



Private Stormwater Facility Maintenance Management Guide

*A brief introduction to maintaining stormwater facilities
for residential and commercial property owners*



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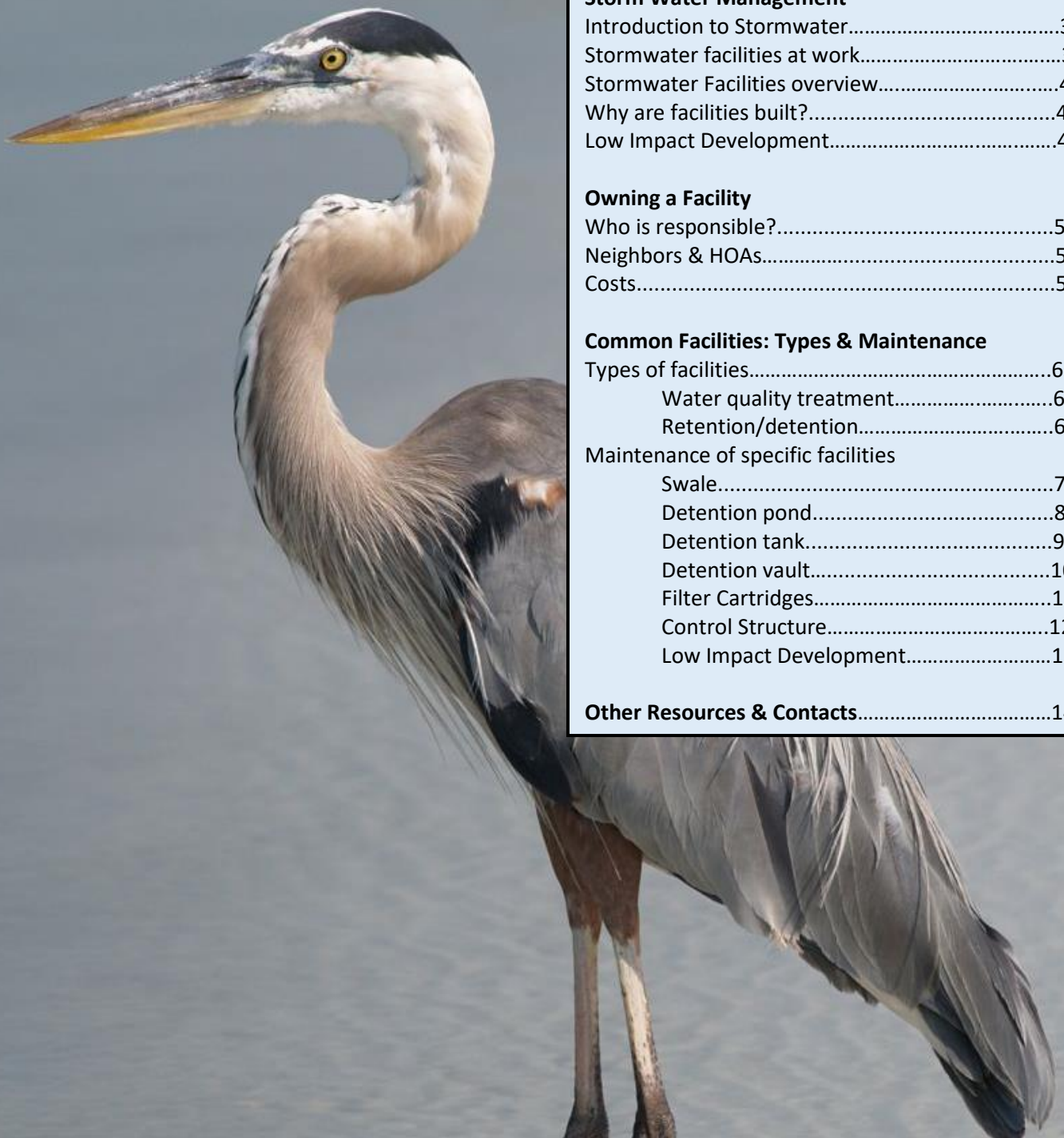
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Stormwater Management

Before development, western Washington was a vast forested landscape. As cities like Kenmore become more urbanized, the excessive rain no longer falls onto forests and wetlands; it falls onto our roads and buildings. As soon as the rain hits the ground, it becomes stormwater runoff, or surface water. The runoff eventually travels to Lake Washington carrying all the dirt, waste, oil, and other pollutants with it.

