CITY OF POULSBO

STORMWATER FACILITY MAINTENANCE MANUAL

FOR USE BY PRIVATE AND PUBLIC STORMWATER DRAINAGE FACILITIES

Revision July-1-2022

This revision incorporates major revisions to all chapters, largely comprised of condensing and streamlining information. Inspection and maintenance checklists were also revised and placed at the end of the document, to make checklists easily printable for use. Defect codes for checklists were removed. Very minor revisions to maintenance standards and requirements were made to make standards consistent with the 2019 Stormwater Management Manual for Western Washington.

The City of Poulsbo
acknowledges the following jurisdictions
for providing resource material for portions of this manual:

King County
Pierce County
Clark County
Washington Department of Ecology
City of Federal Way
City of Olympia
City of Port Orchard
City of Bremerton

Table of Contents

1.0 Introduction

1.1 Background

The City of Poulsbo's Municipal Code (PMC) Chapter 13.17 requires private property owners to inspect and maintain their stormwater facilities to ensure that the system does not lose its capacity to manage stormwater. This manual is designed to assist private stormwater facility owners in identification, inspection, and maintenance of their facilities in order to comply with PMC Chapter 13.17. Stormwater facilities include landscape and structural components that convey, filter, infiltrate, slow, and/or retain stormwater runoff. At a minimum, a private stormwater facility will usually include conveyances, such as pipes or ditches, as well as catch basins. Other common stormwater facilities include wet and dry ponds, ditches, biofiltration swales, and detention vaults.

1.2 Using This Manual

This manual is organized to help stormwater facility owners develop their own stormwater maintenance plan. Use **section two** to learn about the types of stormwater facilities. **Section three** will aid in development of an inspection and maintenance plan, including performing in-house work and hiring a contractor. To execute an inspection and maintenance program, use **section four** to identify your stormwater facility components. Each facility type in section four contains a brief description of the type of facility, illustrations, key operations and maintenance considerations, and a link to the applicable inspection and maintenance checklist found in **section five**. The inspection and maintenance checklists are designed to be printable and used by facility owners for tracking inspections. For proprietary stormwater facilities, refer to that unit's Operation and Maintenance manual for additional information and the manufacturer's inspection and maintenance forms.

2.0 Stormwater Management Facilities

2.1 Types of Stormwater Facilities

Stormwater facilities, sometimes called “storm drains” or “storm drainage systems”, convey, detain, filter, and/or control stormwater. These components work together to reduce the impacts of development on the environment and provide a safe method to convey stormwater to local waterways. Different facility types have different maintenance requirements. The three main types of stormwater facilities are collection/conveyance, stormwater quantity control (detention/retention), and stormwater quality control (treatment).

Collection and Conveyance Systems

Collection and conveyance systems intercept and transport stormwater. They typically consist of inlets (catch basins) that collect water and convey it to pipes or open channels (ditches). Stormwater conveyance systems are designed to provide capacity for a specific maximum flow rate. Typical failures include reduced capacity due to sediment and large debris clogging surface grates or pipes. Reduced conveyance system capacity results in localized flooding and possible property damage. Inlets also provide some stormwater quality control (treatment) by providing a sump for sediments and oils to collect in; however, lack of maintenance of these structures results in the discharge of pollutants from the property.

Stormwater Quantity Control (Flow Control, Detention, Retention)

Stormwater quantity control facilities slow down stormwater flow discharged to the environment from developed sites. Impervious surfaces, such as roads, roofs, and lawns, quicken the rate of stormwater runoff into natural streams which can create flooding. Stormwater quantity control facilities mitigate the increased runoff by providing temporary storage and controlling the release rate from the site to prevent flooding and erosion. Detention and retention facilities may be designed as ponds or underground facilities.

Retention facilities are typically located in areas where water soaks easily into the ground. Retention facilities provide temporary storage while allowing the water to soak into the ground, mimicking natural conditions. There is typically no release of stormwater to other pipes or water bodies in retention facilities.

Stormwater Quality Control (Treatment)

Stormwater quality control systems provide limited stormwater treatment through a combination of filtration, sediment settling, plant nutrient uptake, and/or physical separation. The most common treatment systems include biofiltration swales, filter strips, wet ponds, and sand filters. There are also proprietary structural treatment systems, including Stormfilters®, oil/water separators, and Vortech® treatment units. Stormwater treatment facilities are designed to help remove pollutants such as oils, chemicals, metals, and sediment from stormwater runoff prior to being discharged from the property. Stormwater treatment facilities have a limited pollutant removal capability and are not intended to replace source control best management practices (BMPs), maintenance of other stormwater treatment components, good housekeeping, or spill prevention and clean-up. The most effective technique for reducing pollutant discharge from the site is to provide good housekeeping through source control Best Management Practices (BMPs) as provided in "Volume IV – Source Control BMPs" of the Department of Ecology Stormwater Management Manual for Western Washington. A link to the on-line manual can be accessed from:

http://www.ecy.wa.gov/programs/wq/stormwater/municipal/StrmwtrMan.html

Swales and ponds also provide limited stormwater treatment by settling out particles, chemically binding sediment to pollutants, and biologically converting pollutants to less harmful compounds. However, swales and ponds do not provide universal treatment of all pollutants. The rate of pollutant treatment can be affected by a number of variables including pond maintenance, location, surrounding vegetation, flow rates, soil type, and seasons.

3.0 Creating an Inspection and Maintenance Plan

3.1 Overview

The City sends a reminder notice of inspection and maintenance requirements to owners of private stormwater facilities every year. Stormwater facility inspection and maintenance, as well as the report with signatures of the owner/managing agent and service provider, must be turned into the city by ***September 15th of each year***. The annual *Private Drainage Facility Inspection & Maintenance Report* form, this manual, and other resource information are available by request and from the Public Works Stormwater pages on the City's website at: **https://cityofpoulsbo.com/public-works-stormwater-quality/**. The City of Poulsbo will perform spot checks to evaluate the effectiveness of the program and property owner compliance.

To assist in identification of stormwater facility components, refer to the descriptions and drawings in Section 4 of the manual. By request, City staff are available to help identify stormwater facility components.

IMPORTANT SAFETY WARNING

Use caution when entering or working around any stormwater facility component as some stormwater facilities may be considered confined spaces, and therefore subject to confined space entry laws (WAC 296-809). **Never stick your head or any part of your body into a manhole or other type of confined space.** Use a flashlight to look into confined spaces and check sediment depths using a pole or broom handle. Property owners are ultimately responsible for the safety of all persons performing confined space entry work on their property, including in-house and vendor personnel. This includes identifying enclosed spaces that require a certified person for inspection and maintenance.

3.2 Inspection and Maintenance

Inspection and maintenance of non-confined spaces may be performed by in-house personnel or by a vendor/contractor. A list of stormwater service providers is available on the City's website. The listed providers are **not** endorsed by the City, and it is not required to use a listed provider. Service providers may not inspect or maintain all types of stormwater facilities and depending on the components of your stormwater facility you may need to hire multiple contractors/vendors. Some activities, such as litter removal, mowing and sediment estimating, can be effectively performed in-house. However, it may be worth the cost to have a professional inspect and maintain more complicated stormwater facility structures. Re-seeding stormwater ponds, correcting soil

erosion, and sediment removal from drainage structures are examples of tasks that may require an experienced contractor and specialized equipment.

Refer to this manual for descriptions of the maintenance standard for each component and how to recognize defects. The manufacturer's inspection and maintenance forms should be used for proprietary systems. Submit a copy of completed proprietary system form(s) **with** the *City of Poulsbo Inspection & Maintenance Report*.

3.3 Hiring a Contractor

Hiring a contractor may be required for more complicated stormwater inspection and maintenance tasks or stormwater structures that are considered confined spaces. Different contractors may have different specialties, though there is an increasing number of contractors who specialize in stormwater facility maintenance. Landscape maintenance contractors can typically perform routine maintenance for stormwater ponds. Less frequent and more specialized maintenance tasks may require an earthwork contractor or vactor company. For stormwater facilities with several and/or specialized components, it may be advantageous and cost efficient to enter into an annual maintenance agreement where the contractor monitors the stormwater facility and provides routine maintenance as needed. The following guidelines may help private facility owners select a suitable contractor for their specific stormwater facility:

- Identify and understand all components of a stormwater facility in order to obtain an accurate bid.
- Ask contractors for references of persons/entities they have performed similar work for.
- Compare quotes from multiple contractors. Some may offer free written estimates. Be sure everyone is bidding on the same exact scope of work and including the exact materials needed for maintenance.
- Contractors may perform work on an hourly time-and-materials, cost-plus, or fixed-price basis. Although fixed prices are often quoted as more expensive, it may offer the best price if inspection and maintenance take longer than expected.
- Completely review and understand the contract prior to authorizing work.

MAINTENANCE TASK	CONTRACTOR SPECIALTY
Sediment removal from catch basins, control structures, and underground detention vaults	Vactor truck contractor
Cleaning or maintaining pervious pavement	Vacuum sweeper contractor
Repairing stormwater filter vault or replacing stormwater filters	A contractor that is licensed to work with the specific filter system type
Removing vegetation, debris, sediment, or conducting other maintenance in a stormwater pond	A contractor that specializes in stormwater ponds; a general landscaper is usually adequate for mowing maintenance
Maintaining a biofiltration swale	A contractor that works with biofiltration swales
Identifying unknown pipe blockages or pipe direction	A contractor that has camera equipment and ability to do video inspections
Maintenance of any structure that has limited/ restricted entry or exit and not designed for human occupancy	Contractor that is trained and certified to enter confined spaces. ***Identifying confined spaces is ultimately the property owner's responsibility***

3.4 Performing Maintenance In-House

Inspection and maintenance of some stormwater structures may be performed in-house by property owners, managers, or employees. Use caution when entering or working around any stormwater facility component and conform to confined space laws. Depending on the type of facility, some of the following tools may be needed to perform inspections:

TASK	RECOMMENDED OR REQUIRED TOOLS
General	Flashlight, flathead screwdriver, Phillips screwdriver, shovel, trash rake (4/5 prong), trash can, vise-grip pliers, 10” wrench, 15” wrench
Opening Manhole Cover	½” Allen wrench
Opening stuck lids/grates	crowbar / long bar, hammer
Measuring sediment depths	measuring rod (an 8-foot length of aluminum conduit marked at 1-foot intervals works well for most systems), tape or chalk
Measuring storage space/sediment depths	12-foot tape measuring tape or rod
Lifting grates/lids	manhole cover hook
Inspecting from above ground	mirror on a long handle
Probing catch basins; moving heavy objects	straight-pointed bar

3.6 Certification and Submittals of Annual Reports

After inspection and maintenance of the stormwater facility, complete the *Private Drainage Facility Inspection & Maintenance Report* form. Forms must be signed under the certification section. Certifying the form indicates that, under the penalty of perjury for a false report, both inspection and any needed maintenance of the stormwater facility has been performed.

Completed forms can be mailed, emailed, faxed, or delivered to the City of Poulsbo Public Works Department (address and fax number are provided at the bottom of the form). The report must be sent by the date specified in the annual notice. **Both the inspection and maintenance must be completed before the due date.**

3.7 Additional Information and Resources

- For more information on the operation and maintenance of private stormwater drainage facilities contact the City of Poulsbo Public Works Department at:

  200 NE Moe Street Poulsbo, WA 98370
  (360)-779-4078
  publicworks@cityofpoulsbo.com

- For more information and assistance on confined spaces, contact Washington State Labor & Industries at (800)-423-7233 or by going to www.lni.wa.gov.

- To dispose of hazardous waste used or generated during maintenance, contact Kitsap County's Hazardous Waste Collection Facility:

  5551 SW Imperial Way, Bremerton WA 98312

  Household Waste Drop off: Thursday- Saturday, 10 AM-4PM (Closed 12-12:30PM)
  Business Waste: Schedule a disposal appointment at https://www.kitsapgov.com/pw/Pages/SmallQuantityGenerator.aspx

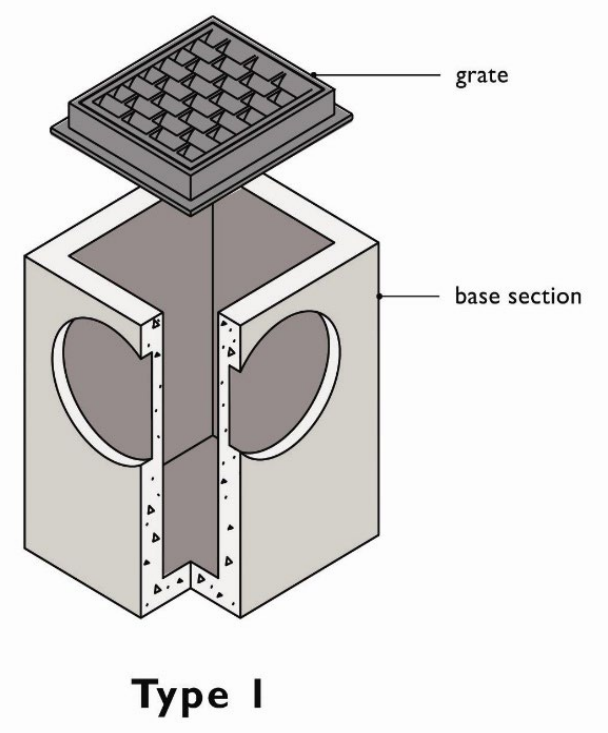
- For assistance identifying noxious weeds, go to https://www.kitsapgov.com/BOC_p/Pages/Noxious-Weed-Control-Board.aspx or contact the Kitsap County Noxious Weed Control Board at (360)-337-5777

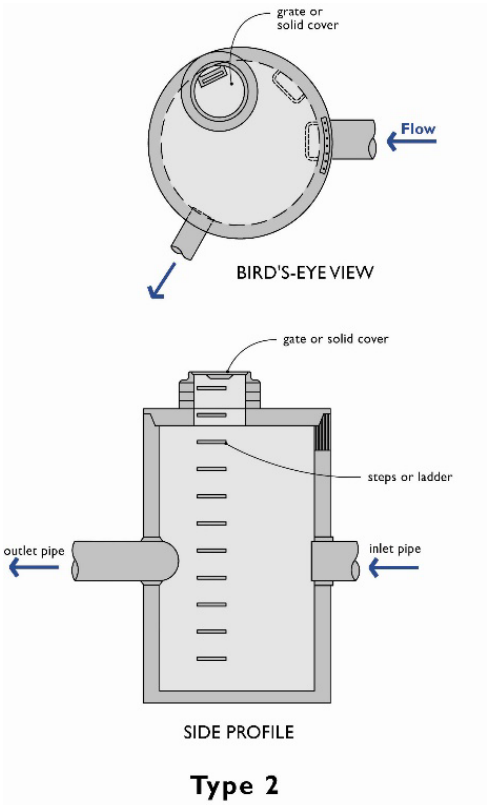
- For disposal of solid waste, including yard waste and contaminated soils, contact Kitsap Solid Waste Disposal at solidwaste@co.kitsap.wa.gov or call (360)-337-4898.

4.0 Facility Descriptions

Group One: Collection and Conveyance Systems

Catch Basins





Catch basins can be found in most stormwater facilities. Catch basins are underground concrete structures, typically with a slotted grate to collect stormwater runoff and route it through underground pipes. They can also be used as a junction in a pipe system and may have a solid lid. There are two catch basin types. Both catch basin types typically provide a storage volume (sump) below the outlet pipe to allow sediments and debris to settle out of the stormwater runoff. Some catch basins are also provided with a spill control device (a tee or inverted elbow on the outlet pipe) intended to contain grease and oils.

Type 1 Catch Basins

A type 1 catch basin is a rectangular box with approximate dimensions of 3'x2'x5'. Type 1 catch basins are utilized when the connected conveyance pipes are less than 18 inches in diameter and the depth from the grate to the bottom of the pipe is less than 5 feet.

Type 2 Catch Basins

Type 2 catch basins, also commonly referred to as storm manholes, are round concrete structures ranging in diameter of 4 feet to 8 feet. Type 2 catch basins are used when the connecting conveyance pipe is 18 inches or greater or the depth from grate to pipe bottom exceeds 5 feet. Type 2 catch basins typically have manhole steps mounted on the side of the structure to allow for access.

Operations and Maintenance Considerations

- Catch basins are most commonly cleaned using an industrial vacuum truck with a tank and vacuum hose (vactor truck) to remove sediment and debris from the sump.

- Catch basins may be an enclosed space where harmful chemicals and vapor can accumulate. If inspection or maintenance requires entering an enclosed space, hire a vendor certified in confined space entry to perform inspection and maintenance

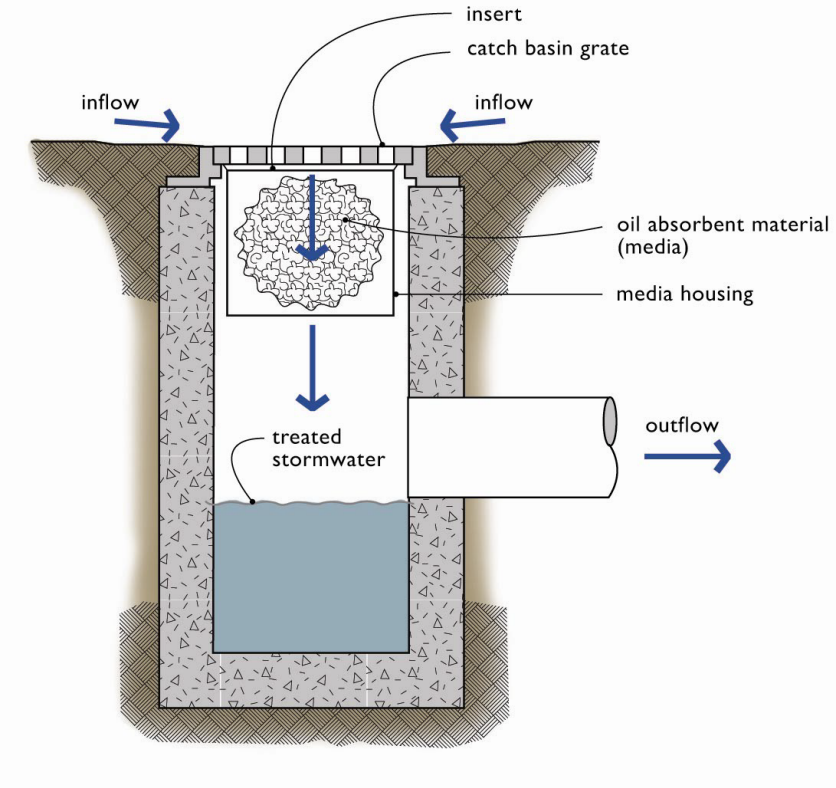
The checklist for catch basin inspection and maintenance can be found on page **51**.

A guide for estimating sediment depth of catch basins can be found on page **53**.

Catch Basin Insert

Catch basin inserts trap sediment and oil entering catch basins.

They function similarly to media filtration except that they are typically limited by the size of the catch basin. Filters avoid flooding by overflowing when they become clogged or during high storm flows.



Catch basin inserts typically consist of the following components:

1. A structure that contains a pollutant removal medium.
2. A means of suspending the structure in a catch basin.
3. Filter medium such as sand, carbon, fabric, etc.
4. Primary inlet and outlet for the stormwater.
5. Secondary outlet for bypassing flows that exceed design flow.

