basin. BMP maintenance can best be broken into three categories: **inspection, routine maintenance, and major maintenance**.

Though each BMP type has its own unique characteristics, **inspections** will generally consist of an assessment to assure its functionality and the general condition.

Routine maintenance will generally consist of trash and vegetation removal, unclogging of drains, minor sediment removal and exchange of filter media where applicable.

Major maintenance will be completed as required from inspections and generally consists of ***significant reconstruction due to failures*** in the BMP. Examples of major maintenance include dredging, excavation, removal of existing media, replacing fabric, replacing the under-drain, and reestablishment of vegetation.

The following schedule is offered as a guideline for performing ***inspection and routine maintenance*** for a range of BMP categories.

BMP	Inspection Frequency	Routine Maintenance Frequency
	Inspection Frequency key: A = annual; M=monthly; S=after major storms; Q=Quarterly; SA=Semi Annually	
Bio-retention Systems	A, S	2 x /year
Cartridge or Module Media Filtration Structures	SA	1 – 2 x /year
Catch Basin Inserts (long term)	Q	3 – 4 x /year
Dry Pond	M	3 – 4 x /year
Dry Wells	A	1 x /year
Filter Strips or Swales	M	2 – 3 x /year
Green Roofs	SA; S	2 – 3 x /year
Hydrodynamic or Gravity Separators	SA	1 – 2 x /year
Infiltration Trenches	A; S	2 – 3 x /year
Permeable Pavement	A	2 – 3 x /year
Rainwater Gardens	SA; S	2 – 3 x /year
Rainwater Harvesting	SA; S	2 – 3 x /year
Sand Filter	Q first year; SA after	1 – 2 x/ year
Trash & Debris Screens	SA; S	2 – 3 x /year
Underground Storage Facilities	SA	1 x /year
Wetlands	SA	2 x /year
Wet Pond	Q	2 – 3 x /year
Headwalls	A	1x/ year
Injection Well	Q	3 – 4 x /year

All BMPs must be inspected and certified by a licensed engineer or landscape architect every 5 years. Questions about BMP maintenance and repair can be directed to the Office of the Stormwater Coordinator.
For more information and inspection sheets go to: https://mcgtn.org/stormwater/best-practices