For our local waterbodies to remain clear and clean, this surface water must be managed. Throughout the city, there are over 300 stormwater facilities, maintained by the city and private owners alike. There are several different types of facilities, but they all share a common goal—slow down, clean, and release the storm water into the waterbodies.

It is undeniable that the daily view of Lake Washington is priceless, but Kenmore is situated at the bottom of several large watershed basins all naturally dumping into the lake. Kenmore is not only responsible for the rain that falls here, but it also conveys water that falls as far north as Everett, as far west as Lynnwood, and as far east as Bothell.



STORMWATER FACILITIES AT WORK

There is a wide range of facilities that contribute to the stormwater system in Kenmore. All of the facilities, big and small, old and new, share one common goal. They all pitch in to clean and retain the stormwater that runs through Kenmore.

CONVEYANCE

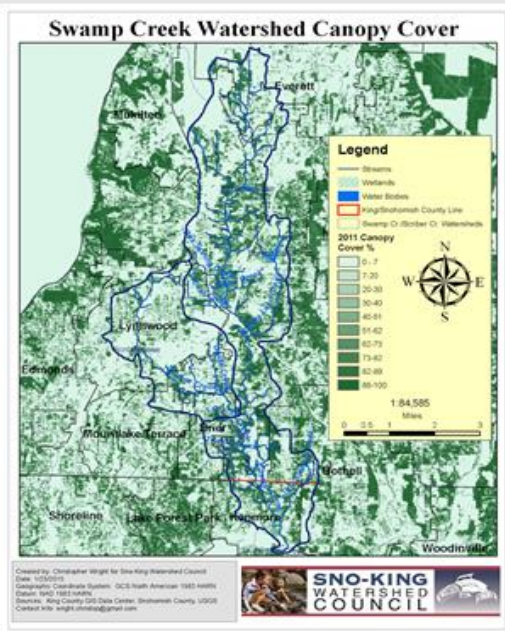
The flow control/water quality facilities around the city would be useless without the complex interwoven system that conveys the water from Point A to Point B. The conveyance system consists of 4000 catch basins, 127 miles of pipe, and hundreds of open ditches. All of the moving parts that make up the conveyance system are all essential to the success of the stormwater system.

RETENTION/DETENTION

Areas like Kenmore can receive up to 39 inches of rain a year. In a naturally rainy climate, retention/detention is an essential part of stormwater management. For the storm system to function properly, only some of the water can enter the system at a time. Retention/detention essentially means "to hold and to slow down", which is the primary goal of a majority of the facilities in the city.

WATER QUALITY

Due to the location at the bottom of the Swamp Creek Watershed, as well as the mouth of the Sammamish River, it is Kenmore's priority to discharge the cleanest water possible. There are both natural and artificial water quality treatment tactics. Using natural, native vegetation is relatively simple way to treat stormwater, ridding it of debris and pollutants. There are also cutting-edge filter technologies that can remove heavy metals, chemicals, and other harmful pollutants from water for several years.



Stormwater Facilities

CONDITIONS FOR APPROVAL

In order for plans for a housing or commercial development to be approved, it must include a runoff treatment program. It is common practice for developments to collect their runoff and feed it into a central flow control/water quality facility. However, this hasn't always been the case. There are many older neighborhoods in Kenmore that don't treat their own runoff and instead allow it to enter the city system freely.

