

# A Citizen's Guide to Maintaining Stormwater Best Management Practices For Homeowners Associations and Property Owners



Types of BMPs ■ Signs of a Degraded BMP ■ Who Should Carry Out Maintenance

Inspecting Your BMP ■ BMP Inspection Schedule ■ Maintenance Costs

Putting Together Your Own Maintenance Plan

**A Citizen's Guide to Maintaining  
Stormwater Best Management Practices (BMPs)  
For Homeowners Associations and Property Owners**

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**CREDITS:** This document is based on a similar document produced by Lake County Stormwater Management Commission.  
The original document is available to download from: [www.co.lake.il.us/smc/publications.asp](http://www.co.lake.il.us/smc/publications.asp)

**DATE:** March 2009

## Do You Have a Stormwater BMP?

The term "Best Management Practices," or BMP, was introduced and defined by the U.S. Environmental Protection Agency as a practice or combination of practices that is an effective, practicable means of preventing or reducing the amount of pollution generated by stormwater runoff.

As development occurs, land is covered by roads, driveways, rooftops and other hard surfaces that do not allow stormwater to infiltrate (or soak) into the ground. Without BMPs, the end result of development may be flooding of, poor water quality and stream bank erosion in our creeks and rivers.

Sources of pollution include sediment, nutrients, motor oil, and lawn care products that run off hard surfaces and yards into storm drains. Storm drains typically empty into nearby creeks, lakes and wetlands. A variety of local, state and federal laws encourage or require the control of pollutants using BMPs.

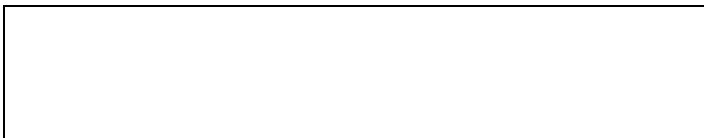
Do you have a BMP on your property or in your neighborhood? Ponds, ditches and depressions that you see every day may actually be engineered stormwater facilities designed to reduce flooding and improve water quality. The most common BMPs are detention basins, vegetated swales, vegetated buffers, and stormwater wetlands. The long-term benefits of BMPs only work if they are maintained to sustain their effectiveness. Maintaining your BMP is an important part of the communities' flood reduction and environmental protection efforts.

The Development Agreement contains language requiring the property owner and/or HOA to maintain the constructed permanent structural BMP. Stormwater facility is located in deed or plat restricted areas.

Procedural BMP's include working with your facility maintenance professional to ensure that their activities do not contribute pollutants to your property. Items to think about are the use of fertilizers or deicers, proper disposal/recycling of chemicals, trash area, pool and landscaping debris management.



*Meet on-site with members of your homeowner's association to find out where your BMPs are located.*



## BMP Lingo

**Basin** - Temporarily stores water before discharging to creek or lake; primarily used to reduce peak discharges, but does not reduce runoff volumes. Can be classified into two groups:

**Dry Extended Detention Basin** - Stores stormwater runoff but dries up usually 48-72 hours following a rainstorm or snow melt.

**Wet Retention Pond Basin** - Also stores stormwater runoff, but contains a permanent pool of water that will more effectively remove nutrients in addition to other pollutants than other BMPs like a dry pond.

**Best Management Practice (BMP)** - A practice or combination of practices of preventing or reducing the amount of pollution generated by stormwater runoff.

**Buffer** - An area of vegetated land, preferably non-mowed native vegetation, left open adjacent to drainageways, streams, wetlands, lakes, ponds and other surface waters for the purpose of minimizing the impacts runoff.

**Catch Basin Inserts** - These inserts hang from the opening of the curb inlet or below the grate of an area inlet. These inserts catch debris, sediment and pollutant particles.

**Easements** - Open spaces or public road right-of-ways that contain any part of the stormwater management system of a development.

**Grass-lined Swale** - An open channel drainageway used along residential streets and highways to convey stormwater and filter pollutants in lieu of conventional storm sewers.

**Oil/Grit Separator** - Generally this consists of a three chamber system designed to remove sediment and absorb hydrocarbons.

**Ordinance** - Regulations implemented in 2003 to set consistent standards for new development. The ordinance references Urban Drainage and Flood Control's Volume 3 [http://www.udfcd.org/downloads/down\\_critmanual.htm#vol3](http://www.udfcd.org/downloads/down_critmanual.htm#vol3)

**Porous Landscape Detention** - Depressed vegetated areas, such as vegetated swales or rain gardens filled with planting soil or a sand/soil mix that collects and filters urban stormwater.

**Porous Pavement Detention** - Porous asphalt, concrete, lattice pavers, concrete blocks, or stones laid on a gravel subgrade with voids filled with sand or turf.

**Proprietary/Manufactured Systems** - Devices that use vortex-motion and/or particulate setting treatment mechanisms. i.e. Stormceptor, Vortechs, BaySaver

**Stormwater Runoff Pollution** - Comes from diffuse or scattered sources in the environment rather than from a defined outlet such as a pipe. As water moves across and through the land it picks up and carries away natural and human-made pollutants, depositing them into lakes, rivers and even underground sources of drinking water.

**Sand Filter** - An excavated basin with sand bed and an under drain system.

**Constructed Wetland Channel or Basin** - A shallow, constructed pool that captures stormwater and allows wetland vegetation to grow.

## Type of BMPs



### WET RETENTION POND BASIN

Wet basins are man-made with permanent pools of water that function much like natural ponds. Excess runoff is stored above the permanent pool and is discharged at a controlled rate through an outlet. A wet basin can be more effective when native plants are added to the slopes and bottom. Adding wetland plants around a wet basin is also known as a stormwater wetland detention facility.

The advantages of a wet basin over a dry basin include higher pollutant removal and less chance that pollutants will be resuspended during a storm. Wet basins can also serve as an aesthetic or recreational amenity as well as a habitat for some wildlife and aquatic species. Unmowed native vegetated buffers on the perimeter makes the basin less attractive to geese.



