# SOP 9: Inspection and Maintenance of Structural Stormwater Best Management Practices (BMPs)

**Introduction**

Best Management Practices (BMPs) are policies, procedures and structures designed to reduce stormwater pollution, prevent contaminant discharges to natural water bodies, and reduce stormwater facility maintenance costs. Structural BMPs are permanent site features designed to treat stormwater before infiltrating it to the subsurface or discharging it to a surface water body. Regular inspection and maintenance of structural stormwater BMPs is critical for these engineered systems to function as designed (e.g., provide benefits to water quality, groundwater recharge, and peak flow attenuation).

This Standard Operating Procedure (SOP) provides general inspection and maintenance frequencies and procedures for eight common structural stormwater BMPs, including:

1. Bioretention Areas and Rain Gardens
2. Constructed Stormwater Wetlands
3. Extended Dry Detention Basins
4. Proprietary Media Filters
5. Sand and Organic Filters
6. Wet Basins
7. Dry Wells
8. Infiltration Basins

This SOP is based on the Massachusetts Stormwater Handbook and is not intended to replace the stormwater BMP Operation and Maintenance guidance contained in the Handbook. This SOP is also not intended to replace the Stormwater BMP Operation and Maintenance (O&M) Plan required by the Massachusetts Wetlands Protection Act, Order of Conditions.

The ##AGENCY OR DEPARTMENT is responsible for inspection and maintenance of structural stormwater BMPs and other stormwater infrastructure in ##MUNICIPALITY. A list of existing structural stormwater BMPs is included in the attachments, along with inspection and maintenance checklists for each type of BMP.

Structural stormwater BMPs will be inspected annually at a minimum. Inspection checklists for each type of structural BMP are provided in the attachments.

**Procedures**

Bioretention Areas and Rain Gardens

Bioretention areas and rain gardens are shallow depressions filled with sandy soil, topped with a thick layer of mulch, and planted with dense native vegetation. There are two types of bioretention cells:

1. Filtering bioretention area: Areas that are designed solely as an organic filter.
2. Exfiltration bioretention area: Areas that are configured to recharge groundwater in addition to acting as a filter.

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| *Instructions: If applicable, list* ***bioretention areas and rain gardens*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

***Inspection and Maintenance***

Regular inspection and maintenance are important to prevent against premature failure of bioretention areas or rain gardens. Regular inspection and maintenance of pretreatment devices and bioretention cells for sediment buildup, structural damage and standing water can extend the life of the soil media.

**Maintenance Schedule: Bioretention Areas and Rain Gardens**

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| **Activity** | **Time of Year** | **Frequency** |
| Inspect for soil erosion and repair | Year round | Monthly |
| Inspect for invasive species and remove if present | Year round | Monthly |
| Remove trash | Year round | Monthly |
| Mulch Void Areas | Spring | Annually  |
| Remove dead vegetation | Fall and spring | Bi-annually |
| Replace dead vegetation | Spring | Annually |
| Prune | Spring or fall | Annually |
| Replace all media and vegetation  | Late spring/early summer | As needed |

When failure is discovered, excavate the bioretention area, scarify the bottom and sides, replace the filter fabric and soil, replant vegetation, and mulch the surface.

Never store snow within a bioretention area or rain garden. This would prevent the recharge and water quality treatment of ground water.

**Constructed Stormwater Wetlands**

Constructed stormwater wetlands maximize pollutant removal from stormwater through the use of wetland vegetation uptake, retention, and settling. Constructed storm water wetlands must be used in conjunction with other BMPs, such as sediment forebays.

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| *Instructions: If applicable, list* ***constructed stormwater wetlands*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

***Inspection and Maintenance***

Regular inspection and maintenance are important for the health of constructed stormwater wetlands. They help identify the need for replacement of vegetation and media, detect potentially harmful invasive species, and ensure the overall health of the wetland.

