

[ORGANIZATION NAME]
OPERATIONS & MAINTENANCE PLAN
FOR

[PROJECT NAME (BIOSWALE, RAIN GARDEN AND BIORETENTION PROJECT)]

OWNER INFORMATION

[Organization Name]

[Address]

[Address]

CONTACT: _____ Phone: _____

Bioswale, Rain Garden, and Bioretention O&M Overview

Maintenance is necessary for any type of infrastructure, whether it be catch basins, and underground piping, or green infrastructure. This plan will overview the maintenance needed to keep nature-based infrastructure functional for the long-term. This plan is designed to keep the plants healthy, and the storage voids open in order to keep infiltrating water over the lifetime of the project. It shall be monitored and revised as necessary.

The minimum Operation & Maintenance (O&M) requirements outlined in this document shall be incorporated into the [Organization]'s inspection and maintenance regimen and shall contain specific information for each Best Management Practice (BMP). If a BMP is installed and is not listed in this guidance document, an O&M specification section must be created.

An inspection and maintenance schedule that complies with this O&M plan shall be created. This schedule shall provide for routine examination of all BMPs and incorporate the varying maintenance needs of each BMP. Each BMP-specific O&M sheet shall serve as a checklist for design elements that require inspection, the frequency of inspections, conditions that indicate that maintenance is needed and correlate to the Owner-maintained log book. The O&M plan must be signed by the Owner and notarized using the Owner's certification statement found at the end of the O&M plan.

In cases where there will be a transfer of ownership of a BMP, a copy of the O&M plan must be provided to each new Owner prior to the consummation of a sale, and the O&M plan must be signed by the new Owner, notarized, and kept on record.

Upon completion of project construction, the following O&M procedures shall take effect and be conducted perpetually from the date that construction was completed.

A. Operation And Maintenance Practices

1. O&M plan procedures and practices must be reviewed and assessed annually.
2. Drainage structures and flow restrictors must be inspected and cleaned semi-annually.
3. Volume control BMPs shall be inspected semi-annually and after significant rainfall events exceeding 1.5 inches
4. The Owner shall keep an updated log book documenting the performance of the required O&M activities for perpetuity. Log books must be produced upon the request of a city or MWRD

inspector. In general, the logbook shall note all inspection dates, facility components and BMPs inspected, and any maintenance performed and repairs made. All inspections and maintenance, both routine and emergency, shall be recorded in the logbook.

5. Vegetation shall be maintained on a regular basis.
6. Pest control measures shall be implemented to address insects and rodents.
7. Signage and fencing shall be installed and maintained where necessary to protect property and the public.

B. General Operations and Maintenance Scope

1. Monthly: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

- a. The Owner shall keep an updated log book documenting the performance of the required O&M activities for perpetuity. Log books must be produced upon the request of a city or MWRD inspector. In general, the log book shall note all inspection dates, facility components and BMPs inspected, and any maintenance performed and repairs made. All inspections and maintenance, both routine and emergency, shall be recorded in the log book. The log book shall correlate to the O&M schedule and checklist.
- b. Vegetation shall be maintained on a regular basis.
- c. Pest control measures shall be implemented to address insects and rodents.
- d. Signage and fencing shall be maintained, cleaned and repaired where necessary to protect property and the public.

2. Twice per year: May, Nov

- a. Drainage structures and flow restrictor shall be inspected and cleaned semi-annually.
- b. Volume control BMPs shall be inspected semi-annually and after significant rainfall events exceeding 1.5 inches.

3. Once per year: Jul (or another month with lower traffic)

- a. O&M plan procedures and practices must be reviewed and assessed annually. Assign maintenance personnel specific O&M responsibilities for all onsite BMPs.
- b. Access routes including roadways and sidewalks shall be inspected annually and maintained as needed.

C. Structure Maintenance

Bioretention basins, stormwater structures, and cleanouts are designed so that the structure is accessible for inspection and maintenance. Structure maintenance procedures must meet OSHA confined space entry requirements.

1. Four times per year: Feb, May, Aug, Nov

- a. Inspect drainage and stormwater structures for sedimentation and debris. This includes, but is not limited to, catch basins, pipes, backflow preventers, flow restrictors, cleanouts, surface cisterns, and subsurface vaults.

- b. As needed, use a jetvac system to remove sediment and debris from structures and subsurface vaults when the sediment zone or sedimentation chamber is full as well as from inlet and outlet pipes. Sediment shall be tested for toxicants in compliance with applicable disposal requirements and if any indications of pollution are found. Maintain a photo record of the chamber and main pipes in a manner so as to view the entire length of the chamber.
- c. Remove any floating debris.
- d. Repair structures or equipment that show signs of excessive wear or damage.
- e. Structure access and maintenance procedures must meet OSHA confined space entry requirements.