### DRY EXTENDED DETENTION BASIN

Dry basins temporarily hold stormwater but are not effective at pollutant filtering because they are typically planted with turf grass. Dry basins can be used for recreational areas like soccer fields. Prior to the mid-1980s, dry basins were the most common type of stormwater management facility. The KICP encourages the retrofitting of dry basins to extend the emptying time for the more frequently occurring rain events to improve water quality. For more on retrofitting, see p. 27.

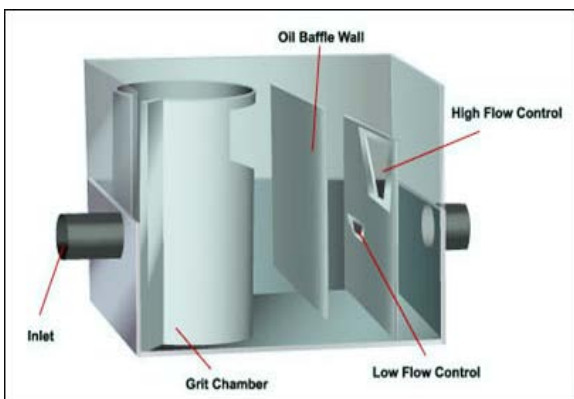


### GRASS BUFFER

Buffers are vegetated areas that surround wet basins and wetlands, and run parallel to streams and lakes. Buffers can be effective in filtering and infiltrating pollutants before they reach a water body. Buffer widths can range from 20 feet to 100 feet wide.

### GRASS-LINED SWALE

Swales are one of the most commonly used stormwater practices. For many years they have been used along highways, parking lots, along residential streets and in between homes to convey water. Swales are designed to slow and infiltrate stormwater runoff.



### PROPRIETARY/ MANUFACTURED SYSTEM

Most manufactured BMPs look like inconspicuous manholes. However underneath is a single or series of vaults and chambers designed to remove common stormwater pollutants, such as sediment, oil, trash and grit. Manufactured BMP facilities are used solely for water quality enhancement, where space for surface facilities is not available.



### **POROUS LANDSCAPE DETENTION**

Consists of a low lying vegetated area underlain by a sand bed with an under drain.



### **POROUS PAVEMENT**

Porous pavement consists of a block or porous pavement layer that is underlain by gravel and sand layers in most cases. This BMP is intended to be used in parking lots and in low traffic areas to accommodate vehicles while facilitating stormwater infiltration near its source.



**SAND FILTER** A structural BMP used to capture and treat a volume of stormwater runoff. This BMP is an excavated basin containing a sand filter bed with an under drain system. Runoff collects in the basin and gradually infiltrates into the sand bed. The under drain then dewateres the sand bed and flows are conveyed to a nearby swale or storm drainage. An outfall is used to drain higher volumes of flow.

# A Plan for Maintaining Your BMPs

The City of Louisville requires all properties under going development and/or redevelopment of over an acre to construct a stormwater facility to address water quality.

All properties with stormwater facilities must provide maintenance to ensure water quality is protected.

Maintenance requirements are available through the City's Storm Water Program. Please call the Public Works Department for contact information. The requirements typically include:

- The party responsible for performing the maintenance tasks.
- The frequency of BMP inspection reporting.

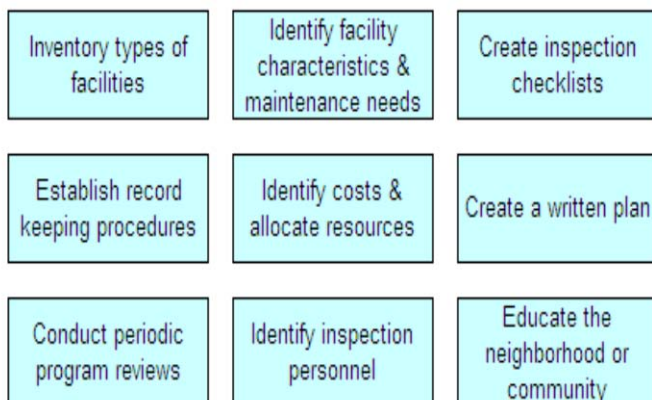
All Homeowner's Association who have ownership of stormwater facilities should:

- Get a copy of the site plan and as-built drawings that include all stormwater facility locations and types, easements, deed restrictions, and stormwater facility maintenance plans.
- Meet with the City's Public works Department and possibly the developer on-site to discuss the stormwater facilities, including the current condition and near-term and long-term maintenance of each facility.

## MAINTENANCE PLAN

Create a maintenance plan if one does not already exist. There are many advantages to having a plan. It provides a historical record of each facility, can be used in policy creation for the next association board, and can include a long-term maintenance budget.

### Elements of a Maintenance Plan



### Inventory Types of Facilities

The plat will show components of the stormwater system including basins, wetlands and swales. Consult with the site designer or permitting agency to identify below-ground features

like storm sewers or above ground features like detention basins and native vegetated areas.

### Identify Facility Characteristics and Maintenance Needs

Spend a day with your BMP! With site plan in hand, walk the site with the developer and a representative from the City. For older BMPs, particularly basins, consider taking along someone from your City's' engineering department or a consulting engineer. Take note of the physical and design characteristics of each drainage component and drainage easements. From there, some basic maintenance needs should become obvious. For example, vegetation may not have been sufficiently established around the perimeter of a basin or the outlet structure may contain a debris jam.

### Inspection Checklists

Checklists are essential to ensure that all system components are functioning as originally constructed. They are important not only during inspection, but checklists provide a historical status of facility functionality. Consider tailoring the checklists to your site and facility types. See page 11 for checklists.

### Establish Record Keeping Procedures

Tracking and recording allows homeowner's associations, facility managers or inspectors to schedule inspections, and to check off observations. A database could include identification numbers for each BMP, BMP type and location, data from previous inspections, special maintenance needs and pictures of your facilities.