**Maintenance Schedule, Constructed Stormwater Wetlands: Years 0-3**

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| **Activity** | **Time of Year** | **Frequency** |
| Inspect for invasive species and remove if present | Year round | Monthly |
| Record and Map: | Year round | Annually |
| Types and distribution of dominant wetland plants  | Year round | Bi-annually  |
| Presence and distribution of planted wetland species | Spring | Annually  |
| Presence and distribution of invasive species | Fall and spring | Bi-annually |
| Indications other species are replacing planted wetland species | Spring | Annually |
| Percent of standing water that is not vegetated  | Spring or fall | Annually |
| Replace all media and vegetation  | Late spring/early summer | As needed |
| Stability of original depth zones and micro-topographic features |  |  |
| Accumulation of sediment in the forebay and micropool and survival rate of plants |  |  |

**Maintenance Schedule, Constructed Stormwater Wetlands: Years 4-Lifetime**

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| **Activity** | **Time of Year** | **Frequency** |
| Inspect for invasive species and remove if present | Year round | Monthly |
| Clean forebays | Year round | Annually |
| Clean sediment in basin/wetland system  | Year round | Once every 10 years |
| Mulch Void Areas | Spring | Annually  |
| Remove dead vegetation | Fall and spring | Bi-annually |
| Replace dead vegetation | Spring | Annually |
| Prune | Spring or fall | Annually |
| Replace all media and vegetation  | Late spring/early Summer | As needed |

Never store snow within a constructed stormwater wetland. This would prevent required water quality treatment and the recharge of groundwater.

**Extended Dry Detention Basins**

Extended dry detention basins are designed to control both stormwater quantity and quality. These BMPs are designed to hold stormwater for at least 24 hours, allowing solids to settle and reducing local and downstream flooding. Pretreatment is required to reduce the potential for overflow clogging. The outflow may be designed as either fixed or adjustable. Additional nutrient removal may be achieved by a micropool or shallow marsh.

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| *Instructions: If applicable, list* ***extended******dry detention basins*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

***Inspection and Maintenance***

Annual inspection of extended dry detention basins is required to ensure that the basins are operating properly. Potential problems include: erosion within the basin and banks, tree growth on the embankment, damage to the emergency spillway, and sediment accumulation around the outlet. Should any of these problems be encountered, necessary repairs should be made immediately.

**Maintenance Schedule: Extended Dry Detention Basins**

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| **Activity** | **Time of Year** | **Frequency** |
| Inspect basins | Spring and fall | Bi-annually and during and after major storms |
| Examine outlet structure for clogging or high outflow release velocities | Spring and fall | Bi-annually |
| Mow upper stage, side slopes, embankment and emergency spillway  | Spring through fall | Bi-annually |
| Remove trash and debris | Spring | Bi-annually |
| Remove sediment from basin | Year round | At least once every 5 years |

**Proprietary Media Filters**

Media Filters are designed to reduce total suspended solids and other target pollutants, such as organics, heavy metals, or nutrients – these materials are sorbed onto the filter media, which is contained in a concrete structure. The substrate used as filter media depends on the target pollutants, and may consist of leaf compost, pleated fabric, activated charcoal, perlite, amended sand in combination with perlite, and zeolite. Two types of Media Filters are manufactured: Dry media filters, which are designed to dewater within 72 hours, and wet media filters, which maintain a permanent pool of water as part of the treatment system.

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| *Instructions: If applicable, list* ***proprietary media filters*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

***Inspection and Maintenance***

Maintenance in accordance with the manufacturer’s requirements is necessary to ensure stormwater treatment. Inspection or maintenance of the concrete structure may require OSHA confined space training. Dry media filters are required to dewater in 72 hours, thus preventing mosquito and other insect breeding. Proper maintenance is essential to prevent clogging. Wet media filters require tight fitting seals to keep mosquitoes and other insects from entering and breeding in the permanent pools. Required maintenance includes routine inspection and treatment.

**Maintenance Schedule: Proprietary Media Filters**

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| **Activity** | **Time of Year** | **Frequency** |
| Inspect for standing water, trash, sediment and clogging | Per manufacturer’s schedule | Bi-annually (minimum) |
| Remove trash and debris | N/A | Each inspection |
| Examine to determine if system drains in 72 hours  | Spring, after large storm | Annually |
| Inspect filtering media for clogging | Per manufacturer’s schedule | Per manufacturer’s schedule |

Sand and Organic Filters

Sand and organic filters, also known as filtration basins, are intended for stormwater quality control rather than quantity control. These filters improve water quality by removing pollutants through a filtering media and settling pollutants on top of the sand bed and/or in a pretreatment basin. Pretreatment is required to prevent filter media from clogging. Runoff from the filters is typically discharged to another BMP for additional treatment.

