# Chapter 4.0

# OPERATING & MAINTAINING STORMWATER FACILITIES

This chapter presents operation and maintenance (O & M) requirements for the stormwater management facilities in this manual.

## 4.1 INTRODUCTION

This chapter provides the operation and maintenance requirements for stormwater management facilities designed and constructed for flood control, stormwater quality, flow control, and source control compliance continue to function in which they were designed.

This chapter also provides pre-approved operations and maintenance (O & M) Plans for various stormwater management facilities outlined in this manual. Applicants proposing to construct a manufactured treatment device are required to submit an O & M Plan prepared by the manufacturer; the plan must include O & M activities consistent with the requirements of this Chapter.

The O & M strategies in this chapter apply to all types of stormwater management facilities and related facility components identified in **Chapter 2.0**. Facilities that are proposed as flood control only facilities, and that are not required to meet stormwater quality or flow control standards, are not required to submit an O & M packet. However, stormwater flood control facilities are required to be operated and maintained in working condition for the life of the facility.

Sample forms and inpsection logs are provided in **Appendix C**.

## 4.2 PRIVATE FACILITIES

To demonstrate that private facilities required pursuant to EC 9.6791-9.6795 will be properly operated and maintained, applicants must submit an Operation and Maintenance packet (O & M packet) with their development permit application. A complete O & M packet must be approved by the City prior to issuance of the construction permit. An O & M Packet for facilities shall include all of the following:

- A copy of the recorded Notice of Operation & Maintenance Form (O & M Notice, see **Appendix C**;
- The stormwater management site plan detailing the stormwater management for the development must show the location of the stormwater facilities on the site, the sources of runoff entering the facility, and the ultimate stormwater destination. The site plans shall be legible with a font size no smaller than 11 point and a page size no smaller than 8.5 x 11 inches;
- An Operations & Maintenance Plan (O & M Plan, see **Appendix C**);
- The approved landscape plan; and
- A copy of the Stormwater Management Facility Inspection and Maintenance Log.

Copies of the approved O & M packets will be kept by the owner and on file at the Public Works Maintenance Division, 1820 Roosevelt Avenue, Eugene, OR 97402.

### 4.2.1 Notice of Operations & Maintenance Form

The O & M Notice gives notice to existing and future property owners that stormwater runoff from impervious surfaces constructed on the subject premises requires stormwater management facilities that are located, designed, and constructed in compliance with this Manual; and that the owners of the property are required to operate and maintain the facilities in accordance with the approved O & M Plan. Signatures on the O & M Notice must be notarized and the document must be recorded at Lane County Deeds and Records. After the City has reviewed and approved the O & M Notice, it may be submitted to the County for recording either in person or mailed, along with payment of the applicable fees, to the Lane County Clerk's Office, Lane County Deeds and Records, 125 E. 8th Avenue, Eugene, OR 97401. The stormwater management site plan shall be incorporated by reference, yet, not recorded with the Notice of O & M Form.

The property description on the O & M Notice must be a full legal description of the property; a tax lot number cannot be used to describe the property.

The O& M Notice shall be printed on legal-sized (8.5" x 14") paper to facilitate the recording process.

### 4.2.2 Operations & Maintenance Plans

Operations and maintenance plans for all stormwater facilities shall be prepared and included as part of the O & M packet. Each plan shall identify the stormwater facility, operation, maintenance, training, inspection, spill management, and pest control responsibilities. O & M Plans are not recorded with the O & M Notice; this allows the future

owners of the stormwater management facilities to submit O & M activity revisions to the City without the need to re-record the O & M Plan with the County.

***Pre-approved Operations & Maintenance Plans.*** An O & M Plan for the chosen type of stormwater facility must be included in the **O & M Packet** and approved as part of the stormwater management facility construction permit. Pre-approved O & M Plans identifying specific maintenance activities for the facilities approved in **Chapter 2** of this Manual are provided in this chapter. Applicants may either select and use the pre-approved O & M Plans provided in this chapter or prepare an O & M Plan that incorporates the specific activities that corresponds with their chosen type of stormwater facilities.

***Operations & Maintenance Plans for Proprietary Facilities.*** Proprietary Operations & Maintenance plans for approved proprietary facilities must describe the inspection, cleaning, operation and maintenance criteria for the facility.