Operations and Maintenance Considerations:

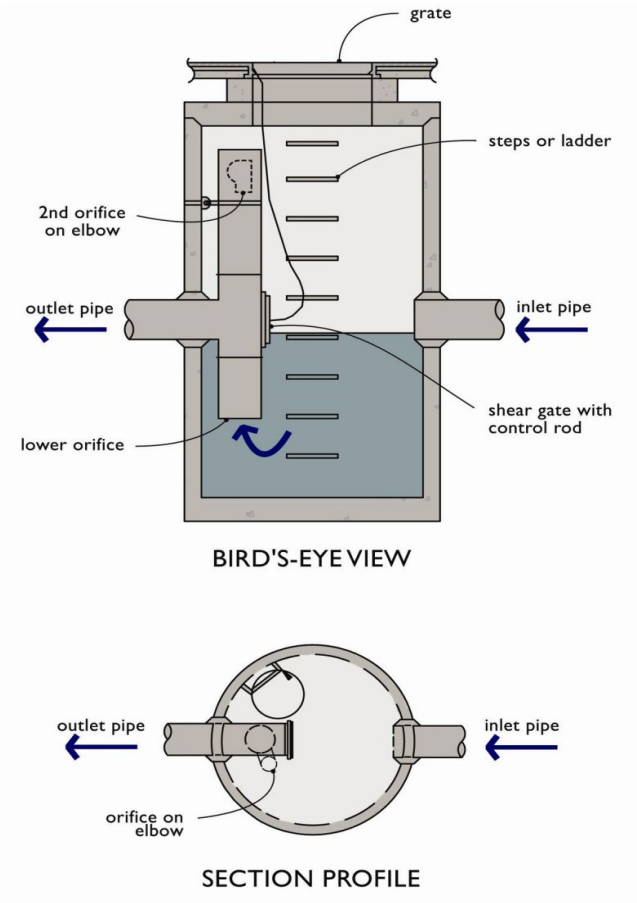
- Catch basin inserts are proprietary and specific maintenance criteria should be taken from the manufacturer's manuals and checklists.

- Catch basin insert maintenance can typically be performed in-house and most common maintenance tasks are removal of insert to empty out debris or to replace insert.

The checklist for catch basin insert inspection and maintenance can be found on page 54.

Control Structure/Flow Restrictor

Control structures/ flow restrictors direct or restrict flow in or out of facility components and are located on the outlet pipe of a detention system. Type 2 catch basins with risers (vertical pipe) often have control structures. This size of catch basin is also called a manhole. The flow is regulated by a combination of orifices (holes with specifically sized diameters) and weirs (plates with a rectangular or V- shaped notch). Lack of maintenance of the control structure can result in the plugging of an orifice. This can result in flooding of the stormwater system and/or an increase in the rate of discharge from the site potentially damaging downstream property.



Operations and Maintenance Considerations

- The most common tool for cleaning control structures/ flow restrictors is an industrial vactor truck to remove sediment and debris from the sump.

- Regular inspection of control structures is needed to prevent overflowing.

The checklist for control structure/ flow restrictor inspection and maintenance can be found on page **55**.

Pipe / Culvert

Pipes and culverts are part of the conveyance system for stormwater. They may be constructed of concrete pipe (CP), corrugated metal pipe (CMP), or smooth wall high-density polyethylene pipe (HDPP). Stormwater pipes and culverts must be clear of obstructions and breaks to prevent flooding.

Operations and Maintenance Considerations

- The most common tool for cleaning pipes and culverts is an industrial vactor truck to flush out sediment and debris.

The checklist for pipe/culvert inspection and maintenance can be found on page **57**.

Ditch

Ditches are V-shaped channels that are part of the conveyance system, usually along the side of a road. They may be rock-lined.

Inspection and Maintenance Considerations:

- The most common tools for maintaining ditches are general landscaping hand tools and lawn-mowers to manage vegetation.

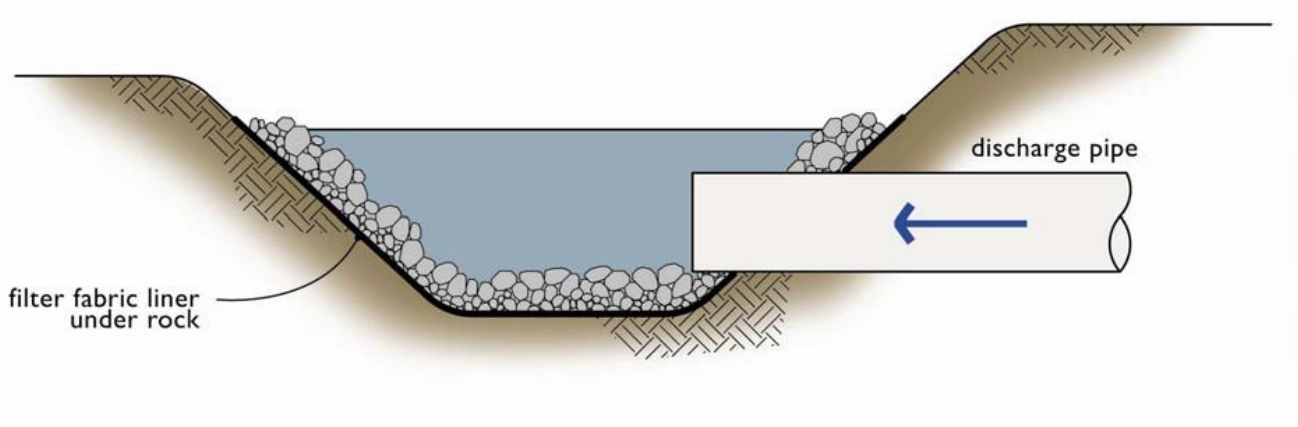
- Never fill in ditches as it may cause flooding during rain. Prevent dirt, rocks, and weeds from accumulating into ditches. Repair erosion on side slopes.

- Remove debris, litter, and anything that may cause flow obstructions.

The checklist for ditch inspection and maintenance can be found on page 58.

Energy Dissipater

Energy dissipaters are installed on the inlet and outlet to a closed pipe system to prevent erosion at these locations. Design of an energy dissipater can vary significantly from highly engineered systems (concrete or rock gabion structures) to the more commonly used rock pad. The rock pad is typically constructed of 4- to 12-inch diameter rocks a minimum of 12 inches thick and is often lined with filter fabric. The rock pad should extend above the top of the pipe a minimum of 1 foot.



Inspection and Maintenance Considerations:

- Most common tools for maintenance of energy dissipators are hand tools to redistribute or add rocks as necessary.

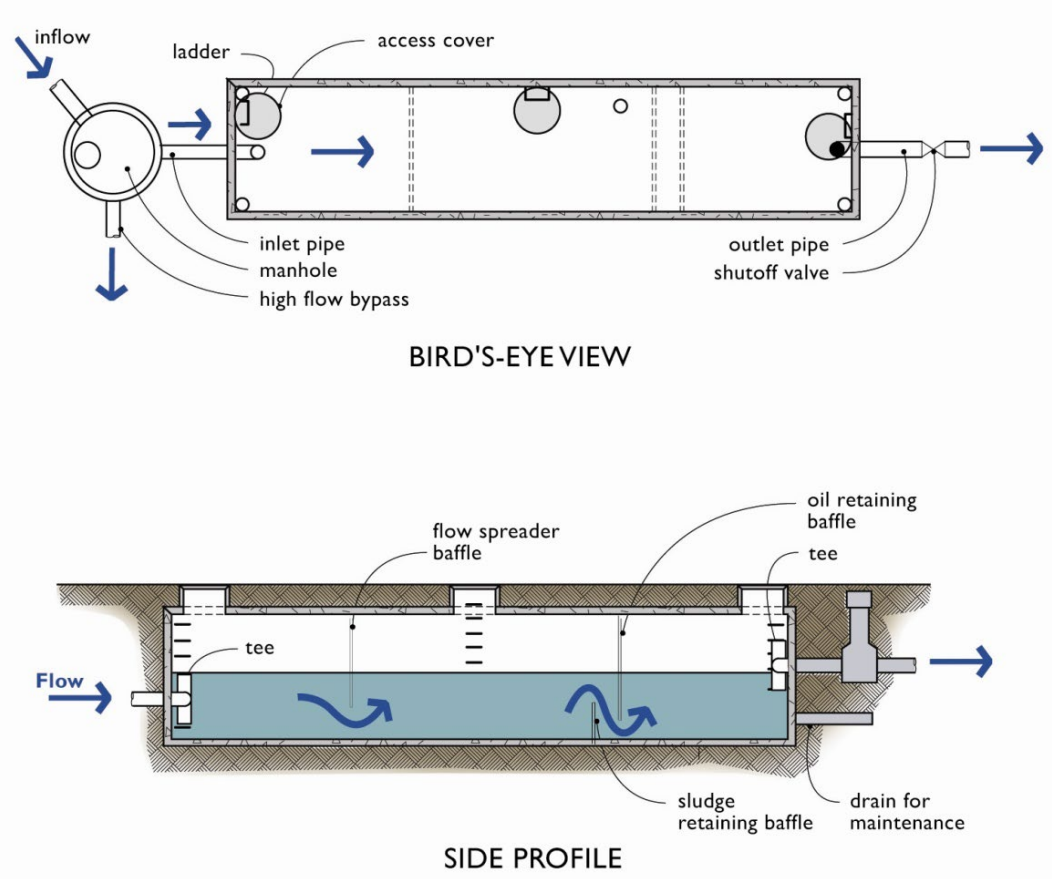
- Periodic maintenance to remove sediment or debris may be necessary.

The checklist for energy dissipator inspection and maintenance can be found on page 59.

Group Two: Oil- Water Separators

Baffle Oil- Water Separator (API Type)

American Petroleum Institute (API) oil water separators are underground vaults separated into three bays by a series of partial divider walls (baffles). The three bays consist of a forebay, separator section, and the afterbay. Oil/water separators are typically utilized in locations where high oil concentrations in the stormwater runoff are anticipated (i.e. service and fuel stations). Oil/water separators are most commonly used as the first pretreatment facility in a series ("treatment train") of stormwater management facilities.



Inspection and Maintenance Considerations

- Common tools for cleaning and maintaining an oil/water separator are vactor trucks and/or oil absorbing media materials to remove oils and other sediments from the vault.

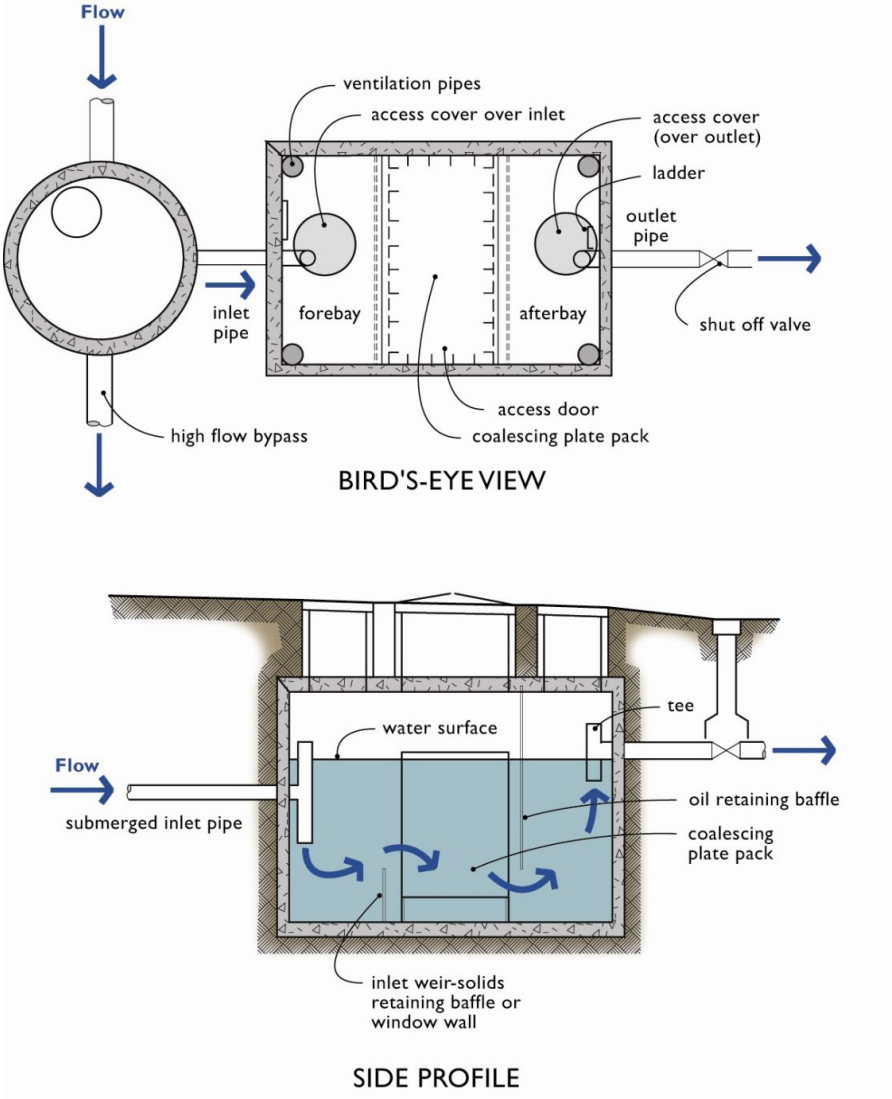
- Clean oil/water separators regularly to prevent accumulated oils from entering the stormwater system.

- Replace oil absorbent pads before their absorption capacities are exceeded.

The checklist for baffle oil-water separator inspection and maintenance can be found on page 61.

Coalescing Plate Oil / Water Separator

Coalescing plate oil water separators differ from API oil/water separators by their inclusion of a series of parallel plates in the separation bay (2nd bay) that increase the oil removal efficiency of the separator.



Inspection and Maintenance Considerations

- Common tools for cleaning and maintaining an oil/water separator are a vacuum truck and/or oil absorbing media materials to remove oils and other sediments from the vault.

- Replace oil absorbent pads before they exceed their absorption capacity. Dispose of pads in accordance with local solid waste regulations.

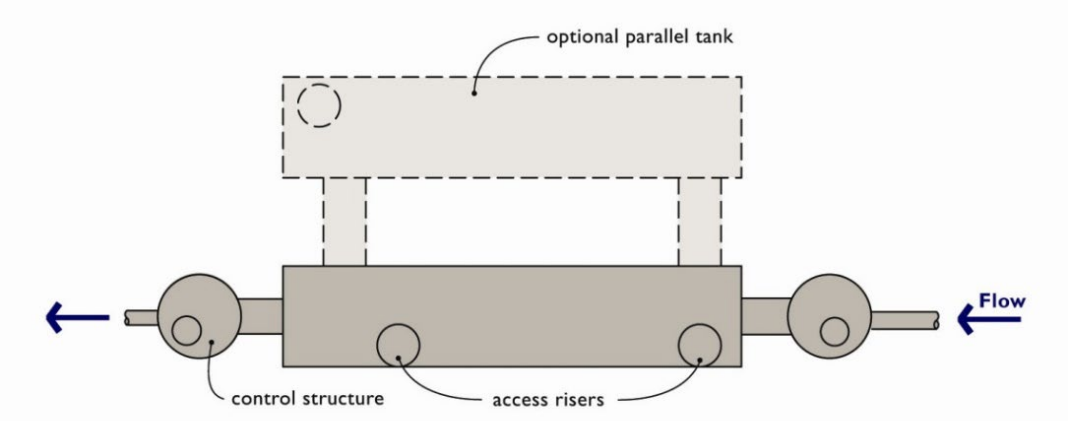
- Regularly clean oil/water separators to keep accumulated oil from entering stormwater system. From October 1st to April 30th, oil/water separators must be inspected monthly and immediately after large storm events to ensure proper operation.

The checklist for coalescing plate oil-water separator inspection and maintenance can be found on page **62**.

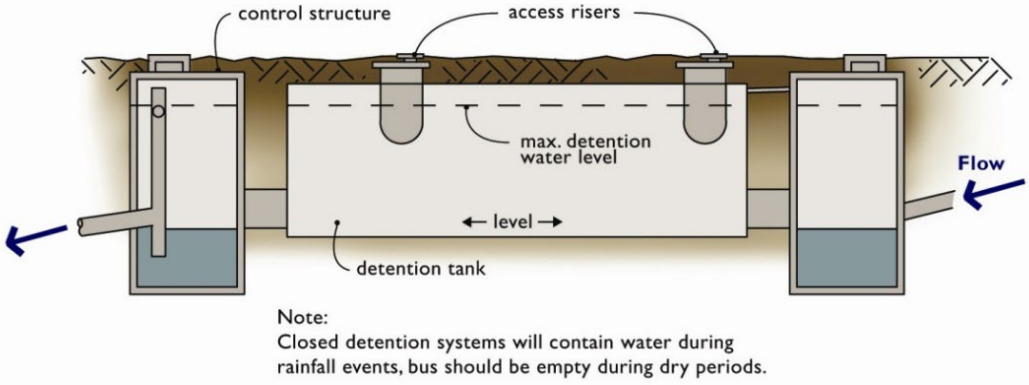
Group Three: Underground Tanks and Vaults

Detention Tank / Vault

Detention tanks and vaults have temporary storage in an underground structure to regulate the stormwater discharge rate from the site, similar to how aboveground detention ponds function. Detention tanks and vaults are optimal for sites that do not have the space for a detention pond or other above ground structures, making them common at commercial sites. The structure is typically constructed of large diameter pipe (48” diameter or greater) or a concrete box (vault).



BIRD'S-EYE VIEW



Note:
Closed detention systems will contain water during rainfall events, bus should be empty during dry periods.

SIDE PROFILE

Inspection and Maintenance Considerations:

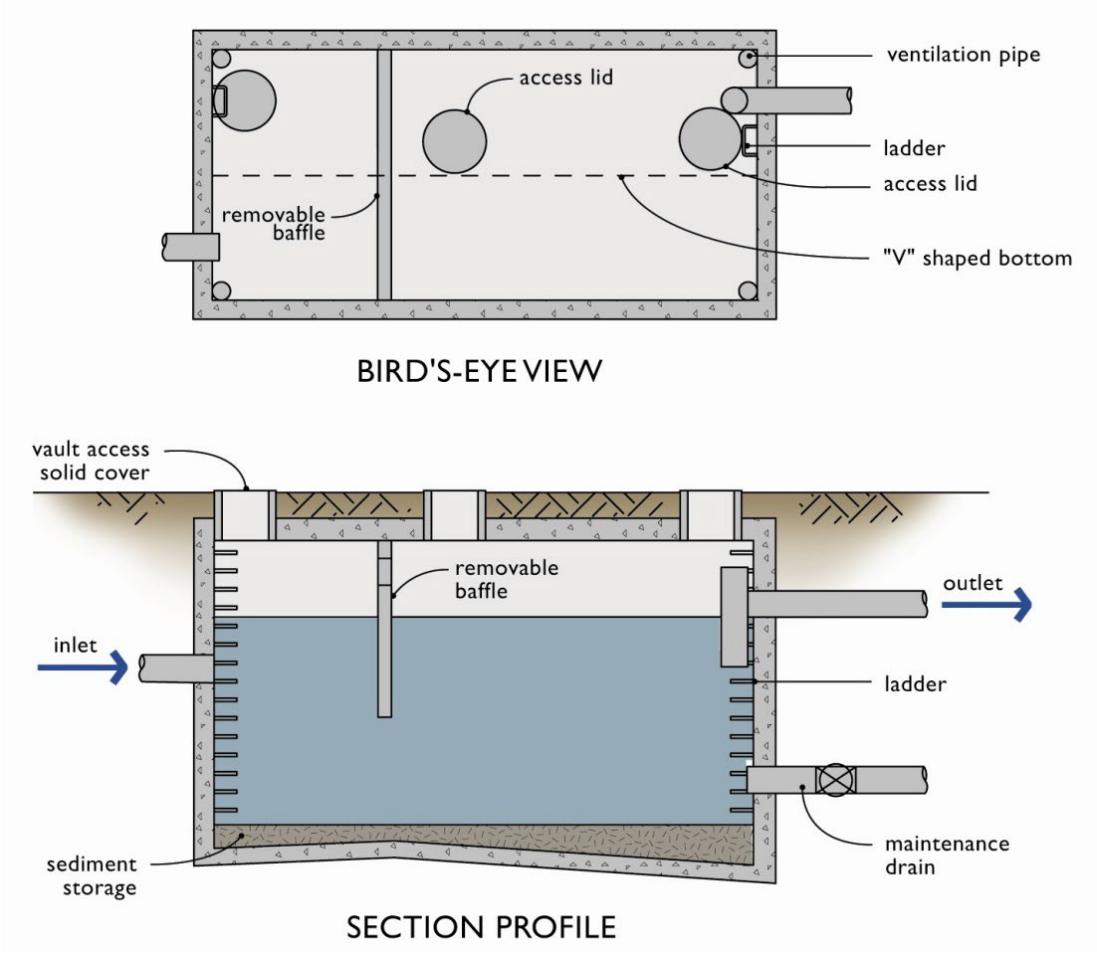
- Underground detention systems are enclosed spaces where harmful chemicals and vapors can accumulate. ***Therefore, the inspection and maintenance of these facilities should be conducted by an individual with training and certification in working in hazardous confined spaces.***

- The most common tool for cleaning detention tanks and vaults is an industrial vactor truck to remove sediment and oils.