### RECORD-KEEPING TOOLS

- Computer
- Map files
- Inspection logs
- Important phone numbers
- Site map/plans

### Identify Costs and Allocate Resources

This task is typically the most difficult task for an association or facility manager. A good rule of thumb is to increase a routine maintenance budget by an average of 3-4 percent each year for inflation. For long-term maintenance needs, consult the city's Public works Department or work with a consulting engineer to estimate the cost of the needed work.

## Create a Written Plan

A written plan should include the following:

- Name, location of site.
- Name, address and phone number of current owner(s) and previous owner(s).
- History of the site including a copy of the site plan and as-built drawings, maintenance plan, and other pertinent information.
- Identify regulatory and legal requirements (including legal implications of ownership, with regard to facility maintenance and the legal impacts of neglect).
- Maintenance for both on-going and periodic maintenance requires record-keeping policies, and an equipment inventory.
- Funding mechanism, collection, distribution of funds, yearly budget approval process, evaluation of services and policies.

## TABLE OF CONTENTS

- Association Structure
- Inventory of Facilities
- Map and Pictures of Facilities
- Maintenance Schedule
- Inspection Log Form & Directions
- Lawn Care Contract Info
- Maintenance Budget
- Equipment Inventory
- Inspection Schedule

## Conduct Periodic Program Reviews

On a yearly basis, review your inspection program, checklists, and contracts with landscaping companies and other contractors. Other items to check:

- Is your computerized tracking system working and does it need updating?
- Does your inspection checklist need to be evaluated for more detailed inspection or other information?
- Are you satisfied with professional services currently under contract, and are you getting what you paid for?
- Is the association fee covering maintenance costs or is there a need to increase it?
- Take time to update information such as phone numbers and addresses of inspectors and other support personnel. Update your inventory of equipment, if applicable.

## Identify Inspection Personnel

Your landscaping company can alert you to maintenance needs on occasion. Inspections on the other hand can monitor and identify on a regular schedule. Inspections can be done by anyone interested in the task. Volunteer inspectors should be reliable, detail-oriented and willing to train others. A job description and training session should be written up and become part of the maintenance plan.

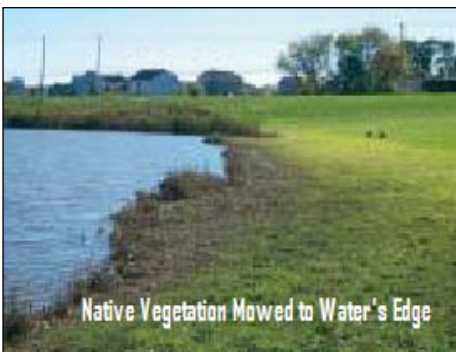
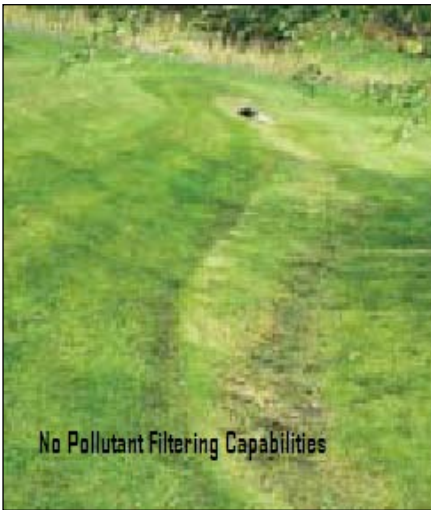
## Educate The Neighborhood or Community

Last, but not least, it is imperative that those who live near a basin or another system component understand the purpose of the facility and the practices that keep the facility operating. For example, a native vegetative buffer is often viewed as a "mosquito haven" and aesthetically unpleasant. The preferred view is a manicured lawn mowed up to the banks of a wet basin with little or no vegetation on the perimeter. This mowing will defeat the purpose of the buffer at slowing down the water and removing pollutants. Use your newsletter or a neighborhood gathering to talk about and show the merits of native vegetated buffers. For more on educating your community, see [p. 9](#).



*Get your homeowner's association involved. Educate members on the maintenance plan, and train volunteers to be inspectors.*

# Signs of a Degraded BMP





# Involving the Whole Community in Maintenance and Pollution Prevention Responsibilities

Consider starting a public education program for your neighborhood. Even if day-to-day maintenance is left to a professional, involving the community in on-going BMP maintenance activities is a cost-effective way to prolong the life of the BMP and to prevent pollution.

Most of the time people are unaware that their activities contribute to pollution. Through education, people become aware of how their activities impact water quality and flooding, and they become a stakeholder in protecting their environment.



Please call 303-413-7365 to schedule a water quality speaker for your next HOA meeting, receive support for a stream/BMP team or have storm drain markers provided!

Share with your neighbors these water protection guidelines.

- Always pick up after pets. Place their waste in trash or flush it down the toilet.
- Recycle or properly dispose of household hazardous waste. Call the Boulder County HHW Hotline at 303-441-4800.
- Wash your car at a commercial carwash that treats its wastewater, or wash your car in your yard so the water soaks into the ground.
- Keep cars tuned up and in good operating condition. Check for drips and repair leaks immediately to keep oil off the pavement. Walk, bike or take the bus.
- Direct downspouts to planting beds and lawns where water can soak into the ground.
- Sweep walks and driveways instead of hosing them down.
- Store landscaping materials away from parking lots, streets or driveways where runoff will carry the material to the storm drain.
- Recycle or put litter in the trash.
- Fertilize in the fall, if at all, to reduce algal blooms.
- Call 303-441-4444 if you see illegal dumping.

## EASEMENT ON YOUR PROPERTY

If you have a BMP in your subdivision or on your property, a deed restriction or easement is required. These legally binding agreements noted on the plat and in your purchasing agreement for your home allow access to stormwater facilities, and requires the property owner to maintain the access point.

BMPs that typically need a dedicated easement include detention basins, overland flow paths, swales, wetlands and buffers.

### Easement Do's and Don'ts

#### Recommended

- Plant trees and shrubs at the top of the embankments or berms to avoid blocking the flow of water. Native, water tolerant grasses and wetlands plants however can be planted at the base of a basin or swale.
- Plant non-woody trees, shrubs and flowers away from outlets and inlets to avoid root blockages.