***O & M Plan Modifications.*** With approval, an O & M Plan may be modified by the facility-owner any time after issuance of the construction permit. The ability to modify the O & M Plan provides facility owners an opportunity to adjust maintenance needs according to site-specific history and conditions. Letters requesting modifications to an existing O & M Plan must be submitted, along with the proposed amended O & M Plan, to the Public Works Department, 1820 Roosevelt Avenue, Eugene, OR 97402. Modification requests must demonstrate that the stormwater facilities will continue to be operated and maintained in compliance with Eugene Code 9.6797.

### 4.2.3 Stormwater Management Facility Inspection and Maintenance Log

Specific operation and maintenance activities for each of the different types of stormwater facilities include inspection as well as maintenance responsibilities. Facility owners must document and keep on file stormwater management facility inspection and maintenance logs. The logs must note all inspection dates, the facility components that were inspected, and any maintenance or repairs made to the facility. The O & M Plans can serve as a checklist for what should be included in the inspection log (*e.g*. the facility elements that need to be inspected, frequency of inspection, conditions that indicate maintenance is needed, *etc.*). See **Appendix C** for a sample **Inspection and Maintenance Log**. Proprietary and manufactured stormwater facility owners are required to submit a stormwater facility maintenance log provided by the proprietor.

### 4.2.4 Enforcement

Pursuant to EC 6.615, stormwater management facilities constructed to comply with the requirements of EC 9.6792-9.6795 and this Manual must be properly operated and maintained for the life of the facility. The Notice of Operations and Maintenance Form will identify the parties responsible for the on-going private operation and maintenance.

Pursuant to Eugene Code 6.615, the City has the right and responsibility to inspect private facilities to assure they are being operated and maintained in accordance with the approved design, the O & M Plan, the Eugene Code and this Manual.

## 4.3 PUBLIC FACILITIES

Public stormwater facilities will be operated and maintained by the City. In accordance with EC 7.145, prior to issuance of the PEPI permit, the owner/developer is required to submit a Performance and Warranty Bond for a period of at least 1 year for all public stormwater facilities. This bond amount shall be calculated as directed in the Public Improvement Design Standards (PIDS) Manual. Operation and maintenance activities will start when the facilities constructed as part of a privately engineered public improvement (PEPI) construction project is placed on warranty.

## 4.4 SOURCE CONTROLS

Source Control measures typically include structural and non-structural controls used to manage potential pollutants at the site and prevent them from entering the City's stormwater system. Structural controls include Spill Control Manholes and lynch-type catch basins. Non-structural controls include street sweeping and other good housekeeping practices.

All required Source Control measures shall be operated, maintained, and inspected annually in compliance with Chapters 6, 7, and 9 as outlined in this manual. Annual inspection logs shall be kept by the owner and made available to City staff upon request.

## 4.5 PRE-APPROVED OPERATIONS AND MAINTENANCE PLANS

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### 4.5.1 Contained Planter O & M Plan

**Contained Planters** are free-standing plant containers placed over impervious surfaces such as patios, sidewalks, and rooftops that intercept and filter rainfall that would otherwise contribute to stormwater runoff from the underlying impervious surface.

Contained Planters may be prefabricated pots of various dimensions or may be constructed in place and have an infinite variety of shapes and sizes. Contained Planters intercept precipitation only, not stormwater runoff from other surfaces. Drainage is allowed through the bottom of the Contained Planter onto the impervious surface.

All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation and 2 times per year thereafter.

**Training and/or Written Guidance** information for operating and maintaining Contained Planters shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the Contained Planter shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the Contained Planter shall be removed.
- **Debris and Litter** shall be removed routinely.
- **Filter Media** consisting of sand and/or topsoil shall be tested to ensure stormwater percolates through the Contained Planter. Water should drain through the planter within 3-4 hours after a storm event. Remove and replace sand and/or topsoil to correct percolation deficiencies.
- **Mulch** shall be replenished at least annually.
- **Planter Walls** shall be examined for deficiencies, such as rot, cracks, and failure, and repaired as needed. Holes that are not consistent with the design and allow water to flow directly through the Contained Planter to the ground shall be plugged.
- **Vegetation** shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Dead vegetation shall be removed to maintain less than 10% of area coverage or when planter function is impaired. Vegetation shall be replaced within a specific timeframe, e.g., 3 months, or immediately, if required to maintain cover density and control erosion where soils are exposed. Vegetation, large shrubs or trees that limit access or interfere with the Contained Planter operation shall be pruned or removed. Fallen leaves and debris from deciduous plant foliage shall be removed. Nuisance and prohibited vegetation shall be removed when discovered.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.2 Eco-Roof O & M Plan

**Eco-Roofs** are lightweight vegetated roof systems used in place of conventional roofs. Eco-Roofs provide stormwater management by capturing, filtering, and, depending on the season, evapo-transpirates 10 to 100 percent of the precipitation while providing aesthetic and energy conservation benefits.