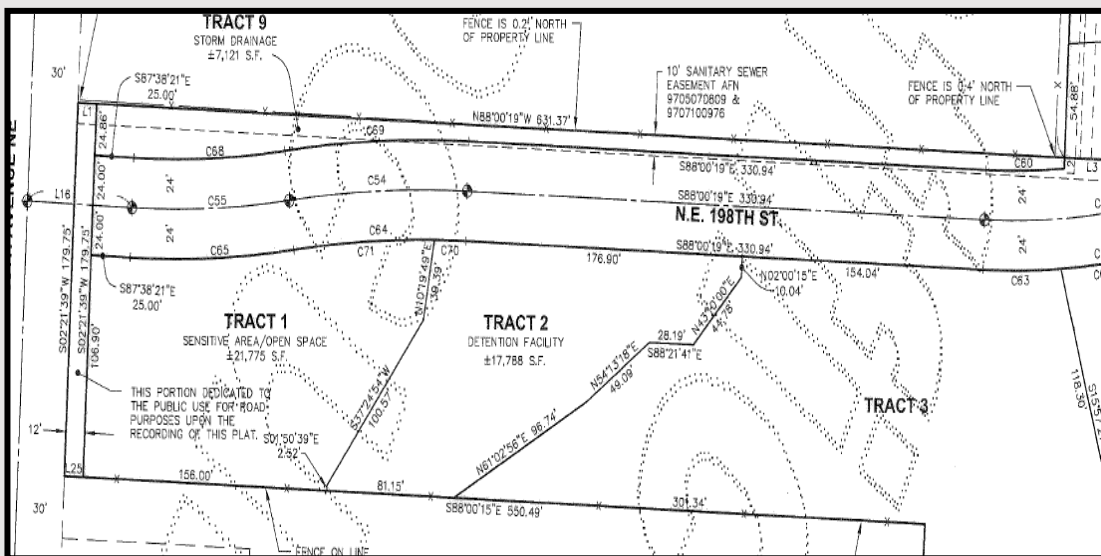
When these facilities are approved and constructed, maintenance and ownership typically goes to the Homeowner's Association or the collection of property owners. As this practice continues, many of the typical "who's-who" problems should be alleviated. If everyone is responsible for their own runoff, in theory, Kenmore should be putting out clean, low-velocity water.

LOW IMPACT DEVELOPMENT (LID)

In the stormwater circles, the newest technology stems from the concept called Low Impact Development, or LID. It is a best management practice (BMP) that reduces the costs and burden of large stormwater treatment infrastructure, as well as providing equivalent water treatment. Many LID features hide in plain sight and can enhance landscaping.

LID can come in a variety of forms. Emerging technologies commonly include natural and synthetic filtration and/or infiltration components. LID facilities also include retention/detention, but the primary focus has been water quality.

There are specific guidelines for the City to follow for large projects, but also small-scale ways for each resident to contribute. Many of the newer stormwater facilities employ the LID techniques for effective stormwater treatment. (Page 13)



Plat of Bridlepath showing the detention facility built into the development plans

How do I know if a facility is public or private?

Unless the facility is clearly marked, there is no clear-cut way to tell who the facility is maintained by. Talking with your HOA, neighbors, and checking the City's database are the best first steps.

See Page 5



Owning a Facility

WHO IS RESPONSIBLE?

There are many factors that are included when deciphering who is directly responsible for a stormwater facility. If City of Kenmore owns both the land and the facility, it is easily declared “Public”. When the land is owned by private property owners (individuals or an HOA) and treats only the runoff they create, the facility is easily declared “Private”. Most of the facilities in Kenmore are owned by the private property owners, but the actual maintenance is done by City staff. When this is the case, the City of Kenmore typically has a legally binding Drainage Easement over the land.

If you are looking through this booklet, it is likely that your facility falls into the “Private” category. Ownership and maintenance is the responsibility of the property owner(s) that directly benefit from the facility. Checking your plat map is a great place to see exactly which lots are technically responsible for the facility. Additionally, if you, your community, or your business receive an annual Maintenance Correction Letter (MCL) from the city, the facility is deemed “Private”.

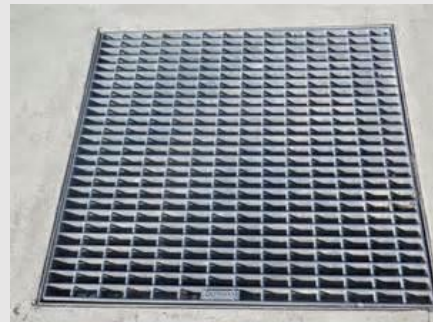
NEIGHBORS & HOAs & BUSINESSES:

If your development has an HOA, it is very likely that they are responsible for the drainage facility. Most developments collect a Surface Water fee as part of HOA fees to keep the facility up to date. There is no personal liability when the HOA owns and maintains the facility.

When there is no HOA, you and your neighbors will be personally responsible for the residential facility that benefits your land. Talking with your neighbors or property owner is the first step in keeping the facility up to date. The information in this booklet will help to inform you and your neighbors on how to start a routine inspection/maintenance schedule.

COSTS:

A well maintained facility can be relatively inexpensive. Keeping up with routine maintenance can help to reduce the frequency of large-scale repairs. At some point, nearly all facilities will need some type of larger servicing, and it is wise for property owners to set aside money for proper maintenance. The overall cost of facility maintenance will vary depending on the age, condition, amount of water flow, and the level of routine maintenance the facility receives.