D. Landscape Maintenance - Rain Gardens, Vegetated Swales, Bioretention Areas and Detention Systems

Properly designed and installed rain gardens, swales, bioinfiltration and detention systems require maintenance similar to traditionally landscaped areas after a successful establishment period (typically three (3) years). During periods of extended drought, these systems may require watering approximately every 10 days. See Plant Maintenance and Tree Care sections herein for other plant based maintenance requirements.

1. Monthly During Growing Season: Apr, May, Jun, Jul, Aug, Sep, Oct

- a. Identify the source of ponding when extended periods of ponding greater than 48 hours occur within the bioretention area.
 - i. Inspect cleanouts to determine if the underdrain or downstream storm line are clogged as evidenced by standing water in the cleanouts to the elevation of the surface ponding in the bioretention area.
 - ii. If no water is standing in the cleanouts, the bioretention surface is clogged. The clogged soil shall be remediated by removing the top one to two inches of bioretention soil until the area drains. Removed soil shall be replaced in November after the growing season ends. Replacement bioretention soil must meet project specifications.
- b. Mow and trim vegetation to ensure safety, aesthetics, proper swale operation, and to suppress weeds and invasive vegetation; mow only when swale is dry to avoid rutting.
- c. Re-seed and/or replant bare areas in accordance with project plans and specifications; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- d. Re-mulch void areas.
- e. Plant alternative grass species in the event of unsuccessful establishment or bare areas measuring larger than 2 feet by 2 feet (4 square feet (SF)).
- f. Remove, as needed, matted organic debris such as large leaves and other layered matter that prevents movement of water into the soil.
- g. Rake accumulated sediment from the rain garden, swale or bioretention surface, taking care to protect plants. Minor accumulations may be raked into the soil.
- h. Remove litter and debris.
- i. Inspect and clear obstructions inlet and outlet pipes as needed.

2. Twice per year: May, Aug

- a. Inspect areas to identify accumulation of sediment and matted organic debris that could seal the surface as well as extended duration of ponding (ponding for more than 24 hours after cessation of rain). Inspections shall be conducted semi-annually and after rainfall events exceeding 1.5".
- b. Inspect trees, shrubs and plants to evaluate health.

3. Once per year: Aug

- a. Inspect and correct erosion problems, damage to vegetation, sediment and debris accumulation, and pools of standing water.
- b. Inspect for uniformity in cross-section and longitudinal slope, correct as needed.
- c. Inspect facility and pretreatment areas for erosion, vegetative conditions, etc.

E. Plant Maintenance

To maintain the property, the Owner shall provide basic maintenance services including the maintenance of trees, shrubs and ornamental perennials. The schedule for maintenance activities shall be designed to promote healthy plant growth and to enhance the natural beauty of these areas. Maintenance will include mowing, weed control, pest management, mulching, pruning, watering and fertilization to ensure healthy, vigorous plant growth.

Like any garden, weeding is one of the most important tasks in maintaining the planting areas. It is important for those weeding these areas to be familiar with the appearance of each plant used in the design and the appearance of each plant in all stages of its growth. As the plants flower and release seed they may begin to grow in new locations. Comparing the location of the plants as observed on site with the planting locations shown on the planting plans will be a valuable aid in learning their identification.

1. Weekly During Growing Season: Apr, May, Jun, Jul, Aug, Sep, Oct

- a. Water plants 2 to 3 times per week during first growing season.
- b. Water plants during dry periods after first growing season.
- c. Weed vigorously during the first 3 years after installation while plants establish and until they can out-compete weeds.

2. Monthly During Growing Season: Apr, May, Jun, Jul, Aug, Sep, Oct

- a. Weeds shall be removed before they are allowed to set seed, at minimum 6 times each growing season. It is preferred to hand-pull weeds, taking care to remove the entire root mass and shake any loose soil back into the planting bed. If herbicide applications are used, care shall be taken to avoid contact with non-weed plants.
- b. Learning the appearance of each species as it opens in the spring, will make it easier to identify new native seedlings and differentiate them from unwanted weeds. Weeds, e.g. unwanted or undesirable plants, shall be pulled before their roots become well established. It is easiest to pull them when the soil is soft after a rain.