All facility components, including the growth medium, vegetation, drains, membranes, and roof structure shall be inspected for proper operations, integrity of the waterproofing, and structural stability throughout the life of the Eco-Roof. All elements shall be inspected once a month from April through September.

**Aesthetics** of the Eco-Roof shall be maintained as an asset to the property owner and community. Evidence of damage or vandalism shall be repaired and accumulation of trash or debris shall be removed upon discovery.

**Training and/or Written Guidance** information for operating and maintaining Eco-Roofs shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the Eco-Roof shall be safe and efficient. Walkways shall be clear of obstructions.
- **Debris and Litter** shall be removed to prevent clogging of drainage and damaging plant growth. Fallen leaves and debris from deciduous plant foliage shall be removed.
- **Growing Medium** shall be inspected for evidence of erosion from wind or water. If erosion channels are evident, they shall be stabilized with additional soil substrate/growth medium and covered with additional plants.
- **Structure Components** shall be operated and maintained in accordance with manufacturer's requirements. Drain inlets shall be kept unrestricted. Inlet pipe shall be cleared when sedimentation, vegetation, debris or other materials clog the drain inlet. Sources of sediment and debris shall be identified and corrected. Determine if drain inlet pipe is in good condition and correct as needed.
- **Vegetation** shall be maintained to provide 90% plant cover. During the Establishment Period, plants shall be replaced once per month as needed. During the long-term period, dead plants shall generally be removed and replaced once per year in the Fall months. Weeding shall be manual without the use of herbicides or pesticides. Weeds shall be removed regularly and not allowed to accumulate. Only non-chemical fertilizers may be used, if necessary. During drought conditions, mulch or shade cloth may be applied to prevent excess solar damage and water loss. Mowing of grasses shall occur as needed. Clippings shall be removed.

**Irrigation** can be accomplished either through hand watering or automatic sprinkler systems. If automatic sprinklers are used, manufacturer's instructions for operations and maintenance shall be followed.

- During the Establishment Period (2 years), water sufficiently to assure plant establishment and not to exceed ¼ inch of water once every 3 days shall be applied.
- During the long-term period (2+ years), water sufficiently to maintain plant cover and not to exceed ¼ inch of water once every 14 days shall be applied.

**Spill Prevention Measures** from mechanical systems located on Eco-Roofs shall be exercised when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.3 Permeable Pavement O & M Plan

**Permeable Pavements** are pervious and porous load bearing structures with an underlying stone reservoir that temporarily stores and filters surface runoff before infiltrating into the subsoil or being collected in underlying drain pipes and being discharged off-site. Permeable Pavements include, but are not limited to, pervious concrete, asphalt, plastic rings planted with grass, stone and block pavers. The system generally consists of a permeable wearing course surface placed upon layered permeable base materials.

All facility components shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining Permeable Pavement shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the Permeable Pavements shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the Porous Pavement shall be removed.
- **Pavement Surfaces** shall be kept clean and free of leaves, debris, and sediment. The surface shall not be overlaid with an impermeable paving surface. Regular sweeping shall be implemented for porous asphalt or concrete systems.
- **Overflows or Emergency Spillways** are used in the event that the facility's infiltration capacity is exceeded. Overflow devices shall be inspected for obstructions or debris, which shall be removed upon discovery. Overflow or emergency spillways shall be capable of transporting high flows of stormwater to an approved stormwater receiving system. Sources of erosion damage shall be identified and controlled when native soil is exposed near the overflow structure.
- **Vacuuming** of the facility shall be provided to remove fine particulate matter than will degrade the performance of the facility over time.
- **Vegetation** such as trees and shrubs, should not be located in or around the Permeable Pavement because roots from trees can penetrate the pavement, and leaves from deciduous trees and shrubs can increase the risk of clogging the surface. Vegetation and large shrubs/trees that limit access or interfere with Porous Pavement operation shall be pruned.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Release of pollutants on Permeable Pavements shall be corrected as soon as identified.