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| *Instructions: If applicable, list* ***sand and organic filters*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

**Inspection and Maintenance**

If properly maintained, sand and organic filters have a long life. Maintenance requirements of the filters include raking the sand and removing sediment, trash, and debris from the surface of the BMP. Over time, fine sediments will penetrate deep into the sand requiring replacement of several inches or the entire sand layer. Discolored sand is an indicator of the presence of fine sediments, suggesting that the sand should be replaced.

**Maintenance Schedule: Sand and Organic Filters**

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| **Activity** | **Frequency** |
| Inspect filters and remove debris  | After every major storm for the first 3 months after construction completion. Every 6 months thereafter. |

**Wet Basins**

Wet basins are intended to treat stormwater quality through the removal of sediments and soluble pollutants. A permanent pool of water allows sediments to settle and removes the soluble pollutants, including some metals and nutrients. Additional dry storage is required to control peak discharges during large storm events. If properly designed and maintained, wet basins can add fire protection, wildlife habitats, and aesthetic values to a property.

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| *Instructions: If applicable, list* ***wet basins*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

***Inspection and Maintenance***

To ensure proper operation, wet basin outfalls should be inspected for evidence of clogging or excessive outfall releases. Potential problems to investigate include erosion within the basin and banks, damage to the emergency spillway, tree growth on the embankment, sediment accumulation around the outlet, and the emergence of invasive species. Should any of these problems be encountered, perform repairs immediately. An on-site sediment disposal area will reduce sediment removal costs.

**Maintenance Schedule: Wet Basins**

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| **Activity** | **Time of Year** | **Frequency** |
| Inspect wet basins | Spring and/or fall | Annually (Minimum) |
| Mow upper stage, side slopes, embankment and emergency spillway  | Spring through fall | Bi-annually (Minimum) |
| Remove sediment, trash and debris | Spring through fall | Bi-annually (Minimum) |
| Remove sediment from basin | Year round | As required, but at least once every 10 years |

**Dry Wells**

Dry wells are used to infiltrate uncontaminated runoff. These BMPs should never be used to infiltrate stormwater or runoff that has the potential to be contaminated with sediment and other pollutants. Dry wells provide groundwater recharge and can reduce the size and cost required of downstream BMPs or storm drains. However, they are only applicable in drainage areas of less than one acre and may experience high failure rates due to clogging.

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| *Instructions: If applicable, list* ***dry wells*** *that the municipality owns or maintains using the attached form, including their location and associated maintenance areas. Include the information below.* |

***Inspection and Maintenance***

Proper dry well function depends on regular inspection. Clogging has the potential to cause high failure rates. The water depth in the observation well should be measured at 24 and 48 hour intervals after a storm and the clearance rate calculated. The clearance rate is calculated by dividing the drop in water level (inches) by the time elapsed (hours).

**Maintenance Schedule: Dry Wells**

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| **Activity** | **Frequency** |
| Inspect dry wells | After every major storm for the first 3 months after construction completion. Annually thereafter. |

**Infiltration Basins**

Infiltration basins are designed to contain stormwater and provide groundwater recharge. Pollution prevention and pretreatment are required to ensure that contaminated stormwater is not infiltrated. Infiltration basins reduce local flooding and preserve the natural water balance of the site. High failure rates, however, often occur due to improper siting, inadequate pretreatment, poor design, and lack of maintenance.

***Inspection and Maintenance***

Regular maintenance is required to prevent clogging, which results in infiltration basin failure. Clogging may be due to upland sediment erosion, excessive soil compaction, or low spots. Inspections should include signs of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, riprap condition, sediment accumulation, and turf health.

**Maintenance Schedule: Infiltration Basins**

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| **Activity** | **Time of Year** | **Frequency** |
| Preventative maintenance  | Spring and fall | Bi-annually  |
| Inspection  | Spring and fall | After every major storm for the first 3 months after construction completion. Bi-annually thereafter and discharges through the high outlet orifice.  |
| Mow/rake buffer area, side slopes and basin bottom | Spring and fall | Bi-annually  |
| Remove trash, debris and organic matter | Spring and fall | Bi-annually |

**Employee Training**

* Employees who perform inspection or maintenance on structural BMPs are trained ##NUMBER times per year on proper procedures.
* If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

**Attachments**

1. Structural BMP Inventory Template
2. Structural BMP Inspection and Maintenance Checklists