The checklist for detention tank/ vault inspection and maintenance can be found on page **63**.

Wet Vault

Wet vaults are underground structures similar in appearance to a detention vault, except that a wet vault has a permanent pool of water (wet pool) which dissipates energy and improves the settling of sediment and other pollutants.



Inspection and Maintenance Considerations:

- Wet vaults are a closed space where harmful chemicals and gasses can accumulate. ***Inspection and maintenance of these facilities should be conducted by an individual trained and certified to work in confined spaces. Vault maintenance procedures must meet OSHA confined space entry requirements.***

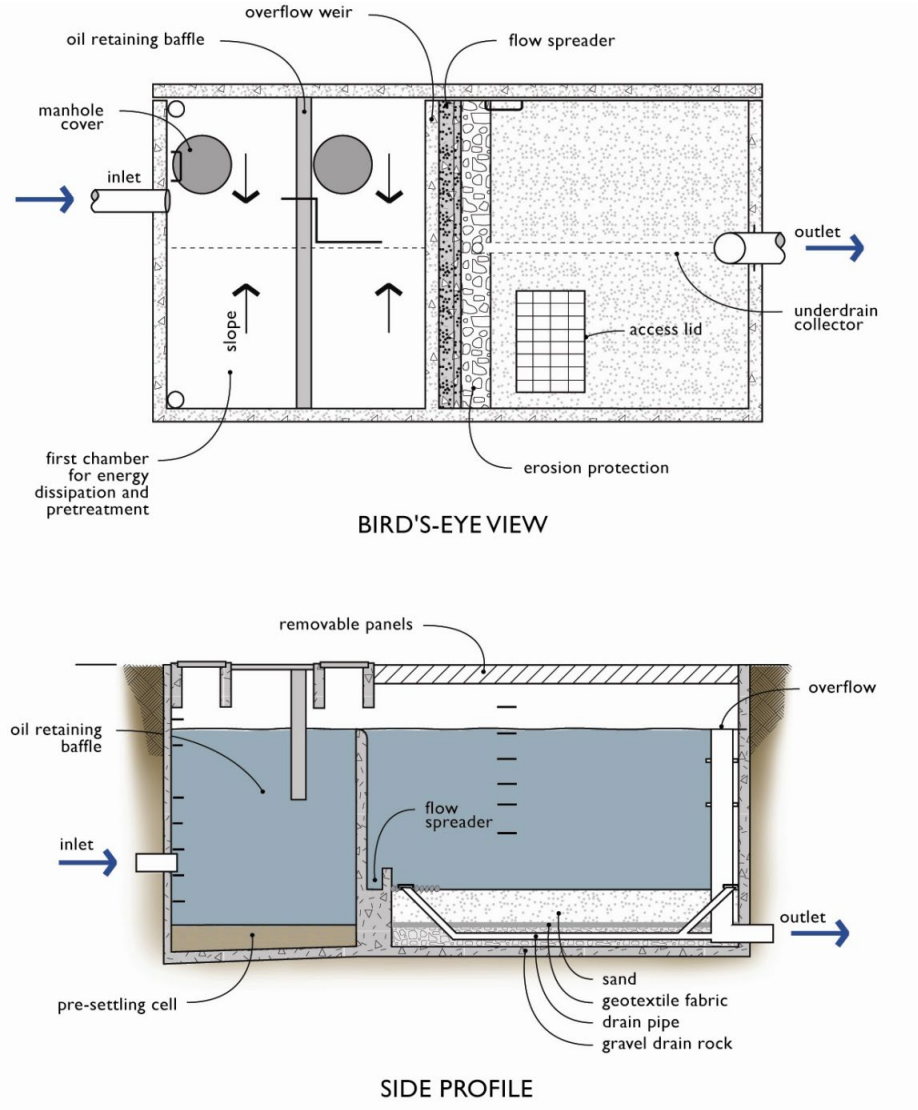
- Removed sediments should be tested for hazardous chemicals and disposed of in accordance with current local health department requirements and solid waste regulations.

- Common tools for cleaning wet vaults are an industrial vactor truck to remove sediment and debris from the vault.

The checklist for wet vault inspection and maintenance can be found on page **65**.

Sand Filter (Below Ground / Enclosed)

Sand filter vaults consist of pre-settling and sand filtration cells that filters stormwater runoff. Treated runoff is collected in the underdrain system and routed to a detention/retention facility or a downstream conveyance system. Access roads, easements, fences, gates, and stormwater pipe conveyances are often associated with enclosed sand filters.



Inspection and Maintenance Considerations:

- Sand filters are enclosed spaces where harmful chemicals and vapor can accumulate. ***Inspection and maintenance of these facilities should only be conducted by hazardous confined space trained and certified individuals.***

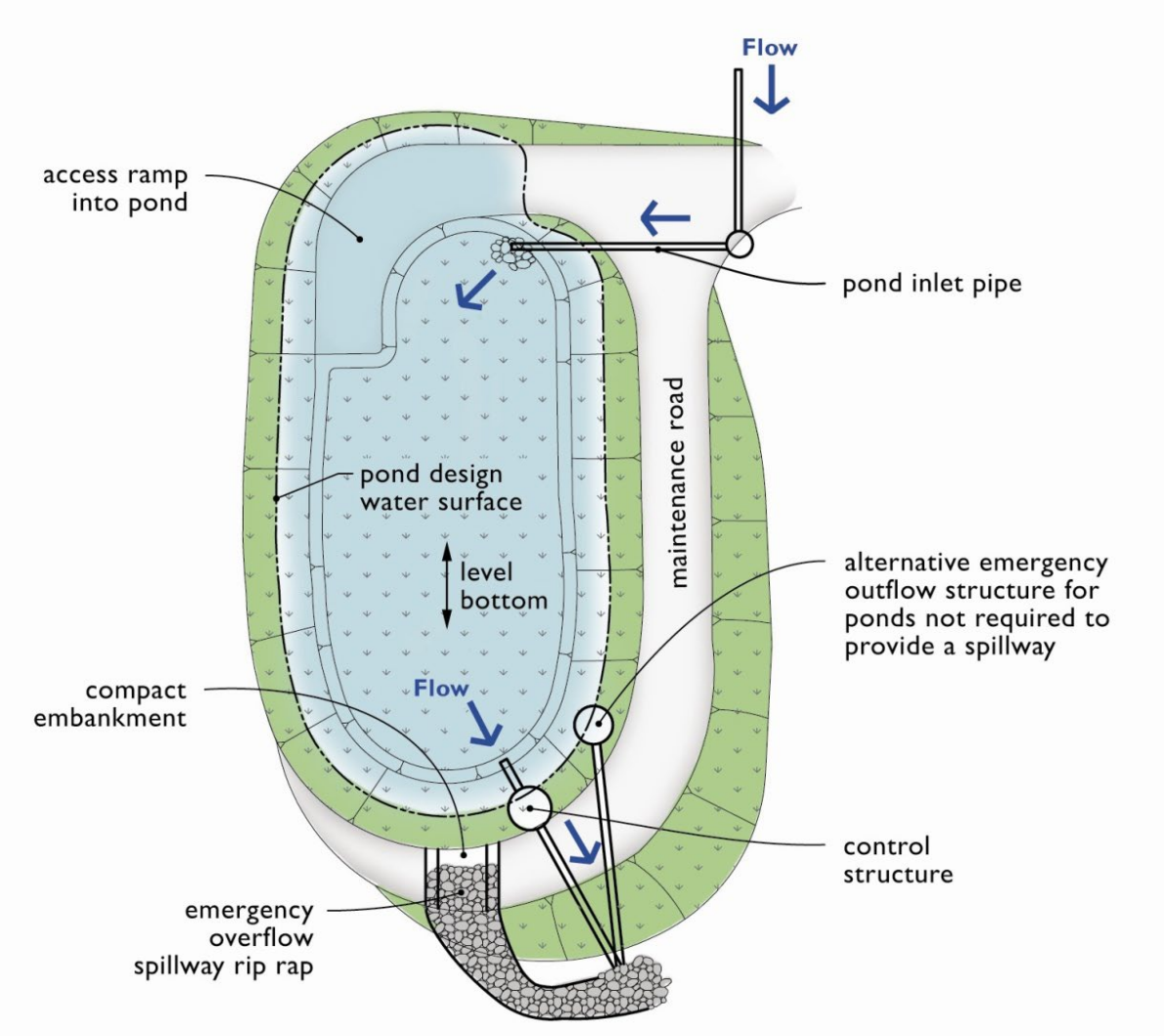
- A sand filter should empty within 24 hours after a storm event. A slow draining sand filter may need one or more of the following maintenance tasks: removal of top layer of fine-grain sediment, aeration of filter surface, or replacement of top 4 inches of sand.

The checklist for below ground/ enclosed sand filter inspection and maintenance can be found on page **66**.

Group Four: Ponds and Swales

Detention Pond ("dry pond")

Stormwater detention ponds are open basins built by excavating below existing ground or by constructing above-ground berms (embankments). The detention pond temporarily stores stormwater runoff during rain events and slowly releases it downstream through an outlet (control structure) to prevent flooding and erosion. Detention ponds are typically designed to completely drain within 24 hours after the completion of a storm event. Components that are typically associated with a detention pond include the following: control structure/flow restrictor, debris barrier (e.g. trash rack), energy dissipaters, access road, and fence. Dry ponds generally have only one cell to hold the water.



Inspection and Maintenance Considerations:

- Common tools for maintaining detention ponds are a small bulldozer or excavator to remove built-up sediment and debris from the bottom of the pond.

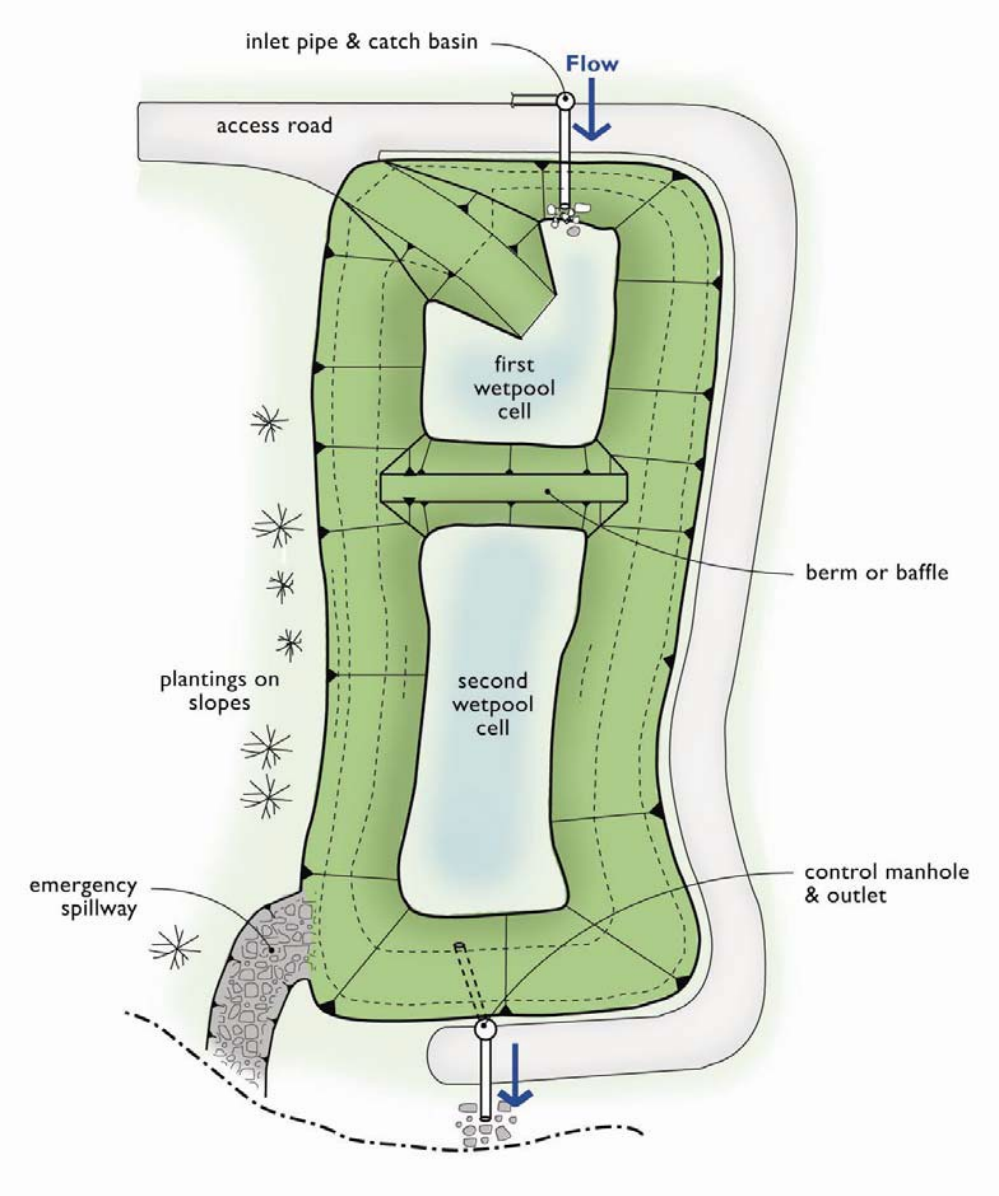
- Continually monitor sediment deposition in dry ponds to ensure that they continue to function well and to prevent flooding. Sediment should be removed when the standards in the defect table are exceeded.

- Revegetation and/or regrading may be necessary if pond slopes are bare, or erosion is occurring.

The checklist for detention pond ("dry pond") inspection and maintenance can be found on page **68**.

Wet Pond

Wet ponds are open basins that retain a permanent pool of water (wetpool) year-round or during the wet season. The volume of the wetpool allows sediment and other pollutants to settle out of the runoff. Wetland vegetation may be planted within the wet pond to provide additional treatment through nutrient removal. Detention quantity control can be provided with additional temporary storage volume above the permanent pool elevation. After flowing into the first wetpool to allow sediment to settle, stormwater flows into the second wetpool cell that is designed to slow the rate of stormwater leaving the outlet pipe.



Inspection and Maintenance Considerations

- Common tools for wet pond maintenance includes small bulldozers and excavators to remove built-up sediment and debris from the bottom of the pond, as well as tools to trim and weed vegetation.

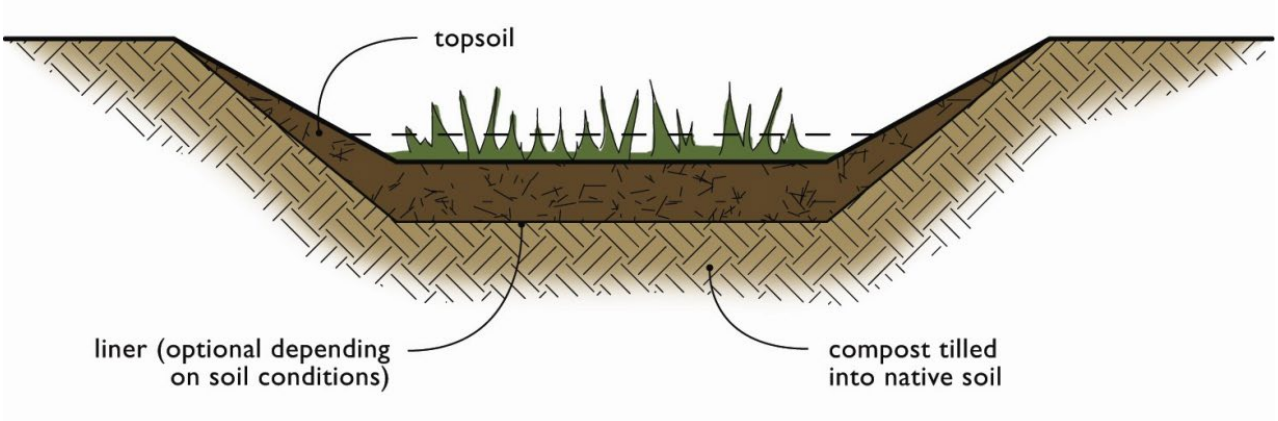
- Site vegetation should be trimmed as necessary to keep the pond free of leaves. Slope areas that become bare should be revegetated and eroded areas regraded.

- Sediment should be removed when the standards in the checklist are exceeded.

The checklist for wet pond inspection and maintenance can be found on page **70**.

Biofiltration Swale

Biofiltration swales are engineered, flat-bottomed, open channels with moderate centerline slopes similar in appearance to typical ditches. Biofiltration swales use grass or other vegetation to remove pollutants through the combined effects of filtration, infiltration, and settling. The velocity of stormwater reduces as it passes through the biofilter, further aiding in stormwater quality control (treatment). Biofiltration swales do not provide stormwater quantity control (detention/retention).



Inspection and Maintenance Considerations:

- Biofiltration swales have different maintenance requirements than ditches. Vegetation must be regularly maintained through mowing or weeding to ensure access to the swale's inlet and outlet.

- The most common tools for maintenance of biofiltration swales are mowers and hand tools to remove built up sediment and debris in the swale and to redistribute or add soil media as needed.

- Inspect swales at least once every 6 months, preferably during or after storm events.

- Maintain adequate grass growth and reseed bare spots if needed.

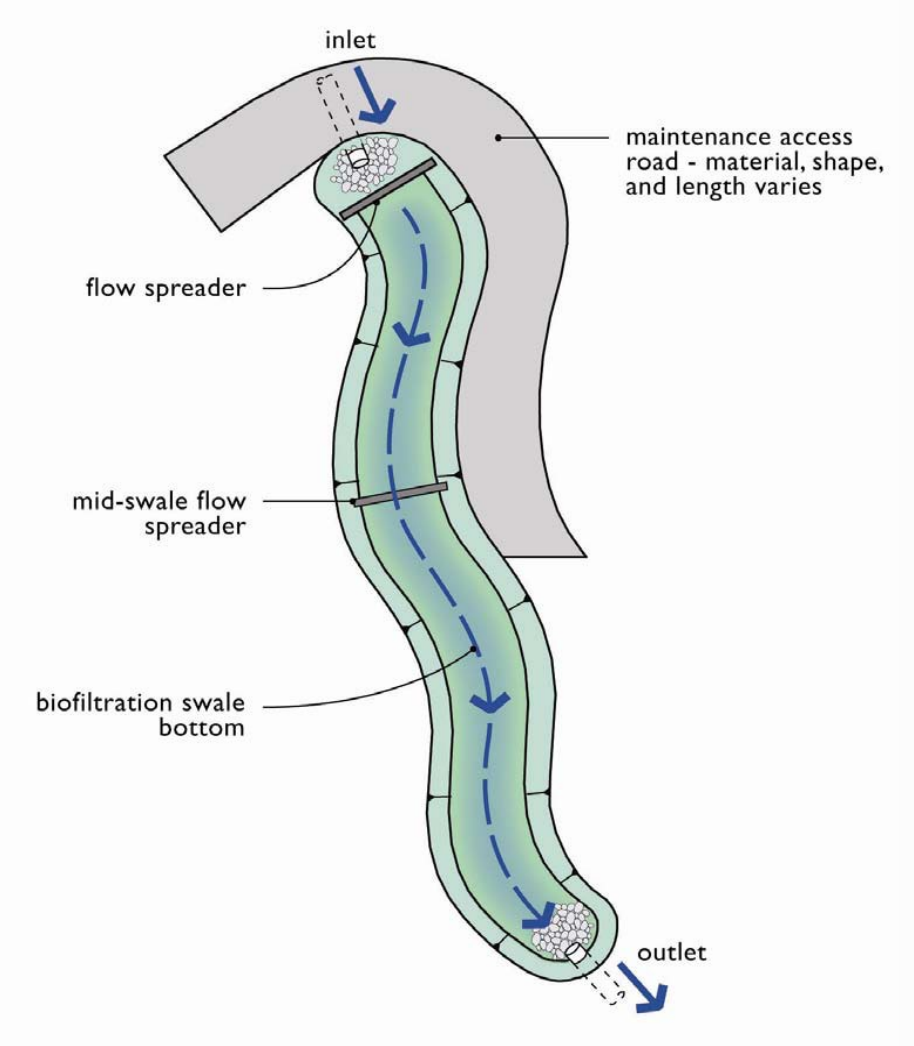
- Regrading of the bioswale may be needed if scouring or soil erosion occurs.

- Do not plant invasive species in biofiltration swales.

The checklist for biofiltration swale inspection and maintenance can be found on page **72**.

Wet Biofiltration Swale

Wet biofiltration swales are variations of a basic biofiltration swale for use in areas where the centerline slope is slight, groundwater tables are high, or a continuous low base flow is likely to result in wet soil conditions for long periods of time. Typical grasses cannot survive in soil conditions where the soil is continuously wet. Wet biofiltration swales require vegetation specifically adapted to survive in areas where the soil is wet for more than 2 weeks at a time. The site conditions and specific vegetation types requires modification of several of the design and maintenance requirements from the basic biofiltration swale.



Inspection and Maintenance Considerations

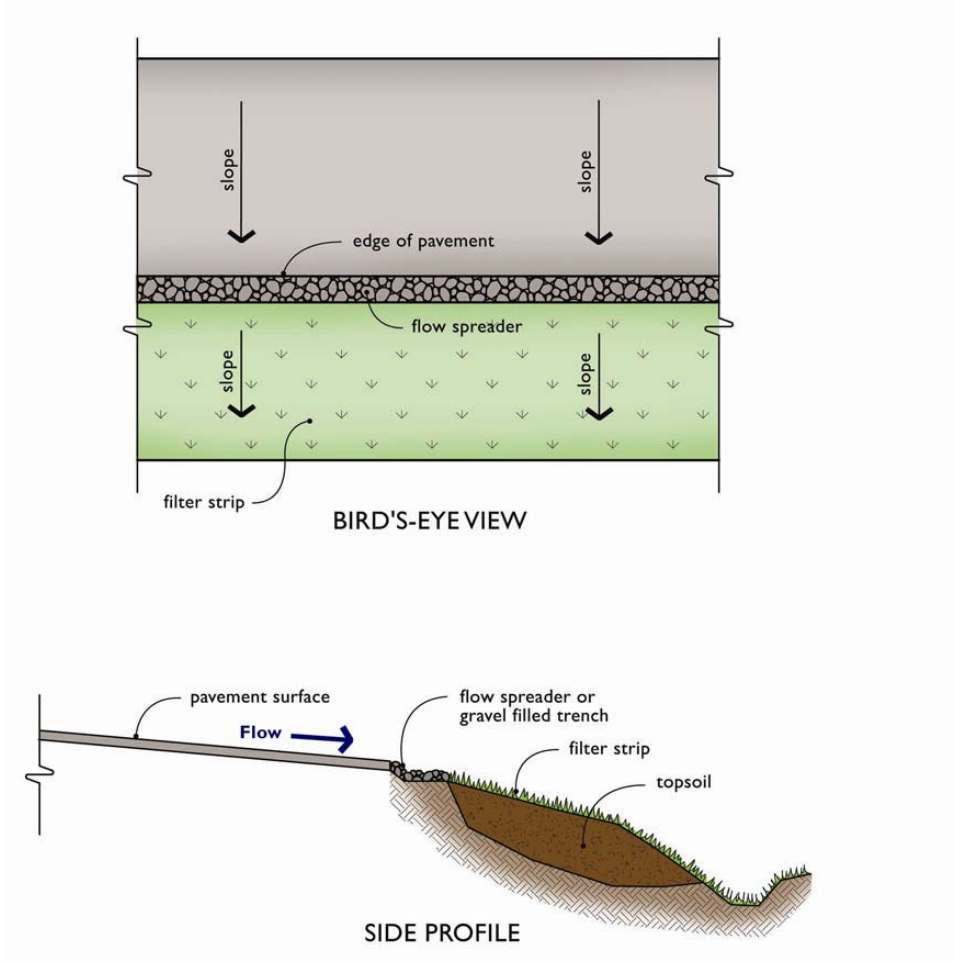
- The most common tools for maintenance of wet biofiltration swales are hand tools to remove built up sediment and vegetation management.

- Wet biofiltration swales do not require mowing like basic biofiltration swales do. However, removal of dead vegetation and weed management may be needed.

The checklist for wet biofiltration swale inspection and maintenance can be found on page **74**.

Filter Strip

Filter strips are linear strips of grass that remove sediment and oils from stormwater in a mechanism similar to a biofiltration swale. Stormwater runoff is distributed as shallow flow across the top width of a biofilter strip through a level-spreader device or curb cuts at the edge of a paved area. The level-spreader device typically consists of a gravel trench with a board or concrete curb with a level top to evenly distribute the stormwater runoff across the entire length of the filter strip. Most filter strips have a collection ditch at its base to collect and route the treated runoff to a detention/retention facility or downstream conveyance system.



Inspection and Maintenance Considerations:

- Reseed bare areas of filter strip as needed. Avoid compaction of soil and mow as necessary to maintain moderate vegetation height.

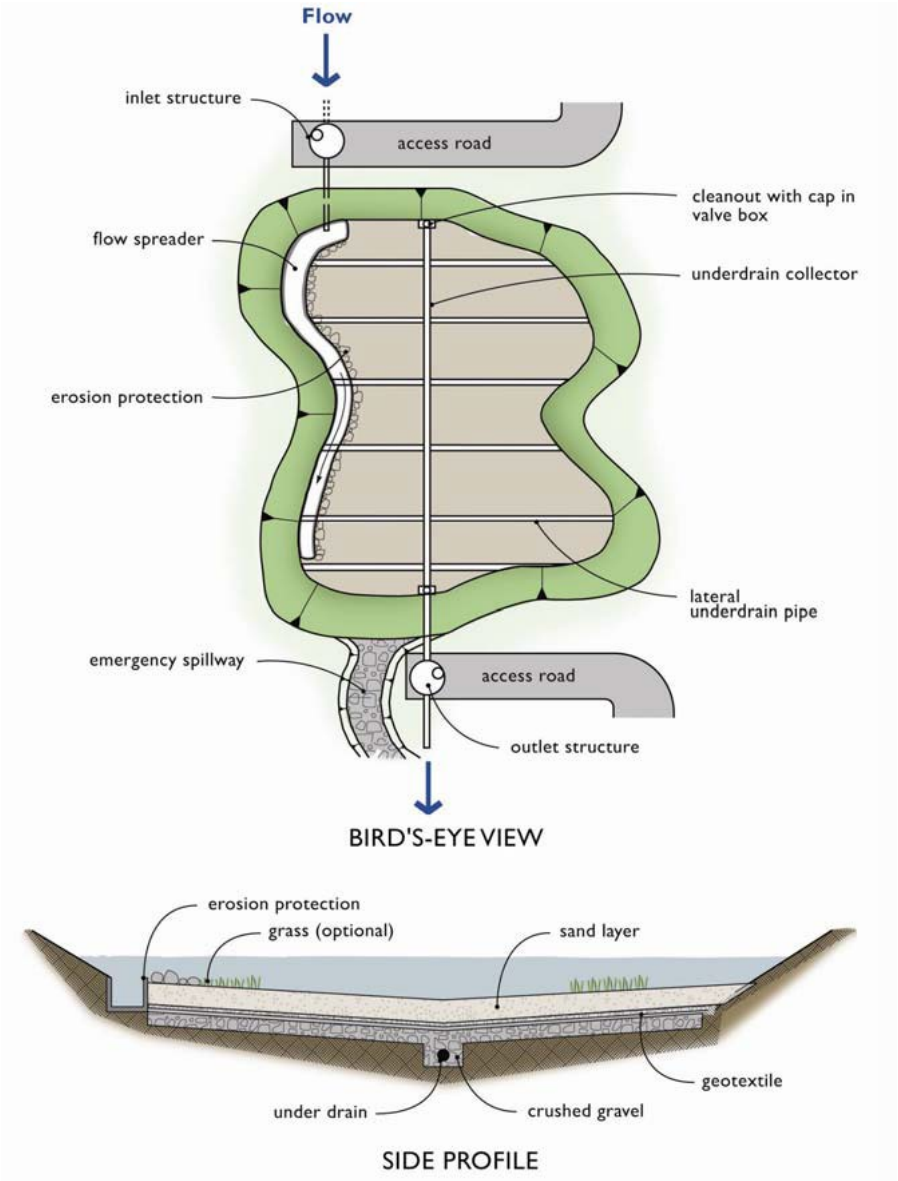
- Control trees, brush, and noxious weeds in the filter strip.

- The most common tools for maintaining filter strips are mowers and hand tools to remove built-up debris and sediment, weeding noxious weeds, and reseeding.

The checklist for filter strip inspection and maintenance can be found on page **75**.

Sand Filter (Above Ground/ Open)

Sand filters function by filtering stormwater runoff through a sand bed typically 18 inches in depth. The treated runoff is collected in the underdrain system and routed to a detention/retention facility or a downstream conveyance system. A typical sand filtration system consists of a pretreatment system for removing larger sediment and debris from the runoff, a flow spreader, a sand bed, and an underdrain piping. The sand filter bed typically includes a woven (geotextile) fabric between the sand bed and the underdrain system. Open, above-ground sand filters have a physical appearance similar to a detention pond with the main difference being the sand lined bottom.



Inspection and Maintenance Considerations:

- Avoid driving heavy equipment on the filter to prevent compaction and ruts.

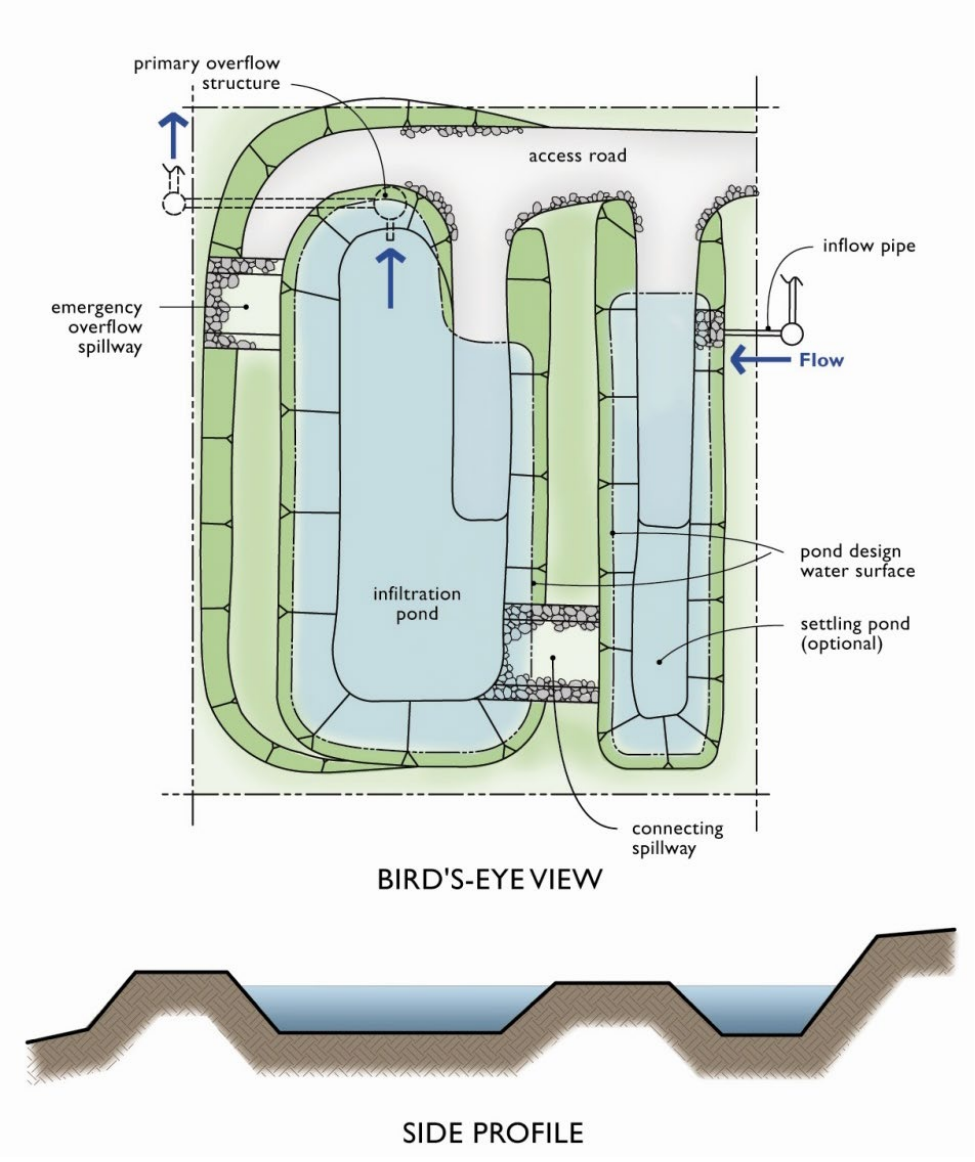
- Accumulated silt should be scraped off during dry periods with steel rakes or other devices. Once sediment is removed, the design permeability of the filtration media can typically be restored by striating the surface layer of the media.

- A sand filter should empty within 24 hours of a storm event. A slow draining sand filter may need one or more of the following maintenance tasks: fine sediment accumulation removed, replacement of sand, tilling of the filter surface, or removal of thatch.

The checklist for above ground sand filters can be found on page **76**.

Infiltration Facility

Stormwater infiltration facilities are often open basins built by excavating below existing ground or by constructing above-ground berms (embankments). Like the detention pond, the infiltration pond temporarily stores stormwater runoff during rain events, however, infiltration ponds do not discharge to a downstream conveyance system or nearby surface water. Instead, the infiltration facility relies on the ability of the site's soils to absorb the stormwater into the ground. Components that are typically associated with a retention pond include energy dissipaters, an access road, and fencing. While infiltration ponds are not designed to discharge stormwater downstream, they do have an overflow feature to direct the stormwater if the water volume in the pond exceeds the infiltration rate. Infiltrations facilities can also be a buried pipe, chamber, or vault with an open bottom. For proprietary systems, follow the manufacturer's maintenance protocols.



Inspection and Maintenance Considerations:

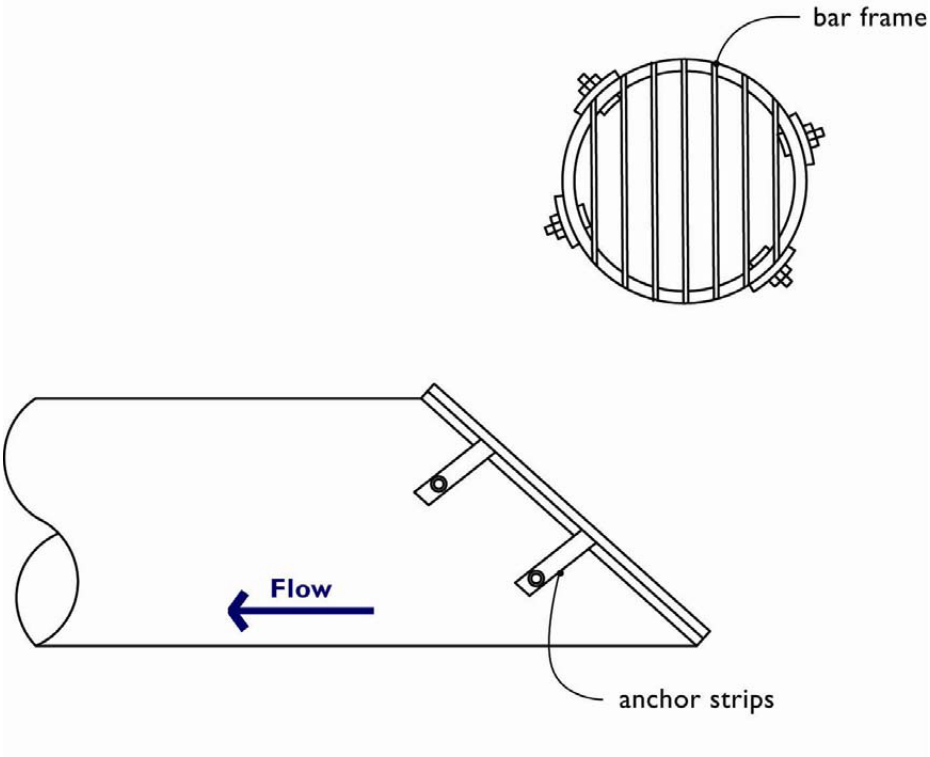
- Extreme care must be taken to avoid compacting soil, which may cause clogging and lead to facility failure.
- Basin floors and slopes should be maintained to promote dense turf that enhances infiltration, prevents erosion, and deters invasive weed growth.
- Do not allow vegetation growth to exceed 18 inches in height. Mow the slopes periodically and check for clogging and erosion.
- Use seed mixes that are functionally similar to the facility's design specifications.
- Avoid fertilizer and pesticide use.
- The most common tools for cleaning infiltration facilities are hand tools to remove built-up sediment and debris.

The checklist for infiltration facilities can be found on page 77.

Debris Barrier

Debris barriers consist of bar grates over the open end of a culvert or conveyance pipe. The intent of a debris barrier is to prevent large materials from entering a closed pipe system. Debris barriers are typically located on the outlet pipe from a detention pond to the control structure. If a debris barrier is not located on the outlet pipe, one should be provided to prevent plugging of the control structure and possible flooding.