A spill prevention plan shall be implemented at all non-residential sites and in areas where there is likelihood of spills from hazardous materials. However, virtually all sites, including residential and commercial, present potential danger from spills. All homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, solvents, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.4 Tree Credit O & M Plan

**Trees** intercept precipitation and hold water on the leaves and branches and allow it to evaporate, retain runoff and dissipate the energy of runoff. They also provide shade, providing two direct benefits. First, hard surfaces are protected from direct solar exposure, which reduces heat gain. The less heat gain there is in pavement, the less heat is absorbed by stormwater as it flows over the surface. Second, by shading pavement, the trees help reduce or minimize air temperature increases caused by the hot pavement. Cooler air may help prevent stream temperature increases associated with air temperatures.

These functions are most measurable for storms of less than 0.5 inches over 24 hours. While deciduous trees are not as effective during winter months, evergreen trees are effective year round for these smaller storms and portions of larger storms. Generally, large trees with small leaves are the most efficient rainfall interceptors. Trees also facilitate stormwater infiltration and groundwater recharge.

Trees used to meet stormwater management requirements shall be kept on a site and maintained properly to ensure continued stormwater benefits. Trees shall be inspected 2 times a year and within 48 hours of a major wind or storm event.

**Inspection Logs** shall be kept by the Tree owner demonstrating the following items have been inspected and are being maintained properly:

- **Dead Trees** shall be removed and replaced with a comparable. The replacement Tree shall be a minimum of 6' tall at planting.
- **Dead Vegetation** shall be pruned from the Tree on a regular basis.
- **Poisonous and Nuisance Vegetation** around the Tree shall be removed when discovered.
- **Protection** of the Tree trunk and roots shall ensure Tree survival. Care should be taken when digging near Tree roots.

**Irrigation** shall be implemented during the establishment period to ensure Tree survival. Hand watering is preferred, but a drip-irrigation system may be used.

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### 4.5.5 Filter Strip O & M Plan

**Filter Strips** are gently sloped vegetated or grassed areas that stormwater runoff is directed to flow over and filter through. Stormwater enters the filter as sheet flow from an impervious surface or is converted to sheet flow using a level spreader. Pollutants are removed through filtration and sedimentation.

All facility components and vegetation shall be inspected for proper sheet flow and stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining vegetated filters shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the filter strip shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Channelization** and causes for altered water flow shall be identified and corrected upon discovery. Stormwater should exit the vegetative filter as sheet flow, unless a collection drainpipe is used.
- **Debris and Litter** shall be removed to prevent channelization, clogging, and interference with plant growth. Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- **Erosion Damage** shall be identified and controlled when native soil is exposed or erosion channels are forming.
- **Inlets** shall be cleared when conveyance capacity is plugged to ensure unrestricted stormwater flow to the vegetated filter.
- **Level Spreaders** shall allow water to exit as sheet flow.
- **Nuisance and Prohibited Vegetation** from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- **Outlet**s shall be cleared when 50% of the conveyance capacity is plugged.
- **Sedimentation** build-up near or exceeding 2" in depth shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- **Vegetation** shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Dead vegetation shall be removed to maintain less

than 10% of area coverage or when vegetative filter function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.6 Pond O & M Plan

**Ponds** are constructed ponds with a permanent pool of water. Pollutants are removed from stormwater through gravitational settling and biologic processes. Extended Wet Ponds are constructed ponds with a permanent pool of water and open storage space above for short-term detention of large storm events. Pollutants are removed from stormwater through gravitational settling and biologic processes. Dry Detention Ponds are constructed ponds with temporary storage for the detention of large storm events. The stormwater is stored and released slowly over a matter of hours.