Modern residential stormwater facilities can double as recreational space for the neighborhood (Left). It usually has several solid drain lids as well as access grates for maintenance (Right).

Types of Facilities

There are several types of stormwater facilities that are common around Kenmore. They come in all shapes and sizes, but all share a common goal. Together, they all pitch in to clean and slow down the high volume of water that moves through this city. Some facilities focus mainly on retention/detention, while others may have an added water quality component.

WATER QUALITY TREATMENT

Biofiltration: the use of natural materials like vegetation, sediment, and rock layers to filter out pollutants, and/or allow the water to re-enter the groundwater supply (Page 7-8). (Left)

Filter cartridges: The use of natural and mixed synthetic materials contained within a cartridge system to treat stormwater and allow the clean water to reenter the storm system (Page 11). (Right)



RETENTION & DETENTION

Flow control: each site has a calculated maximum of water that can freely flow, orifice plates and valves are used to only allow a certain amount of water thorough at a time

Sediment capture: when flows are given time to slow down, sediment will settle out. Removing sediment from the system greatly reduces pollutants.



◀ Control structures allow for the water to release slowly. They are all equipped with an orifice plate, with varying orifice sizes, to control the flow. (Page 12)

Some ponds utilize both biofiltration to clean the water as well as retention/detention structures to slow it down (Page 8) ▶



Swales

SWALE

Bioswales are a Low Impact Development technique that aid in water filtration. Compared to the average stormwater ditch, a swale is much longer and much flatter. They are designed to slowly guide stormwater to their outlet pipe and allow it to pass over the natural vegetation.

Maintenance is needed when you see:

- Exposed soil or dirt
- Either inlet and/or outlet pipes are clogged
- The swale has erosion or signs of channeling
- Overgrown vegetation that would restrict flow
- Unhealthy or excess dead vegetation
- Lawn clippings
- Leaves, trash, or other debris

Tips and general maintenance:

- During spring and summer months:
 - Replace damaged or dead vegetation
 - Avoid using fertilizer, herbicides, and pesticides. These chemicals will pollute the water.
 - Control erosion by reseeding bare areas, hardy plants will survive best on slopes
 - Removing sediment annually to reduce the likelihood of clogs
 - Remove harmful vegetation (blackberry and English Ivy) on a regular basis to reduce overgrowth
- During fall months:
 - Pick up leaves (#1 cause of surface clogs!)
- During winter months:
 - Remove trash and debris in a timely manner, especially after storms
 - Ensure the system works efficiently
- Year-round:
 - Mow grass to keep blade height between 4 and 6 inches, remove clippings
 - Check fencing and access roads



◀ *Bad: This ditch has exposed soil and dead vegetation. Maintenance will be needed for this ditch to be effectively filter water*

Good: this swale has healthy vegetation and a clear path for water to follow



Ponds

DETENTION POND

A detention pond is built to temporarily store stormwater and stormwater runoff. Some water will drain slowly into the control structure, some will infiltrate back into the ground (if design allows) and some will evaporate. The natural vegetation is another mechanism for biofiltration and should rid the water of some pollutants.

Maintenance is needed when you see:

- Bare or exposed soil
- Slopes deteriorating
- Sediment exceeding 10% of the designed pond depth or 20% of the pipes
- Unhealthy, dead, overgrown, or invasive vegetation
- Water surface is discolored, cloudy, or has a sheen
- Large trees growing on the slopes
- Trash or debris, visual evidence of dumping



Wet pond: generally stays wet all year and has wetland vegetation



Dry pond: Allows water to infiltrate and release within a few days of rain



Ducks in a pond can cause damage to the pond and increase pollutants!

Tips and general maintenance:

During summer months:

- Removing dead or invasive plants
- Maintenance that involves larger trash and debris removal operations
- Removing sediment from the pond if it has exceeded 10% of the designed pond depth and/or 20% of the pipes

During fall months:

- Raking leaves and removing trees that impede flow, threatens stability, or blocks maintenance access
- Reseeding bare areas new grasses will help reduce erosion and flooding (early fall)

During winter months:

- Ensuring the stormwater passes through the system in the appropriate amount of time for the system
- Removing trash, debris, and leaves after large storms

Year-round:

- Check access and fencing
- Checking for signs of erosion (2" deep where cause is still present or continued erosion is likely)

Detention Tanks

DETENTION TANK

A tank system is usually composed of a large diameter pipe and a control structure (page 12). The pipe's purpose is to capture some sediment and store water as needed. The control structure allows the water to release at a lower velocity and drain the tank after storms.

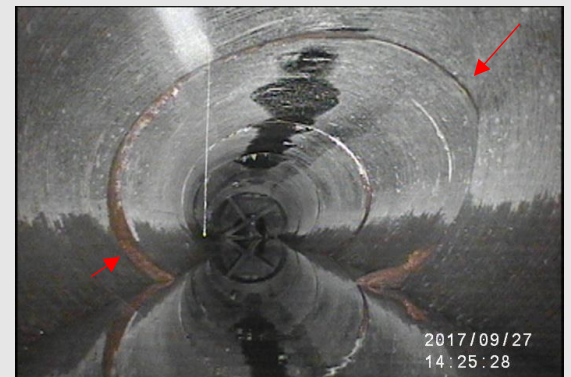


▲
Good: Light sediment accumulation, but the shape and structure of the tank are in tact

Maintenance is needed when you see:

- Sediment is accumulated in the tank or the adjacent structures
- The control structure is in constant overflow or the tank is not draining
- Tank is bent out of shape or joints are separating (below)
- A cover/lid is missing, damaged, or does not fit properly. An open manhole requires immediate maintenance

►
Bad: the tank is bent over 10% and the joints are separating more than 1/2". Evidence of rust, soil, and seepage are apparent



Tips and general maintenance:

- **Maintenance of tank structures should be completed by a professional. Amateur inspections should not exceed a visual inspection of what is visible from the surface**
- Sediment exceeding 15% at any point, or 10% for at least half the length of the tank needs to be maintained
- Any trash or debris exceeding 1 cubic foot (about an office wastebasket)
- Any indication of pollution or contaminants entering the system
- Keeping the access area free of overgrown vegetation, including invasive plants and large trees.
- Large trees in the area will increase likelihood root damage to the structure



Detention Vaults

DETENTION VAULT

A vault is generally a box-shaped structure with a control structure at the downstream end. There are several common additions to the basic box shape including: stormwater filters, sediment capture, and internal walls and baffles. However many additions there are, its primary purpose is to store water during storms and release it slowly via the control structure.

Maintenance is needed when you see:

- Sediment is accumulated in the vault or the adjacent structures
- The control structure is in constant overflow or the vault is not draining
- Cracks exceeding ½" or soil entering the structure through cracks
- A cover/lid is missing, damaged, or does not fit properly. An open manhole or access grate requires immediate maintenance



▲ Good: water level not too high, no cracks in the concrete, and few scum-lines lining the walls.

**CONFINED SPACE ENTRY
CERTIFIED PERSONNEL ONLY**



▲ Bad: sediment accumulation exceeding 10-15%, this vault needs to be cleaned before the wet season

Tips and general maintenance:

- Maintenance of vaults should be completed by a professional. Amateur inspections should not exceed a visual inspection of what is visible from the surface
- Sediment accumulating between 10% and 15%
- Cracks or any sign of structural damage
- Trash or debris accumulating in vault or adjacent structures
- Any indication of pollution or contaminants entering the system
- Large access grates should be able to easily open and lay flush with the opening
- Access grate handles and hinges should remain rust-free

Filter Cartridges

FILTER CARTRIDGES

A filter cartridge is a mixed-media self-contained system that absorbs dirty stormwater. It filters water through the media and redeposits the clean water into an underdrain system, allowing the clean water to reenter the storm system. They are commonly found in catch basins or manholes with 2-5 filter cartridges, or large vaults with 20-30 filter cartridges.

Downstream end of filter vault quickly accumulates sediment, debris, and the media will be used faster than the upstream end. The upstream end will generally stay cleaner longer.

Downstream: dirty ►



◀ Upstream: clean



There are several types of media available for the cartridges. This is a relatively clean Pearlite cartridge.



Bad: Filter catch basin with sediment accumulated on top of the cartridges and scum lines around the edges

Maintenance is needed when you see:

- If you have the proper tools, it is time to replace the cartridges when you can see that the media is discolored and used up.
- If the cartridge is inaccessible from the surface, greater than ½" sediment deposited on the cartridge surface and/or scum lines around the structure indicate the cartridge may need replacing
- Vaults: 2" or more accumulated sediment on the vault floor
- If water remains in structure more than 24 hours following a storm event

Tips and general maintenance:

- **Maintenance of filter vaults should be completed by a professional. Amateur inspections should not exceed a visual inspection of what is visible from the surface**
- If sediment has accumulated or the structure is not draining properly, hiring a professional to replace the cartridges in a timely manner
- Each cartridge has a life expectancy, they must be replaced before they expire regardless of their physical condition

Control Structure



▲ The basic shape of a control structure: a metal or corrugated metal tube (FROP-T), shear gate and rod, outflow pipe at the bottom, a downturn elbow, and an orifice plate welded to the bottom

CONTROL STRUCTURE

The control structure is arguably the most important part of the stormwater system. Each facility has a calculated maximum amount of water that can pass through the downstream system at once. The control structure keeps the flow less than the calculated maximum. The orifice plate contained within the structure has various orifice sizes and creates the retention/detention aspect of all types of facilities.



◀ Additional components are frequently added to the basic control structure. Here, there is an additional downturn elbow.

Maintenance is needed when you see:

- Sediment accumulating to 60% of the height between the bottom of the FROP-T and the floor
- Cracks wider than ½" and longer than 1 foot, and/or sediment entering the structure
- T-section not properly attached to the wall
- Sheer gate rod not properly attached to gate, or inaccessible from the surface
- Structure not upright, or at an angle due to settling or damage



◀ The orifice plate: a plate at the bottom of the FROP-T section with a small hole (orifice) in the center. The diameter of the orifice depends on the flow volume of the system.

Tips and general maintenance:

- Maintenance of control structures should be completed by a professional. Amateur inspections should not exceed a visual inspection of what is visible from the surface
- If the system is in constant overflow (water entering the elbows or the top of the structure) the orifice plate is likely clogged and will need to be unclogged in a timely manner
- The control structure is usually the last stop of the facility, ensuring it is in working order will keep the rest of the facility running smoothly

**CONFINED SPACE ENTRY
CERTIFIED PERSONNEL ONLY**



Low Impact Development

LOW IMPACT DEVELOPMENT

LID encompasses the use of many different flow control BMPs to reduce the impact of impervious surfaces. They are designed to reduce development-related increases in runoff, and include but not limited to, native vegetated surfaces, pervious surfaces, and infiltration techniques.



▲ **Permeable pavement:** a porous compactable surface (concrete, gravel, asphalt etc.) with particles less fine than their non-permeable counterparts. This allows gaps to form and water to seep through soil, drain rock layers, and into the groundwater supply. Maintenance of permeable surface is crucial and you should follow manufactures specifications. Keeping the surface clean by sweeping frequently is a good practice to prolong maintenance cycles.



▲ **Rain garden:** a bioretention area consisting of native vegetation and a meandering pathway for water to pass through. It is usually slightly lower than the ground elevation so water will pool in the garden and filter into the groundwater supply. Maintenance can be as simple as tending to a normal garden, however, keeping an eye out for flooding/pooling water 24-hours after a storm event is a good idea.



◀ **Bioretention cell:** a specific depression with certain types of soil and plants designed to hold onto runoff and filter it naturally. It is not designed to convey water, but is useful when a land frequently floods during storms. Simply keeping the vegetation pruned back and pipes clear of sediment is best practice for maintenance.



▲ **Green roof:** designed to capture and filter roof runoff instead of flowing freely into the storm system. Regular triangular roofs directly feed the stormwater into the storm system. Green roofs use some for the water for the plants, along with draining it slowly into the storm system—likely well after the storm has passed. The benefits of green roofs include aesthetic appeal, increased insulation for the building, as well as the storm water application. Maintenance of green roofs should be done by a professional according to design specifications, but any signs of pooling water or plugged outlets should be reported promptly.



City of Kenmore Resources:

Visit kenmorewa.gov to find:

- Best Practices for Businesses
- Private Maintenance (non-facility)
- How to Identify Pollution
- Links to:
 - King County Surface Water Design Manual
 - Kenmore Operations and Maintenance Manual

Other Resources:

- King County:
 - kingcounty.gov
- Washington State Department of Ecology:
 - ecology.wa.gov

Contact:

Richard Sawyer
Surface Water Program Manager
rsawyer@kenmorewa.gov

REPORT SPILLS!
All spills must be reported.
Do not try to wash away any type of spill.
Getting the spill cleaned up quickly and efficiently is the number one priority!

SPILL HOTLINE:
(425) 398-8900
BUSINESS HOURS
(206) 296-8100
AFTER HOURS