#### Not Recommended

- Do not erect any permanent structures like buildings, walls or fences made of blocks or bricks.
- Do not install tennis courts, swimming pools, dams or anything that might block the flow of water.



Educate your neighbors about your BMPs.

# Inspecting Your BMPs

## Maintenance Program Components

- Regular Inspections
- Vegetation Management
- Embankment and Outlet Stabilization
- Debris and Litter Control
- Mechanical Components/Inlet/Outlet Replacement
- Insect Control
- Maintenance of Access Route to BMP
- Overall Pond Maintenance
- Sediment/Pollutant Removal

### REGULAR INSPECTIONS

This section outlines the maintenance needs for the most common types of BMPs found in the City. It is important to remember that while general maintenance tasks can be outlined, actual maintenance needs will vary according to specific site conditions. Many BMP inspections are conducted on an annual or semi-annual inspection schedule.

Consider evaluating the storm system in general. A storm system consists of inlets, manholes, underground pipes and curb and gutter. In most cases, it is the property owner's responsibility to maintain these systems. Private systems must be kept in clean working order - as many of them drain to public systems.

### VEGETATION MANAGEMENT

Most BMPs heavily rely on vegetation to filter out pollution and to prevent erosion on embankments and slopes. The following is a quick reference on how to keep your vegetation healthy.

- **Mowing.** Short grass (Kentucky blue grass, etc.) may look nice, but doesn't have a deep root system and is ineffective as a pollutant filter. Cut grass no shorter than 6-8 inches, particularly grass near basin embankments and slopes. Never mow down to the water's edge. In fact, replace your grass around wet basins with native vegetated buffers.
- **Weed and Pest Control.** More is not better when it comes to fertilizing and pesticide use, especially near basins, swales, lakes and streams. Excess fertilizer can flow off your lawn and into storm sewers that eventually drain into nearby water bodies.
- **Non-Native Vegetation.** Non-native species can impact a BMP's effectiveness by blocking out the more effective long-rooted native vegetation. Short-rooted non-native species can actually destabilize a BMP's embankment or slope, and reduce the BMP's pollutant filtering capabilities. Monitoring, mowing

and prescribed burning can help control unwanted, non-native species.

- **No Mow Zones.** Quality wetland areas benefit having native vegetated buffers up to 100 feet.

## Factors Affecting Type and Frequency of Maintenance

**Function of the BMP Facility.** Inspections will vary depending on the type of BMP.

**Visibility of the BMP Facility.** The needs and preferences of the surrounding community will determine to a large extent the amount of maintenance for aesthetics and BMP facility effectiveness.

**Landscaping.** Maintenance needs will vary depending on the types of vegetation used in landscaping. Native vegetation needs less care and less mowing than turf grass.

**Upstream Conditions.** The conditions of the watershed upstream from your BMP can significantly impact the amount of sediment and other pollutants entering your BMP facility. Upstream commercial areas or roads may result in an increased need for litter and sediment removal, and other maintenance tasks.

**Safety.** Since BMPs can often involve the impoundment of water, the safety of nearby residents must be considered.

**Need for Professional Judgment.** BMPs are water treatment as well as storage facilities. While some routine maintenance can be undertaken by a nonprofessional, the judgment of a professional should be consulted regularly.

**Financing.** The costs associated with non-routine BMP maintenance tasks can be considerable. A fund should be established to provide for the costs of long-term needs such as sediment removal.

*Source: Northern Virginia Planning District, Division of Environmental Services*

# BMP INSPECTION CHECKLISTS

(adapted from Urban Drainage and Flood Control District, Vol. 3)

- Irrigated grass buffer strips
- Grass-lined swale
- Modular block porous pavement
- Porous pavement detention
- Porous landscape detention
- Extended detention basin
- Sand filter extended detention basin
- Constructed wetland basin
- Retention pond basin
- Constructed wetland channel

## ANNUAL BMP INSPECTION REPORT

Owner/Corporation \_\_\_\_\_

Location of Property/Plat # \_\_\_\_\_

Date of Annual Inspection Report \_\_\_\_\_

Signature of person completing annual report/phone # \_\_\_\_\_

\_\_\_\_\_

please print name

Type of Facility	Location	Date Maintenance Completed	Type of Work Completed	Work Performed By	Sediment Removal (quantity/disposal location)	Overall condition of Facility (properly functioning?)

**Please attach copies of the routine Inspection Checklists completed throughout the year covered in this report.**

**ADDITIONAL COMMENTS (include any problems encountered and any maintenance activity anticipated for the following year):**