All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. Gauges located at the opposite ends of the wet pond shall be maintained to monitor sedimentation. Gauges shall be checked 2 times per year. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining Ponds shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to Ponds shall be safe and efficient. Vehicular routes shall be maintained to design standards to accommodate size and weight of vehicles. Obstacles preventing maintenance personnel and/or equipment access shall be removed.
- **Debris and Litter** shall be removed to prevent channelization, clogging, and interference with plant growth. Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- **Erosion Damage** shall be identified and controlled when native soil is exposed or erosion channels are forming.
- **Inlets** shall be cleared when conveyance capacity is plugged to ensure unrestricted stormwater flow to the wet pond.
- **Nuisance or Prohibited Vegetation** from the Eugene Plant List (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- **Outlets and Overflow Structures** shall be cleared when 50% of the conveyance capacity is plugged.
- **Piping** shall be examined and re-installed if more than 1-inch of settlement. Remove sediment deposits to maintain flow capacity.
- **Rocks or Other Armoring** shall be replaced when only one layer of rock exists above native soil.

- **Sedimentation** build-up near or exceeding 50% of the facility capacity shall be removed every 2-5 years, or sooner if performance is being affected. Wet Ponds shall be dredged when 1 foot of sediment accumulates in the pond.
- **Slopes** shall be stabilized using appropriate measures when native soil is exposed.
- **Vegetation** shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion and minimizing solar exposure of open water areas. Vegetation producing foul odors shall be eliminated. Dead vegetation shall be removed to maintain less than 10% of area coverage or when wet pond function is impaired. Vegetation shall be replaced within 3 months, or immediately if required to maintain cover density and control erosion where soils are exposed. Vegetation, large shrubs or trees that limit access or interfere with wet pond operation shall be pruned or removed. Grass (where applicable) shall be mowed to 4"-9" high and grass clippings shall be removed.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified. Gravel or ground cover shall be added if erosion occurs, e.g., due to vehicular or pedestrian traffic.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

- If a complaint is received or an inspection reveals that the pond is significantly infested with mosquitoes or other vectors, the property owner/owners or their designee will be required to eliminate the infestation. Control of the infestation shall be attempted by using first non-chemical methods and secondly, only those chemical methods specifically approved by the City.
- Acceptable methods include but are not limited to the following:
    - Installation of predacious bird or bat nesting boxes.
    - Alterations of pond water levels approximately every four days in order to disrupt mosquito larval development cycles.
- If non-chemical methods have proved unsuccessful, contact the City inspector prior to use of chemical methods such as the mosquito larvicides Bacillus thurengensis var. israeliensis or other approved larvacides. These materials may only be used with City inspector approval if evidence can be provided that these materials will not migrate off-site or enter the public stormwater system. Chemical larvicides shall be applied by a licensed individual or contractor.

### 4.5.7 Rain Garden O & M Plan

**Rain Gardens** are vegetated surface reservoirs used to collect and treat stormwater runoff from impervious surfaces by allowing the pollutants to settle and filter out as the water percolates through vegetation and soil mediums before infiltrating into the ground below or being piped to its downstream destination.

Rain Gardens can be used to help fulfill a site's required landscaping area requirement and should be integrated into the overall site design. Numerous design variations of shape and planting scheme can be used to fit the character of a site.

The reservoir basin shall infiltrate stormwater within 24 hours. All facility components and vegetation shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining vegetated infiltration basins shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to Rain Gardens shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Debris and Litter** shall be removed to prevent channelization, clogging, and interference with plant growth. Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- **Erosion Damage** shall be identified and controlled when native soil is exposed or erosion channels are forming.
- **Grassed Rain Gardens** shall be mowed to 4"-9" high and grass clippings shall be removed no less than 2 times per year.
- **Infiltrating Rain Gardens** shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates.
- **Inlets** shall be cleared when conveyance capacity is plugged to ensure unrestricted stormwater flow to the rain garden.
- **Mulch** shall be replenished as needed to ensure healthy plant growth.
- **Nuisance and Prohibited Vegetation** from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- **Outlets** shall be cleared when 50% of the conveyance capacity is plugged.
- **Overflows** shall be cleared when 25% of the conveyance capacity is plugged.

- **Rocks or Other Armoring** shall be replaced when only one layer of rock exists above native soil.
- **Sedimentation** build-up near or exceeding 2" in depth shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- **Slopes** shall be stabilized using appropriate measures when native soil is exposed.
- **Vegetation** shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetative filter function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.8 Sand Filter O & M Plan

**Sand Filters** consist of a layer of sand in a structural box used to trap pollutants. The water filters through the sand and then infiltrates into the ground or has an underdrain system that conveys the filtered stormwater to a discharge point.

All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, and 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining Sand Filters shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the Sand Filter shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the facility shall be removed.
- **Debris and Litter** shall be removed to ensure stormwater infiltration and to prevent clogging. Debris in quantities more than 1 cu ft or sufficient to inhibit operation shall be removed upon discovery. Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- **Erosion Damage** shall be identified and controlled when native soil is exposed or erosion channels are forming.
- **Infiltrating Sand Filters** shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates.
- **Inlet** shall allow water to uniformly enter the Sand Filter as calm flow, in a manner that prevents erosion. Clear sediment and debris when 40% of the conveyance capacity is plugged.
- **Nuisance or Prohibited Vegetation** from the Eugene Plant List (such as blackberries or English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed.
- **Piping** shall be cleared of sediment and debris to maintain conveyance capacity.
- **Sedimentation** shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- **Structural Deficiencies** in the Sand Filter box including rot, cracks, and failure shall be repaired upon discovery. Holes that are not consistent with the design structure and allow water to flow directly through the Sand Filter to the ground shall be filled. Rocks or other armament shall be replaced when sand is exposed and eroding from wind or rain.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.9 Stormwater Planter O & M Plan

**Stormwater Planters** are infiltration and filtration stormwater facilities that can provide flood control, flow control and stormwater quality benefits. Stormwater Planters are walled vegetated surface reservoirs used to collect and treat stormwater runoff from impervious surfaces by allowing pollutants to settle and filter out as the water percolates through the vegetation and soil mediums before infiltrating into the ground below or being piped to its downstream destination.

Stormwater Planters can be used to help fulfill a site's required landscaping area requirement and should be integrated into the overall site design. Numerous design variations of shape and planting scheme can be used to fit the character.

All facility components and vegetation shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining Stormwater Planters shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to Stormwater Planters shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Debris and Litter** shall be removed to prevent channelization, clogging, and interference with plant growth. Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- **Erosion Damage** shall be identified and controlled when native soil is exposed or erosion channels are forming.
- **Filter Media** consisting of sand and/or topsoil shall be tested to ensure stormwater percolates through the planter. Remove and replace sand and/or topsoil to correct percolation deficiencies.
- **Infiltrating Stormwater Planters** shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates. Water should drain through the planter within 3-4 hours after a storm event.
- **Inlets** shall be cleared when conveyance capacity is plugged to ensure unrestricted stormwater flow to the rain garden.
- **Mulch** shall be replenished as needed to ensure healthy plant growth.
- **Nuisance and Prohibited Vegetation** from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive

vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.

- **Outlets** shall be cleared when 50% of the conveyance capacity is plugged.
- **Piping** shall be cleared of sediment and debris to maintain conveyance capacity.
- **Planter Walls** shall be examined for deficiencies, such as rot, cracks, and failure, and repaired as needed. Holes that are not consistent with the design and allow water to flow directly through the planter to the ground shall be plugged.
- **Sedimentation** build-up near or exceeding 2" in depth shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- **Vegetation** shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetative filter function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.10 Swale O & M Plan

Swales are filtration stormwater conveyance facilities that provide flow control and stormwater quality benefits. Swales are long and narrow vegetated and grassed depressions used to collect and convey stormwater runoff which allows pollutants to settle and filter out as the water flows through the facility.

All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability, at a minimum, quarterly for the first 2 years from the date of installation, 2 times per year thereafter, and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining Swales shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to Swales shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Channelization** and causes for altered water flow shall be identified and corrected upon discovery. Stormwater should exit the vegetative filter as sheet flow, unless a collection drainpipe is used.
- **Debris and Litter** shall be removed to prevent channelization, clogging, and interference with plant growth. Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- **Erosion Damage** shall be identified and controlled when native soil is exposed or erosion channels are forming.
- **Grassed Swales** shall be mowed to 4”-9” high and grass clippings shall be removed no less than 2 times per year.
- **Infiltrating Swales** shall be excavated and cleaned, and gravel or soil shall be replaced to correct low infiltration rates. The Swale should drain within 48 hours of a storm event.
- **Inlets** shall maintain a calm flow of water entering the Swale and shall be cleared when conveyance capacity is plugged to ensure unrestricted stormwater flow to the rain garden.
- **Mulch** shall be replenished as needed to ensure healthy plant growth.
- **Nuisance and Prohibited Vegetation** from the Eugene Plant List (such as blackberries and English Ivy) shall be removed when discovered. Invasive vegetation contributing up to 25% of vegetation of all species shall be removed and replaced.
- **Outlet**s shall be cleared when 50% of the conveyance capacity is plugged.