- i. It is easiest to pull weeds when the soil is soft after a rain.
 - ii. At a minimum, the flowers of these undesirable species shall be cut and removed before they set seed.
 - iii. As the plantings mature they shall become more robust and the unwanted weeds shall be reduced.
 - iv. Weeding the perennial beds will take approximately 90 minutes for every 1,000 square feet of planting (using a push hoe). The weeding shall be done 3 to 4 times between April and mid-June and on an as-needed basis between mid-June to Nov.
 - v. When uncertain about whether a plant is a weed, it may be helpful to let it grow for a period of time. As the leaves mature it will be easier to match it to the plants that were planted deliberately as part of the design. Maintaining a plant identification chart for all perennials and a common weed identification chart may be helpful.
 - vi. Iowa state university is a good source for weed identification resources. See <http://www.weeds.iastate.edu/mgmt/qtr97-1/weedid.htm>.
- c. Pest management: integrated pest management (IPM) procedures shall be followed to control insects and diseases within shrub and ornamental perennial plant beds. IPM methods shall include establishing action thresholds for certain diseases/pests, monitoring disease/pest levels, developing prevention strategies, and identifying control strategies. Control methods may include mechanical removal (trapping), or highly targeted chemical treatments, such as pheromone applications. Broadcast spraying of non-selective pesticides shall be avoided and used only as a last resort.

3. Once per Year Spring Clean-up: Apr

- a. The spring clean-up shall be performed to remove accumulated winter debris from plant beds, and pavement areas.
- b. Clean up shall include cutting back ornamental grasses and flower stalks from herbaceous plants from the previous season's growth. Clean up shall be completed by April 30 each year.
- c. Spring clean-up shall include the removal of winter protection devices such as tree wrapping and burlap snow fence.
- d. Tree Staking: Inspect installed tree staking or remove tree staking for young trees. Note: trees shall not be staked for more than 1 total calendar year.
- e. When fertilizing is required: shrubs, groundcover, and perennials in plant beds shall be fertilized in the spring. Fertilizer shall be of a 1:1:1 ratio (nitrogen : phosphorus : potassium), and the nitrogen portion shall consist of at least 50% slow release nitrogen. The fertilizer shall be acidic in soil reaction, and shall be applied at a rate of three pounds of nitrogen per 1000 SF.
- f. Cut back non-hardy woody shrubs that incur frequent die-back of stems over the winter shall be pruned back to within 6 to 12 inches from the ground each. This includes plants in the following genuses: *Rosa*, *Spirea*, *Potentilla* and *Diervilla*.

4. Once per year Fall Cleanup: Nov

- a. Remove leaves, branches and spent plant material from plant and cobble bed areas. Winter protection measures as required herein shall also be installed.

- b. All ornamental grasses and certain late-flowering ornamental perennials with decorative seed heads, such as Aster, Echinacea, Rudbeckia, etc. shall be allowed to keep their spent foliage and flower heads through the winter.
- c. Mulching: partially decomposed leaf mulch shall be applied in a 2 inch layer to all bare areas in May of each year.
- d. Tree Staking: Inspect installed tree staking or install tree staking for young trees
 - i. Temporary staking shall be provided to young trees that are vulnerable to wind damage.
 - ii. Staking methods shall include the use of adjustable, flexible tree loops made of plastic, or rubber. Rope and wire can be used as tie-downs, but shall not be in contact with the tree.
 - iii. Once trees are established the staking shall be removed.
- e. Perennials and bulbs, except as identified below, shall be deadheaded after blooming, and spent foliage shall be removed.
- f. All ornamental grasses and certain late-flowering ornamental perennials with decorative seed heads, such as aster, *echinacea*, *rudbeckia*, and *sedum*, shall be allowed to keep their spent foliage and flower heads through the winter. Any remaining vegetation from these plants shall be pruned to the ground in March, or early April and removed.

F. Tree Care

Basic maintenance services shall include the maintenance of trees and shrubs. The schedule for maintenance activities shall be designed to promote healthy tree growth and to enhance the natural beauty of these areas. Maintenance will include pruning, mulching, staking, pest management, and winter protection and repair measures.

1. Monthly: Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

- a. Inspect trees to remove any torn and hanging branches. Branches shall be pruned off with sharp hand saws or loppers.
- b. Inspect for diseased wood and prune as soon as it is observed. To avoid exposure to oak wilt disease, oak trees (all varieties) shall only be pruned when they plants are dormant (between November and March).
- c. Pest management
 - i. Integrated pest management (IPM) procedures shall be followed to control insects and diseases on trees and large shrubs. IPM methods shall include establishing action thresholds for certain diseases/pests, monitoring disease/pest levels, developing prevention strategies, and identifying control strategies. Control methods may include mechanical removal (trapping), or highly targeted chemical treatments, such as pheromone applications.
 - ii. Broadcast spraying of non-selective pesticides shall be avoided and used only as a last resort.

