

Municipal Separate Storm Sewer System (MS4) Program

MAINTENANCE OF COMMON STORM WATER BEST MANAGEMENT PRACTICES

Introduction

All storm water treatment practices will eventually require maintenance. The performance of a storm water treatment practice will decline over time. Eventually, levels of pollutant removal and/or infiltration become inadequate. It's important to inspect storm water best management practices (BMPs) on a regular basis, which will be defined in the Storm Water Management Program (SWMP). The frequency of inspection will vary depending on the type of BMP, and the amount of sediment, trash or debris entering the BMP from the contributing area.

Monthly inspections may be needed in situations where a storm water treatment practice collects a significant volume of trash or debris. Maintenance would consist of removing the trash and/or debris from the inlet or outlet. Frequency must be sufficient to ensure flow is not obstructed. Increased maintenance frequency may be needed during the autumn, when leaves accumulate.

More involved inspections are typically necessary semiannually or annually. During these less frequent inspections, staff or contractors inspect for structural integrity, erosion issues at the inlet, outlet, side slopes, berms and/or emergency overflow, accumulated sediment, and the presence of invasive or unwanted vegetation. The results of these inspections will inform the municipality regarding the needed preventative maintenance and/or major maintenance.

Preventative maintenance is needed to optimize performance and extend the life of each BMP. Recommended frequencies for preventative maintenance are provided by manufacturers of treatment devices, pump station manufacturers, and by engineers who design storm water systems. These recommended frequencies often need to be adjusted based on site-specific conditions.

Proper site selection and site preparation are critical to the long-term performance of storm water BMPs. For infiltration practices, common reasons for failure include: poor site selection, improper soil textures, lack of pretreatment structures, clogging of the soil, compaction of the soil, and improper maintenance of vegetation. It's important to assess depth to water table and soil texture. In addition, the design should include a pretreatment structure to settle out sediment prior to the storm water entering a detention or retention basin. During construction, care must be taken to avoid compaction of the soils by heavy equipment. Plants should be chosen based on the desired aesthetics, suitability for the climate, and potential to promote infiltration. Native grasses and flowers are typically chosen because they are more resistant to erosion than turf grass and provide habitat for native species. In addition, most native plants have long root structures which promote a higher rate of infiltration.

Design Considerations

Pretreatment systems, such as a sediment forebay, can reduce the amount of maintenance needed in a basin, swale, or trench. Settleable solids will settle out in the forebay, reducing the quantity of sediment which will reach the BMP. Maintenance of the sediment forebay is typically less expensive and takes less time as compared to removing sediment from the larger basin, swale, or trench.

The forebay design should include an access point for staging of heavy equipment during the sediment removal process. The smaller size of the forebay as compared to the main BMP, and the presence of a level staging area, allow sediment removal to be done with less cost and difficulty. As a result, the BMP will need major maintenance much less frequently. When maintenance of the larger BMP is needed, care must be taken to limit driving heavy equipment within the basin, swale, or trench in order to avoid compaction of the soils. Soil compaction will reduce infiltration rates, and BMPs designed to infiltrate storm water may no longer function as designed.

Native plants should be chosen that are well adapted to the climate and soil conditions. Plants at the bottom of a basin or swale should be tolerant of standing water. It's important to choose plants with long root structures in order to reduce the potential for erosion within the basin. Most native plants have root structures that extend down into the soil for a depth approximately equal to the above-ground height of the plant. Water droplets will travel down along these deep roots, resulting in increased infiltration as compared to basins planted with turfgrass.

Maintenance considerations and the desired appearance of the BMP should be kept in mind when choosing plants. In an urban setting, a more manicured appearance may be desired. In this case, cultivars of native plants may be chosen. Using a smaller number of plant varieties will make weeding easier, especially in cases when the maintenance will be done by staff with limited training in native plant varieties. In other settings, a more natural appearance may be desired, and Michigan native plants may be chosen in order to provide habitat for insects, birds, reptiles and amphibians.

Inspection Tasks

Inspection checklists are available in Appendix F of [the Low Impact Development Manual for Michigan](#).

- The Detention checklist is designed to assess ponds, basins, and wetlands which provide settling of solids, then discharge storm water at a slow rate to surface waters of the state.
- The Infiltration checklist is designed to assess basins and trenches which provide infiltration of storm water.
- The Bioretention checklist is designed to assess basins and trenches which utilize specific plants with long root structures to enhance the infiltration rate of storm water.
- The Bioswales and Vegetated Filter Strips checklist is designed to assess vegetated land areas designed to allow sediment and other pollutants to settle out, prior to storm water reaching surface waters of the state.

Maintenance Tasks

Special attention should be given to any erosion issues in the upstream drainage area or “storm sewershed.” Sediment entering the trench, swale, or basin should be reduced as much as possible through practices including regular street sweeping, inspection of catch basins at least once every three years, and cleaning out catch basins when the level of sediment in the sump reaches 30-40% of capacity. In addition, it is important to make sure that all sites of earth change in this upstream area are covered under a Soil Erosion and Sedimentation Control (SESC) permit, if required. The permit must be posted in an area viewable by the public. Regardless of whether an SESC permit is required, all sites of earth change must have appropriate SESC measures installed to retain sediment on-site. There should be no discharges of sediment onto neighboring property or to waters of the state.

Any concerns should be brought to the attention of the appropriate agency that issues permits, either the County Enforcing Agency or Municipal Enforcing Agency. If the project is being completed by a governmental agency with Authorized Public Agency (APA) status, the agency should be notified. If the issue is not resolved promptly, EGLE’s [SESC Program staff](#) should also be notified.

Maintenance tasks for specific BMPs are described in the following charts:

BMP: Infiltration Trench

Activity	Frequency	Waste Management	Level of Effort (hours)	Documentation
Inspect for erosion, sediment, trash, debris, vegetation, and damage from animals	Weekly and after each rain event during establishment of surrounding vegetation Quarterly/As needed once vegetation is fully established	NA	Low- 1 hour	Inspection reports
Inspect for infiltration rate	Annually- after a large storm event	NA	Medium- 1 to 3 or more inspections, conducted daily to check infiltration rate.	Inspection reports- include measurements of water level over time.
Remove sediment and debris	Seasonally/As Needed	Clean sediment may be applied to an upland area on-site and seeded, or it may be landfilled.	Medium- several hours for a large trench	Maintenance records, such as completed work orders.
Remove trash	Seasonally/As Needed	Trash needs to be landfilled.	Low - 1 hour	Maintenance records, such as completed work orders.
Mow surrounding grass	Seasonally/As Needed	Grass clippings may be composted, or a mulching lawn mower may be used. Yard waste may not be landfilled.	Low - 1 to 3 hours	Maintenance records, such as completed work orders.
Clear inlet and outlet structures	Seasonally/As Needed	Organic materials may be composted or used as mulch on-site.	Low - 1 hour	Maintenance records, such as completed work orders.
Fill in holes caused by animal activity	Seasonally/As Needed Note: Add fill materials as needed.	NA	Low - 1 hour	Maintenance records, such as completed work orders.
Regrade and stabilize eroded areas	Seasonally/As Needed Note: Add control measures such as additional stone and/or check dams to slow the flow	NA	Medium - several hours	Maintenance records, such as completed work orders.
Replace filter	Infrequently- When filter is clogged, as evidenced by standing water that does not readily infiltrate.	Clean sediment may be applied to upland area on-site and seeded, or it may be landfilled. Stones may be rinsed to remove sediment, and then reinstalled. Take care to avoid a discharge of sediment to surface waters during this process.	High – 1 day or more	Maintenance records, such as completed work orders.