- **Sedimentation** build-up near or exceeding 2" in depth shall be hand-removed with minimum damage to vegetation using proper erosion control measures. Sediment shall be removed if it is more than 4 inches thick or so thick as to damage or kill vegetation.
- **Slopes** shall be stabilized to prevent erosion and failure using appropriate measures when native soil is exposed.
- **Vegetation** shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Dead vegetation shall be removed to maintain less than 10% of area coverage or when vegetative filter function is impaired. Vegetation shall be replaced immediately to control erosion where soils are exposed and within 3 months to maintain cover density.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

### 4.5.11 Spill Control Manhole O & M Plan

**Spill Control Manholes** are source control devices specific to controlling oil releases. Spill Control Manholes rely on passive mechanisms that take advantage of oil being lighter than water. Oil floats to the surface and is periodically removed. Spill Control Manholes are simple underground manhole designs with a "T" outlet designed to trap small spills. Spill Control Manholes must be used in conjunction with other water quality systems to meet stormwater quality requirements.

The Spill Control Manhole shall be inspected and cleaned quarterly.

**Training and/or Written Guidance** information for operating and maintaining Spill Control Manholes shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to Swales shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Absorbent Pillows and Pads** (where applicable) absorbing oil from the separation chamber shall be replaced at least twice a year, in the spring and fall, or as necessary to retain oil-absorbing function.
- **Cleaning** shall be done without use of detergents or surfactants. A pressure washer may be used if necessary.
- **Debris/Sediment** that is found to clog the inlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.
- **Holes** in the ground located in and around the manhole shall be filled.
- **Inlet Pipe** shall be inspected for clogging or leaks where it enters the manhole during every inspection and cleanout.
- **Manhole Chamber** shall be inspected for cracks or damage during each inspection.
- **Outlet Pipe** shall be inspected for clogging or leaks where it exits the manhole. Cleaning shall be done in a manner to minimize the amount of trapped oil entering the outlet pipe. If there is a valve on the outlet pipe it shall be closed otherwise the outlet will be plugged prior to cleanout.
- **Water and Oil** shall be removed, tested, and disposed of in accordance with regulations. Grit and sediment that has settled to the bottom of the chamber shall be removed during each cleaning.
- **Vegetation** such as trees should not be located in or around the Spill Control Manhole because roots can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging. Large shrubs or trees that are

likely to interfere with manhole operation shall be identified at each inspection and removed.

**Source Control Measures** typically include structural and non-structural controls. Non-structural controls can include street sweeping and other good housekeeping practices. Source Control measures shall be maintained and documented.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

Spill Prevention procedures require high-risk site users to reduce the risk of spills. However, virtually all sites, including residential and commercial, present dangers from spills. Homes contain a wide variety of toxic materials including gasoline for lawn mowers, antifreeze for cars, nail polish remover, pesticides, and cleaning aids that can adversely affect storm water if spilled. It is important to exercise caution when handling substances that can contaminate stormwater.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

## 4.5.12 Structural Detention Facility O & M Plan

**Structural Detention Facilities** are flow control devices. Structural detention facilities include tanks, vaults, and oversized pipes designed to fill with stormwater during large storm events and slowly release the runoff over a number of hours. There are numerous components to each system; inlet pipes conveying stormwater into the detention facility, detention chambers storing stormwater during storm events, and outlet drains restricting the flow out of the detention chamber.

Underground Structural Detention Facilities shall be inspected quarterly and within 48 hours after each major storm event.

**Training and/or Written Guidance** information for operating and maintaining Detention Facilities shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the detention facility shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Debris/Sediment** that is found to clog the inlet shall be removed, tested, and disposed of in accordance with applicable federal and state requirements.
- **Detention Chamber** shall be cleaned out yearly or after an inch of sediment has accumulated and inspected for cracks or damage. Grit and sediment that has settled to the bottom of the chamber shall be removed during each cleaning. Cleaning shall be done without use of detergents or surfactants. A pressure washer may be used if necessary.
- **Inlets** shall be cleared when conveyance capacity is plugged to ensure unrestricted stormwater flow.
- **Outlets** shall be cleared when 50% of the conveyance capacity is plugged.
- **Vegetation** such as large shrubs or trees that are likely to interfere with detention facility operation shall be identified at each inspection then removed.