# Irrigated Grass Buffer Strip Inspection Checklist

Owner/Corporation \_\_\_\_\_

Date of Inspection \_\_\_\_\_

Inspection performed by (w/signature) \_\_\_\_\_

Location of Facility \_\_\_\_\_

Required Action	Maintenance Objective	Frequency of Action	Work completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing	Maintain a dense grass cover at 2 to 4 inches. Collect and dispose of cuttings offsite or use a mulching mower.	Routine – As needed or recommended by inspection.			
Lawn care	Use minimum amount of biodegradable, nontoxic fertilizers and herbicides needed to maintain dense grass cover, free of weeds. Reseed and patch damaged areas.	Routine – As needed.			
Irrigation	Adjust timing sequence and water cover to maintain required minimum soil moisture for dense grass growth. Do not overwater.	As needed.			
Litter removal	Remove litter/debris to prevent gully development, enhance aesthetics, and prevent floatables from being washed offsite.	Routine – As needed by inspection			
Inspections	Inspect irrigation, turf grass density, flow distribution, gully development, and traces of pedestrian or vehicular traffic and request repairs as needed.	Annually and after each major storm (that is, larger than 0.75 inches in precipitation).			
Turf replacement	To lower the turf below the surface of the adjacent pavement, use a level flow spreader, so that sheet flow is not blocked and will not cause water to back up onto the upstream pavement.	As needed when water padding becomes too high or too frequent a problem. The need for turf replacement will be higher if the pavement is sanded in winter to improve tire traction on ice. Otherwise, expect replacement once every 5 to 15 years.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Grass-Lined Swale Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objective	Frequency of Action	Work completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing and Lawn care	Maintain irrigated grass at 2-4" tall and nonirrigated native grass at 6-8" tall. Collect cuttings/dispose of them offsite or use a mulching mower.	Routine – As needed.			
Debris and Litter removal	Keep the area clean for aesthetic reasons, which also reduces floatables being flushed downstream.	Routine – As needed by inspection, no less than two times/year			
Sediment removal	Remove accumulated sediment near culverts and in channels to maintain flow capacity. Replace the grass areas damaged in the process.	Routine – As needed by inspection. Estimate the need to remove sediment from 3-10% of total length per year, as determined by annual inspection.			
Grass reseeding and mulching	Maintain a healthy dense grass in channel and side slope.	Nonroutine – As needed by annual inspection.			
Inspections	Check the grass for uniformity of cover, sediment accumulation in the swale, and near culverts.	Routine – Annual inspection suggested.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Modular Block Porous Pavement Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Requires Action	Maintenance Objective	Frequency of Action	Work completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Debris and litter removal	Accumulated material should be removed as a source control measure.	Nonroutine – As needed.			
Sod maintenance	If sandy loam turf is used, provide lawn care, the irrigation system, and inlay depth maintenance as needed.	Routine – As dictated by inspection.			
Inspection	Inspect representative areas of surface filter sand or sandy turf for accumulation of sediment or poor infiltration.	Routine and during a storm event to ensure that water is not bypassing these surfaces by not infiltrating.			
Replacement of Surface Filter Layer	Remove, dispose, and replace surface filter media by pulling out turf plugs and by vacuuming out sand media from within the annular spaces of the blocks. Replace with fresh ASTM C-33 sand and, if appropriate, sandy loam turf plugs.	Nonroutine – when it becomes evident that runoff does not rapidly infiltrate into the surface. May be as often as every year or as little as every 5 to 10 years.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Porous Pavement Detention Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Debris and litter removal	Accumulated material should be removed as a source control measure.	Nonroutine – As needed.			
Inspection	Inspect representative areas of surface filter sand accumulation of fine sediment.	Routine and during a storm event to ensure that water is not bypassing these surfaces or taking too long to drain out.			
Replacement of Surface Filter Layer	Using a power vacuum remove all sand media within the annular spaces of the concrete blocks. Replace with fresh ASTM C-33 sand, vibrate into place and remove excess.	Nonroutine – when it becomes evident that runoff does not rapidly infiltrate into the surface, namely, the ponded water does not drain within one hour. May be as often as once a year or as little as once every 5 to 10 years.			

Adapted from Urban Drainage and Flood Control District, Vol. 3



# Porous Landscape Detention Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing and vegetative care	Occasional mowing of grasses and weed removal to limit unwanted vegetation. Maintain irrigated turf grass as 2 to 4 inches tall and nonirrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.			
Debris and litter removal	Remove debris and litter from detention area to minimize clogging of the sand media.	Routine – depending on aesthetic requirements			
Landscaping removal and replacement	The sandy loam turf and landscaping layer will clog with time. This layer will need to be removed and replaced, along with all turf and other vegetation growing on the surface, to rehabilitate infiltration rates.	Every 5 to 10 years, depending on infiltration rates needed to drain the WQCV in 12-hours or less. May need to do it more frequently if exfiltration rates are too low to achieve this goal.			
Inspections	Inspect detention area to determine if the sand media is allowing acceptable infiltration.	Routine – bi-annual inspection of hydraulic performance			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Extended Detention Basin Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing and lawn care	Occasional mowing to limit unwanted vegetation. Maintain irrigated turf grass as 2 to 4 inches tall and nonirrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.			
Debris and litter removal	Remove debris and litter from the entire pond to minimize outlet clogging and improve aesthetics.	Routine – Including just before annual storm seasons (that is, April and May) and following significant rainfall events.			
Erosion and sediment control	Repair and revegetate eroded areas in the basin and channels.	Nonroutine – Periodic and repair as necessary based on inspection.			
Structural	Repair pond inlets, outlets, forebays, low flow channel liners, and energy dissipators whenever damage is discovered.	Nonroutine – Repair as needed based on regular inspections.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Sand Filter Extended Detention Basin Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Debris and litter removal	Remove debris and litter from detention area to minimize clogging of the sand media.	Routine – depending on aesthetic requirements			
Landscaping removal and replacement	If the sand filter is covered with rock mulch, bluegrass, or other landscaping covers, the cover must be removed to allow access to the sand media. Replace landscaping cover after maintenance of sand media is complete.	Every 2 to 5 years			
Scarify Filter Surface	Scarify top 3 to 5 inches by raking the filter's surface.	Once per year or when needed to promote drainage.			
Sand filter removal	Remove the top 3 inches of sand from the sand filter. After a third removal, backfill with 9 inches of new sand to return the sand depth to 18 inches. Minimum sand depth is 12 inches.	If no construction activities take place in the tributary watershed, every 2 to 5 years depending on observed drain times, namely when it takes more than 24 hours to empty 3-foot deep pool. Otherwise more often. Expect to clean out forebay every 1 to 5 years.			
Inspections	Inspect detention area to determine if the sand media is allowing acceptable infiltration.	Routine – bi-annual inspection of hydraulic performance, one after a significant rainfall.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Constructed Wetland Basin Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing and lawn care	Mow occasionally to limit unwanted vegetation. Maintain irrigated turf grass at 2 to 4 inches tall and nonirrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.			
Debris and litter removal	Remove debris and litter from entire pond to minimize outlet clogging and aesthetics. Include removal of floatable material from the pond's surface.	Routine – Including just before annual storm seasons (that is, in April and May) and following significant rainfall events.			
Sediment removal	Remove accumulated sediment and muck along with much of the wetland growth. Re-establish growth zone depths and spatial distribution. Revegetate with original wetland species.	Nonroutine – Every 10 to 20 years as needed by inspection if no construction activities take place in the tributary watershed. More often if they do. Expect to clean out forebay every 1 to 5 years.			
Aquatic plant harvesting	Cut and remove plants growing in wetland (such as cattails and reeds) to remove nutrients permanently with manual work or specialized machinery.	Nonroutine until further evidence indicates such action would provide significant nutrient removal. In the meantime, perform this task once every 5 years or less frequently as needed to clean the wetland zone out.			
Inspections	Observe inlet and outlet works for operability. Verify the structural integrity of all structural elements, slopes, and embankments.	Routine – At least once a year, preferably once during one rainfall event resulting in runoff.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# Retention Pond Inspection Checklist