Access barriers are similar to debris barriers but are included on all pipe ends that exceed 18 inches in diameter. Access barriers prevent debris and unauthorized access into the storm conveyance pipe. When there is flow through the conveyance pipe removal of debris and maintenance of the debris barrier should be performed by qualified personnel only.



Inspection and Maintenance Considerations:

- The most common tools for cleaning debris and access barriers are hand tools such as a rake to remove collected debris.

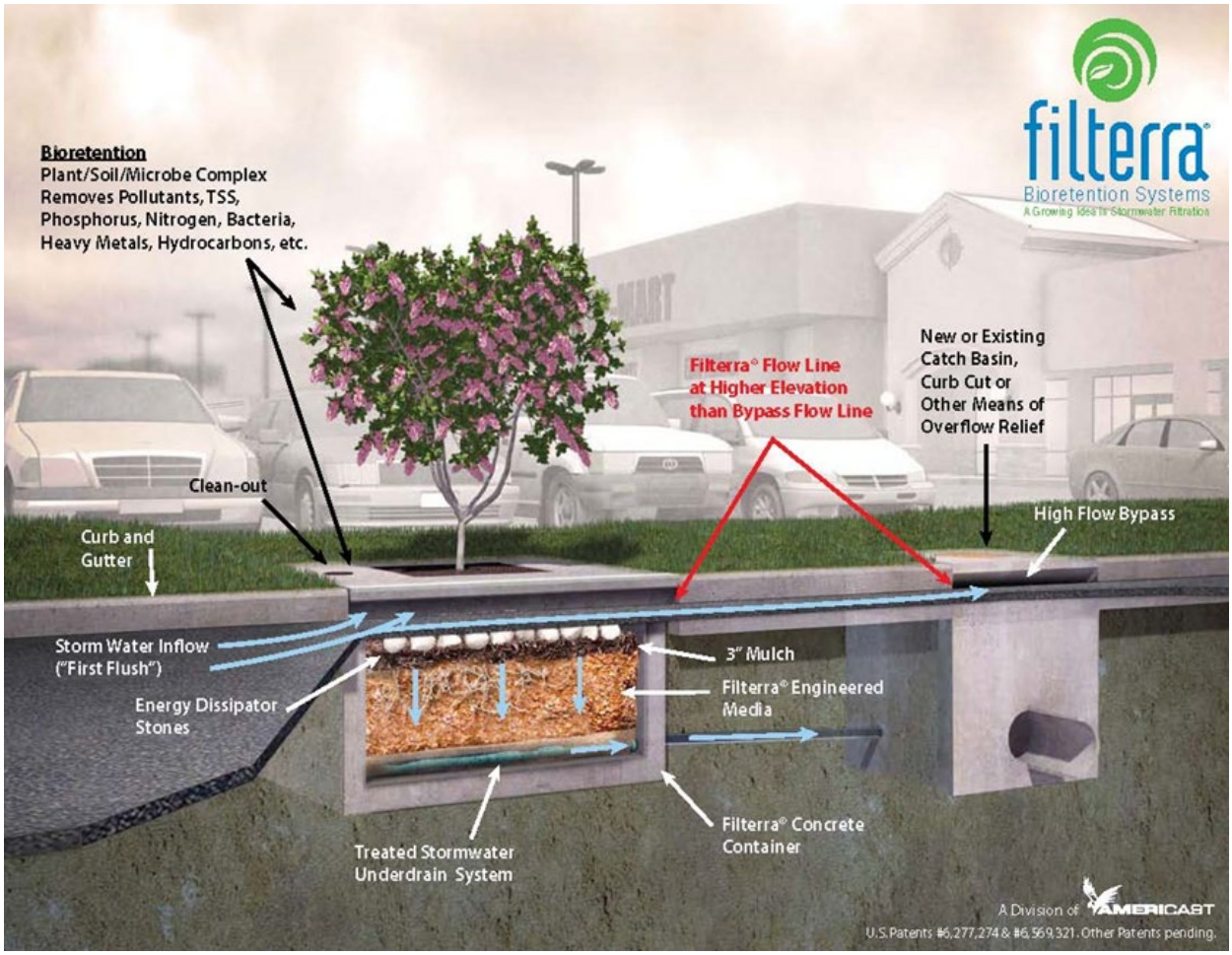
The checklist for debris barriers can be found on page 79.

Group Five: Proprietary Treatment Systems

Follow manufacturer's guidance for the inspection and maintenance of proprietary treatment systems. In general, these systems require semi-annual inspection and at least annual maintenance. If you have a system that is not included in this manual, please contact the City of Poulsbo so that the manual can be updated.

Filterra® Bioretention System

Filterra® has a specially designed filter media mixture contained in a landscaped concrete container. The filter media captures and immobilizes pollutants; those pollutants are then decomposed, volatilized, and incorporated into the biomass of the Filterra® system. Stormwater runoff flows through the media and into an underdrain system at the bottom of the container, where the treated water is discharged. Higher flows bypass the Filterra® via a downstream inlet structure, curb cut or other appropriate relief.



Inspection and Maintenance Considerations:

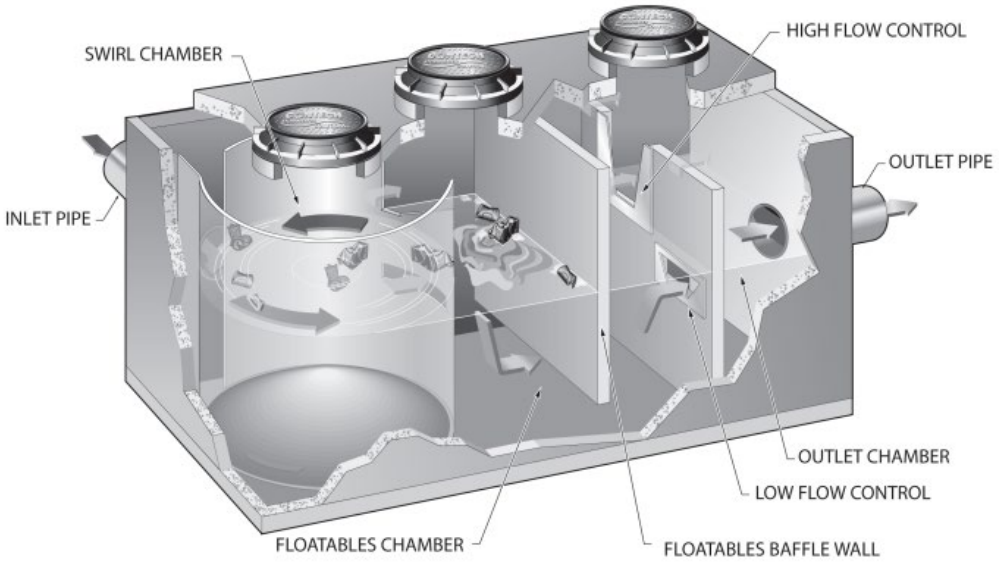
- Common tools for Filterra® inspection and maintenance are hand tools including buckets, shovels, brooms, pruners as well as a tape measure.

- Routine inspection and maintenance of Filterra® units include removal of debris, trash and mulch, plant health evaluation, mulch replacement, and pruning of plant.

For more information regarding inspection and maintenance of Filterra® units, visit the manufacturers website at https://www.conteches.com/stormwater-management/biofiltration-bioretention/filterra.

Vortechs® Stormwater Treatment System

Vortechs® stormwater facilities are proprietary, manufactured hydrodynamic separators that combine swirl concentration and flow control into a shallow treatment unit to trap debris, sediment, and hydrocarbons from stormwater runoff. The inlet flows into a cylindrical vessel that spirals around the perimeter in a vortex-type action causing the heavier particles to settle out of the stormwater. Additional technical and maintenance information can be found in the manufacturer's publications.



Inspection and Maintenance Considerations:

- Generally, inspections should be performed twice per year (in the spring and fall), however, more frequent inspections may be needed if unit is in proximity to an equipment washdown area.

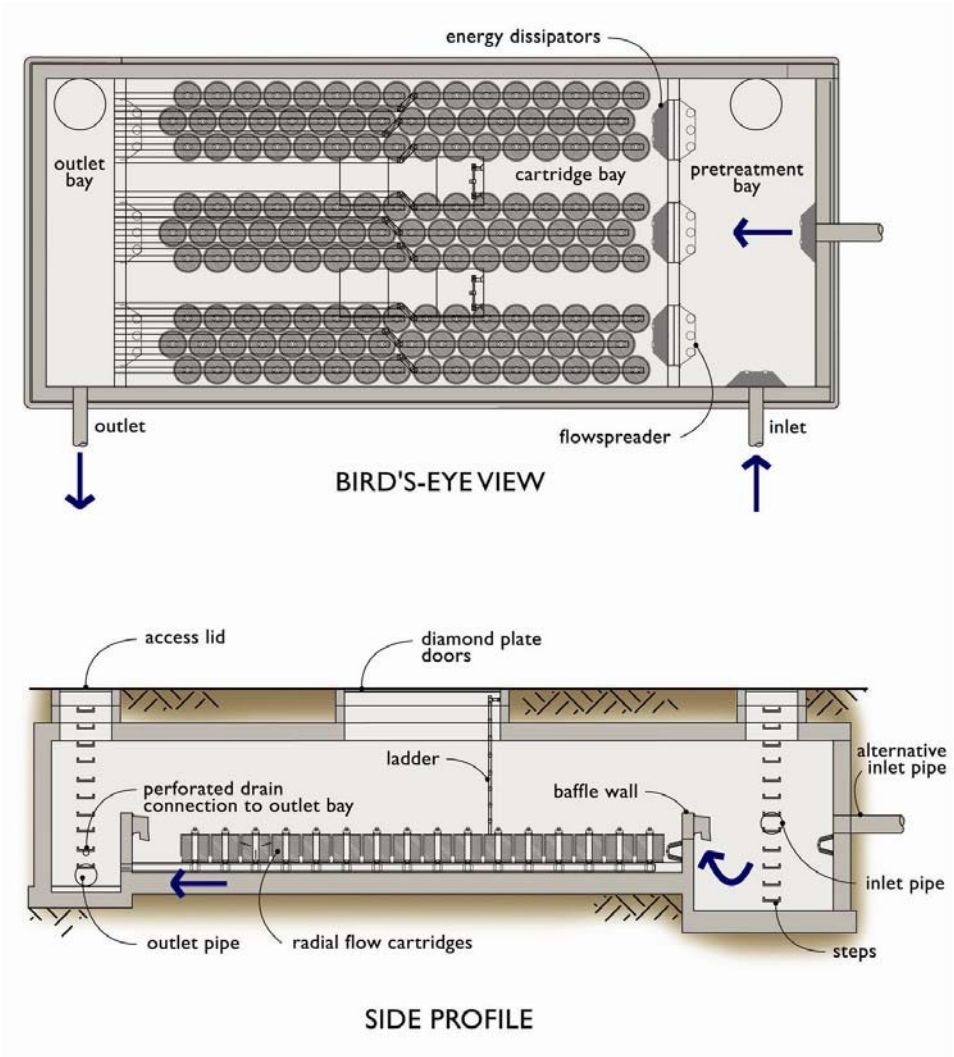
- Vortech® units should be cleaned when inspections reveal that the sediment depth has accumulated to within 12 to 18 inches of the dry-weather water surface elevation. This can be determined by taking one measurement from the manhole opening to the top of the sediment pile and another from the manhole opening to the water surface.

- Maintenance of a Vortech® unit is usually performed with a vactor truck. ***Vortech® units are an enclosed space where harmful vapors may accumulate. NEVER stick your head or any other part of your body into the unit.***

For more information regarding inspection and maintenance of Vortech® units, visit the manufacturers website at https://www.conteches.com/stormwater-management/treatment/vortechs.

Stormfilter® Units

A Stormfilter® unit is a proprietary underground stormwater treatment device comprised of one or more structures that contain media-filled cartridges that trap sediment and adsorb pollutants from stormwater runoff. The filter cartridges can be enclosed in concrete vaults or structures similar to catch basins. An assortment of filter media types are available.



Inspection and Maintenance Considerations:

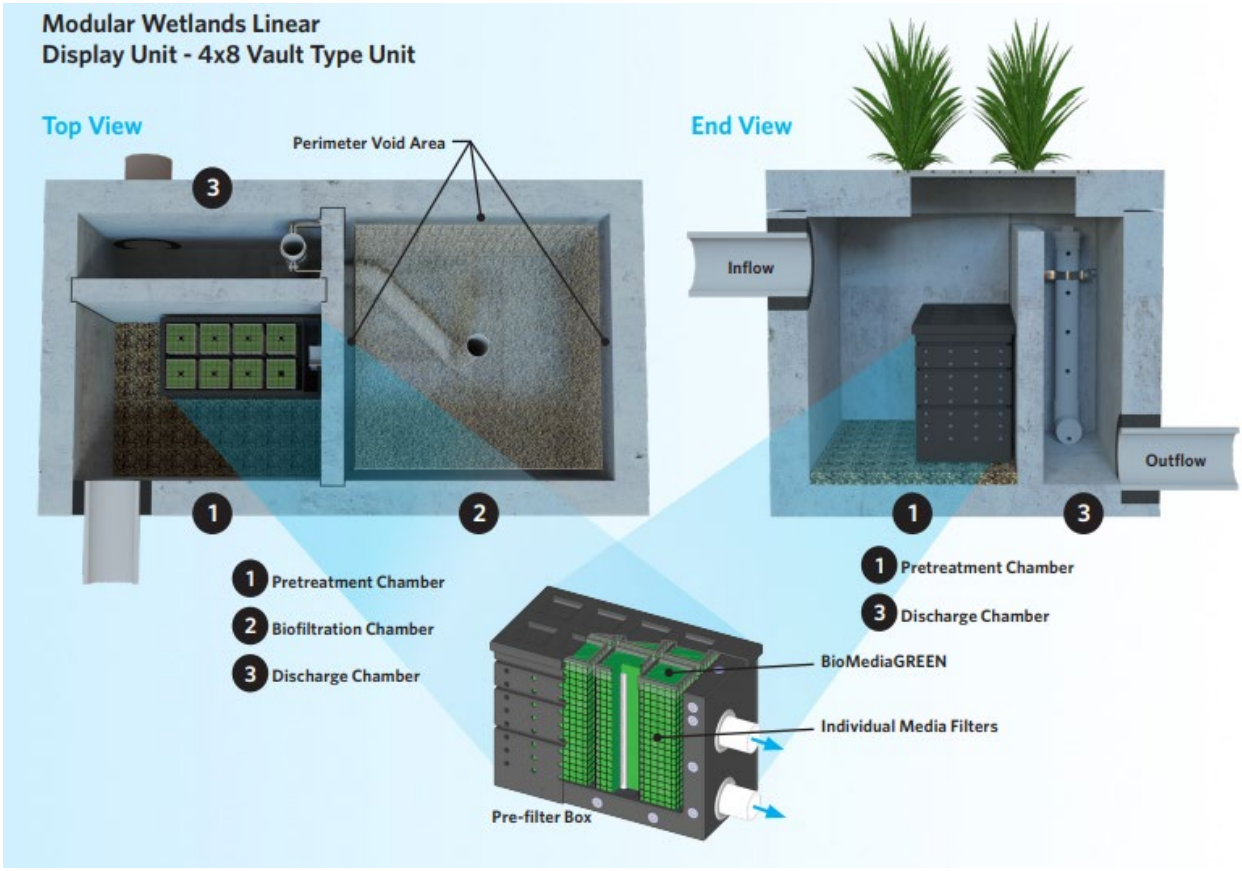
- At least one inspection should take place per year. Stormfilter® units are an enclosed spaced and inspectors should NEVER place their head or other part of their body into the unit.

- Common tools for maintaining Stormfilter® units are vactor trucks. ***Personnel performing maintenance must follow OSHA confined space entry and be certified to work in confined spaces***.

More information, including maintenance and inspection sheets, for Stormfilter® units can be found at the manufacturers website at https://www.conteches.com/stormwater-management/treatment/stormwater-management-stormfilter.

Modular Wetland® Systems (or MWS Linear)

Modular Wetland® Systems have two chambers: a pretreatment chamber with a changeable filter media in primary chamber and a secondary biofiltration chamber. Modular Wetland® Systems are approved for removal of total suspended solids, metals, nutrients, hydrocarbons, and bacteria.



Inspection and Maintenance Considerations:

- Common tools for maintenance of Modular Wetland® System includes landscaping tools for vegetation maintenance and vactor truck with pressure washer for removal of accumulated solids.

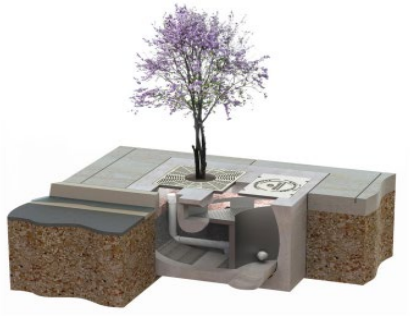
- The average maintenance interval for sediment removal and replacement of pre-filter cartridge media is 12-24 months. Vegetation maintenance is typically needed between 6-12 months.

- ***Any personnel entering any part of their body into a Modular Wetland System must comply with OSHA confined space laws and have appropriate certification.***

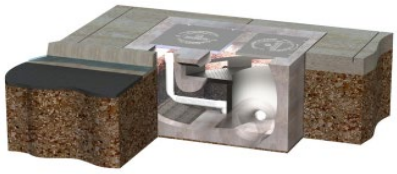
Refer to the manufacturer's maintenance manual for specific guidance on maintaining a Modular Wetlands®, found here: https://biocleanenvironmental.com/modular-wetlands-system-linear.

BioPod™ Systems with StormMix™ Media

BioPod™ Systems are approved for removal of total suspended solids, metals, nutrients, trash and debris, and petroleum hydrocarbons through a biofiltration media called StormMix™. The biofiltration chambers in a BioPod™ is filled with horizontal layers of aggregate, biofiltration media, and mulch. They can optionally be configured with an internal or external bypass when stormwater runoff exceeds design capacity. BioPod™ is designed as either a planter box, tree, surface, or underground vault.

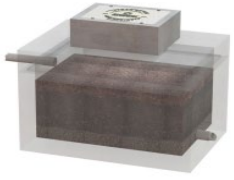


BioPod Tree Module



BioPod Media Module

BioPod Planter Module



BioPod Media Vault

Inspection and Maintenance Considerations:

- Common tools for BioPod™ maintenance include hand tools like shovel, rakes, and pruners, as well as a vacuum truck for excessive sediment loads in the biofiltration chamber.

- Full inspections of BioPod™ should be conducted at a minimum of twice per year, but more frequent inspections should be performed for removal of trash and debris, vegetation maintenance, and after major storm events.

Specific guidance on inspection and maintenance, as well as inspection logs, can be found at the manufacturer's website: https://oldcastleinfrastructure.com/brands/biopod/. Owners of BioPod™ should refer to the manufacturers website for developing an inspection and maintenance plan.

Group 6: Miscellaneous

Fencing / Gates / Landscaping

Fencing and/or a shrubbery screen are present around open stormwater management facilities for visual aesthetics and to limit unauthorized access for safety purposes. Gates typically consist of a chain link gate for fenced stormwater facilities to provide safety and allow vehicle and/or personnel access to the facility. Landscaping is an essential component of stormwater management. Bare soil areas generate higher levels of stormwater runoff and sedimentation in stormwater facilities.

Inspection and Maintenance Considerations:

- The most common tools for maintaining fencing, gates, and landscaping are hand tools and landscaping equipment.

The checklist for fencing, gates, and landscaping can be found on page **80**.

Access Road

Many stormwater facilities have access roads for heavy equipment to perform facility maintenance. Access roads are a minimum of 12 feet wide and may be constructed of asphalt, concrete, rock, or other approved material.

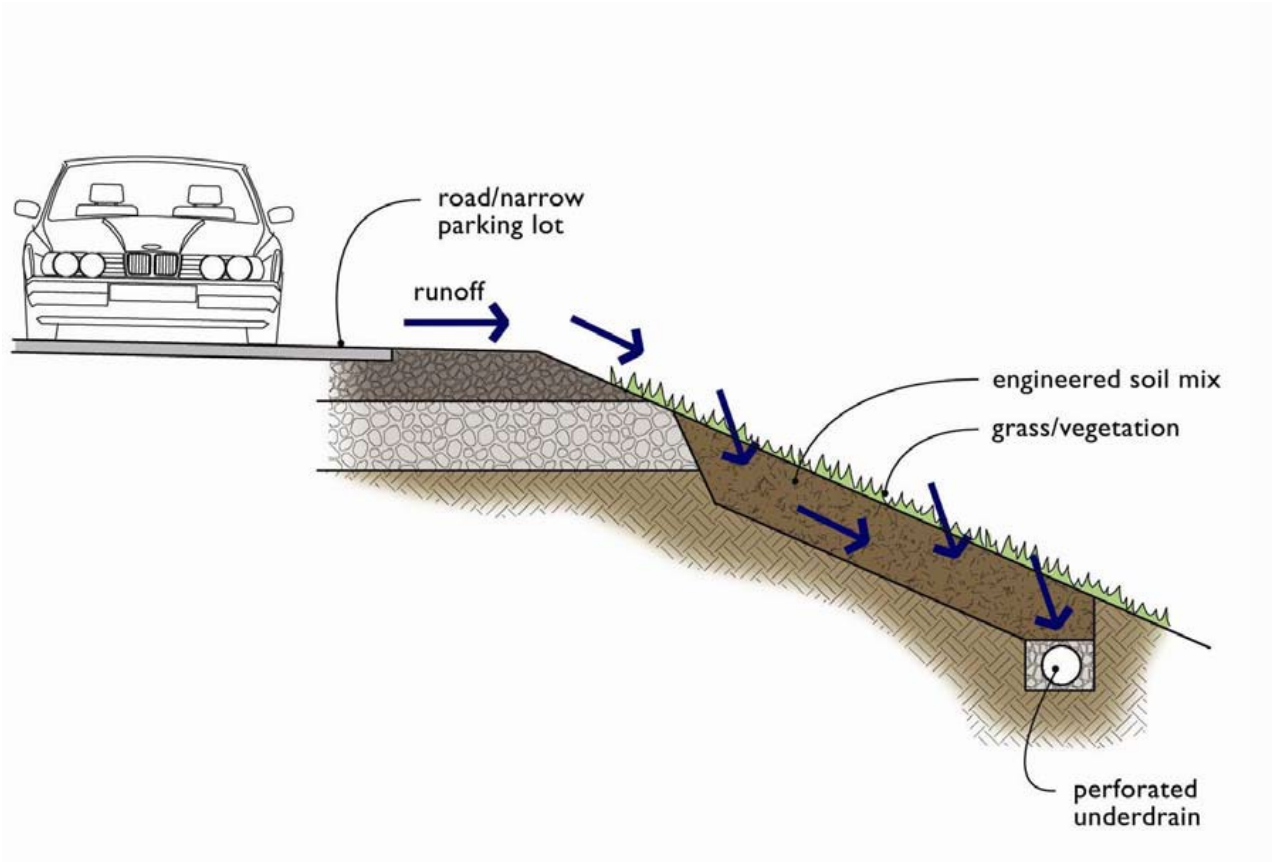
Inspection and Maintenance Considerations:

- Common tools for maintaining access roads can include general landscaping tools for vegetation management. In the case of erosion or degradation of the road, heavy machinery may be needed.

The inspection and maintenance checklist for access roads can be found on page **82**.

Media Filter Drain (Ecology Embankment)

Media filter drains, formerly known as Ecology embankments, are filter strips that can be sited along highway side slopes, medians, borrow ditches, and other linear depressions. Media filter drains are designed for impervious areas with flow paths of 30 feet or less that can drain along their widest dimension to grassy areas.



Inspection and Maintenance Considerations:

- Do not run heavy equipment on media filter drains and limit foot traffic to prevent soil compaction.

- The most common tools for maintenance of media filter drains are mowers and hand tools to remove built up debris and manage vegetation.

The checklist for inspection and maintenance of media filter drains can be found on page **83**.

5.0 Low Impact Development (LID)

6.1 What is LID?

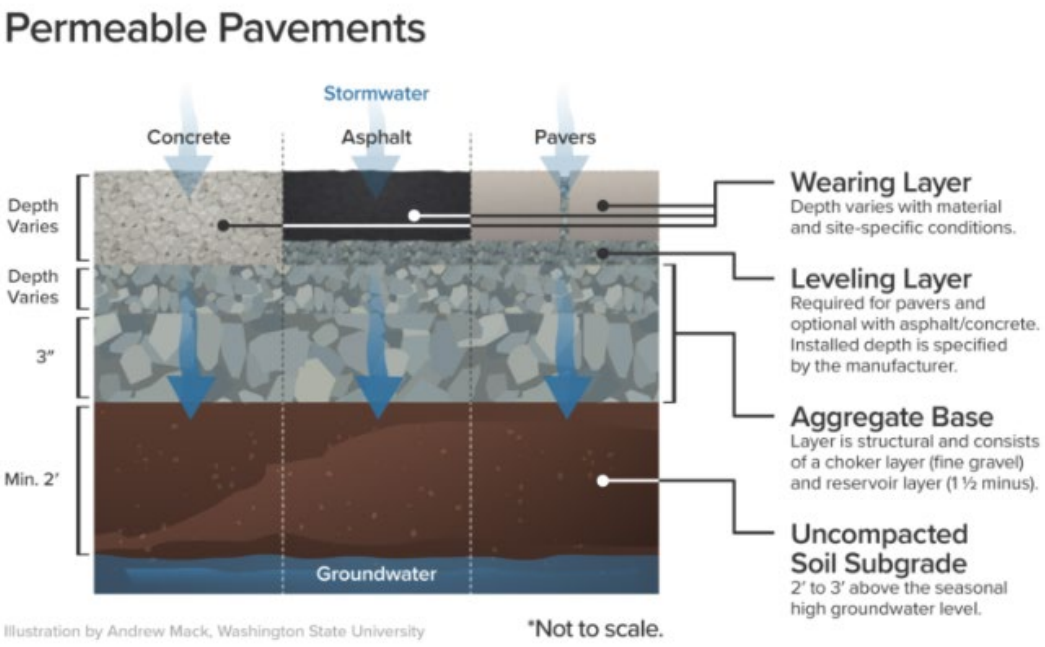
Low impact development (LID) is a stormwater and land use management strategy that strives to mimic pre-development stormwater processes, including filtration, infiltration, and evapotranspiration of stormwater. LID uses on-site natural features, site planning, and distributed stormwater management practices into a project design. These techniques are based upon the premise that stormwater is a resource, rather than a waste product. By implementing LID principles and practices, stormwater can be managed in a way that reduces the impact of built areas and promotes the natural movement of water within an ecosystem or watershed.

LID techniques include preserving and re-creating natural landscape features, minimizing impervious areas, bioretention facilities, rain gardens, vegetated rooftops, rain barrels, and permeable pavements. Regular and appropriately timed inspections are necessary for the proper operations of LID facilities. Inspections should be seasonally timed in order to protect the function of the facility. Generally, during the fall debris and organic material should be removed from structures. Structures should be inspected after winter storm events to confirm proper flow control and identify any erosion problems.

This section contains extractions from *Guidance Document—Western Washington Low Impact Development (LID) Operation and Maintenance (O&M),* as prepared for the Washington Department of Ecology, for common LID facilities. If your LID facility is not listed in this manual, follow the maintenance requirements in the guidance document.

6.2 Permeable Pavement

Permeable pavement is a paving system which allows rainfall to percolate through the surface into the underlying soil or an aggregate bed, where stormwater is stored and infiltrated or removed by an overflow drainage system.



There are several different types of surface layers found in permeable pavement, including:

- Porous Asphalt: a flexible pavement similar to standard asphalt but with the fine material reduced or eliminated. This results in the formation of voids that allows water to infiltrate to the underlying aggregate base.
- Pervious Concrete: a rigid pavement similar to conventional concrete but the fine material is reduced or eliminated. This results in the formation of voids that allows water to infiltrate to the underlying aggregate base.
- Interlocking Concrete Paver Blockers: solid, precast, manufactured pavers. These units create joints that are filled with permeable aggregate to allow stormwater infiltration.
- Pervious or Aggregate Pavers: solid, permeable, manufactured paving units bound with Portland cement concrete. Pavements constructed with these units create joints that are filled with permeable aggregate.
- Open-celled Paving Grid with Gravel: concrete or plastic grids that are filled with permeable aggregate. The system can be installed on an open-graded aggregate base.
- Open-celled Paving Grid with Grass: concrete or plastic grids that are filled with a mix of sand, gravel, and topsoil for planting vegetation. The cells can be planted with a variety of non-turf forming grosses or groundcovers.

Inspections and Maintenance Considerations:

- Commonly used tools to maintain permeable pavement are regenerative air or vacuum sweepers and hand tools to remove vegetation from the pavers.

- Vacuum sweepers can be expensive, and it may be more cost effective to hire a contractor with a vacuum sweeper.

- Sealants should never be used on permeable pavements.

- To prevent clogging, protect permeable pavement from excessive sediment from nearby construction, landscaping materials, or snow clean-up operations.

For more information on permeable pavement, including detailed inspection and maintenance requirements, see Ecology's LID Guidance document at: https://ecology.wa.gov/DOE/files/0b/0b070df2-4aff-4e74-821a-152e3fcb4ff5.pdf.

6.3 Rain Gardens

Rain gardens are non-engineered, shallow, landscaped depressions with compost-amended soils and plants. Rain gardens temporarily store stormwater runoff and allow it to pass through compost-amended soils and into the underlying native soil. Rain gardens have overflow for heavy rain events.

Inspections and Maintenance Considerations:

- The most common tools for rain garden maintenance are hand tools to maintain vegetation and manage amended soils.

- Rain gardens should be protected from foot traffic and vehicles to avoid soil compaction.

- Fertilizers and pesticides should not be used in rain gardens.

- The *Rain Garden Handbook for Western Washington Homeowners* (http://www.wastormwatercenter.org/low-impact/) provides in-depth guidance for rain garden maintenance and planting.

- Inspect rain gardens after heavy rain events to ensure that the rain garden is infiltrating water quickly and that water is flowing into the rain garden and away from buildings.

6.4 Compost-Amended Soils

Compost-amended soils are added to post-development landscapes to supplement native soils that have been compacted during construction to enhance stormwater infiltration.

Inspection and Maintenance Considerations:

- Common tools for maintaining compost-amended soils include general landscaping hand tools. If compaction of soils occurs, a soil aeration tool may be needed.

- Compost-amended soils can be low maintenance if vegetation is protected, and compaction is avoided by limiting vehicle and foot traffic.

For more information about compost-amended soils, including detailed inspection and maintenance guidance, visit Ecology's LID Guidance Document at: https://ecology.wa.gov/DOE/files/0b/0b070df2-4aff-4e74-821a-152e3fcb4ff5.pdf

6.4 Vegetated Roofs

Vegetated roofs, otherwise known as eco-roofs or green roofs, are thin layers of engineered soil and vegetation on top of a conventional roof. Vegetated roofs consist of four components: a waterproof membrane, drainage layer, lightweight growth medium, and vegetation.

Inspection and Maintenance Considerations:

- For vegetated roofs to function properly, stormwater must filter through several layers. Filtration can be reduced if the soil is compacted due to foot traffic.

- Caution should be used when maintaining or inspecting vegetated roofs. Only individuals with training in roof work safety should maintain or inspect vegetated roofs.

- Common tools for vegetated roof maintenance includes general landscaping hand tools, sprinklers, or soaker hoses, and fall protection equipment.

For more information about vegetated roofs, including detailed inspection and maintenance guidance, visit Ecology's LID Guidance Document at: https://ecology.wa.gov/DOE/files/0b/0b070df2-4aff-4e74-821a-152e3fcb4ff5.pdf

6.0 Stormwater Facility Checklists

Stormwater facility checklists can be printed and used to track inspection and maintenance of stormwater facilities. Facility checklists are not a substitute for completing the Inspection and Maintenance Form that must be turned into the City by September 15th every year.

The “inspection frequency” column uses letters to denote how often a facility should be inspected for a potential defect. An “M” means that a facility should be inspected for the respective potential defect monthly during the rainy season (November to April). Potential facility defects that should be inspected annually during the dry season (May to September) are listed by an “A”. Some facilities should be inspected after any major rain event, characterized by more than one inch of rain in any 24-hour period. In the checklist those facilities are labeled with a “S”.

CATCH BASIN INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Trash, debris, vegetation, and sediment	M,S		Trash, sediment, or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%.	No trash, debris, or vegetation located immediately in front of catch basin or on grate opening.
		M, S		Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
		M		Trash, debris, or sediment exceeds 60 percent of the sump depth, as measured from the bottom of basin to the lowest pipe in the basin **OR** has less than six inches clearance from the debris surface to the invert of the lowest pipe.	No trash, debris, or sediment in the catch basin.
		M		Trash, debris, or sediment in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash, debris, or sediment.
	Structure damage to frame and/or top slab	A		Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		A		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached.	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or cracks in basin walls/ bottom	A		Maintenance person judges that structure is unsound.	Basin replaced or repaired
		A		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe; any evidence of soil particles entering catch basin through cracks.	Pipe is re-grouted and secure at basin wall.
	Settlement/ misalignment	A		Failure of basin has created a safety, function, or design problem	Basin replaced or repaired.
	Contamination and pollution	M		Any evidence of oil, gasoline, or other chemical pollutants	No contaminants or pollutants present

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

CATCH BASIN INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Catch Basin Cover	Cover	A		Cover is missing or only partially in place.	Catch basin covered is closed.
		A		One maintenance person cannot remove lid.	Cover can be removed by one maintenance person.
Metal Grates (if applicable)	Grate opening unsafe	M		Grate opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and debris	M		Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate is free of trash and debris.
	Damaged or missing	M		Grate missing or broken.	Grate is in place and meets design standards.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

Estimating Sediment Depth of a Catch Basin

1. **Remove the manhole cover / grate.**
   Using a ½-inch Allen wrench and a catch basin grate hook or crowbar.

2. **Identify the sump depth (water level).**
   Using a probe or rod, identify the sump depth. This is done by inserting the rod through the water and sediment until it hits the bottom of the catch basin; water level will be visible for measurement upon removal. NOTE: Under normal conditions, the water level should be even with the outlet pipe. A higher level indicates a blockage in the outlet.

3. **Identity the sediment level.**
   a. Put the probe or rod in through the water until it touches the top of the sediment. Mark it with relation to a stationary point in the catch basin with tape or chalk (position A on the following diagram).

   b. Put the probe or rod in through the water and sediment until it touches the bottom of the catch basin, and mark the probe with relation to the same stationary point as in item 1 above (Position B on the following diagram). The difference between the two marks is the **sediment depth**.

   c. The water mark left on the rod is the “sump depth”. Measure the ratio of sediment depth to sump depth to determine the allowable amounts.

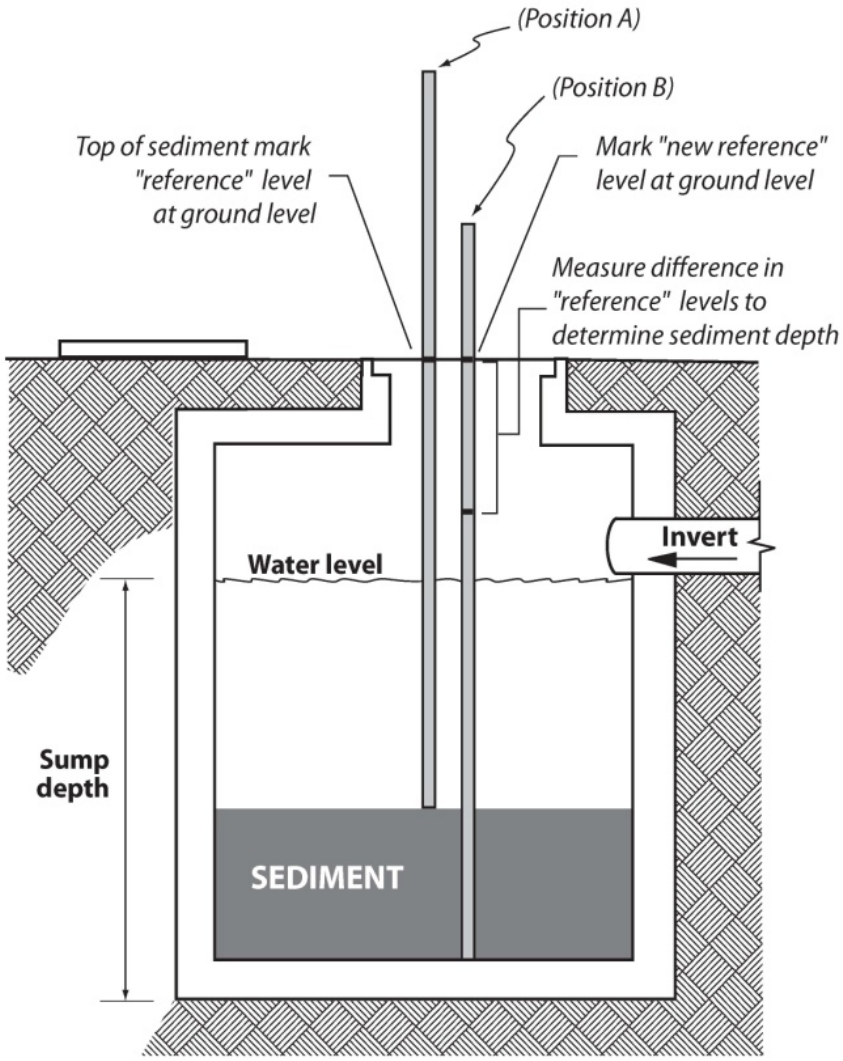


Diagram from King County Drainage Maintenance Standards

CATCH BASIN INSERT INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment accumulation	M		When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and debris Accumulation	M		Trash and debris accumulate on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media insert not removing oil	M		Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Saturation of media insert	M		Catch basin insert is saturated with water or oil and no longer has the capacity to absorb.	Remove and replace media insert.
	Media insert use beyond normal product life	M		Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

CONTROL STRUCTURE/ FLOW RESTRICTOR INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
General	Trash/ debris, sediment	M		Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash, debris, or sediment removed.
General	Structural damage	A		Structure is not in upright position (allow up to 10% from plumb).	Structure in correct position.
		A		Connections to outlet pipe are not watertight and show signs of rust.	Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.
		A		Any holes, other than designed holes, in the structure.	Structure has no holes other than designed holes.
		A		Any holes, other than designed holes, in the structure.	Structure has no holes other than designed holes.
Clean-out Gate	Damaged or missing components	A		Cleanout gate is not watertight or is missing.	Gate is watertight and works as designed.
		A		Gate cannot be moved up and down by one maintenance person.	Gate moves up and down easily and is watertight.
		A		Chain/rod leading to gate is missing or damaged.	Chain is in place and works as designed.
		A		Gate is rusted over 50% of its surface area.	Gate is repaired or replaced to meet design standards.
Orifice Plate	Obstructions	M,S		Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Damaged or missing components	A		Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	obstructions	M,S		Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

