



**THE ENCLAVE AT OAK TREE**

**2022100898**

**Maintenance Plan**

**Prepared for:** DR Horton  
11241 Slater Ave NE, Ste 200  
Kirkland WA, 98033  
(425) 825 - 3180  
rhulquist@drhorton.com

**Report Date:** July 7, 2023

**Prepared by:** Jared Greisz, EIT

**Reviewed by:** Chloe McIntyre, PE  
HATTON GODAT PANTIER  
3910 Martin Way E., Suite B  
Olympia, WA 98506  
(360) 943-1599

**Project No:** 21-088

**Project Name:** THE ENCLAVE AT OAK TREE

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## Introduction

### What Is Stormwater Runoff?

When urban and suburban development covers the land with buildings, streets, and parking lots, much of the native topsoil, duff, trees, shrubs and grass are replaced by asphalt and concrete. Rainfall that would have soaked directly into the ground instead stays on the surface as *stormwater runoff* making its way into storm drains (including man-made pipes, ditches or swale networks), stormwater ponds, surface and groundwater and, eventually, to Puget Sound.

### What Is a Storm Drain System and How Does It Work?

The storm drain system for most developments includes measures to *carry, store, cleanse and release* the stormwater. Components work together to reduce the impacts of development on the environment. Impacts can include *flooding* that results in property damage and blocked emergency routes, *erosion* that can cause damage to salmon spawning habitat and *pollution* that harms fish and/or drinking water supplies.

The storm drain system provides a safe method to carry stormwater to the treatment and storage area. Filter Strips and ponds filter pollutants from the stormwater by *physically* settling out particles, *chemically* binding pollutants to pond sediments and *biologically* converting pollutants to less harmful compounds. Ponds also store treated water, releasing it gradually to a nearby stream or to groundwater.

### What Does Stormwater Runoff Have to Do With Water Quality?

Stormwater runoff must be treated because it carries litter, oil, gasoline, fertilizers, pesticides, pet wastes, sediments and anything else that can float, dissolve or be swept along by moving water. Left untreated, polluted stormwater can reach nearby waterways where it can harm and even kill aquatic life. It can also pollute groundwater to the extent that it requires treatment before it is suitable for drinking. Nationally, stormwater is recognized as a major threat to water quality. Remember to keep everything out of stormwater systems except the rainwater they are designed to collect.

## Section 1 – Project Description

The Enclave at Oak Tree project is located east of Marvin Road SE in the City of Lacey Urban Growth Area of Thurston County in Section 23, Township 18, Range 1 West, W.M. on tax parcel numbers 11823430100, 11826110000, and 11826110300. The project proposes to construct 131 single-family homes and 51 townhomes across three parcels totaling 36.05 acres. Construction will include approximately 8.08 ac of roof area, 4.22 ac of roadway, 1.31 ac of sidewalk, 1.95 ac of driveway, and two infiltration ponds.

Stormwater from all roads, sidewalks, and single-family roofs will be conveyed via pipes and catch basins to one of two infiltration treatment ponds. Runoff from the roofs of lots 12-20, 56-67, and 102-116 will be conveyed to an infiltration trench located in Tract E.

## Section 2 – Maintenance Importance and Intent

The importance of maintenance for the proper functioning of stormwater control facilities cannot be over-emphasized. A substantial portion of failures (clogging of filters, resuspension of sediments, loss of storage capacity, etc.) are due to inadequate maintenance. Stormwater BMP maintenance is essential to ensure that BMPs function as intended throughout their full life cycle.

The fundamental goals of maintenance activities are to ensure the entire flow regime and treatment facilities designed for this site continue to fully function. For this site these include:

- Maintain designed stormwater infiltration capacity
- Maintain designed stormwater detention/retention volume
- Maintain ability of storm facility to attenuate flow rates
- Maintain ability to safely convey design stormwater flows
- Maintain ability to treat stormwater runoff quality
- Preserve soil and plant health, as well as stormwater flow contact with plant and soil systems
- Clearly identify systems so they can be protected
- Keep maintenance costs low
- Prevent large-scale or expensive stormwater system failures
- Prevent water quality violations or damage to downstream properties

The intent of this section and manual is to pass on to the responsible party(s) all the information critical to understand the design of the system, risks and considerations for proper use, suggestions for maintenance frequencies, and cost so that realistic budgets can be established.

## Section 3 – Responsible Parties

All property owners within this subdivision are members of the Homeowners' Association (HOA). The HOA is responsible for many of the mitigation measures discussed herein. However, most of the responsibility for protection of our water resources lies with each individual property owner. The common areas within the subdivision will be managed by the HOA and they may hire outside contractors where needed. This Maintenance Plan is recorded against the title for all properties within the subdivision. Enforcement of the recommendations lies with the underlying jurisdictions, and the property owners and HOA should strive to incorporate them in their daily activities. All parties below shall read the Maintenance Plan:

### Specific Responsibilities

Landscape Maintenance	Developer / HOA and Maintenance Contractors / Homeowners
Common Facilities	Developer / HOA and Maintenance Contractors / Homeowners
Stormwater Facilities	Developer / HOA and Maintenance Contractors
Household activities	Homeowners (proper landscape maintenance & disposal of products)

All stormwater facilities require maintenance. Regular maintenance ensures proper functioning and preserves visual appeal. The property owner is responsible for many of the mitigation measures discussed herein. This Maintenance Plan is recorded against the title this property. Enforcement of the recommendations lies with the underlying jurisdictions, and the property owners should strive to incorporate them in their daily activities. All parties below shall read this Maintenance Plan:

### Specific Responsibilities

Landscape Maintenance	Developer / Maintenance Contractors / Property Owners
Common Facilities	Developer / Maintenance Contractors / Property Owners
Stormwater Facilities	Developer / Maintenance Contractors / Property Owners

## Section 4 – Facilities Requiring Maintenance

This Maintenance Plan was designed to explain how stormwater facilities work and provide user-friendly, straightforward guidance on facility maintenance.

Stormwater facilities on this site include two infiltration treatment ponds and an infiltration trench, catch basins, and storm pipes.

All stormwater facilities located in the public right-of-way are maintained by Thurston County. This includes catch basins and storm pipes.

The HOA and individual property owners are responsible for infiltration treatment ponds, the infiltration trench, and private pipes and catch basins.

Runoff is to be conveyed to a pre-settling basin for the west or east pond, which will then flow into the infiltration pond lined with treatment infiltration soil. Runoff from roof areas to lots 12-20, 56-67, and 102-116 will be conveyed to Tract E for infiltration. These facilities must be maintained so they continue providing 100% infiltration of the storm runoff.

See the Drainage Report submitted as part of the Drainage Control Plan for a more detailed explanation of the onsite stormwater facility design and operation.

## Section 5 – Maintenance Instructions

The stormwater system owner(s) must review and apply the maintenance requirements contained in the Stormwater Maintenance Agreement. The owner shall inspect all stormwater facilities annually and maintain them at their own expense. The owner shall complete and file an inspection and maintenance form with the city following inspection and maintenance. When inspections indicate a maintenance need, the owner shall complete all maintenance within one year for typical maintenance of facilities, within six months for catch basins, and within two years for maintenance that requires capital construction of greater than \$25,000.

### **How to Use the Stormwater Facility Maintenance Guide**

This Maintenance Plan includes a Site Plan specific to your development and a Facility Key that identifies the private stormwater facilities you are responsible for maintaining. A “Quick List” of maintenance activities has also been included to help you identify the more routine needs of your facility.

### **Included in This Guide**

- Comprehensive Maintenance Checklists that provide specific details on required maintenance located in Appendix B
- Pollution Prevention Tips that list ways to protect water quality and keep storm drain systems functioning smoothly
- Resources to provide more information and technical assistance

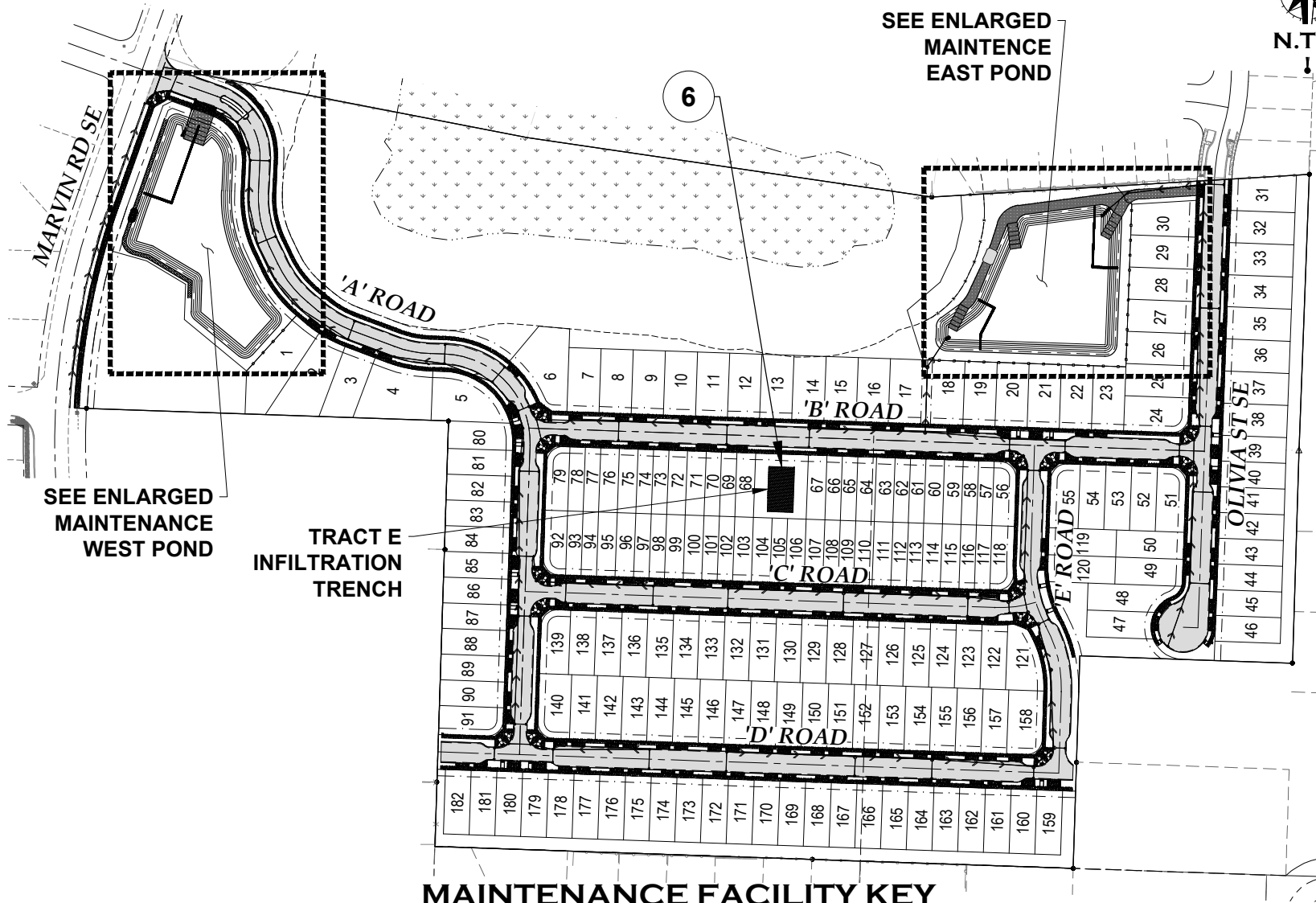
## Facility Key

The stormwater facilities in your neighborhood are comprised of the following elements:

Type of Feature and Checklist Name	Location on Site Plan
Treatment Infiltration Pond	1
Catch Basins	2
Debris Barriers (Trash Racks)	3
Energy Dissipators (Rock Lining)	4
Conveyance Piping	5
Infiltration Trench	6
Fencing / Shrubbery Landscaping	7

# ENCLAVE AT OAK TREE

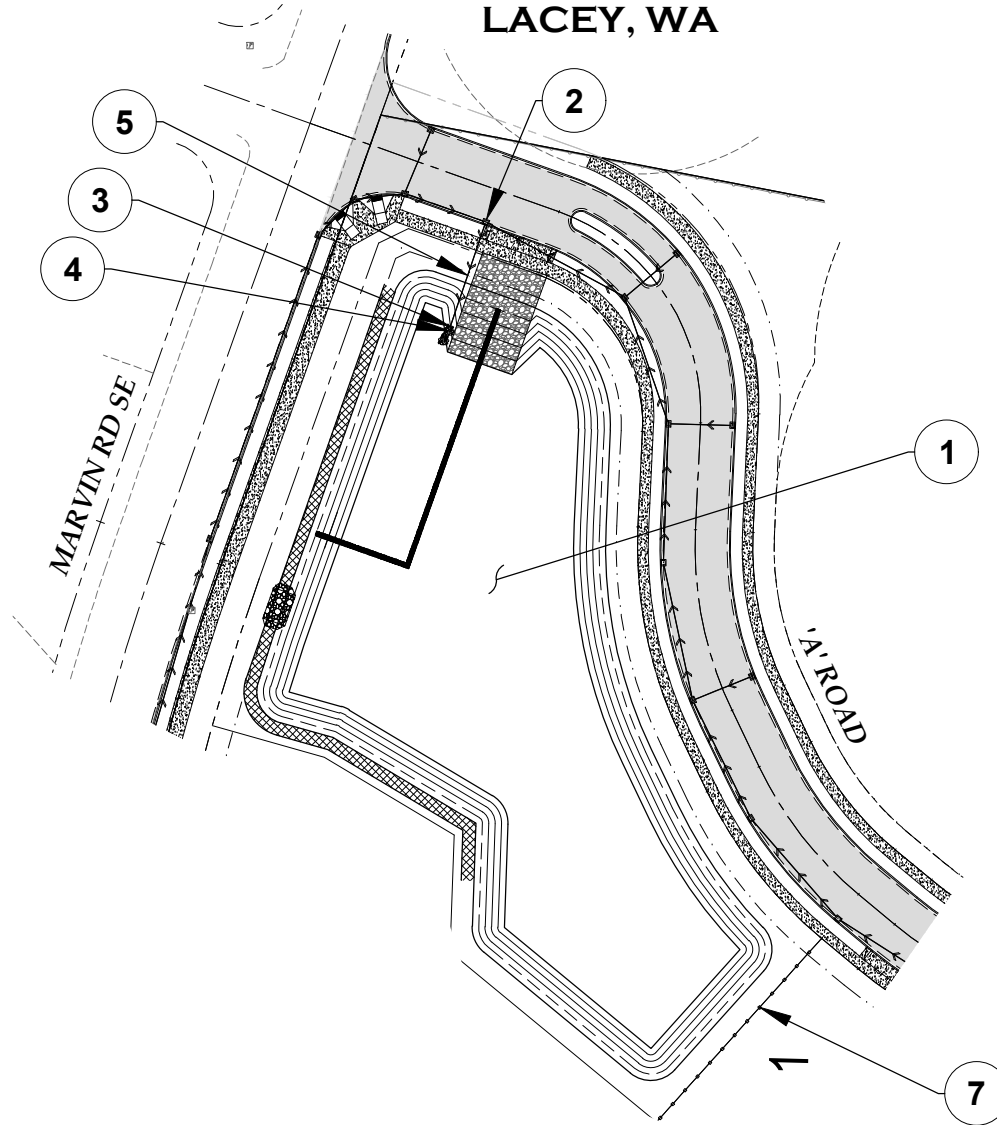
## LACEY, WA



MAINTENANCE FACILITY KEY

# ENCLAVE AT OAK TREE

## LACEY, WA

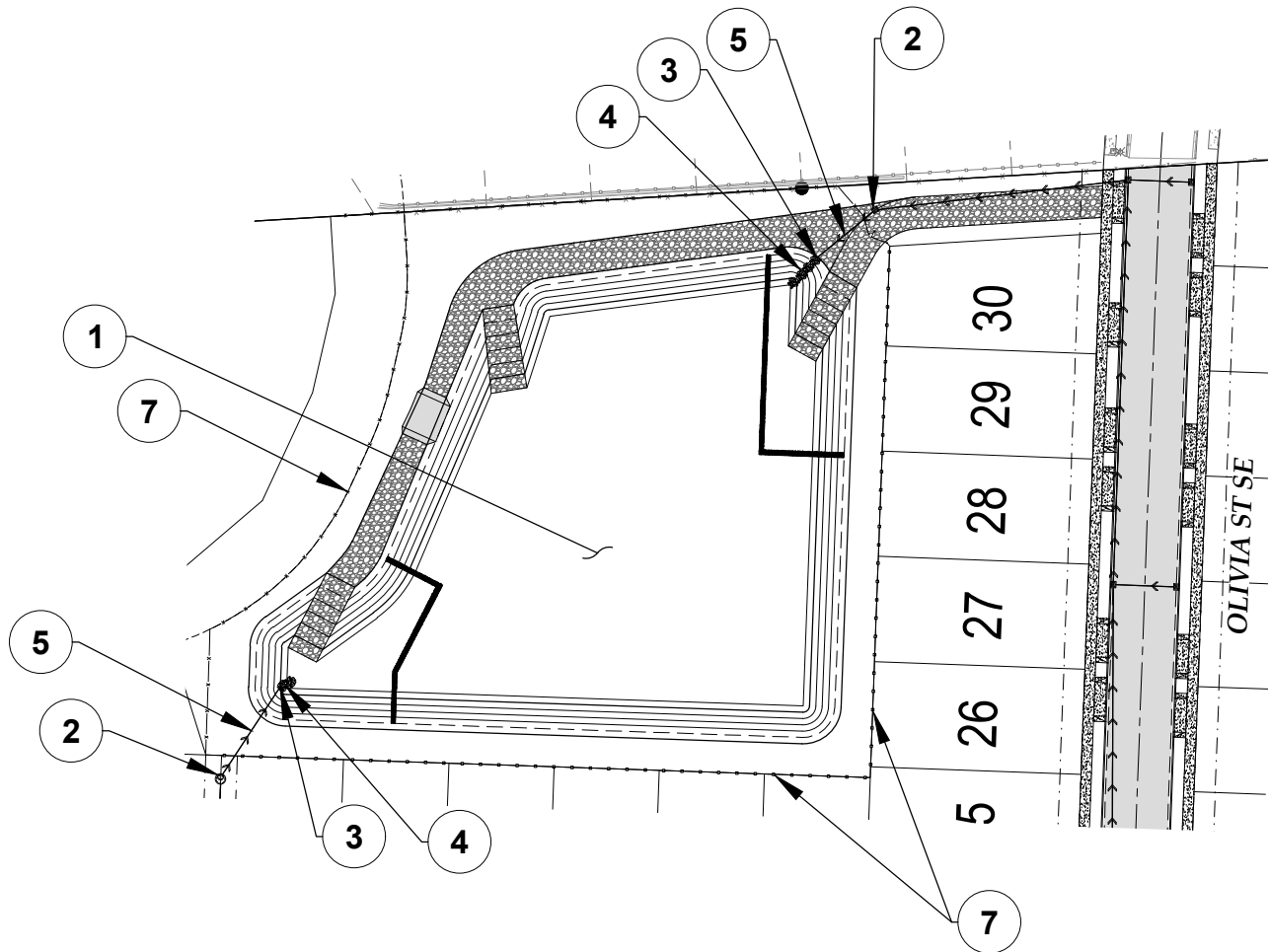


ENLARGED MAINTENANCE - WEST POND



# ENCLAVE AT OAK TREE

## LACEY, WA



ENLARGED MAINTENANCE - EAST POND

## Quick List

The following is an abbreviated checklist of the most common types of maintenance required. Please go over this checklist after heavy rains. The list represents minimum maintenance to be performed and should be completed in conjunction with the other checklists for an effective maintenance program. More comprehensive maintenance checklists specific to each onsite stormwater facility are included in Appendix B.

- ☐ Inspect catch basin grates to see that they are not clogged or broken. Remove twigs, leaves or other blockages. Contact the local jurisdiction to replace the grate if it is broken.
- ☐ Inspect inlet and outlet pipes for blockages. Clear all blockages.
- ☐ Inspect filter strip, swale and pond walls for erosion or caved in areas.
- ☐ Inspect riprap (rocks) at the inlets and outlets of culverts and other pipes. If they are silted in or eroded away, replace them.

## Resource Listing

If you suspect a problem exists, please contact your local jurisdiction at one of the numbers below and ask for Technical Assistance.

### CONTACT NUMBERS

Thurston County Public Works Department	(360) 754-4681
Thurston County Environmental Health – Hazardous Waste Disposal	(360) 754-4111
Thurston County Environmental Health – Solid Waste Disposal	(360) 789-5136
WSU Thurston Co. Extension	(360) 786-5445

### DEVELOPER INFORMATION

DR Horton 11241 Slater Ave NE, Ste. 200, Kirkland WA, 98033	(425) 825 - 3180
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### ENGINEER'S INFORMATION

Hatton Godat Pantier 3910 Martin Way E., Suite B Olympia, WA 98506	(360) 943-1599
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## Section 6 – Vegetation Management

The homeowners, HOA, and Landscape Maintenance Contractor are responsible for applying integrated pest management control techniques to maintain landscaped areas. This includes pest control, pesticide management, and watering. Reference the construction drawings in the Drainage Control Plan for detailed information on landscaping throughout the site.

### Landscape Design and Maintenance

The following techniques shall be applied:

1. **Native Plants:** One of the best methods of reducing impacts to water resources is by using landscaping materials that do not require extensive care. Native plants have adapted themselves to our region, particularly their root structure and water needs. These plants have also built tolerances over the centuries to local pests and disease. By using native plants in the landscape, we are less likely to need fertilizers, herbicides, and pesticides. Native plants are also more tolerant of drought conditions and typically require less water. The Developer shall install the native plant materials called out on the Landscape Plan. Additional plantings may be installed by individual homeowners/property owners.

Native plants come in all shapes and sizes so there is probably one that will fit into your landscape plans. There are deciduous and evergreen varieties of trees, shrubs and groundcovers. Some suggested species of native plants are listed below. Contact your local garden supply store for more ideas on use of native plants in your garden.

Evergreen Plants:

Trees: Western red cedar, Douglas-fir, Western hemlock

Shrubs: rhododendron, evergreen huckleberry, tall Oregon-grape

Ferns: lady fern, sword fern, deer fern

Groundcover: manzanita, kinnikinnik, common juniper

Deciduous Plants:

Trees: big leaf maple, Pacific dogwood, bitter cherry

Shrubs: western azalea, Nootka rose, red huckleberry

2. **Grasses for Lawns:** Both the developer and individual homeowners/property owners will install lawns. The lawn is a major component of the landscape. Selection of a grass well suited to our area is an important step in reducing the impact to water resources. The *National Turfgrass Evaluation* studies various types of grasses for their resistance to insects, drought tolerance, seasonal appearance, density, the strength of their sod and leaf texture. Based upon these characteristics, specific grass types are recommended for specific areas throughout the country. Fescue and perennial rye grass are recommended for this area.
3. **Mulching:** Use of native plants will greatly reduce the need for fertilizer. Use of mulch may eliminate the need altogether. Mulch acts as a physical barrier to weeds and is an excellent alternative to herbicides. Mulch can be compost, bark or wood chips, or leaves and grass clippings. It should be spread around the base of plants and within flowerbeds. The recommended depth of mulch varies between plant varieties but should typically be 2- to 4 inches.
4. **Use of Fertilizers:** Proper use of fertilizers yields better plants and reduces negative impacts to our water resources. Fertilizers typically contain high levels of nitrogen and

phosphorus, both of which can damage ground and surface waters. The following are a few tips to optimize the use of fertilizers in your garden.

5. **Soil Testing:** The first step in fixing a problem is to know what that problem is. Therefore, before applying any fertilizer, test your soil. Existing soil conditions, particularly nitrogen, phosphorus, potassium and pH levels, can be easily determined by using kits available at garden stores or from the WSU Cooperative Extension. Applying fertilizer before knowing the components of the soil could lead to over loading certain areas that may impact our water resources.
6. **Proper Fertilization:** Proper fertilization is important in maintaining a healthy lawn that resists environmental stress, including competition with weeds and moss and drought stress. Because Spring and Fall are periods of optimal growth, these are the most important times to fertilize. The use of slow release fertilizers is recommended. Natural organic and synthetic organic fertilizers (such as IBDU, sulfur or polymer coated urea, or methylene urea) behave similarly once they are applied to the soil.

Although some people feel that natural organic fertilizers provide added benefits to soil health, research has not shown this to be true as a general rule. The natural organic nutrient sources in these products are often supplemented with synthetic plant nutrients anyway. The most important thing to remember is to use a slow release fertilizer. Extensive research around the country has shown that when these materials are applied properly there is very little risk of surface or groundwater contamination, and they provide an even feeding, which is better for your lawn. Remember to sweep granules off pavement to prevent washing into storm drains.

Many soils can benefit from the use of organic fertilizers such as compost or peat. These substances add nutrients to soil and increase the porosity of the soil as well as its ability to hold water.

For lots with additional restrictions regarding phosphorus contamination to stormwater runoff, phosphorus-free fertilizers must be used for all lawn and landscaping activities.

7. **Fertilizing the Lawn:** Turf fertilization practices for the entire year are built around what is done in the fall. Apply fertilizer in early to mid-September to promote regrowth from summer stress. Another application in November is important in keeping the grass competitive with moss through the winter. If you fertilize in November, you probably don't need an early spring fertilization. If not, your lawn will probably be ready for fertilizer in the spring. Again, use a slow release fertilizer so that you don't promote a big flush of growth. Fertilize again in early June so that the grass has the nutrients it needs to grow at a moderate rate through the summer stress period.

If you want to maintain a lawn of moderate quality, a minimum of three fertilizations through the year is needed. Additional light fertilizations can be added if you are looking for a higher quality lawn. In general, you should apply no more than one pound of actual fertilizer nitrogen per 1000 square feet at a time, although this rate can be increased to 1.5 pounds in the fall when using slow release products. (If the fertilizer analysis is 24-4-12, for example, it contains 24% nitrogen. To apply 1 pound of Nitrogen per 1,000 square feet, apply 4.2 pounds of fertilizer:  $1 \div 0.24 = 4.2$ ).

Return clippings (grasscycle) when you mow to recycle nutrients into the lawn. Use mulching mowers to return grass clippings directly to the lawn. Essential nutrients from the decomposed grass can then be retained in the soil thereby reducing the need for fertilizer.

8. **Water Before Fertilizing:** Water plants and lawns before fertilizing. Water enough to dampen the ground thoroughly, but not enough to cause surface runoff. Dampening the

soil prevents fertilizer from being washed from the surface of dry soil in the first rain or watering after application.

9. Proper Watering: Proper watering can help build strong plants resistant to drought, pests and disease. Water infrequently but enough to dampen soil down to 10 inches. Be careful not to water so rapidly that water runs off the surface. Infrequent watering promotes shallow root depths making the plants susceptible to damage during periods of drought. Unhealthy plants are easy targets for pests and disease. Also, water during early morning hours rather than during the day or at night. Irrigating during the day loses a sizable amount of water to the atmosphere through evaporation. Watering at night can lead to mold and fungi growth on plants left damp over a cool night.

The irrigation system should be programmed to provide about 1" of water per week during the growing season. This includes normal precipitation. The system shall be provided with rain sensors which can suspend watering, and soil moisture sensors which can automatically adjust watering intervals and run times (e.g. Cycle-Soak).

10. Weed Control: Use of mechanical means for weed control is typically less attractive due to the cost. However, non-chemical controls for transient and invasive weed problems shall be emphasized in the IPM program in efforts to reduce overall environmental impacts. The quick establishment of a thick, healthy, native or ornamental groundcover planting will reduce the need for weed control. Implement measures to reduce this establishment time by increasing plant spacing, adding/replacing groundcovers, and using groundcover species that are spreading or widely-mounding. Reduce compaction to mulch to encourage groundcover establishment and cover-rate.

The initial establishment of groundcovers may require more weed control. When the need for chemical treatment is necessary over woody groundcovers, carefully determine the target broadleaf or grass species, and choose a selective herbicide that specifically labeled for application over the type of planting. Use labeled rates and ensure proper training for applicators and handlers for proper coverage.

Reduce the need for selective broadleaf herbicide treatments in lawn areas by using clean soil amendment and turf seed, proper installation, and appropriate nutrient applications for the lawn area. Use selective mechanical measures to remove broadleaf weeds in newly seeded lawn areas. Proper watering and mowing height will increase vigor and reduce broadleaf pressure in lawn areas established with turf.

## **Pest Control**

Some of the tactics that can be used to decrease or eliminate the use of pesticides include:

1. Use of Natural Predators or Pathogens: Because chemical sprays generally kill many beneficial insects instead of just the target pest, it may be necessary to introduce natural predators back into the garden. Ladybugs, lacewings, predatory wasps and nematodes are all commercially available. Garter snakes and toads are also predators and should not be eliminated from the garden.

There are some bacteria, viruses and insect parasites that are specific to pests and will not harm other insects or animals. A commonly used bacterium in the Puget Sound area is *Bacillus thuringiensis* (Bt), which is intended to control infestations of tent caterpillars.

2. Habitat Changes: Many times a change of habitat can control pest infestations. Removal of any item that will pond water, like buckets or tires, can cut down on the mosquito population by removing a convenient location for them to breed in. Removing last year's

leaves from under rose bushes can cut down on the incidence of mildew and blackspot, as these fungi overwinter in dead leaves.

3. Timing: Crops that can overwinter (such as leeks or carrots) should be planted in the fall. This gives them time to become established before pests arrive in the spring.
4. Mechanical: Many eggs, larvae, cocoons and adult insects can be removed by hand. Be sure that the insect is properly identified prior to removing it so those beneficial insects are not destroyed in error. Drowning insects in plain water or spraying them with soapy water are alternatives to squashing them.
5. Resistant Plants: Plants that are native to this area are often more resistant to pests and tolerant of the climate than are introduced plants. Many plant cultivars have been developed which are resistant to such diseases as verticillium wilt and peach leaf curl. Grass seed mixes are also available for lawns that need much less watering, mowing and chemical use.
6. Growing Conditions: Plants, such as hostas, that require some shade are more susceptible to pests when they are growing in the sun. Improperly fertilized or watered plants are less vigorous in growth and tend to attract pests. Plants that prefer an acid soil, such as azaleas, will perform better and be less susceptible to pests when they are grown in soil with the proper pH.
7. Chemicals: Chemicals are a small part of the IPM plan and should be applied only as needed after reviewing all other alternatives. Avoid the use of broad-spectrum pesticides which may kill beneficial insects.

### **Pesticide Management**

When use of a chemical is the best or only option, follow the basic guidelines below. Maintenance Contractors shall be licensed commercial applicators and shall always follow the Pesticide Label.

1. Know your target pest before spraying. Use the pesticide according to the manufacturer's instructions and buy only the needed quantity. Many pesticides have a limited shelf life and may be useless or degrade into even more toxic compounds if stored for extended periods of time.
2. Do not apply more than the specified amount. Overuse can be dangerous to your health as well as the health of wildlife and the environment. If more than one chemical can be used to control the pest, choose the least toxic. The word "caution" on the label means that the chemical is less toxic than one that is labeled "warning".
3. Do not spray on windy days, in the morning of what will be a very hot day or when rain is likely. Herbicides can drift and injure valuable ornamental plants. Do not water heavily after application. Plants should be lightly watered before application to prevent burning of the foliage and to help evenly spread the chemical.
4. Never apply pesticides near streams, ponds or wetlands (exception: approved applications for aquatic weeds). Do not apply pesticides to bare eroded ground. Many pesticides bind to soil particles and can be easily carried into a stream or storm drain.
5. Pesticides should be stored well away from living areas. Ideally, the storage area should have a cement floor and be insulated from temperature extremes. Always keep pesticides in their original containers with labels intact. Labels often corrode and become illegible in this climate and may have to be taped onto the container.
6. Federal law now requires that all pesticides be labeled with the appropriate disposal method. Leftovers should never be dumped anywhere, including a landfill. Take unwanted

pesticides to Hazo House located at the former landfill at 2420 Hogum Bay Road NE, Lacey. Call the Thurston County Hazardous Waste Section at (360) 867-2664 for more information.

7. Empty pesticide containers should be triple rinsed, and the rinse water used in the same manner as the product. Once containers are rinsed, they can be disposed of as regular garbage.
8. If a pesticide is spilled onto pavement, it can be absorbed using kitty litter or sawdust. The contaminated absorbent should be bagged, labeled and taken to Hazo House.
9. If the pesticide is spilled onto dirt, dig up the dirt, place it in a plastic bag and take it to Hazo House.
10. Many pest control companies and licensed applicators have access to pesticides that are more toxic than those available to the consumer. Check with the company before they spray indoors or outdoors to find out what spray they will be using and what precautions, if any, are necessary after the operator leaves.



## Section 7 – Permanent Pollution Source Control Plan (Attachment B)

# ATTACHMENT B

## Permanent Pollution Source Control Program

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# Introduction

## ABOUT THIS MANUAL

Thurston County's water resources – its streams, lakes, wetlands, groundwater, and Puget Sound – play an important role in the quality of life we enjoy. They provide us with recreation and drinking water, support tourism and salmon and are used by industry. These waters, however, are vulnerable to pollution from a wide variety of human activities.

This manual applies to those residential properties and activities in unincorporated Thurston County that have the potential to contribute pollutants to stormwater runoff or directly to receiving waters. Stormwater runoff may seep into the ground, drain to a storm drain or a drainage ditch, or flow over the ground. Regardless of the way runoff leaves your site, it ends up in a stream river, lake, wetland, groundwater or Puget Sound.

Contaminated stormwater can negatively affect every water body it enters. Therefore, this manual provides detailed information on what you can do to reduce the contamination of surface water, groundwater, and stormwater from your property.

Many of our water pollution problems are due in large part to pollutants washed off the land by storms. The quality of “stormwater” from residential properties is an increasing concern nationwide. Many people believe that stormwater is “clean” and does not harm water quality. This perception is understandable since the amount of pollution from any one place is not usually significant by itself. But when all these small amounts are combined, they can cause significant pollution problems.

The federal Clean Water Act mandates that cities and counties control the quality of stormwater runoff. One way to achieve this is to implement pollution prevention measures on individual properties. By following the “Best Management Practices” described in this manual you can do your part to protect our streams, groundwater, and Puget Sound.

## BEST MANAGEMENT PRACTICES ... WHAT ARE THEY?

Best Management Practices (BMPs) are a set of activities designed to reduce stormwater pollution. BMPs are separated into two broad categories: *source control* and *treatment*.

### Source Control BMPs

**Source control BMPs** prevent contaminants from entering stormwater runoff by controlling them at the source. Some source control BMPs are operational, such as checking regularly for leaks and drips from equipment and vehicles, covering materials that have potential to add pollutants to surface water if rainwater comes in contact with the materials, cleaning up pet waste, and minimizing use of pesticides, fertilizers, and insecticides. Other source control BMPs require use of a structure to prevent rainwater

from contacting materials that will contaminate stormwater runoff such as provide a covered area or berm to prevent clean stormwater from entering work or storage areas.

*Source control BMPs prevent contaminants from entering stormwater by controlling them at the source.*

## **Treatment BMPs**

In contrast, *treatments BMPs* are structures that treat stormwater to remove contaminants. Treatment BMPs typically require elaborate planning, design and construction. A stormwater pond for your subdivision is an example of a *treatment BMP*. No treatment BMP is capable of removing 100 percent of the contaminants in stormwater and the less contaminants in the stormwater prior to the treatment BMP, the more effective the BMP is.

Also remember that, just because there is a stormwater collection system where you live, it does not necessarily mean that the stormwater is treated. Many developments were created prior to requirements to treat stormwater. The runoff from your property may go directly or indirectly to a stream or wetland without any treatment.

*Keep in mind that runoff from your property may go directly or indirectly to a stream or wetland without any treatment.*

This manual will focus on *source control* BMPs applicable to the routine practices of most owners of a single family residence..

## **WHAT'S IN THIS MANUAL?**

This manual has been developed for the owners of single family residences. If you are trying to get a building permit to construct a new home you may be required to submit a copy of this manual, or its equivalent as part of your permit application and then record it with the Thurston County Auditor's office prior to receiving final approval of your project.

The manual is divided into three sections as follows:

- **Introduction**
- **General Principles of Pollution Prevention**
- **Best Management Practices for Single-Family Residences**

The general principles and best management practices described are based on the requirements of the *Thurston County Drainage Design and Erosion Control Manual*, Volume IV – *Source Control*.

# General Principles of Pollution Prevention

*There are 15 general principles of pollution prevention that every homeowner should consider.*

This section describes simple pollution prevention principles that every homeowner should consider. Most of these are common sense, “housekeeping” types of solutions. With collective action by individuals throughout the county in implementing these principles, the improvement in water quality can be substantial. There are 15 general principles of pollution prevention.

## **1. Avoid the activity or reduce its occurrence**

Avoid potentially polluting activity or do it less frequently, especially if it takes place outdoors. Apply lawn care chemicals following directions and only as needed. Do not apply herbicides right before it rains.

## **2. Move the activity indoors**

Move a potentially polluting activity indoors out of the weather. This prevents runoff contamination and provides more control for a cleanup if a spill occurs. For example unload and store chemicals inside a garage area or shed instead of outside. Be safe and ensure any storage area is well ventilated and required building and fire code requirements are met.

## **3. Cleanup spills quickly**

Promptly contain and cleanup solid and liquid pollutant leaks and spills on any exposed soil, vegetation, or paved area. Use readily available absorbents such as kitty litter to absorb spills and then sweep up the material and dispose of it in the garbage. Promptly repair or replace leaking connections, pipes, hoses, valves, etc. on vehicles and equipment you own.

## **4. Use less material**

Don't buy or use more material than you really need. This not only helps keep potential disposal, storage and pollution problems to a minimum, but will probably save you money too.

## **5. Use the least toxic materials available**

Investigate the use of materials that are less toxic. For example, replace a caustic-type detergent or solvent with a more environmentally friendly product. Even if you do switch to a biodegradable product, remember that only uncontaminated water is allowed to enter the stormwater drainage system.

*Remember that only uncontaminated water is allowed to enter the stormwater drainage system.*

## **6. Create and maintain vegetated areas near activity locations**

Vegetation can filter pollutants out of stormwater. Route stormwater from parking and work areas through vegetated areas. Remember that wastewater other than stormwater runoff, such as wash water, must be discharged to a wastewater collection system (sewer or septic system), and may not be discharged to a storm drainage system.

## **7. Locate activities as far as possible from surface drainage paths**

Activities located as far as possible from known drainage paths such as ditches, streams, other water bodies, and storm drains will be less likely to pollute, since it will take longer for material to reach the drainage features. This gives more time to react to a spill, or if it is a “housekeeping” issue, may protect the local waters long enough for you to cleanup the area around the activity. Don’t forget that groundwater protection is important throughout Thurston County, no matter where the activity is located, so the actions you take on a day-to-day basis are always important, even in dry weather.

*Don’t forget that groundwater protection is important throughout Thurston County.*

## **8. Maintain stormwater drainage systems**

Pollutants can concentrate over time in storm drainage facilities such as catch basins, ditches, and storm drains. When a large storm event occurs, turbulent runoff can mobilize these pollutants and carry them to receiving waters. By performing regular maintenance on stormwater facilities located on your property you can prevent this from occurring. Also repair or replace cracked or otherwise damaged pavement in parking areas and any other drainage areas that are subject to pollutant material leaks or spills.

## **9. Reduce, reuse, and recycle as much as possible**

Look for ways to recycle instead of just disposing. This saves money and keeps hazardous and non-hazardous materials out of landfills. Contact the Thurston County Solid Waste Division at (360) 357-2491 for more information on recycling opportunities at the Thurston County Waste and Recover Center.

## **10. Be an advocate for stormwater pollution prevention**

Help friends, neighbors, and business associates find ways to reduce stormwater pollution in their activities. Most people want clean water and do not pollute intentionally. Share your ideas and the BMPs in this manual to get them thinking about how their everyday activities affect water quality.

## **11. Report problems**

We all must do our part to protect water, fish, wildlife, and our own health by implementing proper BMPs, and reporting water quality problems that we observe. In Thurston County, call the Storm and Surface Water Utility at (360) 867-2099 to report dumping to storm drains or ditches.

## **12. Provide oversight and training**

Talk to the members of your family, or if you are a landlord talk to your tenants, to ensure they understand the pollution prevention source control measures and BMPs described in this manual. If you are a landlord monitor the activities of your tenants to ensure that they are carrying out the principles of this manual.

## **13. Dust control**

Sweep paved parking and storage areas regularly to collect and dispose of dust and debris that could contaminate stormwater. Do not hose down pollutants from any area to the ground, storm drain, conveyance ditch or any receiving water (stream, wetland, lake, etc.). Do not use used oils or other petroleum products for dust control. Volumes of water used for light watering for dust control of dirt driveways or gravel roads should be conducted to prevent any runoff of stormwater from the surface.

*Do not hose down pollutants from any area to the ground, storm drain, conveyance ditch or any receiving water (stream, wetland, lake, etc.)*

## **14. Eliminate illicit connections**

A common problem with the stormwater drainage system for most communities is the existence of illicit connections of wastewater to the storm drainage system. Many businesses and residences have internal building drains, sump overflows, sump pumps, garage and outdoor sinks and showers, and even sanitary sewer and septic system pipes that were inadvertently connected to the nearby storm drainage system in the past.

Examine the plumbing system for your home to determine if illicit connections exist. Any time it is found that toilets, sinks, appliances, showers and bathtubs, floor drains, industrial process waters, and/or other indoor activities are connected to the stormwater drainage system; these connections must be immediately rerouted to the sanitary or septic system, holding tanks, or process treatment system. For assistance in methods to detect and eliminate illicit connections contact the Storm and Surface Water Utility at (360) 867-2099.

## **15. Dispose of waste properly**

Every business and residence in Thurston County must dispose of solid and liquid wastes and contaminated stormwater properly. There are generally four options for disposal depending on the type of materials. These options include:

- Sanitary sewer and septic systems.
- Recycling facilities
- Municipal solid waste disposal facilities
- Hazardous waste treatment, storage and disposal facilities.

*Every business and residence in Thurston County must dispose of solid and liquid wastes and contaminated stormwater properly.*



# Best Management Practices for Single Family Residences

*Stormwater goes directly to our groundwater, lakes, streams and to Puget Sound. It does not go to the wastewater treatment plant.*

The actions we take each day in and around our homes have a profound effect on surface water quality and fish habitat. Stormwater goes directly to our groundwater, lakes, streams, and to Puget Sound. It does not go to the wastewater treatment plant. Any pollutants that get into the stormwater go directly to surface or groundwater. Small amounts of pollution from many different sources can significantly affect our waterways. Stormwater BMPs discussed in this section are practical ways to keep stormwater from becoming polluted in the first place. It is recommended that all residents in Thurston County use these BMPs. **Please note that some of these procedures are required by various state, or county laws, and are noted as required BMPs.**

This section provides a general list of activities typically conducted by home owners and describes the BMPs that may be required or recommended to prevent stormwater pollution. The list includes brief information on applicability. More detailed information for the BMPs described in this section can be found in the Thurston County Drainage Design and Erosion Control Manual, Volume IV or by contacting the Thurston County Storm and Surface Water Utility at (360) 754-4681. BMPs for the following activities are described in this section:

- 1. Automobile Washing*
- 2. Automobile Maintenance*
- 3. Storage of Solid Wastes and Food Wastes*
- 4. Composting*
- 5. Yard Maintenance and Gardening*
- 6. Swimming Pool and Spa Cleaning and Maintenance*
- 7. Household Hazardous Material use, Storage and Disposal*
- 8. Pet Waste Management*
- 9. On-Site Sewage Maintenance and Operation*
- 10. Activities in Wetlands and Wetlands Buffers*
- 11. Illicit Discharge Detection and Elimination*

# 1

## Automobile Washing

Many residents wash their cars in the driveway or on the street. Wash waters typically flow to a storm drain or ditch, which discharges stormwater directly to the underlying groundwater or to the nearest stream, lake, or Puget Sound. Soaps and detergents, even the biodegradable ones, can have immediate and long-term effects on aquatic life in water bodies. The grime washed off the car also contains a variety of pollutants that can harm fish and wildlife.

### Suggested BMPs

#### At Home:

- Wash your car directly over your lawn or make sure the wash water drains to a vegetated area. This allows the water and soap to soak into the ground instead of running off into a local water body.
- Ideally, no soaps or detergents should be used, but if you do use one, select one without phosphates.
- Commercial products are available that allow you to clean a vehicle without water. These were developed for areas where water is scarce, so a water saving benefit is realized, as well as reduced pollution.
- Use a hose nozzle with a shut-off valve to save water.
- Do not wash your car if rain is expected.
- Pour the bucket of soapy, dirty wash water down your sink. This way the water doesn't pollute surface water. Instead, it's treated at the wastewater treatment plant or by your septic system.

#### Away from Home:

- Consider not washing your car at home. Take it to a commercial car wash that has a recycle system and discharges wastewater to the sanitary sewer for treatment.

## 2

# Automobile Maintenance

Many of us are “weekend mechanics”. We enjoy the cost savings of changing our own oil and antifreeze, topping off the battery with water, and generally making our car perform its’ best. There is a lot of potential for stormwater pollution associated with these activities; however, the following BMPs will help you minimize pollution while servicing your car, truck, van, or RV.

### Required BMPs

- Recycle all oils, antifreeze, solvents, and batteries. Many local car parts dealers and gas stations accept used oil and oil filters. The Household Hazardous Waste facilities at the Thurston County Waste and Recovery Center accept oil, oil filters, antifreeze, and solvents.
- Never dump new or used automotive fluids or solvents on the ground, in a storm drain or street gutter, or in a water body. Eventually, it will make its way to local surface waters or groundwater, including the water we drink.
- Do not mix wastes. The chlorinated solvents in some carburetor cleaners can contaminate a huge tank of used oil, rendering it unsuitable for recycling. Always keep your wastes in separate containers which are properly labeled and store them out of the weather.

*Never dump new or used automotive fluids or solvents on the ground, in a storm drain or street gutter...*

### Suggested BMPs

- Fix all leaks, to keep the leaky material off streets and out of surface water.
- To dispose of oil filters, punch a hole in the top and let drain for 24 hours. This is where a large funnel in the top of your oil storage container will come in handy. After draining, wrap in 2 layers of plastic and dispose of in your regular garbage or recycle by taking it to the Thurston County Waste and Waste and Recovery Center. Call the Thurston County Department of Public Works at (360) 867-2491 for up-to-date information on the appropriate disposal of consumer products.
- Use care in draining and collecting antifreeze to prevent accidental spills. Spilled antifreeze tastes sweet and can be deadly to animals that ingest it.
- Perform your service activities on concrete or asphalt or over a plastic tarpaulin to make spill cleanup easier. Keep a bag of kitty litter on hand to absorb spills. If there is a spill, sprinkle a good layer on the spill, let it absorb for a little while and then sweep it up. Place the

contaminated litter in a plastic bag, tie it up, and dispose of it in your regular garbage. Take care not to leave kitty litter out in the rain; it will form a sticky goop that is hard to clean up.

- If you are doing body work outside, be sure to use a tarpaulin to catch material resulting from grinding, sanding, and painting. Dispose of this waste by double bagging in plastic and placing in your garbage.

*Spilled antifreeze tastes sweet and can be deadly to animals that ingest it.*

# 3

## Storage of Solid Wastes and Food Wastes

Improper storage of food and solid waste at residences can lead not only to water pollution problems, but problems with neighborhood pets and vermin as well. Following the BMPs listed below can help keep your property a clean and healthy place to live.

### Suggested BMPs

- Recycle as much as you can. Most Thurston County residents have access to curbside pickup for yard waste and recyclable materials. Also, look under “recycling” in the phone book for firms which take other recyclables.
- All waste containers kept outside should have lids. If your lid is damaged, please call your local solid waste hauler to get the lid repaired or replaced. The Thurston County web site lists haulers for your neighborhood: <http://www.co.thurston.wa.us/solidwaste/recycling/recycling-curbside.html>
- Leaking waste containers should be replaced. If your container is damaged, please call your local solid waste hauler.
- Store waste containers under cover if possible, or on grassy areas.
- Inspect the storage area regularly to pick up loose scraps of material and dispose of them properly.
- Purchase products which have the least amount of packaging materials.
- Compost biodegradable materials such as grass clippings and vegetable scraps instead of throwing them away. Your flowerbeds will love the finished compost, and you’ll be helping to conserve limited landfill space. Call Thurston County Department of Public Works at (360) 867-2491 for more information on composting or information on yard waste collections. See the section on composting for BMPs relating to that activity.
- A fun alternative to traditional composting is worm composting. You can let worms do all the work for you by keeping a small vermiculture box just outside your kitchen. For more information on getting started with worms, call the number listed above.

# 4

## Composting

Composting is an earth-friendly activity as long as some common sense rules outlined below are followed. If you choose to compost, the following BMPs should be utilized. More information can be found on-line at: <http://www.co.thurston.wa.us/solidwaste/organics/organics-home.htm>

### Suggested BMPs

- Compost piles must be located on an unpaved area where runoff can soak into the ground or be filtered by grass and other vegetation. Compost piles should be located in an area of your yard not prone to water ponding during storms, and should be kept well away from wetlands, streams, lakes, and other drainage paths.
- Compost piles must be maintained and turned over regularly to work properly. Large piles of unattended compost may create odor and vermin problems.
- Avoid putting hazardous, inorganic, plastics or metal waste in the pile.
- Cover the compost pile (See Figure) for two reasons:
  1. To keep stormwater from washing nutrients into waterways.
  2. To keep excess water from cooling the pile—this slows down the rate of decomposition.
- Build bins of wood, chicken wire, or fencing material to contain compost so it can't be washed away. You can purchase reduced price compost bins through Thurston County's web-site or find information on building your own bins. Call Thurston County Department of Public Works at (360) 867-2491 to get free composter designs and [materials lists or see: http://www.co.thurston.wa.us/solidwaste/index.htm](http://www.co.thurston.wa.us/solidwaste/index.htm).
- Building a small earthen dike around your compost pile is an effective means of preventing nutrient-rich compost drainage from reaching stormwater paths.

*Compost piles should be located in an area of your yard not prone to water ponding during storms, and should be kept well away from wetlands, streams, lakes and other drainage paths.*

## 5

# Yard Maintenance and Gardening

This section deals with the normal yard maintenance activities we all perform at our homes. Over watering, over fertilizing, improper herbicide application, and improper disposal of trimmings and clippings can all contribute to serious water pollution problems. Following the BMPs listed below will help alleviate pollutant runoff.

### Required BMPs

- Follow the manufacturer's directions exactly for mixing and applying herbicides, fungicides, and pesticides, and use them sparingly. Never apply when it is windy or when rain is expected. Never apply over water, within 100 feet of a well-head, or adjacent to streams, wetlands, or other water bodies. Triple-rinse empty containers, using the rinsate for mixing your next batch of spray, and then double-bag and dispose of the empty container in your regular garbage. Never dispose of grass clippings or other vegetation in or near storm drains, streams, lakes, or Puget Sound.

### Suggested BMPs

- Use natural, organic soil amendments when possible. The excellent soil conditioning properties of the organic matter aid water retention in lighter soils and help to break up and aerate heavier soils, so roots can grow better and less watering is needed. It contains both readily available and long term nitrogen and other nutrients commonly lacking in Northwest soils. The slow release of nitrogen better matches the needs of plants. Thus, there is much less potential for nitrates to leach into surface or groundwater due both to less “excess nitrogen” and less water use. Better vegetative growth can also reduce erosion and runoff.

*Use natural, organic soil amendments when possible...The slow release of nitrogen better matches the needs of plants.*

- Follow manufacturer's directions when applying fertilizers. More is not better, either for your lawn or for local water bodies. Never apply fertilizers over water or adjacent to ditches, streams, or other water bodies. Remember that organic fertilizers have a slow release of nitrogen, and less potential to pollute than synthetic fertilizers.
- Save water and prevent pollution problems by watering your lawn sensibly. Lawns and gardens typically need the equivalent of 1 inch of rainfall per week. You can check on how you're doing by putting a wide mouth jar out where you're sprinkling, and measure the water with a small plastic ruler. Overwatering to the point of runoff can carry polluting nutrients to the nearest water body.

*Lawns and gardens typically need the equivalent of 1 inch of rainfall per week.... Put a wide mouth jar out when sprinkler, and measure the water with a small plastic ruler.*

- Consider planting a vegetated buffer zone adjacent to streams or other water bodies on your property. Call the Thurston County Conservation District at (360) 754-3588 for advice and assistance in developing a planting plan. The Stream Team program (360) 754-4681 at the County may even be able to help you plant it!
- Reduce the need for pesticides and fertilizers on lawns by improving the health of the soil. Aerating, thatching, and topdressing with compost will improve soil health and help desired grasses compete with weeds and moss.
- Make sure all fertilizers and pesticides are stored in a covered location. Rain can wash the labels off of bottles and convert 50 pounds of boxed fertilizer into either a solid lump or a river of nutrients.
- Use a mulching mower and mow higher to improve soil/grass health and reduce or eliminate pesticide use.
- Compost all yard clippings, or use them as mulch to save water and keep down weeds in your garden. See Composting section for more information.

*Aerating, thatching, and topdressing with compost will improve soil health and help desired grasses compete with weeds and moss.*

- Practice organic gardening and virtually eliminate the need to use pesticides and fertilizers. Contact Thurston County Cooperative Extension at (360) 786-5445 for information and classes on earth-friendly gardening.
- Pull weeds instead of spraying and get some healthy exercise, too. If you must spray, use the least toxic formulations that will get the job done. The Master Gardener program listed above can help advise you on which spray to use.
- Work fertilizers into the soil instead of letting them lie on the ground surface exposed to the next rain storm.
- Plant native vegetation which is suited to Northwest conditions, they require less water and little to no fertilizers and pesticides.
- Contact your local waste disposal company for curbside pickup and recycling of yard waste.



# 6

## Swimming Pool and Spa Cleaning and Maintenance

Despite the fact that we immerse ourselves in it, the water from pools and spas is far from chemically clean. Nutrients, pH, and chlorine can adversely affect fish and wildlife in water bodies. Following these BMPs will ensure the cleanliness of your pool and the environment.

### Required BMPs

- Pool and spa water must be dechlorinated to 0.1 mg/L if it is to be emptied into a ditch or to the stormwater drainage system. Contact your pool chemical supplier to obtain the neutralizing chemicals you will need. The rate of flow into the ditch or drainage system must be regulated so that it does not cause problems such as erosion, surcharging, or flooding. Water discharged to the ground or a lawn must not cross property lines and must not produce runoff.
- If pool and spa water cannot be dechlorinated, it must be discharged to the sanitary sewer. Prior to draining, your local sewer provider must be notified to ensure they are aware of the volume of discharge and the potential effects of chlorine levels. A pool service company can help you determine the frequency of cleaning and backwash of filters.
- Diatomaceous earth used in pool filters cannot be disposed of in surface waters, on the ground, or into stormwater drainage systems or septic systems. Dry it out as much as possible, bag it in plastic, and dispose of at the landfill.

### Suggested BMPs

Hire a professional pool service company to collect all pool water for proper disposal. Make sure to ask them where they will dispose of it and the kind of permits they hold to do so.

# 7

## Household Hazardous Material use, Storage and Disposal

Once we really start looking around our houses, the amount of hazardous materials we have on site is a real eye-opener. Oil-based paints and stains, paint thinner, gasoline, charcoal starter fluid, cleaners, waxes, pesticides, fingernail polish remover, and wood preservatives are just a few hazardous materials that most of us have around the house.

When products such as these are dumped on the ground or in a storm drain, they can be washed directly to receiving waters where they can harm fish and wildlife. They can also infiltrate into the ground and contaminate drinking water supplies. The same problem can occur if they are disposed of with your regular garbage; the containers can leak at the landfill and contaminate groundwater. The same type of contamination can also occur if hazardous products are poured down a sink or toilet into a septic system. Don't pour them down the drain if you're on municipal sewers, either. Many compounds can “pass through” the wastewater treatment plant without treatment and contaminate receiving waters, or they can harm the biological process used at the treatment plant, reducing overall treatment efficiency.

With such a diversity of hazardous products present in all homes in Thurston County, a large potential for serious environmental harm exists if improper methods of storage, usage, and disposal are employed. Using the following BMPs will help keep these materials out of our soils, sediments, and waters.

*Don't pour them down the drain... Many compounds can “pass through” the wastewater treatment plant without treatment and contaminate receiving waters.*

### Required BMPs

- Hazardous Materials must be used in accordance with the manufacturer recommendation or guidelines as shown on the label.
- Always store hazardous materials in properly labeled containers, never in food or beverage containers which could be misinterpreted by a child as something to eat or drink.
- Dispose of hazardous materials and their containers properly. Never dump products labeled as *poisonous, corrosive, caustic, flammable, inflammable, volatile, explosive danger, warning, caution, or dangerous* outdoors, in a storm drain, or into sinks, toilets or drains. Call the Thurston County Department of Public Works at (360) 754-4581 for information on disposal methods, collection events, and alternative products. Household hazardous wastes from Thurston County residents and non-residents are accepted at the HazoHouse, at the

Thurston County Waste and Recovery Center in Hawks Prairie at 2418 Hogum Bay Road NE.

*Household hazardous wastes from Thurston County residents and non-residents are accepted at the HazoHouse, at the Thurston County Waste and Recovery Center in Hawks Prairie...*

### **Suggested BMPs**

- Check hazardous material containers frequently for signs of leakage. If a container is rusty and has the potential of leaking soon, place it in a secondary container before the leak occurs and prevent a cleanup problem.
- Hazardous materials should be stored out of the reach of children.
- Store hazardous materials containers under cover and off the ground. Keep them out of the weather to avoid rusting, freezing, cracking, labels being washed off, etc.
- Keep appropriate spill cleanup materials on hand. Kitty litter is good for many oil-based spills.
- Ground cloths and drip pans must be used under any work outdoors which involves hazardous materials such as oil-based paints, stains, rust removers, masonry cleaners, and others bearing label warnings as outlined above (See Figure).
- Latex paints are not a hazardous waste, but are not accepted in liquid form at the landfill. To dispose of, leave uncovered in a protected place until dry, then place in the garbage. If your can is at least half full, you can take it to the HazoHouse to be placed in Swap Shop area. If you wish to dry waste paint quickly, mix kitty litter or sawdust in the can to absorb the paint. Once paint is dry, leave the lid off when you place it in the garbage so your garbage collector can see that it is no longer liquid.
- Use less toxic products whenever possible. Ecology maintains a hotline at 1-800-RECYCLE, or see information online at <https://fortress.wa.gov/ecy/recycle/>
- If an activity involving the use of a hazardous material can be moved indoors out of the weather, then do so. Make sure you can provide proper ventilation, however.
- Follow manufacturers' directions in the use of all materials. Over-application of yard chemicals, for instance, can result in the washing of these compounds into receiving water bodies. Never apply pesticides when rain is expected.
- When hazardous materials are in use, place the container inside a tub or bucket to minimize spills and store materials above the local base flood elevation (BFE).

*Latex paints are not a hazardous waste... leave uncovered in a protected place until dry, then place in the garbage.*

# 8

## Pet Waste Management

Pet waste that washes into lakes, streams or Puget Sound begins to decay, using up oxygen and releasing ammonia. Low oxygen levels and ammonia combined with warm water can kill fish. Pet waste also contains nutrients that encourage weed and algae growth in waters we use for swimming, boating and fishing. Most importantly, in many urban areas, pet waste is the largest source of bacterial loading to streams. It can carry diseases that could make water unsafe for contact and lead to beach closures or affect shellfish harvest. These include:

- Campylobacteriosis—bacterial infection
- Salmonellosis—bacterial infection
- Toxocariasis—roundworm infection
- Toxoplasmosis—protozoan parasite infection
- Giardiasis—protozoan parasite infection
- Fecal Coliform—bacteria in feces, indicates contamination
- *E. coli*—bacteria in feces, may cause disease.

*Pet waste is the largest source of bacterial loading in streams. It can carry diseases that could make water unsafe for contact and lead to beach closures or affect shellfish harvest.*

Cleaning up after your pet can be as simple as taking a plastic bag or pooper scooper along on your next walk. Then choose one of the following:

### Suggested BMPs

- **Bag it** – Put waste in a securely closed bag and deposit it in the trash. Do not put it in your yard waste container because pet waste may carry diseases, and yard waste treatment may not kill disease organisms.
- **Bury it** – Bury waste at least 1 foot deep and cover with soil in your yard or garden (not in food-growing areas).
- **Flush it** – Only flush pet wastes if your home is served by a sanitary sewer which goes to a sewage treatment plant. Water from your toilet goes through a treatment process that removes pollutants before it is discharged into the environment.

To prevent plumbing problems, don't flush debris or cat litter. Cat feces may be flushed, but used litter should be put in a securely closed bag in the trash. Septic systems are not designed to accommodate the high pollutant load of pet waste. To prevent premature failure or excessive maintenance costs do not flush pet wastes to your septic system.

*To prevent premature failure or excessive maintenance costs do not flush pet wastes to your septic system.*

- **Compost it** – waste from small animals **other than dogs and cats** (rabbits, rodents, etc.), can be put in your compost bin.

# 9

## On-Site Sewage Maintenance and Operation

Thurston County is responsible for ensuring that stormwater discharged from stormwater management systems we operate does not harm or impair the use of the receiving waters (creeks, rivers, lakes, groundwater or Puget Sound). Sample tests of stormwater discharges and receiving water occasionally indicate high levels of fecal coliform bacteria.

One potential source of bacteria in surface water is malfunctioning onsite sewage systems (septic systems). Septic tank failures have been documented on private property in Thurston County.

Septic systems vary widely in their design and complexity. Owners of septic systems should contact the Thurston County Department of Public Health and Social Services (Environmental Health Division) at (360) 754-4111 to request an as-built of their system. As-built requests are also available at the Development Review counter at 2000 Lakeridge Drive SW, Olympia. More information is available at: <[www.co.thurston.wa.us/permitting](http://www.co.thurston.wa.us/permitting)>.

In its simplest design the septic tank is the first stage of a private sewage disposal system. The septic tank is a water-tight tank below ground that is usually made of concrete but may be fiberglass, plastic or steel. Septic tanks have one or two access ports for inspection and maintenance which are usually buried a few inches below the ground.

The tank receives household wastewater through an inlet pipe at one end, settles out larger material to the bottom, breaks down waste material with bacteria present in the tank and delivers the partially treated wastewater out another pipe on the opposite end of the tank to the disposal field.

The disposal field is the second stage of the private sewage disposal system and completes the final breakdown of wastewater with organisms in the soil.

The disposal field consists of narrow trenches filled with gravel and perforated pipes that distribute the wastewater to the field. With proper maintenance, a well designed system can last a long time; however, disposal fields will clog if forced to handle large particles that should settle out in the bottom of the septic tank.

*One potential source of bacteria in surface water is malfunctioning onsite sewage systems.*

## Required BMPs

Owners of septic systems must follow all of the requirements of the Thurston County Department of Public Health and Social Services, Environmental Health Division. They can be contacted at Thurston County Health Department at (360) 754-3355 extension 6518 for further information and specific requirements applicable to your system.

## Suggested BMPs

- **Regular Inspection and Maintenance**

Septic tanks require regular inspection and maintenance. Inspections should be done to measure accumulated sludge every 3 to 5 years. Pumping frequency can vary depending on tank size, family size and garbage disposal use. Failure to remove sludge periodically will result in reduced settling capacity and eventual overloading of the disposal field, which can be difficult and expensive to remedy. Maintenance is required on complex systems, those serving more than one single family residence, and commercial establishments.

- **Eliminate or Restrict Garbage Disposal Use**

Eliminating or restricting garbage disposals can significantly reduce the loading of solids to the septic tank thus reducing the pumping frequency.

- **Reduce and Spread Water Use Out Over the Day**

Septic tanks are limited in their ability to handle rapid large increases in the amount of water discharged into them. Excess wastewater flow can cause turbulence in the tank flushing accumulated solids into the disposal field. Over time this will impair the ability of the disposal field to function. Limit water using appliances to one at a time. Do one load of clothes a day rather than several in one day. Practice water conservation at home.

- **Chemical Use**

Septic systems are to be used for the disposal of household wastewater only. Never dispose of excess or unwanted chemicals into the septic system. Occasional use of household cleaners in accordance with the manufacturers' recommendations should not harm your septic system. There is little evidence that products advertised for use as septic system cleaners and substitutes for pumping actually work as advertised.

For additional information on proper operation of your septic system or to report a failing septic system in your neighborhood, contact Thurston County Environmental Health at (360) 786-5490 or at: <[www.co.thurston.wa.us/health/ehoss/index.html](http://www.co.thurston.wa.us/health/ehoss/index.html)>.

# 10

## Activities in Wetlands and Wetlands Buffers

Wetlands and associated buffers are vegetated ecosystems through which water passes. These areas usually have a high water table and are often subject to periodic flooding. Wetlands can be very effective in removing sediments, nutrients and other pollutants from stormwater.

*Wetlands can be very effective in removing sediments, nutrients and other pollutants from stormwater.*

Maintaining wetlands and associated buffers helps to slow stormwater runoff, trap sediments and other pollutants and reduce the volume of runoff by allowing infiltration to occur. Reducing the velocity of runoff reduces soil erosion and increases contact time with soil and vegetation. Increasing contact of stormwater with soils and vegetation in a wetland or riparian area can be effective in removing sediments, nutrients and other pollutants from stormwater runoff.

Buffer areas are important to both the wetland and the upland areas as habitat for aquatic wetland-dependant wildlife and as buffers during extreme weather events. Other functions of buffer areas that contribute to water quality include shading, flood attenuation and shoreline stabilization.

Persons responsible for maintenance of wetland areas are encouraged to call Thurston County Development Services at (360)786-5490 prior to performing work in wetlands or their buffers.

### Required BMPs

- Removal by hand of manmade litter and control of noxious weeds that are included on the state noxious weed list (Washington Administrative Code [WAC] 16-750) or invasive plant species as identified by Thurston County. Control may be conducted by clipping, pulling, over-shading with native tree and shrub species, or non-mechanized digging. Alternative methods such as mechanical excavation, barrier installation, or herbicide use may be allowed if acceptable to the Department of Resource Stewardship and acquisition of any necessary permits, per Thurston County Code Title 17 *Environment*, 17.15 - *Critical Areas*.
- Check with Thurston County Development Services and Planning on guidelines for vegetation and hazardous tree removal in critical areas.

### Suggested BMPs

- To prevent possible contamination limit fertilizer and herbicide use around wetlands and their buffers.
- Limit access to wetlands and their buffers. To avoid compaction do not establish trails within the wetland areas



# 11

## Illicit Discharge Detection and Elimination

A common problem with Thurston County's stormwater drainage system is illegal hook-ups to the system. Many businesses and residences hooked internal building drains, sump overflows, and even sanitary sewer and septic system pipes to the storm drain in the past, allowing a variety of pollutants to flow directly to receiving waters instead of the sanitary sewer or septic system. Frequently, these connections are unknown to the current owner, and do not appear on any plans for the site. Because of the pollution potential these connections represent, the Environmental Protection Agency, under the mandate of the NPDES stormwater permits, has made elimination of illegal connections a top priority.

All businesses and residences in Thurston County must examine their plumbing systems to determine if illegal connections exist. We recommend starting with site plans, to better understand what piping systems were initially installed, making piping that does not appear on the plan a priority for investigation. Wherever toilets, sinks, appliances, showers and bathtubs, floor drains, or other indoor activities are connected to the stormwater drainage system, immediately reroute them to the sanitary or septic system or holding tanks.

*All businesses and residences in Thurston County must examine their plumbing systems to determine if illegal connections exist.*

If sanitary facilities (such as toilets) are connected to the stormwater drainage system, you must obtain a permit from your local sewer utility and reroute them to the sanitary sewer. If sanitary service is not available, contact the Thurston County Public Health and Social Services Department at (360) 786-5581 for septic permits.

### **Dye Testing**

Dye testing with a non-toxic dye is one way to determine where a pipe or structure drains if not obvious by observations or on plans. The dye is put into the structure and flushed with some water. Observations are then made at ends-of-pipes, drainage ditches, catch basins, and manholes to look for the color coming through. Contact Thurston County Storm and Surface Water Utility (360) 754-4681 if you need assistance in locating structures adjacent to your property.

### **Smoke Testing**

Smoke testing can also help detect illegal connections and is best done by qualified personnel. To conduct smoke testing, shut off all indoor discharges, place a smoke bomb or other smoke-generating device in a storm drain manhole, and force air in after it. Station personnel at each suspect drain location to observe if smoke is coming out. Identify smoking drains for future rerouting.

**Plugging or Rerouting Illicit Discharges**

Drains which are found to connect to the stormwater drainage system must either be permanently plugged or disconnected and rerouted as soon as possible. Plug unused drains with concrete or similar permanent materials. If a drain pipe is to be rerouted and a sanitary sewer services the property, then the local sewer provider must be contacted. It is the responsibility of the property owner to follow through on rerouting illicit storm drainage connections to the sanitary sewer.

*It is the responsibility of the property owner to follow through on rerouting illicit storm drainage connections to the sanitary sewer.*

If the property is not served by a sanitary sewer, alternate measures will be necessary. If the discharge is simply domestic waste, a septic system may be feasible. If it is necessary to install a septic system, the proper permits will need to be obtained from the Thurston County Public Health and Social Services Department at (360) 786-5581. If the discharge is anything other than domestic waste, then a holding tank or onsite treatment will be necessary. Contact LOTT Alliance Industrial Pretreatment Program at (360) 528-5708 or your local sewer service provider for specific directions for installation and disposal.

## QUICK REFERENCE PHONE NUMBERS AND WEB SITES

### **PHONE NUMBERS**

Environmental Protection Agency (U.S. EPA) – Region X 800-424-4372

Thurston County:

Stormwater Utility 360-754-4681

Department of Public Works 360-867-2300

After-hours water and sewer emergencies (paging service) 800-926-7761

Thurston County Waste Line (automated information) 360-867-2491

LOTT Alliance Industrial Pretreatment Program 360-528-5708

Development Services – Permits 360-786-5490

Weed Control/ Noxious Chemical Use 360-786-5576

Thurston County Public Health and Social Services Department:

On-Site Sewage 360-754-3355 x 6518

Asbestos Removal 360-786-5461

Hazardous Waste Section 360-786-5457

Solid Waste 360-786-5461

University of Washington Center for Urban Water Resources 206-543-6272

Washington State Department of Agriculture 360-902-2010

877-301-4555

Washington State Department of Ecology 360-407-6000

Southwest Regional Office 360-407-6300

Dangerous/Hazardous Waste 360-407-6300

NPDES Stormwater or Wastewater Permits 360-407-6400

Spill Reporting 800-424-8802

Recycling 800-732-9253

Groundwater Quality and Protection 360-407-6400

Underground and Aboveground Storage Tanks 360-407-7170

Washington State University/Thurston County Cooperative Extension 360-867-2151

Industrial Materials Exchange 206-296-4899

Nisqually Tribe 360-456-5221

Confederated Tribes of the Chehalis 360-273-5911

Olympic Region Clean Air Agency (ORCAA) 800-422-5623

Underground Utility Locate “Call Before You Dig” 800-424-5555

## **WEB PAGES**

### **Washington State Departments:**

Washington State Department of Health  
<<http://www.doh.wa.gov/>>

Washington Department of Fish and Wildlife  
<<http://wdfw.wa.gov/>>

Washington State Government Information and Services  
<<http://www.access.wa.gov/>>

Washington State Department of Ecology – Flood Information  
<<http://www.ecy.wa.gov/programs/sea/floods/>>

Washington State Department of Ecology - Digital Coastal Atlas  
<[http://www.ecy.wa.gov/programs/sea/SMA/atlas\\_home.html](http://www.ecy.wa.gov/programs/sea/SMA/atlas_home.html)>

Washington State Department of Ecology - Stormwater Home Page  
<<http://www.ecy.wa.gov/programs/wq/stormwater/index.html>>

Salmon and Watershed Information Management (SWIM) Team  
<<http://www.swim.wa.gov/>>

### **Federal Departments:**

Federal Emergency Management Agency (FEMA)  
<<http://fema.gov/>>

U.S. EPA Office of Water, Academy 2000  
<<http://epa.gov/watertrain/>>

### **U.S. Geological Survey (USGS) Departments:**

USGS Historical Water Resource Data  
<<http://wa.water.usgs.gov/realtime/historical.html>>

USGS National Water Information System (NWISWeb)  
<<http://water.usgs.gov/nwis/>>

TerraServer (zoom in on USGS aerial photos anywhere in the USA)  
<<http://terraserver-usa.com/>>

## Water Quality and NPDES:

Natural Resources Conservation Service (NRCS) and U.S. Department of Agriculture (USDA)

<<http://www.nrcs.usda.gov/>>

National Climatic Data Center Data Archive

<<http://www.ncdc.noaa.gov/>>

National Weather Service Hydrologic Forecasts (River Flooding)

<<http://ahps2.wrh.noaa.gov/ahps2/index.php?wfo=sew>>

USGS Real Time Gauging Info

<<http://wa.water.usgs.gov/realtime/current.html>>

U.S. Army Corps of Engineers Real Time Gauge Info

<<http://www.nwd-wc.usace.army.mil/nws/hh/basins/puy.html>>

The Central Puget Sound Water Suppliers' Forum

<<http://www.ci.seattle.wa.us/Forum>>

## Thurston County:

Thurston County Homepage

<<http://www.co.Thurston.wa.us/>>

Thurston County Stormwater Utility

< <http://www.co.thurston.wa.us/stormwater/>>

Thurston County Mapping

<<http://www.geodata.org>>

Thurston Conservation District

<<http://www.Thurstoncountycd.org/>>

Thurston County Public Health and Social Services

<<http://www.co.thurston.wa.us/health/ehadm/index.html>>

## Other Agencies:

NWS River Forecast Center - Flood Outlook

<<http://www.nwrfc.noaa.gov/river/fop.cgi>>

NOAA Tide and Current Predictions

<<http://co-ops.nos.noaa.gov/tp4days.html>>

## Appendix A – Maintenance Agreement

Maintenance Agreement to be included with final design submittal

## Appendix B – Maintenance Checklists

The Maintenance Checklists in this packet are for your use when inspecting the stormwater facilities on your property. This packet has been customized so that only the checklists for your facilities are included. If you feel you are missing a checklist, or you have additional facilities not identified or addressed in this packet, please contact your local jurisdiction.

The checklists are in tabular format for ease of use. Each describes the area to inspect, inspection frequency, what to look for and what action to take. A log sheet is included after the appropriate maintenance checklists to help you track maintenance of your storm drainage system.

Although it is not intended for the maintenance survey to involve anything too difficult or strenuous, there are a few tools that will make the job easier and safer including:

- A flashlight
- A long pole or broom handle
- Some kind of pry bar or lifting tool for pulling manhole and grate covers
- Gloves

A resource list is included on page 9 of this Maintenance Plan. There you will find the phone numbers of the agencies referenced in the tables, as well as the contractors and consultants who designed and constructed your facilities.



**SAFETY WARNING:** In keeping with OSHA regulations, you should never stick your head or any part of your body into a manhole or other type of confined space. When looking into a manhole or catch basin, stand above it and use the flashlight to help you see. Use a long pole or broom handle to check sediment depths in confined spaces. ***NO PART OF YOUR BODY SHOULD BREAK THE PLANE OF THE OPEN HOLE.***

**#2 – Maintenance Standards for Infiltration Basins (BMP IN.01) and Trenches (BMP IN.02):**

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash and Debris	Any trash and debris, including yard wastes such as grass clippings and tree branches, which exceed five cubic feet per 1,000 square feet. If less than threshold, all trash and debris will be removed as part of next scheduled maintenance.	Trash and debris cleared from site.
General	Poisonous Vegetation and Noxious Weeds	Any poisonous or nuisance vegetation which may constitute a hazard to maintenance personnel or the public. Any evidence of noxious weeds as defined in the <a href="#">Thurston County Noxious Weeds List</a> . (Apply requirements of adopted integrated pest management policies for the use of herbicides.)	No danger of poisonous vegetation where maintenance personnel or the public might normally be. <i>(Coordinate with Thurston County Public Works) Complete eradication of noxious weeds may not be possible. Compliance with state or local eradication policies required.</i>
General	Contaminants and Pollution	Any evidence of oil, gasoline, contaminants, or other pollutants.	No contaminants or pollutants present. <i>(Coordinate removal/cleanup with Thurston County Water Resources 360-754-4681 and/or Dept. of Ecology Spill Response 800-424-8802.)</i>
General	Rodent Holes	If the facility is constructed with a dam or berm, look for rodent holes or any evidence of water piping through the dam or berm.	Rodents removed and dam or berm repaired. <i>(Coordinate with Thurston County; coordinate with Ecology Dam Safety Office if pond exceeds 10 acre-feet.)</i>
General	Beaver Dams	Beaver dam results in an adverse change in the functioning of the facility.	Facility returned to design function. <i>(Contact WDFW Region 6 to identify the appropriate Nuisance Wildlife Control Operator)</i>
General	Insects	When insects such as wasps and hornets interfere with maintenance activities.	Insects destroyed or removed from site. <i>Apply insecticides in compliance with adopted integrated pest management policies.</i>
General	Performance	Check crest gauge against design expectations (see Maintenance and Source Control Manual).	Crest gauge results reflect design performance expectations. Reading recorded. County notified if not meeting design performance.
Crest Gauge	Crest Gauge Missing/ Broken	Crest gauge is not functioning properly, has been vandalized, or is missing.	Crest gauge present and functioning. Repair/replace crest gauge if missing or broken.
Storage Area	Water Not Infiltrating	Water ponding in infiltration basin after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events. (A percolation test pit or test of facility indicates facility is only working at 90 percent of its designed capabilities. If 2 inches or more sediment is present, remove).	Facility infiltrates as designed. Sediment is removed and/or facility is cleaned so that infiltration system works according to design.



**#2 – Maintenance Standards for Infiltration Basins (BMP IN.01) and Trenches (BMP IN.02):**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than one-half full.	Filter bag less than one-half full. Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rainstorms.	Water flows through filter. Replace gravel in rock filter if needed.
Trenches	Observation Well (Use Surface of Trench if Well is Not Present)	Water ponds at surface during storm events. Less than 90 percent of design infiltration rate.	Remove and replace/clean rock and geomembrane.
Ponds	Vegetation	When grass becomes excessively tall. When nuisance weeds and other vegetation starts to take over.	Vegetation mowed or nuisance vegetation removed so that flow is not impeded. Grass or groundcover mowed to a height of 3 to 4 inches. Removed clippings.
Ponds	Vegetation	Bare spots.	No bare spots. Revegetate and stabilize immediately.
Side Slopes of Pond	Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	Slopes stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. <i>If erosion is occurring on compacted slope, a professional engineer should be consulted to resolve source of erosion.</i>
Pond Berms (Dikes)	Settlements	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. Settling can be an indication of more severe problems with the berm or outlet works.	Dike is built back to the design elevation. <i>If settlement is significant, a professional engineer should be consulted to determine the cause of the settlement.</i>
Pond Berms (Dikes)	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue.	No water flow through pond berm. Piping eliminated. Erosion potential eliminated. <i>Recommend a geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.</i>
General	Hazard Trees	If dead, diseased, or dying trees are identified.	Hazard trees removed. <i>(Use a certified Arborist to determine health of tree or removal requirements).</i>
General	Tree Growth and Dense Vegetation	Trees growing on pond bottom or side slopes. Tree growth and dense vegetation which impedes inspection, maintenance access or interferes with maintenance activity (i.e., slope mowing, silt removal, vactoring, or equipment movements).	Trees removed from facility bottom, side slopes, and maintenance access areas. Species removed that are not part of recorded planting plan. Harvested trees should be recycled into mulch or other beneficial uses (e.g., alders for firewood).

**#2 – Maintenance Standards for Infiltration Basins (BMP IN.01) and Trenches (BMP IN.02):**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
Pond Berms (Dikes)	Tree Growth	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 on berms removed. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>
Emergency Overflow/ Spillway	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping.	Trees on emergency spillways removed. <i>If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A professional engineer should be consulted for proper berm/spillway restoration.</i>
Emergency Overflow/ Spillway	Rock Missing	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 out flow path of spillway.	Rocks and pad depth restored to design standards. (Riprap on inside slopes need not be replaced.)
Emergency Overflow/ Spillway	Erosion	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion. Any erosion observed on a compacted berm embankment.	Slopes stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction. <i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>
Presettling Ponds and Vaults	Facility or sump filled with Sediment and/or Debris	6 inches or designed sediment trap depth of sediment.	No sediment present in presettling pond or vault. Sediment is removed.
Drain Rock	Water Ponding	If water enters the facility from the surface, inspect to see if water is ponding at the surface during storm events. If buried drain rock, observe drawdown through observation port or cleanout.	No water ponding on surface during storm events. <i>Clear piping through facility when ponding occurs. Replace rock material/sand reservoirs as necessary. Tilling of subgrade below reservoir may be necessary (for trenches) prior to backfill.</i>

If you are unsure whether a problem exists, please contact Thurston County for technical assistance.

## #5 – Maintenance Standards for Catch Basins:

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	"Dump no pollutants" (or similar) stencil or stamp not visible	Stencil or stamp should be visible and easily read.	Warning signs (e.g., "Dump No Waste-Drains to Stream" or "Only rain down the drain"/ "Puget Sound starts here") painted or embossed on or adjacent to all storm drain inlets.
General	Trash and Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inlet capacity by more than 10 percent.	No trash or debris located immediately in front of catch basin or on grate opening.
General	Trash and Debris	Trash or debris (in the basin) that exceeds 1/3 of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
General	Trash and Debris	Trash or debris in any inlet or outlet pipe blocking more than one-third of its height.	Inlet and outlet pipes free of trash or debris.
General	Trash and Debris	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
General	Sediment	Sediment (in the basin) that exceeds 1/3 of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin.
General	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than one-fourth inch.	No holes and cracks in the top slab allowing material to run into the basin.
General	Structure Damage to Frame and/or Top Slab	Frame not sitting flush on top slab, i.e., separation of more than three-fourth 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.
General	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
General	Fractures or Cracks in Basin Walls/ Bottom	Grout fillet has separated or cracked wider than one-half-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 regouted and secure at basin wall.
General	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
General	Vegetation	Vegetation growing across and blocking more than 10 percent of the basin opening.	No vegetation blocking opening to basin.

**#5 – Maintenance Standards for Catch Basins:**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
General	Vegetation	Vegetation growing in inlet/outlet pipe joints that is more than 6 inches tall and less than 6 inches apart.	No vegetation or root growth present.
General	Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No contaminants or pollutants present. <i>(Coordinate removal/cleanup with Thurston County Water Resources 360-754-4681 and/or Dept. of Ecology Spill Response 800- 424-8802.)</i>
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is in place and secured.
Catch Basin Cover	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than one-half-inch of thread.	Mechanism opens with proper tools.
Catch Basin Cover	Cover Difficult to Remove	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 by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Grates	Grate Opening Unsafe	Grate with opening wider than seven-eighths of an inch.	Grate opening meets design standards.
Grates	Trash and Debris	Trash and debris that is blocking more than 20 percent of grate surface inletting capacity.	Grate free of trash and debris.
Grates	Damaged or Missing	Grate missing or broken member(s) of the grate.	Grate is in place and meets design standards.

If you are unsure whether a problem exists, please contact Thurston County for technical assistance .

**#6 – Maintenance Standards for Debris Barriers (e.g., Trash Racks):**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
General	Trash and Debris	Trash or debris that is plugging more than 20 percent of the openings in the barrier.	Barrier cleared to receive design flow capacity.
General	Damaged/Missing Bars	Bars are bent out of shape more than 3 inches.	Bars in place with no bends more than three-fourth inch.
General	Damaged/Missing Bars	Bars are missing or entire barrier missing.	Bars in place according to design.
General	Damaged/Missing Bars	Bars are loose and rust is causing 50 percent deterioration to any part of barrier.	Barrier replaced or repaired to design standards.
General	Inlet/Outlet Pipe	Debris barrier missing or not attached to pipe.	Barrier firmly attached to pipe.

If you are unsure whether a problem exists, please contact Thurston County for technical assistance .

## #7 – Maintenance Standards for Energy Dissipaters:

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
External:			
Rock Pad	Missing or Moved Rock	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.
Rock Pad	Erosion	Soil erosion in or adjacent to rock pad.	Rock pad replaced to design standards.
Dispersion Trench	Pipe Plugged with Sediment	Accumulated sediment that exceeds 20 percent of the design depth.	Pipe cleaned/flushed so that it matches design.
Dispersion Trench	Not Discharging Water Properly	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.	Water discharges from feature by sheet flow. Trench redesigned or rebuilt to standards.
Dispersion Trench	Perforations Plugged	Over one-half of perforations in pipe are plugged with debris and sediment.	Perforations freely discharge flow. Perforated pipe cleaned or replaced.
Dispersion Trench	Water Flows Out Top of "Distributor" Catch Basin	Water flows out of distributor catch basin during any storm less than the design storm or is causing or appears likely to cause damage.	No flow discharges from distributor catch basin. Facility rebuilt or redesigned to standards.
Dispersion Trench	Receiving Area Over-Saturated	Water in receiving area is causing or has potential of causing landslide problems.	No danger of landslides.
Internal:			
Manhole/ Chamber	Worn or Damaged Post, Baffles, Side of Chamber	Structure dissipating flow deteriorates to one-half of original size or any concentrated worn spot exceeding 1 square foot which would make structure unsound.	Structure in no danger of failing. Structure replaced to design standards if needed.
Manhole/ Chamber	Trash and Debris	Trash or debris (in the basin) that exceeds 1/3 of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the debris surface to the invert of the lowest pipe.	No trash or debris in the catch basin.
Manhole/ Chamber	Trash and Debris	Trash or debris in any inlet or outlet pipe blocking more than one-third of its height.	Inlet and outlet pipes free of trash or debris.
Manhole/ Chamber	Trash and Debris	Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within the catch basin.
Manhole/ Chamber	Sediment	Sediment (in the basin) that exceeds 1/3 of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin.

## #7 – Maintenance Standards for Energy Dissipaters:

Drainage System Feature	Defect or Problem	Condition When Maintenance Is Needed	Results Expected When Maintenance Is Performed
Manhole/ Chamber	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than one-fourth inch.	No holes and cracks in top slab allowing material to run into the basin.
Manhole/ Chamber	Structure Damage to Frame and/or Top Slab	Frame not sitting flush on top slab, i.e., separation of more than three-fourth 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.
Manhole/ Chamber	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound.	Basin replaced or repaired to design standards.
Manhole/ Chamber	Fractures or Cracks in Basin Walls/ Bottom	Grout fillet has separated or cracked wider than one-half-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 regouted and secure at basin wall.
Manhole/ Chamber	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
Manhole/ Chamber	Contamination and Pollution	Any evidence of oil, gasoline, contaminants or other pollutants.	No contaminants or pollutants present. <i>(Coordinate removal/cleanup with Thurston County Water Resources 360-754-4681 and/or Dept. of Ecology Spill Response 800- 424-8802.)</i>
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Catch basin cover is closed.
Catch Basin Cover	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than one-half-inch of thread.	Mechanism opens with proper tools.
Catch Basin Cover	Cover Difficult to Remove	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 by one maintenance person.

If you are unsure whether a problem exists, please contact Thurston County for technical assistance.

**#19 – Maintenance Standards for Fencing/Shrubby Screen/Other Landscaping:**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
General	Missing or Broken Parts/Dead Shrubby	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.
General	Erosion	Erosion has resulted in an opening under a fence that allows entry by people or pets.	Soil under fence replaced so that no opening exceeds 4 inches in height.
General	Unruly Vegetation	Shrubby, including blackberries and scotch broom, is growing out of control or is infested with weeds. See also Thurston County Noxious weeds list.	Shrubby is trimmed and weeded. Use Thurston County Integrated Pest Control methods when applicable.
Fences	Damaged Parts	Posts out of plumb more than 6 inches.	Posts plumb to within 1.5 inches of plumb.
Fences	Damaged Parts	Top rails bent more than 6 inches.	Top rail free of bends greater than 1 inch.
Fences	Damaged Parts	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.
Fences	Damaged Parts	Missing or loose tension wire.	Tension wire in place and holding fabric.
Fences	Damaged Parts	Missing or loose barbed wire that is sagging more than 2.5 inches between posts.	Barbed wire in place with less than three-fourth inch sag between posts.
Fences	Damaged Parts	Extension arm missing, broken, or bent out of shape more than 1.5 inches.	Extension arm in place with no bends larger than three-fourth inch.
Fences	Deteriorated Paint or Protective Coating	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.
Fences	Openings in Fabric	Openings in fabric are such that an 8-inch diameter ball could fit through.	No openings in fabric.



**#20 – Maintenance Standards for Grounds (Landscaping):**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
General	Weeds (nonpoisonous)	Weeds growing in more than 20 percent of the landscaped area (trees and shrubs only). See also Thurston County Noxious weeds list.	Weeds present in less than five percent of the landscaped area.
General	Insect Hazard/Vegetation (poisonous)	Any presence of poison ivy or other poisonous vegetation or insect nests.	No poisonous vegetation or insect nests present in landscaped area.
General	Trash or Litter	See Detention Ponds (Checklist #1).	See Detention Ponds (Checklist #1).
General	Erosion of Ground Surface	Noticeable rills are seen in landscaped areas.	Causes of erosion are identified and steps taken to slow down/spread out the water. Eroded areas are filled, contoured, and seeded.
Trees and shrubs	Damage	Limbs or parts of trees or shrubs that are split or broken which affect more than 25 percent of the total foliage of the tree or shrub.	Trim trees/shrubs to restore shape. Replace trees/shrubs with severe damage.
Trees and shrubs	Damage	Trees or shrubs that have been blown down or knocked over.	Tree replanted, inspected for injury to stem or roots. Replace if severely damaged.
Trees and shrubs	Damage	Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Stakes and rubber-coated ties placed around young trees/shrubs for support.

**#22 – Maintenance Standards for Conveyance Systems (Pipes and Ditches):**

<b>Drainage System Feature</b>	<b>Defect or Problem</b>	<b>Condition When Maintenance Is Needed</b>	<b>Results Expected When Maintenance Is Performed</b>
Pipes	Sediment & Debris	Accumulated sediment that exceeds 20 percent of the diameter of the pipe.	Pipe cleaned of all sediment and debris.
Pipes	Vegetation	Vegetation that reduces free movement of water through pipes.	Vegetation does not impeded free movement of water through pipes. <i>Prohibit use of sand and sealant application and protect from construction runoff.</i>
Pipes	Damaged (Rusted, Bent or Crushed)	Protective coating is damaged: rust is causing more than 50 percent deterioration to any part of pipe.	Pipe repaired or replaced.
Pipes	Damaged (Rusted, Bent or Crushed)	Any dent that significantly impedes flow (i.e. decreases the cross section area of pipe by more than 20 percent).	Pipe repaired or replaced.
Pipes	Damaged (Rusted, Bent or Crushed)	Pipe has major cracks or tears allowing groundwater leakage.	Pipe repaired or replaced.
Open Ditches	Trash & Debris	Dumping of yard wastes such as grass clippings and branches. Unsightly accumulation of non-degradable materials such as glass, plastic, metal, foam, and coated paper.	No trash or debris present. Trash and debris removed and disposed of as prescribed by the County.
Open Ditches	Sediment Buildup	Accumulated sediment that exceeds 20 percent of the design depth.	Ditch cleaned of all sediment and debris so that it matches design.
Open Ditches	Vegetation	Vegetation (e.g. weedy shrubs or saplings) that reduces free movements of water through ditches.	Water flows freely through ditches. Grassy vegetation should be left alone.
Open Ditches	Erosion Damage to Slopes	Erosion damage over 2 inches deep where cause of damage is still present or where there is potential for continued erosion.	No erosion damage present. Slopes stabilized using appropriate erosion control measure(s); e.g., rock reinforcement, planting of grass, compaction.
Open Ditches	Erosion Damage to Slopes	Any erosion observed on a compacted berm embankment.	<i>If erosion is occurring on compacted berms a professional engineer should be consulted to resolve source of erosion.</i>
Open Ditches	Rock Lining Out of Place or Missing (If Applicable)	Native soil is exposed beneath the rock lining.	Rocks replaced to design standards.

If you are unsure whether a problem exists, please contact Thurston County for technical assistance.

## Log Sheet

Use log sheets to track maintenance checks and what items, if any, are repaired or altered. Make copies of this page; use a fresh copy for each inspection. The completed sheets will serve as a record of maintenance activity and will provide valuable information about how your facilities are operating. Log sheets should be kept in a dry, readily accessible place.

<b>INSPECTION DATE:</b> _____			
<b>PERFORMED BY:</b> _____			
<b>PHONE NUMBER:</b> _____		<b>ADDRESS:</b> _____	
<b>POSITION ON HOA:</b> _____		<b>CITY, ST, ZIP:</b> _____	
<b>PART OF FACILITY INSPECTED</b>	<b>OBSERVATIONS (LIST REQUIRED MAINTENANCE ACTIVITIES)</b>	<b>ACTION TAKEN</b>	<b>DATE OF ACTION</b>

## Appendix C – Average Annual Cost of Maintenance

### INTRODUCTION

The following are assumptions, estimates, and recommendations for funds to set-aside for annual maintenance costs and future replacement costs for the drainage facilities that are the responsibility of the Subdivision Homeowners' Association. The sinking fund estimate is an approximation of the annual funding needed over the next 20 years to keep the drainage system fully functional.

The fund reserve amount is computed with consideration for probable inflation over the life of the materials, structures, and facilities, and includes a summary of the amount of money to be set aside annually for the fund and the annual charge per lot owner to equal the annual set-aside value.

Note that the sinking fund calculations are only an estimate, using approximated values. The Homeowners' Association should use these computations as a guide and modify as needed to more accurately reflect annual costs.

### ASSUMPTIONS:

1. The drainage facilities are constructed properly, as per the approved plans and details.
2. Inspection and minor maintenance (e.g. debris removal) is performed by HOA members/facility owners (no labor cost) but mowing and all other work is performed by hired workers.
3. Catch basins will be cleaned by hired vector truck, once per year.
4. Catch basins and pipes should last at least 20 years but assume replacement of 20% of the drainage system over the next 20 years.
5. Presettling ponds will need excavation/removal of accumulated sediment and muck every 15 years.
6. Infiltration facilities will need infiltration enhancement every 15 years.

### ROUTINE OPERATION & MAINTENANCE ESTIMATED COSTS:

Operation cost of the surface runoff drainage facilities is essentially zero if there are no electric pumps or other devices serving the drainage system. Routine maintenance tasks and expenses, as detailed in the Stormwater Facilities Maintenance Plan, are as follows:

**Average Annual Cost of Maintenance**

<b>Facility</b>	<b>Quantity</b>	<b>Activity</b>	<b>Frequency</b>	<b>Units</b>	<b>Unit Price</b>	<b>Cost</b>	<b>Cost Per Year</b>
All	8	Annual & Routine Inspections by HOA	3x per year	HRS	\$0.00	\$0.00	\$0.00
All	8	Annual Report	Annual	HRS	\$0.00	\$0.00	\$0.00
Infiltration Treatment Pond	2	Routine Tasks: Remove excess vegetation from within the ponds, inspect/repair rock lining and stabilize slopes, conduct routine landscape maintenance and mowing of the infiltration basins.	Annual	EA	\$400.00	\$800.00	\$800.00
Infiltration Treatment Pond	2	Remove muck/debris from presettling basins and restore/enhance infiltration	1x 15 yrs	EA	\$9,000.00	\$18,000.00	\$1,200.00
Catch Basins (private)	3	Clear grates, remove vegetation, repair (grout) cracks	Annual	EA	\$20.00	\$60.00	\$60.00
Catch Basins (private)	3	Vactor-out sediment	Annual	EA	\$80.00	\$240.00	\$240.00
Storm System Pipes	250	Manually clear pipe ends of sediment/debris, remove vegetation, repair/grout damaged pipe	Annual	LF	\$0.50	\$125.00	\$125.00
Miscellaneous Facilities	2	Maintain and repair various features such as maintenance access roads, energy dissipators, etc.	Annual	EA	\$100.00	\$200.00	\$200.00
<b>TOTAL</b>							\$2,625.00 (before inflation)

## Calculations for Stormwater Facilities O&M Fund Reserve Account:

### ASSUMPTIONS:

1. Assume the average inflation rate over the next 20 years will be about 4%. (The average inflation rate over the past 30 years has been approximately 4%).
2. Assume interest rates earned over the next 20 years will be about 3%. (Interest rates paid by banks as of January 2010, are lower than 3%.
3. Assume 20% of storm system will need major repair/replacement during next 20 years.

### ROUTINE O&M FUNDING:

OM	Annual Operation & Maintenance costs (from above calculations)	\$2,625
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### FUTURE FACILITY REPLACEMENT FUNDING:

PV	Present Value of Storm Drainage Facilities (From Bond Quantities Worksheet)	\$233,737
----	---	-----------

PV/5	20% of PV for partial system repair/replacement in 20 years	\$46,747
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FV	Future Value of portion of drainage system to replace in 20 years assuming inflation = 4%, $FV = PV/5 * (1+0.04)^{20}$	\$102,430
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A	Annual amount to set aside for future replacement costs (@3% interest and n=20; $A/F=0.037216$ ; $A = FV * A/F$ )	\$3,812
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### TOTAL FUNDING NEEDED:

TOT	Routine O&M + Set aside for Future = OM + A	\$6,437
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Total Annual Funding Contribution per Lot Owner	$\$6,437 / 182 =$	\$35.37
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Total Monthly Funding Contribution per Low Owner	$\$35.37 / 12$	\$2.95
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Note: Since O&M costs will vary and are also subject to inflation, they should be adjusted over time. Facility owners should evaluate actual O&M needs and costs each year and adjust set aside funds for the following year's cost projection.

## Appendix D – Facility Summary Forms

# FACILITY SUMMARY FORM

Complete one for each facility on the project site including flow control and water quality treatment facilities (BMPs) such as, but not limited to: detention ponds, vaults, or tanks; infiltration ponds, trenches, swales, or vaults; bioretention facilities; biofiltration BMPs; wet ponds; constructed wetlands; dispersion areas & flow spreaders; StormFilters & other proprietary devices; etc. Attach 8 ½" by 11" sketch showing location of facility. Applicant may prepare one copy of parts 1 to 5 for the project and then attach multiple copies of parts 6 to 8 for each separate facility.

Facility Name or Identifier (e.g., Pond A):  
Total Number of Facilities Associated with Project:  
(For which a Facility Summary Form is being prepared)

**West Infiltration Treatment Pond,  
East Infiltration Treatment Pond  
Tract E Infiltration Trench**

**2**

Name of Road or Street to Access Facility:

**A Road, O Road**

Name of Nearest Major Cross Street:

**Marvin Rd SE**

Hearings Examiner Case Number:

Thurston County Project No./Bldg Permit No.:

Parcel Number(s):

**11823430100, 11826110000, 11826110300**

To Be Completed By Utility Staff:

Utility facility number .....

Parcel number status, (num) .....

Parcel Number Status, (num, 1ch)  
(0, Known; 1, Public; 2, Unknown; 3, Unassigned) .....

Basin and Subbasin: (num, 6ch)  
(2ch for basin, 2ch for subbasin, 2ch future) .....

## Part 1 – Project Name and Proponent

Project Name: **McAllister Springs**

Project Owner: **DR Horton**

Project Contact: **Raelyn Hulquist**

Address: **11241 Slater Ave NE, Ste. 200, Kirkland WA, 98033**

Phone: **(425) 825-3180**

Project Proponent (if different):

Address:

Phone:

Project Engineer: **Chloe McIntyre, PE**

Firm: **Hatton Godat Pantier**

Phone: **(360) 943 – 1599**



## Part 2 – Project Location

Section	<u>23</u>
Township	<u>18</u>
Range	<u>1 W</u>

Names and addresses of adjacent property owners:

Glick Family Trust	2322 Marvin Rd SE, Olympia WA 98503
McAllister Meadows Homeowners Association	17404 Meridian E Ste F PMB 171, Puyallup WA 98375
Justin & Karah Wright	8403 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Yohan Son	8409 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Nyra Gallardo	8415 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Bradley Lawrance Stark	8421 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Abhineet Chowdhary	8427 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Swathi Narayanamoorthy	8433 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Daniel J Wagner	8439 23 <sup>rd</sup> Ave SE, Lacey WA 98513
Emily Sheikh	2308 Olivia St SE, Lacey WA 98513
Toni M Forster	2647 Woodgrove St SE, Olympia WA 98513
Janet E Contes	2645 Woodgrove St SE, Olympia WA 98513
John H Wasierski	8422 Woodgrove Ct SE, Olympia WA 98513
William & Rebeca Lindauer	8438 Woodgrove Ct SE, Olympia WA 98513
John P Stalcup	8344 Woodgrove Ct SE, Lacey WA 98513
Josephine E Evans Trust	PO Box 5901, Lacey WA 98509-5901
Cathleen J Cook	8328 Woodgrove Ct SE, Olympia WA 98513
Frank & Linda Tekin	8320 Woodgrove Ct SE, Olympia WA 98513
Debbie D Thompson	8312 Woodgrove Ct SE, Olympia WA 98513
Daniel & Sarah Evans	8304 Woodgrove Ct SE, Olympia WA 98513
Katherine & Marlon Wakefield	8248 Woodgrove Ct SE, Olympia WA 98503
Ingrid Velasquez	8240 Woodgrove Ct SE, Olympia WA 98513
Clayton B Alayon	2636 Marvin Rd SE, Olympia WA 98503
Lacey Amer Lgn Post 94	PO Box 5639, Lacey WA 98509
American Legion Post 94	PO Box 5639, Lacey WA 98509
McAllister Park Homeowners Association	8617 Martin Way E, Lacey WA 98516

Joan S Hicks	2503 Mugho St SE, Olympia WA 98513
Julie C Manson	2521 Mugho St SE, Olympia WA 98513
Robert & Alicia Keeney	8506 27 <sup>th</sup> Ave SE, Olympia WA 98503

## Part 3 – Type of Permit Application

Type of permit (e.g., Building, Plat, etc.):

**Plat**

Other permits (☒):

☐ DOF /W HPA

☐ COE 404

☐ COE Wetlands

☐ DOE Dam Safety

☐ FEMA

☐ Floodplain

☐ Shoreline Management

☒ Rockery/Retaining Wall

☒ Encroachment

☒ Grading

☐ Other

Other agencies (e.g., federal, state, local) that have had or will review this Drainage and Erosion Control Plan: City of Lacey

## Part 4 – Proposed Project Description

What stream basin is the project in (e.g., Percival, Woodland)?	<u>Woodland</u>
Project Area, acres (total area of all parcels)	<u>36.05</u>
Project Area Disturbed, acres (total of all areas disturbed by project) (Include all area cleared, graded, etc. as part of this project)	<u>27.94</u>
Onsite Impervious Surfaces: <i>(excluding offsite public/private street frontage)</i>	
Existing Impervious Surface, acres:	<u>0</u>
Replaced Impervious Surface, acres:	<u>0</u>
Existing Impervious Converted to Landscape, acres:	<u>0</u>
New Impervious Surface, acres:	<u>17.30</u>
Total Impervious, acres (existing, new, and replaced):	<u>17.30</u>
Zoning:	<u>Low Density Residential 3-6 (LD 3-6) and Moderate Density Residential (MD)</u>
Onsite:	
Residential Subdivision:	
Number of Lots:	<u>182</u>
Lot size (average), acres:	<u>0.09</u>
Building Permit/Commercial Plat:	
Building(s) Footprint, acres:	<u></u>
Concrete Paving, acres:	<u></u>
Gravel Surface, acres:	<u></u>
Lattice Block or Porous Paving, acres:	<u></u>
New Public Roads (including gravel shoulder), acres:	<u>3.89</u>
New Private Roads (including gravel shoulder), acres:	<u>0</u>
Frontage Improvements (including gravel shoulder), acres:	<u>0.38</u>
Existing road frontage to center of right-of-way, acres:	<u>0.61</u>

## Part 5 – Pre-Developed Project Site Characteristics

Stream through site (Y/N)      N  

Name: \_\_\_\_\_

DNR Type: \_\_\_\_\_

Type of feature this facility discharges to (e.g., lake, stream, intermittent stream, pothole, roadside ditch, sheet flow to adjacent private property, etc.):

Infiltration to groundwater

---

Swales (Y/N).....	<u>  N  </u>
Steep slopes—steeper than 15% (Y/N) .....	<u>  Y  </u>
Erosion hazard (Y/N).....	<u>  N  </u>
100-year floodplain (Y/N) .....	<u>  N  </u>
Lakes or Wetlands (Y/N) .....	<u>  Y  </u>
Seeps/springs (Y/N) .....	<u>  N  </u>
High groundwater table (Y/N).....	<u>  Y  </u>
Wellhead Protection Area (Y/N) .....	<u>  Y  </u>
Other: .....	_____

## Part 6A – Facility Description West

Facility Type:	West Pond
Facility Description:	Treatment Infiltration Pond
Total Area Tributary to Facility Including Offsite (acres):	12.21
Total Onsite Area Tributary to Facility (acres):	11.60
Design Impervious Area Tributary to Facility (acres):	7.92
Design Landscaped Area Tributary to Facility (acres):	4.29
Design Native Vegetation Area Tributary to Facility (acres):	0
Design Total Tributary Area to Facility (acres):	12.21
Water Quality Design Volume (ft <sup>3</sup> ):	47,289
Water Quality Design Flow (cfs):	1.2715
100-Year Return Interval, 24-hr Design Flow (cfs):	9.4051

## Part 6B – Facility Description East

Facility Type:	East Pond
Facility Description:	Treatment Infiltration Pond
Total Area Tributary to Facility Including Offsite (acres):	14.33
Total Onsite Area Tributary to Facility (acres):	14.33
Design Impervious Area Tributary to Facility (acres):	8.57
Design Landscaped Area Tributary to Facility (acres):	5.76
Design Native Vegetation Area Tributary to Facility (acres):	0
Design Total Tributary Area to Facility (acres):	14.33
Water Quality Design Volume (ft <sup>3</sup> ):	52,521
Water Quality Design Flow (cfs):	1.4397
100-Year Return Interval, 24-hr Design Flow (cfs):	10.8492

## Part 6C – Facility Description Tract E

Facility Type:	Tract E Trench
Facility Description:	Infiltration Trench
Total Area Tributary to Facility Including Offsite (acres):	1.65
Total Onsite Area Tributary to Facility (acres):	1.65
Design Impervious Area Tributary to Facility (acres):	1.65
Design Landscaped Area Tributary to Facility (acres):	0
Design Native Vegetation Area Tributary to Facility (acres):	0
Design Total Tributary Area to Facility (acres):	1.65
Water Quality Design Volume (ft <sup>3</sup> ):	-
Water Quality Design Flow (cfs):	-
100-Year Return Interval, 24-hr Design Flow (cfs):	1.8956

## Part 7 – Release to Groundwater (if applicable)

Design Infiltration Rate (in/hr):	2
Average Annual Infiltration per WWHM:	55.9 ac-ft
Designed for 100% Infiltration (Y/N):	Y
Designed for Infiltration Treatment (Y/N):	Y

## Part 8 – Release to Surface Water (N/A)

Discharge Structure: (check all that apply)

Single Orifice	_____	Elev.	_____	Dia.	_____
Multiple Orifice	_____	Elev. 1	_____	Dia.	_____
		Elev. 2	_____	Dia.	_____
		Elev. 3	_____	Dia.	_____
Weir	_____	Elev.	_____	Type	_____
Overflow Weir	_____	Elev.	_____	Dia./Width:	_____
Spillway	_____	Elev.	_____	Dia./Width:	_____
Pump(s)	_____	Model/Type:	_____	Rating:	_____
Other	_____				

Discharge to Surface Water:

<u>Return Period</u>	<u>Pre-Developed</u>	<u>Post-Developed</u>
2-Year:	_____	_____
5-Year:	_____	_____
10-Year:	_____	_____
25-Year:	_____	_____
50-Year:	_____	_____
100-Year:	_____	_____

Pond Information:

Design Max Surface Water Elevation (ft, msl):	_____
Design Maximum Pond Depth (ft):	_____
Pond Volume at Max Design Water Level (ft <sup>3</sup> ):	_____
Overflow Water Elevation (ft, msl):	_____
Sediment Storage Volume (ft, depth below outlet):	_____