Owner/Corporation \_\_\_\_\_  
 Date of Inspection \_\_\_\_\_  
 Inspection performed by (w/signature) \_\_\_\_\_  
 Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing and lawn care	Mow occasionally to limit unwanted vegetation. Maintain irrigated turf grass at 2 to 4 inches tall and nonirrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.			
Debris and litter removal	Remove debris and litter from entire pond to minimize outlet clogging and aesthetics. Include removal of floatable material from the pond's surface.	Routine – Including just before annual storm seasons (that is, in April and May) and following significant rainfall events.			
Sediment removal	Remove accumulated sediment and muck along with much of the wetland growth. Re-establish growth zone depths and spatial distribution. Revegetate with original wetland species.	Nonroutine – Every 10 to 20 years as needed by inspection if no construction activities take place in the tributary watershed. More often if they do. Expect to clean out forebay every 1 to 5 years.			
Aquatic plant harvesting	Cut and remove plants growing in wetland (such as cattails and reeds) to remove nutrients permanently with manual work or specialized machinery.	Nonroutine until further evidence indicates such action would provide significant nutrient removal. In the meantime, perform this task once every 5 years or less frequently as needed to clean the wetland zone out.			
Structural repairs	Repair such items as inlet/outlet works and energy dissipator liners. Stabilize banks and berms. Repair damage caused by larger storm events.	Nonroutine – As necessary per inspection.			

Sediment removal	Empty the pond, divert the base flow, and dry out bottom sediments in fall and winter months to allow access with backhoe. Remove accumulated sediment along with aquatic growth overlaying them. Re-establish original design grades and volumes and replant aquatic vegetation.	Nonroutine – As indicated per inspections and sediment accumulation. Expect to do this every 10 to 20 years if no construction activities take place in the tributary watershed. More often if they do. Expect to clean out the forebay every 1 to 5 years.			
Aquatic Growth Harvesting	Remove aquatic plants such as cattails or reeds, which also permanently removes nutrients. Use an aquatic harvester and dispose of the material offsite.	Nonroutine – Perform every 5 to 15 years or as needed to control their accumulation.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

## Constructed Wetlands Channel Inspection Checklist

Owner/Corporation \_\_\_\_\_

Date of Inspection \_\_\_\_\_

Inspection performed by (w/signature) \_\_\_\_\_

Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated
Lawn mowing and lawn care	Mow occasionally to limit unwanted vegetation. Maintain irrigated turf grass 2 to 4 inches tall and non-irrigated native turf grasses at 4 to 6 inches.	Routine – Depending on aesthetic requirements.			
Debris and litter removal	Remove debris and litter from the entire pond to minimize outlet clogging and aesthetics. Include the removal of floatable material from the pond's surface.	Routine – Including just before annual storm seasons (that is, April and May) and following significant rainfall events.			
Erosion and sediment control	Regrade and revegetate eroded and slumped areas above the pond and along channels. Repair damaged inlet and outlet energy dissipators.	Nonroutine – Periodic and repair as necessary based on inspection.			
Inspections	Inspect the retention pond for functioning as initially intended. Pay attention to outlet clogging. Also note erosion, slumping, sedimentation levels, overgrowth, embankment and spillway integrity, and damage to structural elements of the facility.	Routine – Annual inspection of hydraulic and structural facilities. Biannual performance and maintenance inspections.			
Nuisance control	Address odor issues, insects, and overgrowth with appropriate measures.	Nonroutine – As necessary per inspection or local complaints.			

Adapted from Urban Drainage and Flood Control District, Vol. 3

# General BMP Inspection Checklist

Owner/Corporation \_\_\_\_\_  
Date of Inspection \_\_\_\_\_  
Inspection performed by (w/signature) \_\_\_\_\_  
Location of Facility \_\_\_\_\_

Required Action	Maintenance Objectives	Frequency of Action	Work Completed/date	Overall condition of Facility (properly functioning or not?)	Future work anticipated



## Who Should Carry out Maintenance?

Cost, safety and effectiveness are key factors in determining who will carry out your maintenance needs. Some of the more routine maintenance tasks can be done by the BMP facility owner. Those tasks may include landscaping, educating the neighborhood, and litter removal.

It is recommended that a professional landscaping company be hired for the more difficult routine work. Mowing, burning, working around sloping embankments, stabilizing eroded areas, and replanting vegetation are tasks a professional landscaping company might best manage. Trained professionals can also identify problems early on saving expensive repairs later.

Professional engineers may be required to retrofit or provided extensive maintenance.

### TIPS FOR WORKING WITH LAWN CARE COMPANIES

Sit down with your landscaping company manager and discuss your BMP maintenance needs. Objectives might include:

- Communicate that the facility is a water quality device.
- Communicate mowing practices; for instance, mowing at a higher level and perhaps not as frequently, or not at all especially in buffer areas. You also can request that use of heavy equipment be avoided where possible particularly in vegetated areas.
- Communicate the need to keep the BMP facility clear of grass clippings and leaf piles (convey this to the residents as well).
- Ask whether the company follows an integrated pest management (IPM) plan and minimize the application of pesticides and fertilizers. An IPM plan can include:
  - Use of pesticides only as needed and only in trouble spots.
  - Use of alternatives to pest control or no control at all.
  - Policy of not applying chemicals when there is a heavy rainfall in the forecast.
  - Testing the soil before applying low-phosphorous fertilizer if needed.

**TIP: The key is communication. If the company cannot agree or is not willing to agree to your needs, find another company that will.**

### EMBANKMENT AND OUTLET STABILIZATION

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 a lack of deep-rooted vegetation that holds soil in place. There are several techniques to stabilize banks including the combination of structural products.

In addition to erosion, problems like sink holes, a rusty, broken or crushed pipe, odor, or algae blooms are all clear indications to call a consulting engineer.

Animal burrows also will deteriorate embankment integrity. Take steps to control animal burrowing by quickly filling existing holes.

### DEBRIS AND LITTER CONTROL

Regularly check for litter, debris and floating debris. Floating debris can clog basin inlets and outlets and swales. If dumping is a problem, outreach to the neighborhood can help.

### MOSQUITOES

Mosquitoes breeding grounds can be created in shallow ponds of standing water. The development of a mosquito problem, is usually an indication of a maintenance problem. It is likely the infiltration capacity of the BMP needs to be increased or sediment needs to be removed. It takes only 72 hours for larvae to hatch in standing water. Other insect control options 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.

### MAINTENANCE OF ACCESS ROUTE TO BMP

Access to BMPs for routine and non-routine maintenance is critical. For more on easements, see p. 9.

### OVERALL WET BASIN MAINTENANCE

A healthy aquatic ecosystem has many benefits that are often overlooked. A healthy wet basin should require little maintenance. However, 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 by excess sediment.

Steps should be taken to reduce nutrients at their source and to encourage the growth of more desirable aquatic and emergent vegetation in a wet basin.

### SEDIMENT/POLLUTION REMOVAL

Since the primary purpose of a BMP is to remove sediment and other pollutants from stormwater runoff, sediment will eventually accumulate in a BMP and needs to be removed. There are no specific rules governing the timing of sediment removal because facility maintenance varies. However, some general guidelines on sediment removal frequency are listed below.

SEDIMENT REMOVAL FREQUENCY	
BMP	Sediment Removal Frequency
Wet Basin	5-15 years
Dry Basin	2-10 years
Sand Filter	6 months
Bioretention	5-10 years
Vegetated Swale	2 years
Porous Paving	3-4 year

## Maintenance Costs

	Maintenance	Annual Associated Cost
<b>PLD</b>	Removal of sediments and replacement of some level of soil is required periodically. Mulch should be replaced annually, or as needed.	Between \$1,500 and \$2,000, depending upon the size and complexity of the facility.
<b>Grass Swale/ Grass Buffer</b>	Remove sediments, replace check dams (usually made of earth, riprap, or wood), reseed or sod (if grassed) or replace dead plants, every two years.	
<b>Porous Paving</b>	Vacuum sediments from surface, twice a year.	Between \$500 and \$1,000, depending on the size of the facility.
<b>Sand Filter</b>	Remove the top filter cloth and remove/replace the filter gravel, when a semiannual inspection reveals that it is necessary. Remove and replace the filter cloth and gravel every three to five years.	Between \$3,000 to \$10,000, depending on the type and size of the sand filter and the amount of impervious surface draining to it.

### ROUTINE MAINTENANCE COST CONSIDERATIONS

Routine maintenance costs can vary based on the type of BMPs you have. Costs for mowing, weed control, fertilization and debris removal are typically calculated per acre, per year. Cost estimates can be obtained from lawn care companies and a general rule of thumb is to increase your yearly maintenance budget by 3-4 percent for these activities.

A general rule of thumb is that annual maintenance costs may run from \$100 per acre for minor maintenance, such as mowing, to \$500 per acre for more intensive maintenance including weed control, debris removal, etc.

**TIP: The non-routine maintenance needs of a BMP, while infrequent, can be a major undertaking in terms of funding and logistics, and should always be performed by a consulting engineer.**

### NON-ROUTINE MAINTENANCE COST CONSIDERATIONS

Non-routine costs are often the most expensive and usually are not budgeted. It is advised that a BMP maintenance fund, with annual contributions, be established. You may want to consider hiring a consulting engineer to conduct a replacement fund study. When a fund is started, the primary non-routine maintenance cost is typically related to wet basin pollutant and sediment removal, or dredging.

### Wet Basin Dredging

Associations should have a copy of the "as built" drawings of their wet basin(s) depth contours. It is recommended that depth contours be checked about every two years unless there is a significant change in the basin's functions. Seek a consulting engineer or basin management company to determine if the depths of the basin have changed to the point that they no longer resemble what was designed and built.

A major cause of depth reduction includes high sediments loads from upstream construction site erosion, shoreline erosion, agricultural runoff and decaying aquatic plants. Ideally, you would want to correct these types of problems prior to dredging.

If dredging is the last option, a dredging feasibility study would be performed to determine areas to be dredged and to estimate dredging costs. The cost depends on the volume of sediment removed based on cubic yards, and sediment disposal. **Don't forget that permits may be needed from local, state and federal agencies.** Contact the City's Public Works Department for contact information.

Your cost considerations should include:

**Mobilization and Demobilization.** Depending on the size of the basin, equipment will either be waterborne (mounted to a floating barge) or on the perimeter of the basin. Additional costs for the

construction of access roads and heavy equipment may be required if not already provided in the cost.

**Disposal.** The primary determinant of disposal costs is whether onsite disposal is an option. If on-site disposal is not available, landfill and transportation costs can be high.

**Benefits of Dredging.** Dredging restores the BMP to its original Intent as required by local ordinance and will likely improve it by:

- Removing excessive sediments
- Removing nutrient rich or toxic sediments
- Removing rooted aquatic plants
- Preventing fish kills
- Creating better habitat for fish



*Dredging is an eventual cost. Plan ahead and set funds aside.*

## Need a Retrofit?

Retrofits are stormwater treatment practices put into place after development has occurred to improve water quality, protect downstream BMPs and water resources, reduce flooding, or meet other watershed restoration goals. Several types of retrofit opportunities exist including:

**Create a wet or stormwater wetland basin:** Dry basins can be converted to wetland basins by excavating portions of the basin bottom to create wetland pockets and/or redesigning the outlet to allow for some water retention. Wetland and native prairie vegetation is then planted on the bottom and on banks.

**Stabilize shorelines and improve buffers:** Shorelines of wet basins with erosion problems could be stabilized using native vegetation. Native vegetation buffers should be established around the perimeter of all basins where possible to stabilize shorelines, filter pollutants and to discourage nuisance geese.

**Replace turf grass with native vegetation:** Turf grass is relatively intolerant of water level fluctuations and is maintenance-intensive. It also is not as effective as native vegetation for filtering pollutants. Turf grass should be replaced with native vegetation.

***Seek a consulting engineer to retrofit your BMP.***

*Source: Watershed Management Institute.*

## Contacts for BMP Program Information



### **Boulder County**

Boulder County Transportation/Engineering  
PO Box 471  
Boulder, CO 80306  
720-564-2660

Boulder County Public Health  
3450 Broadway  
Boulder, CO 80304  
303-441-1574

### **City of Louisville**

City of Louisville Public Works  
749 Main Street  
Louisville, CO 80027  
303-335-4780

### **KICP Support**

Boulder County Public Health  
3450 Broadway  
Boulder, CO 80304  
303-441-1439

Watershed Outreach Coordinator  
City of Boulder Water Quality  
4049 75th Street  
Boulder, CO 80301  
303-413-7365

## Other Resources

### Center for Watershed Protection

Works to protect, restore, and enhance streams, rivers, lakes, wetlands, and bays.

[www.cwp.org](http://www.cwp.org)

### Colorado Association of Storm and Floodplain Managers

An organization of professionals whose members are involved in floodplain management, flood hazard mitigation, stormwater management, the National Flood Insurance Program, and flood preparedness, warning, and recovery.

[www.casfm.org](http://www.casfm.org)

### Colorado Water Protection Project

The goal of the Colorado Water Protection Project is to increase public awareness in Colorado about the causes of and solutions to urban polluted runoff resulting from household activities.

[www.ourwater.org](http://www.ourwater.org)

### NEMO: Nonpoint Education for Municipal Officials

Coordinated by the University of Connecticut, NEMO is an educational program for land use decision makers that addresses the relationship between land use to natural resource protection.

[www.nemonet.uconn.edu](http://www.nemonet.uconn.edu)

### Nonpoint Source Colorado

A collaboration to reduce nonpoint source pollution in Colorado.

[www.npscolorado.com](http://www.npscolorado.com)

### PACE Program

A representative can meet with the facility manager to discuss pollution prevention as it relates to maintenance activities of your property.

[facility manager brochure](#)

[facility manager presentation](#)

[PACE](#)

303-441-1574

### Stormdrain Stenciling Information and Stormwater Presentations

[www.keepitcleanpartnership.org](http://www.keepitcleanpartnership.org)

303-413-7365

### Stormwater Manager's Resource Center

### Stormwater Center

Link to various fact sheets on stormwater, BMPs and other useful information. [www.stormwatercenter.net](http://www.stormwatercenter.net)

### Urban Drainage and Flood Control District

Established by the Colorado legislature in 1969, for the purpose of assisting local governments in the Denver metropolitan area with multi-jurisdictional drainage and flood control problems. Volume 3 provides guidance for the selection and design of stormwater quality best management practices. [www.udfcd.org](http://www.udfcd.org)

### US Environmental Protection Agency - Nonpoint Source Pollution Best Management Practices (USEPA)

[www.epa.gov/owow/nps/bestnpsdocs.html](http://www.epa.gov/owow/nps/bestnpsdocs.html)

### US EPA - Stormwater Program

[EPA stormwater](#)

### US EPA Wetlands Website

The value of wetlands, why they need protection and your role as a homeowner and landowner are included on this website. [www.epa.gov/OWOW/wetlands](http://www.epa.gov/OWOW/wetlands)

## BMP Maintenance Contractors

If you would like to be included in the following list please contact 303-441-1439

Airvac Services  
3595 Wynkoop Street  
Denver, CO 80216  
303-299-9300

Anderson Services  
1125 Quaker St  
Golden, CO 80401  
303-277-1112

Clean Harbors Environmental Service  
4770 Fox Street Ste 13  
Denver, CO 80216  
303-293-2500

Clear Water Environmental  
10750 Irma Drive # 24  
Northglenn, CO 80233  
303-237-4209

Down to Earth Compliance LLC  
7845 E Havard Avenue  
Denver, CO 80321  
303-306-1606

McDonald Farms  
7440 E I-25 Frontage Road  
Frederick, CO 80530  
303-772-4577

Phillip Services  
20300 West Highway 72  
Arvada, Colorado 80007  
303-279-5506

RNR Enterprises  
5808 Franklin St  
Denver, CO 80216  
866- 988-4166

VSR Corp  
11730 Wadsworth Blvd  
Broomfield, CO 80020  
303-280-3852

Rapid Vac Service Inc.  
P.O. Box 2289  
Arvada, CO 80001  
303-422-2959

### BMP COMPONENT REPLACEMENT

Eventually, like most infrastructure, some BMP components may need replacing and should be part of a BMP replacement fund. Components may include:

- inflow, outflow devices
- trash racks
- valves, orifices
- pumps and switches
- earthwork such as embankments and side slope stabilization
- mulches and vegetation.

NOTE: The lists of consultants and vendors is provided as a public service and does not constitute a recommendation, endorsement or certification of their qualifications or performance record, nor does the absence of a consultant or vendor from the list constitute a negative endorsement. While an effort has been made to provide a complete and accurate listing, omissions, or other errors may occur and, therefore, other available sources of information should be consulted.

Those seeking professional services are advised to use independent judgment in evaluating the credentials of any consultants and vendors appearing on these lists.