CONTROL STRUCTURE/ FLOW RESTRICTOR INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Manhole	Cover difficult to remove	A		One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Locking mechanism Not Working	A		Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Ladder rungs unsafe	A		Ladder is unsafe due to missing rungs, misalignment, rust, cracks, or not securely attached to wall.	Ladder meets design standards. Allows maintenance person safe access.
General	Sediment and Debris	M		Accumulated sediment and/or debris that exceeds 20% of the diameter of the pipe.	Clean pipe of all sediment and debris.
Vegetation	Overgrowth	M		Vegetation hinders water movement through pipe.	Clean pipe of vegetation.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

PIPE AND CULVERT INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment and debris	M		Accumulated sediment and/or debris that exceeds 20% of the diameter of the pipe.	Clean pipe of all sediment and debris.
Vegetation	Obstruction	M		Vegetation that reduces free movement of water through pipes.	Remove all vegetation so water flows freely through pipes.
Structural	Damage to protective coating	A		Rust is causing more than 50% deterioration to any part of the pipe.	Pipe is repaired and/or replaced per design standards.
	Joints	A		Joints are visible misaligned, or culvert alignment is disrupted.	Joint and culvert alignment are to design specifications.
	Damaged pipe	A		Any dent that decreases the cross-section area of pipe by more than 20%.	Pipe or culvert is free of major dents.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

DITCH INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Trash & debris	M		Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Clear trash and debris from ditch.
	Sediment	M		Accumulated sediment that exceeds 20% of the design depth.	Clean/flush ditch of all sediment and debris so that it matches design. **
Vegetation	Overgrowth	M		Vegetation that reduces free movement of water through ditch (vegetation taller than 8 inches or trees such as alders).	Remove vegetation so that water flows freely through ditch.
Side slopes	Erosion damage to slope	M		Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Stabilize slopes by using appropriate erosion control measure(s): for example, rock reinforcement, planting of grass, erosion control blankets, bonded-fiber matrices or compaction.
Check dams	Sedimentation	M		Silt deposition causes standing water behind check dam	Replace check dam; remove silt.
Rock-lined ditch	Failure of rock-lined ditch	M		Erosion or failure of rock slopes of ditch line.	Replace/repair rock lining to reestablish ditch cross-section.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hour

ENERGY DISSIPATOR CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Rock Pad or Check Dam	Missing or moved rock	M		Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	M		Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
	Vegetation	M		Weeds or nuisance vegetation are present on rock pad.	Weeds have been removed, following IPM protocols.
Dispersion Trench	Pipe plugged with sediment	M		Accumulated sediment that exceeds 20% of the design depth.	Pipe cleaned/flushed so that it matches design.
	Not discharging water properly	M		Visual evidence of water discharging at concentrated points along trench (normal condition is a “sheet flow” of water along trench). Intent is to prevent erosion damage.	Trench redesigned or rebuilt to standards.
	Perforations plugged	M		Over 1/2 of perforations in pipe are plugged with debris and sediment.	Perforated pipe cleaned or replaced.
	Water flows out top of “distributor” catch basin	M		Observation or report of water flowing out during any storm less than the design storm or it is causing or appears likely to cause damage.	Facility rebuilt or redesigned to standards.
	Receiving area over-saturated	M		Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Manhole/ Chamber	Worn or damaged post, baffles, side of chamber	M		Structure dissipating flow deteriorates to 1/2 of original size or any concentrated worn spot exceeding one square foot which would make structure unsound.	Structure replaced to design standards.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

ENERGY DISSIPATOR INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Manhole/ Cover	Trash and debris	M		Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.	Inlet and outlet pipes free of trash or debris.
		M		Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin the lowest pipe; less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe	No trash or debris in the catch basin.
	Sediment	M		Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to the lowest pipe. There shall be a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure damage to frame and/or top slab	A		Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch (Intent is to make sure no material is running into basin).	Top slab is free of holes and cracks.
		A		Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or cracks in basin walls/ bottom	A		Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
		A		Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Pipe is re-grouted and secure at basin wall.
	Settlement / misalignment	A		If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Contamination and Pollution	M		Any evidence of oil, gasoline, contaminants, or other pollutants (Coordinate removal/cleanup with the Public Works Department).	No contaminants or pollutants present.

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BAFFLE OIL/ WATER SEPARATORS (API TYPE) INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
General	Vault Water Quality	M,S		Obvious oil sheen.	Effluent discharge from vault should be clear without thick visible sheen.
	Sediment	M,S		Sediment depth in bottom of vault exceeds 6-inches in depth.	No sediment deposits on vault bottom that would impede flow through the vault and reduce separation efficiency.
	Trash and debris	M,S		Trash and debris accumulation in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil	M,S		Oil accumulations that exceed 1-inch, at the surface of the water.	Oil accumulation is removed via vactor truck.
Structure	Damaged pipes	A		Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired or replaced.
	Access cover	A		Cover cannot be opened, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Openings or voids in walls	A		Any openings or voids through the walls which allow soil particles or debris into structure.	All openings, voids, and joints sections are repaired.
	Vault structure damage	A		Crack wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks.	Vault replaced or repaired design specifications and is structurally sound.
	Cracks, openings, or voids at pipe penetrations	A		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
	Baffles	A		Baffles corroding, cracking, warping and/or showing signs of failure.	Baffles repaired or replaced to design specifications.
Access Ladder	Access ladder damaged	A		Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications and is safe to use as determined by inspection personnel.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

COALESCING PLATE OIL/WATER SEPARATOR INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Vault Water Quality	M,S		signs of poor water quality in discharge water	Effluent discharge from vault should be clear with no thick visible sheen.
	Sediment accumulation	M,S		Sediment depth in bottom of vault exceeds 6-inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
	Trash and debris accumulation	M,S		Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil accumulation	M,S		Oil accumulation that exceeds 1- inch at the water surface.	Oil is removed via vactor truck. Coalescing plates are cleaned.
Structure	Damaged coalescing plates	A		Plate media broken, deformed, cracked, and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged pipes	A		Inlet or outlet piping damaged or broken	Pipe repaired and or replaced.
	Baffles	A		Corrosion, cracks, warping, and/or signs of failure	Baffles repaired or replaced to specifications.
	Openings or voids in walls	A		Any openings or voids through the walls which allow soil particles into facility	All openings, voids, and joints sections are repaired.
	Vault structure damage	A		Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
	Cracks, openings, or voids at pipe penetrations	A		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
	Access ladder damaged	A		Ladder is corroded or deteriorated and/or not safe to use	Ladder replaced or repaired and meets specifications and is safe to use

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

DETENTION TANK/ VAULT INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Storage Area	Plugged air vents	M		One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and sediment	M		Accumulated sediment depth exceeds 10% of the diameter of the storage area for ½ length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Openings or voids in walls	A		Any openings or voids through the walls which allow soil particles or any other material to be transported into the facility through the walls.	All openings, voids, and joints sections are repaired.
	Tank pipe bent out of shape	A		Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Cracks or damage in wall, bottom, frame, top slab	A		Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks. (Will require engineering analysis to determine structural stability).	Vault replaced or repaired to design specifications and is structurally sound.
	Cracks, openings, or voids at pipe penetrations	A		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
Access Riser/Port; Connector Catch Basin/ Manhole	Cover not in place	A		Cover is missing or only partially in place. Any open structure requires maintenance.	Structure is closed.
	Locking mechanism not working	A		Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

DETENTION TANK/ VAULT INSPECTION AND MAINTENANCE CHECKLIST (CONTINUED)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
Access Riser/Port; Connector Catch Basin/ Manhole	Cover difficult to remove	A		One maintenance person cannot remove lid.	Cover can be removed and reinstalled by one maintenance person.
	Unsafe ladder rungs	A		Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

WET VAULT INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Trash/debris accumulation	M		Trash and debris accumulated in vault, pipe or inlet/outlet (includes floatables and non-floatables).	Remove trash and debris from vault.
	Sediment accumulation in vault	M		Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	Remove sediment from vault.
	Damaged pipes	A		Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access cover damaged	A		Cover cannot be opened or removed by one person.	Cover repaired or replaced to proper working specifications.
	Ventilation	M		Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. See design specifications for details.
Vault Structure	Openings or voids in walls	A		Openings or voids through the walls which allow soil particles or any other material to be transported into the facility through the walls.	All openings, voids, and joints sections are repaired.
	Cracks and damage	A		Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks. (Will require engineering analysis to determine structural stability).	Vault replaced or repaired to design specifications and is structurally sound.
	Cracks, openings, or voids at pipe penetrations	A		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.
	Baffles	A		Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection staff.	Baffles repaired or replaced to specifications.
Access Ladder	Damage	A		Ladder is deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications and is safe to use as determined by inspection personnel. Replace confined space warning sign.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

SAND FILTER (BELOW GROUND/ ENCLOSED) INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment accumulation on sand media section	M		Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment accumulation in pre-settling portion of vault	M		Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/debris accumulation	M		Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in drain pipes	M		When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short circuiting	M		Seepage/flow occurring along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged pipes	A		Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access cover damaged/not working	A		Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	M		Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area, in accordance with design specifications.
	Openings or voids in walls	A		Any openings or voids through the walls which allow soil particles or any other material to be transported into the facility through the walls.	All openings, voids, and joints sections are repaired.
	Cracks in pipe	A		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

SAND FILTER (BELOW GROUND/ ENCLOSED) INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Vault structure damage	A		Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound.
	Baffles/internal walls	A		Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access ladder	A		Damaged Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications and is safe to use as determined by inspection personnel.
	Cracks, openings, or voids at pipe penetrations	A		Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls	No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

DETENTION ('DRY POND') INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Trash and debris	M,S		Any trash and debris which exceeds about one standard size garbage can; visual evidence of dumping.	No trash, debris, or evidence of dumping onsite.
	Poisonous vegetation and noxious weeds	A		Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public	No poisonous, or noxious weeds present. Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required.
	Contaminants and pollution	M,S		Any evidence of oil, gasoline, contaminants, or other pollutants	No contaminants or pollutants present. (Notify Public Works Department before removal / cleanup).
	Pests	M		Evidence of rodents, beaver dams, or insects	Pests are removed and/or destroyed. Any damage done by pests is repaired. Coordination of beaver trapping must be done with appropriate agencies.
	Tree Growth/ Hazard Trees	A		Tree growth does not allow maintenance access or interferes with maintenance. If trees are not interfering with access or maintenance, do not remove.	Trees have been trimmed or removed so they do not hinder maintenance activities. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).
		A		Diseased, dead, or unhealthy trees. (use a certified arborist to determine tree health and removal requirements).	Dead and unhealthy trees are removed.
Side Slopes	Erosion	M		Erosion of more than 2 inches deep.	Stabilized slopes using appropriate erosion control measures (rock reinforcement, planting grass, compaction).
		M,S		Any erosion observed on a compacted berm embankment.	Erosion is resolved; consult civil engineer to find source of erosion.
Storage Area	Sediment	M		Accumulated sediment exceeds 10% (usually 6"-12") of designed pond depth.	Sediment cleaned out to designed pond shape and depth; pond reseeded if necessary to control erosion
	Liner (if applicable)	M		Liner is visible and has more than three ¼ inch holes.	Liner is repaired or replaced and fully covered.

DETENTION ('DRY POND') INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Pond Berms (Dikes)	Settling	A		Any part of berm which has settled 4 inches lower than the design elevation. Measure berm to determine amount of settlement. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted.	Dike is built back to the design elevation.
	Piping	A		Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a geotechnical engineer be called in to evaluate condition and recommend repair.)	Piping eliminated. Erosion potential resolved
Emergency Spillway/ Overflow	Tree Growth	A		Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping	Trees should be removed. Root systems with base less than 4 inches may be left in place. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Unprotected spillway			Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of outflow path of spillway.	Rocks and pad depth are restored to design standards
	Erosion	See "Side Slopes of Pond"			
Emergency Spillway and Berms over 4 feet in height	Tree Growth	A		Tree growth on emergency spillways create blockage problems. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. Root systems with base less than 4 inches may be left in place. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Piping	A		Discernible water flow through pond berm and ongoing erosion. (Have a Geotechnical engineer inspect and evaluate discernible water flow conditions and recommend repairs).	Piping eliminated. Erosion potential resolved

WET POND INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
Pond area	Water level	M, A		First cell is empty, doesn't hold water.	First cell lined to maintain at least 4 feet of water. Although the second cell may drain, the first cell must remain full to control turbulence of the incoming flow and reduce sediment re-suspension.
	Vegetation	M, A		Height of vegetation including grass and weeds exceeds 18 inches. Trees, brush, and shrubs are impeding maintenance or flow.	Mow vegetation to 4-5 inches in height. Trees, bushes, and shrubs that interfere with pond maintenance activities are removed. Some wetland species may require harvesting or special maintenance rather than mowing.
	Algae mats	M, A		When algae mats cover more than 10% of the water surface.	Algae mats that cover more than 10% of the surface of any cell are removed. Mats should be removed in dry season before fall rains.
	Trash and debris	M, A		Accumulation that exceeds 1 cubic foot per 1000 square feet of pond area.	Trash and debris removed from pond
	Sediment accumulation in pond bottom	M, A		Sediment accumulations in pond bottom that exceeds the depth of sediment zone (typically 1 foot) plus 6-inches, usually in the first cell.	Sediment removed from pond bottom.
	Oil sheen on water, contaminants, or pollution	M, A		Prevalent and visible oil sheen or any evidence of gasoline, contaminants, or other pollutants.	Oil removed from water using oil- absorbent pads or vactor truck. Source of oil located and corrected. If chronic low levels of oil persist, plant wetland plants such as Juncus effusus (soft rush) which can uptake small concentrations of oil.
	Erosion	A		Erosion of the pond's side slopes and/or scouring of the pond bottom, which exceeds 6-inches, or where continued erosion is prevalent.	Slopes stabilized using proper erosion control measures and repair methods.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours)

WET POND INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Inlet/Outlet Pipe	Trash and debris	M,A		Inlet/Outlet pipe clogged with sediment and/or debris material	No clogging or blockage in the inlet and outlet piping.
	Floatables are Captured	M,A		Floatable material is retained by outlet pipe or T-section.	Ensure outlet pipe or T-section retains floatables.
Pond dike	Settlement of pond dike/berm	A		Any part of these components which has settled 4-inches or lower than the design elevation, or inspector determines dike/berm is unsound.	Dike/berm is repaired to specifications
Internal dike/berm	Concentrated flow	A		Dike/berm dividing the cells should be level.	Dike/berm surface is leveled so that water flows evenly over entire length of dike/berm.
Overflow spillway	Rock missing	A		Rock is missing and soil is exposed at top of spillway or outside slope.	Rocks replaced to specifications.
Access ramp	Not in useable condition	A		Access ramp is capable of supporting trucks and maintenance equipment.	Repair ramp to support trucks and maintenance equipment.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

BIOFILTRATION SWALE INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment accumulation on grass	M		Sediment depth exceeds 2 inches.	Grass treatment areas of the swale is free of accumulated sediment. Once inflow ceases, there is no standing water.
	Standing water	M		Standing water in the swale between storms and does not drain freely.	Any of the following may apply: blockages removed, grade from head to foot of swale is of design standards, clogged check dams cleaned, add underdrains, or conversion to a wet biofiltration swale.
	Flow spreader	M		Flows are not uniformly distributed through entire swale width.	Spreader is level and clean so that flows are spread evenly over the entire filter width.
	Constant baseflow	M		Small quantities of water continually flow through the swale, even when it has been dry for weeks and an eroded, muddy channel has formed in the swale bottom.	A low-flow pea-gravel drain the length of the swale has been added or a by-pass of the baseflow around the swale has been created.
	Poor vegetation coverage	M		Grass is sparse, bare, or eroded patches occur in more than 10% of the swale bottom.	Grass condition has been restored to facility design function. Replanting with plugs of grass from the upper slope or re-seeding the swale bottom at 8-inch intervals may be needed.
	Vegetation	M		Grass becomes excessively tall (greater than 10-inches) or nuisance weeds and other vegetation starts to take over.	Mow vegetation or remove nuisance vegetation so that flow is not impeded. Grass should be mowed to a height of 3 to 4 inches. Remove grass clippings.
	Excessive shading	M		Grass growth is poor because sunlight does not reach swale.	Over-hanging limbs and brushy vegetation on adjacent slopes causing excessive shading is removed or trimmed.
	Inlet/outlet	M		Inlet/outlet areas clogged with sediment and/or debris.	Inlet/outlet is not clogged or blocked.
	Trash and debris accumulation	M		Trash and debris accumulated in the bioswale.	No trash or accumulated debris is present in bioswale.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

BIOFILTRATION SWALE INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Erosion/Scouring	M		Eroded or scoured swale bottom due to flow channelization, or higher flows.	Ruts or bare areas less than 12 inches wide, have been repaired by filling with crushed gravel. Larger bare areas have been re-graded and re-seeded. Smaller bare areas, are overseeded in bare spots or covered with grass plugs from upper slope at 8-inch intervals.
Rock Pad	Missing or moved rock	M		Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil.	Rock pad replaced to design standards.
	Erosion	M		Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

WET BIOFILTRATION SWALE INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment accumulation	M		Sediment depth exceeds 2-inches in 10% of the swale treatment area.	Remove sediment deposits in treatment area.
	Water depth	M		Water not retained to a depth of about 4 inches during the wet season.	Build up or repair outlet berm so that water is retained in the wet swale.
	Wetland vegetation	M		Vegetation becomes sparse and does not provide adequate filtration, OR vegetation is crowded out by very dense clumps of cattail, which do not allow water to flow through the clumps.	Determine cause of lack of vigor of vegetation and correct. Replant as needed. For excessive cattail growth, cut cattail shoots back and compost off-site. Note: normally wetland vegetation does not need to be harvested unless die-back is causing oxygen depletion in downstream waters.
	Inlet/outlet	M		Inlet/outlet area clogged with sediment and/or debris.	Remove clogging or blockage in the inlet and outlet areas.
	Trash and debris accumulation	M		Any trash and debris which exceed one standard size garbage can per 1,000 square feet. In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Remove trash and debris from wet swale.
	Erosion/scouring	M		Swale has eroded or scoured due to flow channelization, or higher flows.	Check design flows to assure swale is large enough to handle flows. By-pass excess flows or enlarge swale. Replant eroded areas with fibrous-rooted plants such as Juncus effusus (soft rush) in wet areas or snowberry (Symphoricarpos albus) in dryer areas.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

FILTER STRIP INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment accumulation on grass	M		Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even and flows pass evenly through strip.
	Vegetation	M		When the grass becomes excessively tall (greater than 10-inches); when nuisance weeds and other vegetation starts to take over.	Mow grass, control nuisance vegetation, such that flow not impeded. Grass should be mowed to a height between 3-4 inches.
	Trash and debris accumulation	M		Trash and debris accumulated on the filter strip.	Remove trash and debris from filter.
	Erosion/scouring	M		Eroded or scoured areas due to flow channelization, or higher flows.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with crushed gravel. The grass will creep in over the rock in time. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re- seeded. For smaller bare areas, overseed when bare spots are evident.
	Flow spreader	M		Flow spreader uneven or clogged so that flows are not uniformly distributed through entire filter width.	Level the spreader and clean so that flows are spread evenly over entire filter width

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

SAND FILTER (ABOVE GROUND/ OPEN) INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Sediment accumulation on top layer	M		Sediment depth exceeds 1/2-inch.	No sediment deposit on grass layer of sand filter that would impede permeability of the filter section.
	Trash and debris	M		Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
	Sediment/ debris in clean-outs	M		When the clean-outs become fully or partially plugged with sediment and/or debris.	Sediment removed from clean-outs.
	Sand filter media	M		Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently.	Removal of top several inches of sand. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis can determine if lower sand has too much fine material).
	Prolonged flows	M		Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities.	Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.
	Short circuiting	M		When flows become concentrated over one section of the sand filter rather than dispersed.	Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area.
	Erosion damage to slopes	M		Erosion over 2-inches deep where cause of damage is prevalent or potential for continued erosion is evident.	Slopes stabilized using proper erosion control measures.
	Rock pad missing or out of place	A		Soil beneath the rock is visible.	Rock pad replaced or rebuilt to design specifications.
	Flow spreader	M		Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged pipes	M		Any part of the piping that is crushed or deformed more than 20%	Pipe repaired or replaced.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

INFILTRATION FACILITY INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Trash & debris	M,S		Any trash and debris which exceeds on standard size garbage can per 1,000 square feet; visual evidence of dumping.	Trash and debris cleared from site. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.
	Poisonous Vegetation and Noxious Weeds	A		Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel, public, or facility function; any evidence of noxious weeds.	No danger of poisonous vegetation where maintenance personnel or the public might normally be. Complete eradication of noxious weeds may not be possible. Compliance with State or local eradication policies required.
	Contaminants and pollution	M,S		Evidence of oil, gasoline, contaminants, or other pollutants.	No contaminants or pollutants present. (Notify Public Works Department before removal / cleanup.)
	Rodent holes	M		Evidence of rodent holes if facility is acting as a dam or berm, or any evidence of water piping through dam or berm via rodent holes.	Rodents destroyed and dam or berm repaired. (Coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)
	Beaver dams	M		Dam results in change or function of the facility.	Facility is returned to design function. (Coordinate trapping of beavers and removal of dams with appropriate permitting agencies)
	Insects	A		insects such as wasps and hornets interfering with maintenance activities.	Insects destroyed or removed from site. Apply insecticides in compliance with adopted IPM policies.
Storage Area	Sediment	M		Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. (A percolation test can indicate if facility is only working at 90% of its designed capabilities. If two inches or more sediment is present, remove).	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.
Filter Bags (if applicable)	Sediment and Debris	M		Sediment and debris fill bag more than ½ full.	Filter bag is replaced or system is redesigned.
Side Slopes of Ponds	Erosion	M		Eroded damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes should be stabilized using appropriate erosion control measures (e.g. planting of grass, rock reinforcement, compaction.)

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

INFILTRATION FACILITY INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
Pond Berms (Dikes)	Settlement	A		Any part of berm which has settled 4 inches lower than the design elevation. If settlement is apparent, measure berm to determine amount of settlement.	Dike is built back to the design elevation. Settling can be an indication of more severe problems with the berm or outlet works. A licensed civil engineer should be consulted to determine the source of the settlement
	Piping	A		Discernible water flow through pond berm. Ongoing erosion with potential for erosion to continue.	Piping eliminated. Erosion potential resolved. (Recommend inspection, evaluation, & recommendation for repair by a geo-technical engineer.
Emergency Overflow/ Spillway	Tree Growth	A		Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.	Trees should be removed. Small root systems (base less than 4 inches) can be left in place. Larger roots should be removed, and the berm restored. A licensed civil engineer should be consulted for proper berm/spillway restoration.
	Riprap and Pad Depth	A		Only one layer of rock exists above native soil in area five square feet or larger; any exposure of native soil at the top of outflow path of spillway. (Riprap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
Pre-settling ponds and vaults	Sediment and Debris	M		Facility or sump filled with sediment and/or debris	Sediment is removed.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

DEBRIS BARRIER INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Trash and Debris	M,S		Trash or debris that is plugging more than 20% of the openings in the barrier.	Barrier cleared to design flow capacity.
	Damaged/Missing Bars	A		Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than 3/4 inch.
		A		Bars are missing or entire barrier missing.	Bars in place according to design.
		A		Bars are loose and rust is causing 50% deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
	Inlet/Outlet Pipe	A		Debris barrier missing or not attached to pipe.	Barrier firmly attached to pipe.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

FENCING/ GATES/ LANDSCAPING INSPECTION AND MAINTENANCE CHECKLIST (SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
General	Missing or broken parts/dead shrubbery	M		Any defect in the fence or screen that permits easy entry to a facility.	Fence is mended or shrubs replaced to form a solid barrier to entry.
	Erosion	M,S		Erosion has resulted in an opening under a fence that allows entry by people or pets.	no opening under fence exceeds 4 inches in height.
	Vegetation	M		Shrubbery is growing out of control or is infested with weeds.	Shrubbery is trimmed and weeded. Do not use chemicals to control weeds.
Fences	Damage	A		Posts out of plumb more than 6 inches.	Posts plumb to within 1-1/2 inches of plumb.
		A		Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
		A		Any part of fence (including posts, top rails, and fabric) more than 1 foot out of design alignment.	Fence is aligned and meets design standards.
		A		Missing or loose tension wire.	Tension wire in place and holding fabric.
		A		Missing or loose barbed wire that is sagging more than 2-1/2 inches between posts.	Barbed wire in place with less than 3/4-inch sag between posts.
		A		Extension arm missing, broken, or bent out of shape more than 1-1/2 inches.	Extension arm in place with no bends larger than 3/4 inch.
	Deteriorated paint	A		Part or parts that have a rusting or scaling condition that has affected structural adequacy.	Structurally adequate posts or parts with a uniform protective coating.
	Fabric	M		Openings in fabric are such that an 8-inch diameter ball could fit through.	No openings in fabric.
Gates	Damaged or Missing Components	M		Gate is broken, jammed, or missing.	Pond has a functioning gate to allow entry of people and maintenance equipment such as mowers and backhoe. If a lock is used, make sure the City field staff has a key.

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FENCING/ GATES/ LANDSCAPING INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
Gates	Damaged or Missing Components	M		Broken or missing hinges such that gate cannot be easily opened and closed.	Hinges intact and lubed. Gate is working freely.
		A		Gate is out of plumb more than 6 inches and more than 1 foot out of design alignment.	Gate is aligned and vertical.
		A		Missing stretcher bands, and ties.	Stretcher bar, bands, and ties in place.
Landscaping- General	Vegetation	M		Weeds growing in more than 20% of the landscaped area (trees and shrubs only).	Weeds present in less than 5% of the landscaped area.
	Insect hazard	M		Any presence of poison ivy or other poisonous vegetation or insect nests.	No poisonous vegetation or insect nests present in landscaped area.
	Trash or litter	M,S		See Ponds Checklist.	See Ponds Checklist.
Landscaping- Trees and Shrubs	Damage	A		Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trim trees/shrubs to restore shape. Replace trees/shrubs with severe damage.
		M		Trees or shrubs that have been blown down or knocked over.	Replant tree, inspecting for injury to stem or roots. Replace if severely damaged.
		A		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Place stakes and rubber-coated ties around young trees/shrubs for support.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

ACCESS ROAD INSPECTION AND MAINTENANCE CHECKLIST					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
General	Subgrade failure	M		Access road is capable of supporting trucks and maintenance equipment.	Repair road to design standards.
	Road surface failure	M		Any surface defect that exceeds 6 inches in depth and 6 square feet in area or hinders or prevents maintenance access.	Repair road surface to be uniformly smooth with no settlement, potholes, soft spots, or ruts.
	Trash and debris	M		Trash and debris exceeds one standard sized garbage can per 1,000 square feet	Clear trash and debris from site.
		M		Debris that could damage vehicle tires (glass or metal).	Remove debris so that roadway is free of debris that could damage tires.**
	Contaminants	M		Presence of any chemical pollutants, flammable materials, or a build-up of sediments mildly contaminated with petroleum hydrocarbons.	Remove contaminants so that none are present.
	Erosion damage	M		Erosion within 1 foot of the roadway more than 8 inches wide and 6 inches deep.	Repair shoulder. Compact soil and stabilize surface to prevent further erosion.
	Obstructions	M		Any obstructions or vegetation that reduces clearance above road surface to less than 14 feet.	Remove obstructions or vegetation so that roadway overhead is clear to 14 feet high.
		M		Any obstructions or vegetation restricting the access to a 10- to 12-foot width for a distance of more than 12 feet or at any point restricting access to less than a 10-foot width.	Remove obstructions to allow at least a 12-foot access.
Vegetation	Vegetation control	M		Trees growing or vegetation in excess of 6 inches high or less than 6 inches apart within a 400 square foot area.	Remove trees, remove/mow access road surface.
		M		Weeds and brush exceed 18 inches in height or hinders maintenance access.	Cut weeds and brush to 2 inches in height, or clear in such a way as to allow maintenance access.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

MEDIA FILTER DRAIN (ECOLOGY EMBANKMENT) INSPECTION AND MAINTENANCE CHECKLIST(SPANS MULTIPLE PAGES)					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done ✓**	**Conditions to Check For**	**Conditions that should Exist**
No Vegetation Zone Adjacent to Pavement	Erosion, scour, or vehicular damage	M		No vegetation zone is uneven or clogged so that flows are not uniformly distributed.	Level the area and clean so that flows are spread evenly.
	Sediment accumulation on edge of pavement	M		Flows no longer sheeting off of roadway. Sediment accumulation on pavement edge exceeds top of pavement elevation.	Remove sediment deposits such that flows can sheet off of roadway.
Vegetated Filter	Sediment accumulation on grass	M		Sediment depth exceeds 2 inches.	Remove sediment deposits, re-level so slope is even, and flows pass evenly through the media filter drain.
	Excessive vegetation or undesirable species.	M		Excessively tall grass; nuisance weeds and other vegetation starts to take over or shades out desirable vegetation growth characteristics.	Mow grass, control nuisance vegetation, such that flow is not impeded. Grass should be mowed to a height that encourages dense, even growth.
	Erosion, scour, or vehicular damage.	M		Eroded or scoured areas due to flow channelization, high flows, or vehicular damage.	For ruts or bare areas less than 12 inches wide, repair the damaged area by filling with suitable topsoil. If bare areas are large, generally greater than 12 inches wide, the filter strip should be re-graded and re- seeded. For smaller bare areas, overseed when bare spots are evident.
Media Bed	Erosion, scour, or vehicular damage.	M		Eroded or scoured areas due to flow channelization, high flows, or vehicular damage.	For ruts or areas less than 12 inches wide, repair the damaged area by filling with suitable media. If bare areas are large, generally greater than 12 inches wide, the media bed should be re-graded.
	Sediment accumulation on media bed.	M		Sediment depth inhibits free infiltration of water.	Remove sediment deposits, re-level so slope is even and flows pass freely through Media Bed.
Underdrain	Sediment	M		Depth of sediment within perforated pipe exceeds 0.5”.	Flush underdrains through access ports and collect flushed sediment.

MEDIA FILTER DRAIN (ECOLOGY EMBANKMENT) INSPECTION AND MAINTENANCE CHECKLIST CONTINUED					
Drainage System Feature	**Problem**	**Inspection Frequency**	**Done** ✓	**Conditions to Check For**	**Conditions that should Exist**
General	Trash and Debris Accumulation	M		Trash and debris which exceed 5 cubic feet per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size garbage can). In general, there should be no visual evidence of dumping. If less than threshold all trash and debris will be removed as part of next scheduled maintenance.	Remove trash and debris.
	Flows are bypassing Ecology Embankment	M		Evidence of significant flows down-slope (rills, sediment, vegetation damage, etc.).	Remove sediment deposits, re-level so slope is even and flows pass evenly through Ecology Embankment. If completely clogged it may require more extensive repair or replacement.

KEY: (M) Monthly from November to April; (A) once a year during dry season (May to September); (S) After any major storm (more than 1 inch in 24 hours).

Glossary

Berm: A constructed barrier of compacted earth.

Best Management Practice (BMP): Physical, structural, and/or managerial practices approved by the Department of Ecology (DOE) that, when used singly or in combination, prevent or reduce pollution of water.

Biofilter: A designed, vegetated treatment facility where the more or less simultaneous processes of filtration, infiltration, adsorption and biological uptake of pollutants in stormwater takes place during the conveyance of concentrated or sheet flowing stormwater.

Biofiltration: The process of reducing pollutant concentrations in water by filtering the polluted water through biological materials.

Channel: A surface feature that conveys surface water and is open to the air.

Check Structure: A dam (e.g. rock, earthen, log) used in channels to reduce water velocities, promote sediment deposition, and/or enhance infiltration.

Compaction: The condensing of fill by mechanical means.

Conveyance: A mechanism for transporting water from one point to another, including pipes, ditches, channels, culverts, gutters, manholes, weirs, man-made and natural channels, water quality filtration systems, dry wells, etc.

Conveyance System: The drainage facilities, both natural and man-made, which collect, contain, and provide for the flow of surface and stormwater from the highest points on the land down to a receiving water.

Culvert: Pipe or concrete box structure which drains open channels, swales, or ditches under a roadway or embankment. Typically with no catch basins or manholes along its length.

Detention Facility: A facility (e.g. pond, vault, pipe) in which surface and stormwater is temporarily stored and released at a controlled rate.

Ditch: A long narrow excavation dug in the earth for drainage with its top width less than 10 feet at design flow.

Drainage: Refers to the collection, conveyance, containment, and/or discharge of surface and storm water runoff.

Drainage Easement: A legal encumbrance that is placed against a property's title to reserve specified privileges for the users and beneficiaries of the drainage facilities contained within the boundaries of the easement.

Dry Pond: A detention facility which drains dry after a storm.

Earthwork: Any operation involving the excavation, grading, filling, or moving of earth materials.

Easement: The legal right to use a described piece of land for a particular purpose. It does not include fee ownership, but may restrict the owner's use of the land. Easements are legally recorded with the County Auditor.

Easement, Private: An interest in the land of someone else, usually for the benefit of one or more individuals, and constitutes an encumbrance on another's land.

Embankment: A structure of earth, gravel, or similar material raised to form a pond bank or foundation for a road, building pad, or similar fill for a particular use.

Energy Dissipater: Any means by which the total energy of flowing water is reduced. In stormwater design, they are usually mechanisms that reduce velocity prior to, or at, discharge from an outfall in order to prevent erosion. They include rock splash pads, drop manholes, concrete stilling basins or baffles, and check dams.

Erosion: Detachment of soil or rock fragments by water, wind, ice and/or gravity.

Erosion/Sedimentation Control: Any temporary or permanent measures taken to reduce erosion, control siltation and sedimentation, and ensure that sediment-laden water does not leave the site.

Filter Fabric: A woven or non-woven, water-permeable material, generally made of synthetic products such as polypropylene and used in stormwater management and erosion and sediment control applications to trap sediment or prevent the clogging of aggregates by fine soil particles.

Filter Fabric Fence: A temporary sediment barrier consisting of filter fabric stretched across and attached to supporting posts and entrenched. The filter fence is constructed of stakes and synthetic filter fabric with a rigid wire fence backing where necessary for support.

Flow Control Manhole: A manhole with a flow regulating device or system such as weirs and orifice plates.

Grading: Any excavating, filling, clearing, or creating of impervious surfaces or combination thereof.

Groundwater: The underground water usually found in aquifers. Groundwater usually originates from infiltration. Wells tap the groundwater for water supply uses.

Illicit Discharge: All non-stormwater discharges to stormwater drainage systems that cause or contribute to a violation of state water quality, sediment quality or ground water quality standards.

Impervious Surface: A hard surface area which either prevents or retards the entry of water into the soil mantle as under natural conditions prior to development. A hard

surface area which causes water to run off the surface in greater quantities or at an increased rate of flow than the flow present under natural conditions prior to development. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, parking lots or storage areas, concrete or asphalt paving, gravel roads, gravel parking lots, or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces.

Infiltration: The downward movement of water from the surface to the subsoil.

Infiltration Facility (or System): A drainage facility designed to use the hydrologic process of surface and stormwater runoff soaking into the ground, commonly referred to as percolation, to dispose of surface and stormwater runoff.

Inlet: A form of connection between the surface of the ground and a drain for the admission of surface and stormwater runoff.

Non-Stormwater Discharge: Any discharge to the storm drain system that is not composed entirely of storm water.

Nutrients: Essential chemicals needed by plants or animals for growth. Excessive amounts of nutrients can lead to degradation of water quality and the growth of excessive numbers of algae. Some nutrients can be toxic at high concentrations.

Off-site: Any area lying upstream of a property that drains onto the property and any area lying downstream of the property to which the property drains.

Oil Water Separator: A structure or device used to remove oil and greasy solids from water.

On-site: The area within a property's boundaries.

Orifice: An opening with closed perimeter, usually sharp-edged, and of regular form in a plate, wall, or partition through which water may flow, generally used for the purpose of measurement or control of such water.

Professional Engineer: A professional civil engineer, currently licensed by the State of Washington.

Retention/Detention Facility: A facility (e.g. pond) with an outlet to surface water but which is intended to primarily discharge to groundwater and/or evaporation.

Retention Facility: A facility with no outlet to surface water and which is intended to discharge to groundwater and/or evaporation.

Riprap: A facing layer or protective mound of stones placed to prevent erosion or sloughing of a structure or embankment due to flow of surface and stormwater runoff.

Runoff: Rain and snowmelt that flows over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. Runoff

enters into drainage facilities, rivers, streams, springs, seeps, ponds, lakes, and wetlands as well as shallow ground water.

Sediment: Fragmented material that originated from weathering and erosion of rocks or unconsolidated deposits, and is transported by, suspended in, or deposited by water.

Site: For the purpose of this manual: a property having a storm drainage facility located within the property boundaries.

Storm Drainage Facility: A component, or combination of components, consisting of a man-made drainage feature designed and constructed to perform one or more particular functions to manage stormwater. A facility may be either publicly or privately owned.

Storm Drain System: Constructed and/or natural features which function together as a network to collect, convey, channel, retain, detain, infiltrate, divert, treat, or filter stormwater from surrounding lands to a point of final outlet, such as creeks, bays, or Puget Sound. A stormwater system may include, but not be limited to, pipes, catch basins, retention or detention ponds, channels, ditches, gulches, gullies, culverts, gutters creeks, and lakes. A system can be publicly owned as with the City's municipal separate storm sewer system or privately owned, serving an individual, private property.)

Storm Drains: The enclosed conduits that transport surface and stormwater runoff toward points of discharge (sometimes called storm sewers).

Stormwater: That portion of precipitation that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, channels or pipes into a defined surface water body or a constructed infiltration facility.

Structure: A catch basin, manhole, or other manufactured unit (in reference to a storm drainage facility or system).

Suspended Solids: Organic or inorganic particles that are suspended in and carried by the water. The term includes sand, mud, and clay particles (and associated pollutants) as well as solids in stormwater.

Swale: A shallow drainage conveyance with relatively gentle side slopes, generally with flow depths less than one foot.

Treatment (or Water Quality) BMP: A BMP that is intended to remove pollutants from stormwater.

Water Quality: The chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.

Water Quantity BMP: A BMP specifically designed to control the quantity of runoff.

Watershed: A geographic region within which water drains into a particular river, stream, or body of water.

Wetlands: An area inundated or saturated by ground or surface water at a frequency and duration sufficient to support, and that under normal conditions do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Wet Pond: A stormwater treatment pond designed to maintain a continuous or seasonal water level below the pond outlet elevation.