BMP: Bioretention Basin

(The same practices also apply to swales)

Activity	Frequency	Waste Management	Level of Effort (hours)	Documentation
Inspect for infiltration rate	Annually- after a large storm event.	NA	Medium- 1 to 3 or more inspections, conducted daily to check infiltration rate.	Inspection reports- include measurements of water level over time.
Water vegetation	Daily for the first two weeks after planting, then ensure the plants receive one inch of water per week (rain or irrigation water) throughout the first season.	NA	Medium – 1 hour daily for the first 2 weeks, then weekly as needed depending on rainfall	Maintenance records, such as completed work orders, records of local precipitation.
Remove sediment and debris	Seasonally/As Needed.	Clean sediment may be applied to an upland area on-site and seeded or it may be landfilled.	Medium – several hours for a large basin.	Maintenance records, such as completed work orders.
Remove trash	Seasonally/As Needed.	Trash needs to be landfilled.	Low – 1 hour	Maintenance records, such as completed work orders.
Mowing/trimming vegetation	Areas planted with turfgrass are typically mowed weekly during the growing season. Areas planted with native species are mowed one or two times per year, in order to remove woody vegetation and to allow the native species to outcompete invasives. Soil may be aerated as needed.	Grass clippings may be composted, or a mulching lawn mower may be used. Yard waste may not be landfilled.	Low – 1 to 3 hours	Maintenance records, such as completed work orders.
Clear inlet and outlet structures.	Seasonally/As Needed.	Organic materials may be composted or used as mulch on-site.	Low- 1 hour	Maintenance records, such as completed work orders.

BMP: Bioretention Basin

(Continued)

Activity	Frequency	Waste Management	Level of Effort (hours)	Documentation
Manually remove weeds. Cut down perennial plantings at end of growing season to enhance root establishment.	Seasonally/As Needed.	Vegetation may be composted on-site or at an off-site composting operation. Invasive species may need to be placed in plastic bags and landfilled.	Medium- several hours for a large trench.	Maintenance records, such as completed work orders.
Fill in holes caused by animal activity. Note: Add fill materials as needed.	Seasonally/As Needed.	NA	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Regrade and stabilize eroded areas. Note: Add control measures such as additional stone and/or check dams to slow the flow.	Seasonally/As Needed.	NA	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Remove and replace dead plants.	Seasonally/As Needed.	Dead plants should be composted on-site or at an off-site composting facility.	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Sediment removal/dredging of pond.	Infrequently- When infiltration basin is no longer functioning as designed, as evidenced by standing water that does not readily infiltrate.	Clean sediment may be applied to an upland area on-site and seeded, or it may be landfilled. Care must be taken to avoid a discharge of sediment to surface waters during this process.	High- 1 day or more	Maintenance records, such as completed work orders.

BMP: Pervious Pavement

Activity	Frequency	Waste Management	Level of Effort (hours)	Documentation
Immediately remove any soil deposited on the pavement. Do not apply sand or other abrasives. Set the snow plow blade higher than for standard pavement.	On a frequent basis/as needed.	Clean sediment may be applied to an upland area on-site and seeded, or it may be landfilled.	Medium- requires regular oversight	Frequent visual inspections are needed. Documentation is not necessarily needed.
Inspect for infiltration rate.	2x per year	NA	Low- 1 hour	Inspections report.
Inspect planted areas adjacent to pavement and remove all trash and other litter. Any bare spots or eroded areas should be replanted and/or stabilized at once.	2x per year	Landfill	Low to Medium- depending on whether replanting is needed.	Inspection reports and maintenance records, such as completed work orders.
Vacuum with a commercial cleaning unit.	2x per year Note: Can be done during parking lot sweeping/ inspection if using a vacuum sweeper.	Landfill	Low- 1 to 3 hours.	Maintenance records, such as completed work orders.
Clean out inlet structures which drain to the pervious pavements.	2x per year	Landfill	Low- 1 to 3 hours.	Maintenance records, such as completed work orders.

BMP: Detention Basins (Wet/Dry)

Activity*	Frequency	Waste Management	Level of Effort (hours)	Documentation
Inspect basin and forebay for erosion, sediment accumulation, trash, debris, vegetation, and damage from animals. Basin structures including the inlet and outlet should be inspected for structural damage and clogging (sediment, debris, ice jam).	Weekly and after each rain event during establishment of vegetation; Quarterly and after a storm greater than 1 inch after vegetation is established. Check for evidence of tunneling or burrowing wildlife in the pond outlet at least twice during the growing season.	NA	Low- 1 hour	Inspection reports.
Water vegetation	Daily for the first two weeks after planting, then ensure the plants receive one inch of water per week (rain or irrigation water) throughout the first season.	NA	Medium- 1 hour daily for the first two weeks, then weekly as needed depending on rainfall.	Maintenance records, such as completed work order, records of local precipitation.
Regrade and stabilize eroded areas Note: Add control measures such as additional stone and/or check dams to slow the flow.	Seasonally/As Needed.	NA	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Vegetated Area Inspection Note: Inspect for growth of invasive and/or unwanted species.	1x per year.	NA	Low- 1 to 3 hours.	Inspection reports.

BMP: Detention Basins (Wet/Dry)

(Continued)

Activity	Frequency	Waste Management	Level of Effort (hours)	Documentation
Mowing/Trimming Vegetation Note: This activity does not include mowing of the embankment.	Areas planted with turfgrass are typically mowed weekly during the growing season. Areas planted with native species are mowed 1-2 times per year to remove woody vegetation and allow the native species to outcompete invasives. Soil may be aerated as needed.	Grass clippings may be composted, or a mulching lawn mower may be used. Yard waste may not be landfilled.	Low - 1 to 3 hours.	Maintenance records, such as completed work orders.
Embankment Mowing	1-2 times per year. Note: The purpose of the mowing is to inhibit growth of woody debris. Embankments should not be mowed regularly.	Grass clippings may be composted or a mulching lawn mower may be used. Yard waste may not be landfilled.	Low - 1 to 3 hours.	Maintenance records, such as completed work orders.
Remove sediment and debris	Seasonally/As Needed.	Clean sediment may be applied to an upland area on-site and seeded, or may be landfilled.	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Remove trash	Seasonally/As Needed.	Trash needs to be landfilled.	Low- 1 hour	Maintenance records, such as completed work orders.
Clear inlet and outlet structures Note: Repair any damage found and remove any burrowing animals.	Seasonally/As Needed.	Organic materials may be composted or used as mulch on-site.	Low- 1 hour	Maintenance records, such as completed work orders.
Manually remove weeds. Cut down perennial plantings at end of growing season to enhance root development,	Seasonally/As Needed.	Vegetation may be composted on-site or at an off-site composting operation. Invasive species may need to be placed in plastic bags and landfilled.	Medium- several hours for a large trench.	Maintenance records, such as completed work orders.

BMP: Detention Basins (Wet/Dry)

(Continued)

Activity*	Frequency	Waste Management	Level of Effort (hours)	Documentation
Fill in holes caused by animal activity.	Seasonally/As Needed.	Add fill materials as needed.	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Remove and replace dead plants.	Seasonally/As Needed.	Dead plants should be composted on-site or at an off-site composting facility.	Medium- several hours for a large basin.	Maintenance records, such as completed work orders.
Main Basin- Remove Sediment and Debris. Note: Dry basins should be completely dry when sediment is removed; Wet basins should be drained.	Remove sediment every 5-10 years or when the sediment accumulation is more than 6-12”.	Material removed from detention basins that treat hot spots such as fueling stations or areas with high pollutant concentrations should be disposed according to Michigan EGLE regulations for solid waste. Detention basins that primarily catch sediment from areas such as lawns may redistribute the waste on site and seed.	High- 1 day or more.	Maintenance records, such as completed work orders.
Forebay- Remove Sediment and Debris	Dry ponds and forebays should be inspected during the winter, when they may fill with sand or other anti-skid materials more quickly. Removal should take place when sediment occupies 50 percent of the forebay (typically every 3 to 10 years).	Material removed from detention basins that treat hot spots such as fueling stations or areas with high pollutant concentrations should be disposed according to Michigan EGLE regulations for solid waste. Detention basins that primarily catch sediment from areas such as lawns may redistribute the waste on site and seed.	High- 1 day or more	Maintenance records, such as completed work orders.

* Sources: Low Impact Development Manual for Michigan: A Design Guide for Implementors and Reviewers (SEMCOG.org)
 Maintaining Your Detention Pond: A Guide for Private Owners in Southeast Michigan (Assembly of Rouge Communities)
[Pennsylvania Stormwater Best Management Practices Manual Chapter 6](#)

BMP: Mechanical Treatment

Activity	Frequency	Waste Management	Level of Effort (hours)	Documentation
Inspect device	<p>At minimum, device should be inspected twice annually and after large storm events</p> <p>Note: Frequency should be determined by the installing engineer, through reviewing the guidance published by the manufacturer, and considering location.</p>	NA	Low- 1 hour	Inspection records and completed work orders
Remove sediment and debris	<p>Varies based on site characteristics</p> <p>Note: Frequency should be determined by a municipal or consulting engineer, through reviewing the guidance published by the manufacturer, and considering inspection results.</p>	<p>Waste management varies based on device location. If the sediment is primarily clean, it may be applied to an upland area on-site and seeded. If material removed comes from hot spots or areas with high pollutant concentrations, it should be disposed of according to EGLE regulations for solid waste</p>	Medium- several hours and vector truck required	Maintenance records, such as completed work orders

RESOURCES

Erickson, Andrew J., Peter T. Weiss, and John S. Gulliver, “Optimizing Stormwater Treatment Practices: A Handbook of Assessment and Maintenance.” Springer, March 14, 2013

Chesapeake Bay Foundation, “Infiltration Trench Maintenance”, cbf.org/document-library/presentation-webinar-materials/CBF_Infiltration_Trench_011614.pdf

Assembly of Rouge Communities, “[Maintaining Your Detention Basin- A Guidebook for Private Owners in Southeast Michigan](http://allianceofrougecommunities.com)”, (allianceofrougecommunities.com)

Employee/Contractor Training Resources

- Department of Environment, Great Lakes and Energy (EGLE) Storm Water Training videos, available at Michigan.gov/IndustrialStormwater:
 - [Introduction to the EGLE Industrial Storm Water Program](#)
 - [Storm Water Employee Training \(English version\)](#)
 - [Storm Water Employee Training \(Spanish version\)](#)
 - [What to Expect During an EGLE Industrial Storm Water Inspection](#)
- [Southeast Michigan Council of Governments \(SEMCOG\) on-demand webinars](http://semcog.org/semoc-university) on various pollution prevention-related topics (semcog.org/semoc-university)
- Excal Visual Inc. produces a series of videos designed for Environmental Health and Safety Employee Training. Training options include DVD kits, digital downloads, an online learning management system, and pay-per-view, and are available at excalvisual.com.
- The U.S. Environmental Protection Agency has fact sheets specific to Pollution Prevention/Good Housekeeping at epa.gov/npdes/stormwater-discharges-municipal-sources-developing-ms4-program. Scroll down to Pollution Prevention/Good Housekeeping.

Inspection/Maintenance Resources

- The “[Low Impact Development Manual for Michigan](#)” contains an appendix that includes maintenance inspection checklists for detention, infiltration, bioretention, and bioswale BMPs. This is available at semcog.org/land.
- The US EPA’s Menu of BMPs (epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater)
- The Alliance of Rouge Communities has developed a guidebook, “[Maintaining Your Detention Basin](http://allianceofrougecommunities.com).” This is available at allianceofrougecommunities.com

Resources for Managing Vegetated Properties

- Michigan Turfgrass Environmental Stewardship Program at <http://www.mtesp.org>.
- Integrated Pest Management (IPM) website at <https://www.canr.msu.edu/ipm/>
- Soil Testing through Michigan State University Extension at <https://homesoiltest.msu.edu/get-started>.
- Landscaping for Water Quality and other resources available at EGLE’s NPS webpage at Michigan.gov/NPS. Under “Information and Education” there is a link to Information & Education Publications.
- Michigan State University Extension has free downloadable fact sheets on many topics at https://www.canr.msu.edu/lawn_garden/index. Click on Publications and then either search or check a box for a particular topic.

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