**Spill Prevention Measures** shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

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### 4.5.13 Drywell O & M Plan

**Drywells** are structural subsurface facilities with perforated sides or bottom, used to inject stormwater runoff into the ground. **Drywells** systems consist of concrete or plastic manhole section with many small holes in the sides to allow stormwater to infiltrate into the surrounding soil.

The Drywell system shall be inspected and cleaned quarterly and within 48 hours after each major storm event. Ponding around the catch basins or sedimentation manhole or drywell lids may indicate that the drywell is failing due to siltation, or the clogging of the sediment pores surrounding the Drywell.

**Training and/or Written Guidance** information for operating and maintaining drywell systems shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the Drywell shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Debris/Sediment** that is found to clog the pipe shall be removed and disposed of in accordance with applicable federal and state requirements.
- **Failing Drywells** shall be repaired and/or replaced.
- **Shut-Off Valve or Flow-Blocking Mechanism** may have been required with the construction of the drywell to temporarily prevent stormwater from flowing into it, in the event of an accidental toxic material spill. This may also involve mats kept on-site that can be used to cover inlet drains in parking lots. The shut-off valve shall remain in good working order, or if mats or other flow-blocking mechanisms are used, they shall be kept in stock on-site.
- **Vegetation** such as trees should not be located in or around the drywell because roots from trees can penetrate the unit body, and leaves from deciduous trees and shrubs can increase the risk of clogging the intake pipe. Large shrubs or trees that are likely to interfere with operation will be identified at each inspection and removed.

**Spill Prevention Measures** shall be exercised when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.

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## 4.5.14 Soakage Trench O & M Plan

**Soakage Trenches** are infiltrating flood control devices. Soakage Trenches are linear excavations backfilled with sand and gravel injecting stormwater runoff into the ground recharging groundwater. There are various components within the system – inlet piping, aggregate storage basin and perforated piping. The trench surface may be covered with grating, stone, sand, or a grassed cover with a surface inlet and may also be installed under hard surfaces such as driveways.

All facility components, vegetation, and source controls shall be inspected for proper operations and structural stability. These inspections shall occur, at a minimum, quarterly for the first two years from the date of installation, then two times per year afterwards, or within 48 hours after each major storm.

**Training and/or Written Guidance** information for operating and maintaining Soakage Trenches shall be provided to all property owners and tenants. A copy of the O & M Plan shall be provided to all property owners and tenants.

**Inspection Logs** shall be kept by the facility owner demonstrating the following items have been inspected and are being maintained properly:

- **Access** to the Soakage Trench shall be safe and efficient. Obstacles preventing maintenance personnel and/or equipment access to the components of the facility shall be removed.
- **Algae Growth** located on top of the soakage trench should be removed and disposed of properly.
- **Debris/Sediment** that is found to clog the pipe shall be removed and disposed of in accordance with applicable federal and state requirements.
- **Failing Soakage Trenches** shall be repaired and/or replaced if water is noticed on top of trench within 48 hours of a major storm.
- **Piping** shall be cleared of sediment and debris to maintain conveyance. If piping is clear of sediment and debris and yet conveyance is poorly maintained, fabric around the pipe shall need replacing.
- **Shut-Off Valve or Flow-Blocking Mechanism** may have been required with the construction of the drywell to temporarily prevent stormwater from flowing into it, in the event of an accidental toxic material spill. This may also involve mats kept on-site that can be used to cover inlet drains in parking lots. The shut-off valve shall remain in good working order, or if mats or other flow-blocking mechanisms are used, they shall be kept in stock on-site.
- **Sediment** in the aggregate obstructing storage and infiltration shall be excavated and replaced.
- **Vegetation** such as trees should not be located in or around the soakage trench because roots from trees can penetrate the unit body, and leaves from deciduous

trees and shrubs can increase the risk of clogging the intake pipe. Large shrubs or trees that are likely to interfere with operation will be identified at each inspection and removed.

**Spill Prevention Measures** shall be exercised on site when handling substances that contaminate stormwater. Releases of pollutants shall be corrected as soon as identified.

**Non-Chemical Pest Control** measures shall be taken to prevent development of insects, mosquitoes, and rodents.