2. Once per year: Dec

- a. Pruning: pruning shall be primarily performed during the winter season between December 1st and March 1st when plants are dormant. Pruning shall be performed to remove diseased or damaged wood and to maintain general form and habit. Any pruning equipment used to remove diseased wood shall be cleaned with a bleach solution before using it on other plants, or non-diseased wood from the same plant. All debris from pruning activities shall be removed and disposed of off-site. Service personnel shall take care to sweep walks and drives after activities are completed. Pruning shall include the following:
 - i. Removal of diseased or damaged wood.
 - ii. Removal of sucker growths at the base of trees.
 - iii. Removal of water sprouts from dormant or adventitious buds on the trunks or main branches of trees.
 - iv. Removal of forked or competing leaders on smaller trees.
- b. Winter protection and repair methods: commercial-grade tree wraps shall be installed on all young trees that are susceptible to sun scald in the winter. This includes plants of the following genera: *Prunus*, *Malus*, *Gleditsia*, *Tilia*, *Acer*, and *Platanus*.
 - i. Tree wraps shall be installed during the fall cleanup in November and removed during the spring cleanup in April.
 - ii. Any sun scald damage occurring to the outer bark of young trees shall be removed with a sharp clean knife.

Each stormwater Best Management Practice (BMP) included in this guidance is defined in the BMP guide sheets found in the City of Chicago Stormwater Ordinance; the particular O&M needs of each BMP are also defined.

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Maintenance Checklist for Bioswales and Rain Gardens

- Refer to the “[Organization] Operations & Maintenance Plan for [Project Name]” for detailed requirements.
- Maintenance of the rain garden, bioswale, or bioretention area is required, at a minimum, twelve (12) times a year and after significant rainfall events exceeding 1.5 inches.

Crew foreman: Date: _____ Time: _____	Maintenance Type: <input type="checkbox"/> Regular (scheduled) <input type="checkbox"/> Emergency/Corrective Action
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List of Rain Gardens and Bioswales Serviced:

Maintenance Items	Completed? (Y/N)	Comments*
Structure Maintenance		
Inspect all drainage and stormwater structures		
Remove sediment and debris, repair if necessary		
Landscape		
Inspect for signs of ponding and identify the source of ponding if applicable		
Mow and trim vegetation		
Re-seed and/or replant bare areas		
Remove matted organic debris, as needed		
Remove accumulated sediment, litter, and debris		
Inspect and clear obstructions inlet and outlet pipes		
Inspect trees, shrubs and plants to evaluate health		
Inspect and correct erosion problems, vegetative conditions, etc.		
Mulch (once per year		
Plant Maintenance		
Water Plants as specified in O&M plan		
Pest Management, if needed		
Weed		
Spring / Fall cleanup as specified in O&M plan		
Tree Care		
Inspect trees to remove any torn and hanging branches		

Tree Care (Continued)		
Inspect for diseased wood and prune as soon as it is observed		
Pest Management, if needed		
Prune (once per year, in winter season)		
Winter protection and repair methods		
Replace Plants, Shrubs and Trees as Necessary		
Additional Comments & Corrective Actions Taken:		

* Include explanation if maintenance is not performed or if further correction action is needed.

Inspection Log for Rain Garden/Bioretention Area

- Refer to the "[Organization] Operations & Maintenance Plan for [Project Name]" for detailed requirements.
- Maintenance of the rain garden, bioswale, or bioretention area is required, at a minimum, twelve (12) times a year and after significant rainfall events exceeding 1.5 inches.
- Fill out one form for each rain garden/bioswale/bioretention area inspected.

Inspector: Date: Time: Time Since Last Rain Event, Rainfall Depth:	Project #: Project Name:
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Rain Garden/Bioretention Area:
General Site Conditions:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)	Comments/Corrective Action, Issue Location
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Vegetation

For mulched area: complete coverage of hardwood mulch		
For seeded or non-mulched area: 90% cover vegetated.		
No more than 25% cover of invasive or weedy species		
All disturbed areas stabilized against erosion		

Surface Infiltration

No accumulation of sediment or debris or signs of sedimentation at inflow areas		
No water ponding 24 hours following rain event		
Check for signs of snow piling over winter		

Drainage Structure and Cleanouts Inspection (if equipped)

No evidence of blockage		
Good condition without need for repair		
Observation wells show water has drained within 72 hours following rain event		

Signage

Check for signage required for the project		
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Additional Comments, Recommendations: