

EXHIBIT F

**Kensington Division 1
Formerly The Villages at Avonlea 3**

Integrated Pest Management Plan

**Prepared for: Avonlea Two, LLC
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3804304
Page: 59 of 83
01/30/2006 11:09A

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TABLE OF CONTENTS

I. INTRODUCTION3

Background3

 A. Responsibility3

 B. Project Description5

II. COMMON HAZARDS TO WATER RESOURCES6

General6

 A. Point Sources of Pollutants6

 B. Non-point sources of pollutants6

III. REDUCING IMPACTS ON WATER RESOURCES8

General8

 A. Household operations8

 B. Automotive care and maintenance9

 C. Landscape design and maintenance10

 D. Pest control12

 E. Pesticide management14

 F. Stormwater control14

IV. RELATED DOCUMENTS.....16

Resources16

 A. Contact Numbers16

 B. Reference material16

 C. Quick reference List of Toxic Products and Alternative Products16

 D. Glossary20

Appendix A – Stormwater Maintenance Guide



INTRODUCTION

Background

When urban development covers the land with buildings, houses, streets and parking lots, much of the native topsoil, duff, trees, shrubs and grass are replaced by homes, asphalt, concrete, and landscaping. Along with the development, people come bringing the potential for contamination to area lakes, streams, and groundwater supplies.

Much of Thurston County is classified as an "Aquifer Sensitive" area. That is to say that the groundwater resource, upon which the vast majority of Thurston County residents rely for water, is vulnerable to contamination from land activities. Many of the aquifers serving Thurston County are relatively shallow and largely unprotected by intervening impermeable layers of soil. Consequently, activities on the surface can have an impact on the water supply.

In addition to protecting the aquifer, this project lies near Smith Lake, Chambers Lake, stream flowing to Chambers Lake and associated wetlands. These surface water bodies are susceptible to contamination from development and future activities on this site. Surface water bodies are typically home to a variety of aquatic life including plants, fish, and animals. Some support endangered species such as Coho and Chinook salmon.

This Integrated Pest Management Plan (IPMP) seeks to address potential sources of contamination of both surface and ground waters. Moreover, it provides guidance to future homeowners of this project to identify actions and activities that can be mitigated to reduce the potential for contamination.

Responsibility

All property owners within this subdivision are members of the Homeowners Association (HA). The HA 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. This IPMP is attached to and a part of the Covenants, Conditions, and Restrictions for this subdivision and, as such, are recorded against the title for all properties within the subdivision. Enforcement of the recommendations of this IPMP lies with the HA, but responsibility rests with each property owner.



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3804304

Page: 61 of 83

01/30/2006 11:09A

Figure 1 Site Map



3804304
Page: 62 of 83
01/30/2006 11:09A

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B. Project Description

This project is a subdivision of 37.59 acres into 240 single family lots as a long plat. Division one is the westerly 91 lots. The project is located on the south side of 45th Avenue, west of College Street in the City of Lacey. Stormwater facilities for this project include an extensive conveyance system of catch basins and piping. This system discharges into the detention ponds constructed by the Stonegate at Avonlea project.

The project is in the vicinity of Chambers Lake and Smith Lake in the Chambers Creek Basin. The surrounding area is spotted with wetlands and ponds. Chambers Lake is approximately 0.75 miles northwest of the development and has a 600 foot wetland buffer, per Thurston County Geodata Mapping. Smith Lake is approximately 0.25 miles west of Avonlea 3 with a 300 foot wetland buffer. A small wetland lies 0.25 miles northwest of the project while a second is approximately 745 feet south of the site. Due to the proximity of the site to the surrounding bodies of water, it is located within a wellhead protection area.

The homeowner is expected to care for his/her property with consideration of the surrounding environment, because how you care for your house and lawn will impact the water quality. Items to consider are described in detail below and include: household operation, automobile maintenance, lawn care, pest control, pesticide management, and stormwater control. All these can have an impact on the water quality of the surrounding lakes, streams, and wetlands.

COMMON HAZARDS TO WATER RESOURCES

General

Many products commonly used in and around our homes are hazardous to both the environment and people. If used improperly, these products can end up in nearby surface or ground waters. This document provides alternatives, where possible, for many products and common practices that can reduce the potential for adverse impacts to those water resources. The term commonly used to describe environmentally conscientious practices is "Best Management Practices" (BMP). Many BMPs are incorporated into the design of your subdivision. BMPs described herein include "good housekeeping" practices that everyone can use.

It has been said that the average home today contains more chemicals than the average chemical lab of 100 years ago. When these chemicals are used industrially, they typically are subject to various health and safety standards. However, many of these same substances can be used freely and carelessly in our homes. Typical residential pollutant sources are classified as either "point" or "non-point" sources. A point source pollutant is one in which the contaminant can be traced to a specific location or locations. Non-point pollutants are more difficult to locate. Stormwater is a good example wherein tiny bits of



contaminant collect over many acres of runoff, eventually reaching a single point. However, the source of the pollutant is anything but a "point" source.

Point sources of pollutants

0. Household products

Many cleaning agents, solvents, polishes, etc. commonly used in the home are considered hazardous. These products may be toxic, corrosive, reactive, flammable, or carcinogenic. It is critical that these products are handled with care and are properly disposed. A list of common household hazardous materials is presented in Table 1.

In addition, many hazardous household chemicals persist for long periods of time in the environment. Manufacturers may truthfully state that a product is "biodegradable"; most products are biodegradable, but what is important is the rate at which they are broken down and the products they are broken down into. The term "biodegradable" is somewhat misleading unless the product rapidly degrades into harmless substances.

It is important to note here that the term "biodegradable" currently has no legal definition in this state. Consequently, any product can use this term according to the manufacturer's own definition. This definition may not be at all similar to the consumer's perception.

0. Automotive care products

Common automotive fluids such as oil, gas, antifreeze, degreasers, etc. are easily spread by small amounts of water and can cause significant damage to area ground and surface waters. Table 1 presents a list of these common items and Table 2 suggests alternatives or handling tips to reduce the potential for negative environmental impacts.

Non-point sources of pollutants

0. Yard care products

Pesticides (including insecticides and herbicides) and fertilizers are commonly used by homeowners in the quest for bigger, healthier plants and greener lawns. These chemicals are often overused. Many times, homeowners apply too much chemical or apply the right amount but at the wrong time. (Such as before heavy rains or any time the plants will not be able to absorb the chemicals.) Excess chemicals are easily introduced into stormwater runoff and can cause algae blooms (fertilizers) or kill off aquatic organisms (pesticides) in surface waters. Large quantities of fertilizer can negatively impact nitrate levels in drinking water well supplies as well.

0. Stormwater runoff



3804304
Page: 64 of 83
01/30/2006 11:09A

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Stormwater runoff needs to be treated because it carries litter, oil, gasoline, fertilizers, pesticides, pet waste, 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 or kill aquatic life. Untreated stormwater can pollute groundwater in similar ways. 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.



3804304
Page: 65 of 83
01/30/2006 11:09A

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III. REDUCING IMPACTS ON WATER RESOURCES

General

The following ideas should help you reduce the risks of stormwater and ground water contamination from many common products or practices. From a waste management standpoint, automobile maintenance is best done by professionals at facilities designed to handle, store, and dispose of waste products properly. Many of these facilities do an excellent job of dealing with waste oils, antifreezes, other fluids, batteries and tires. If you do repair or maintain your car at home, please consider the tips presented in this plan.

Fertilizing a lawn can be done in an environmentally sensitive manner. Also, rather than bringing out the sprayer whenever a pest infestation occurs in the garden, consider using other alternatives. Evaluate all factors that might affect the garden, including environmental effects, before chemicals are applied. Pesticides should only be used as a last resort. Some proven tactics that can be used to decrease the use of pesticides are discussed below.

A. Household operations

1. Read the label of products before you buy them. Toxic product labels carry many warnings. Either bypass such products entirely or buy them in small quantities. If you cannot use the entire product, try to give it away instead of disposing of it. Thurston County periodically facilitates product exchanges for leftover paints and other hazardous wastes. Call the Thurston County Health Department at 754-4111 for more information.
2. Buy detergents that contain little or no phosphorus. Phosphorus can cause algae blooms if washed into lakes or streams. Most detergents that are low or phosphate free are labeled as such.
1. Use no more than the manufacturer's suggested amount of any cleanser. (More isn't necessarily better.)
2. Products such as oven cleanser, floor wax, furniture polish, drain cleaners, and spot removers often contain chemicals that are toxic. Buy the least toxic product available, and use a non-toxic substitute if one can be found. Ovens, for example, can be cleaned by applying table salt to spills, then scrubbing with a solution of washing soda and water. Table 2 lists substitutes for many commonly used household products.

If it is necessary to use a product that contains toxic chemicals, use the product only as directed. Do not combine products, as they may become more dangerous when mixed (example: mixing chlorine bleach and ammonia produces dangerous gases). Use eye-wear and rubber gloves as appropriate.

Contact the Hazardous Substance Hotline at 1-800-633-7585 if you have any

questions regarding disposal of a product or empty container. The County has both hazardous waste collection days and permanent facilities where residents can bring hazardous wastes. Call the Thurston County Health Department at 754-4111 for more information.

3. Many chemicals left over from some activities such as photography and auto repair are hazardous and should not be flushed down the sink or toilet. This is especially important if your home is hooked up to a septic system. Toxic chemicals can kill bacteria in the tank that treat sewage and can also pollute water supply wells.
4. Be sure that all toxic material containers are clearly marked.
5. Common (not automobile) household batteries are one of the largest sources of heavy metals (such as lead, nickel, cadmium, and mercury) found in landfills. Instead of throwing batteries away, dispose of them at a hazardous waste collection site.

B. Automotive care and maintenance

5. Cars should be serviced regularly. Leaky lines or valves should be replaced.
6. Dumping oil, degreasers, antifreeze, and other automotive liquids into a stream or storm drain violates city, county and state law. Do not dump them onto the ground because they will end up in stormwater runoff or in groundwater. Do not use oil to reduce dust levels on unpaved areas. Instead, recycle used oil and antifreeze. (Keep them in separate containers.) Call the Recycling Hotline at 1-800-RECYCLE or call the Thurston County Health Department for the location of the nearest recycling center. You may also call your local automotive service centers to see if they take oil for recycling. (Some also take used oil filters.)
7. Wrap empty oil and antifreeze containers in several layers of newspaper, tie securely, and place them in a covered trashcan. (Antifreeze tastes sweet but is poisonous to people, fish, pets, and wildlife.)
1. Sweep your driveway instead of hosing it down. Fluids and heavy metals associated with automobiles can build up on driveway surfaces. When cleaned with a garden hose, these contaminants can be washed into local surface or ground waters. Sweeping up sediment and disposing of it properly can reduce the impact on our water resources.
2. Wash vehicles on the lawn or in a location where soapsuds can be directed onto the lawn or another vegetated area. This will help to keep soapsuds from washing into the storm drain system or local surface water. (Your stormwater pond is not designed to cleanse soapy water from washed cars.)
3. Small spills of oil or other fluids can be absorbed by using materials such as kitty litter or sawdust. Wrap the used kitty litter and any contaminated soil in a



plastic bag and then place it in the garbage. If a spill reaches surface water, you must notify the nearest regional office of the Department of Ecology immediately! Southwest Regional Office number: 407-6300. There are fines for failure to notify the appropriate agency when a spill occurs.

4. De-icing chemicals, usually a form of salt, can harm concrete less than three years in age, burn vegetation, and are corrosive to cars and other metal objects. De-icing chemicals and their additives can also be toxic. (Cyanide is formed from the breakdown of a common anti-caking agent used in de-icing chemicals.)

Urea salts are an alternative to other types of salt de-icers, but great care must be used in applying them. These salts contain large quantities of nitrogen, which can severely burn plants and encourage algae growth in lakes if over-applied. The use of these chemicals should be minimized or avoided. Instead, shovel walks clear and apply a dusting of sand to improve footing.

C. Landscape design and maintenance

6. 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.

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. Following is a brief list of just some of the more common varieties of native plants. 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



7. 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.

2. 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 two to four inches.

2. 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.
 - 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.

 - 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.

 - 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



3804304

Page: 69 of 83
01/30/2006 11:09A

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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 N per 1000 square feet, you need to apply 4.2 pounds of fertilizer ($1 \div 0.24 = 4.2$). Return clippings (grasscycle) when you mow to recycle nutrients into the lawn.
 - 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.
 - 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.
 - 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.
10. 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.

D. Pest control

1. Use natural predators and pathogens. Because chemical sprays generally kill beneficial insects along with 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.

Some bacteria, viruses, and insect parasites 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. Products containing Bt are available at your nursery.

0. Many times a change of habitat can control pest infestations. Removal of old tires can cut down on the mosquito population by removing a convenient water-filled location for them to breed. Crop rotation, even in a small garden, can reduce the number of pest infestations. 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.
0. Crops that can overwinter, such as leeks and carrots, should be planted in the fall. This gives them time to become established before pests arrive in the spring.
0. 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 beneficial insects are not destroyed in error. Drowning insects in plain water or spraying them with soapy water are alternatives to squashing them.
0. Plants native to this area are often more resistant to pests and climate than are introduced plants. Many plant cultivars have been developed that are resistant to diseases such as verticillium wilt and peach leaf curl. Grass seed mixes are also available for lawns that require less watering, mowing, and chemical use.
0. Plants, such as hostas, that require some shade are more susceptible to pests when they are grown in the sun. Plants that are not properly fertilized or watered 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.



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3804304

Page: 71 of 83
01/30/2006 11:09A

E. Pesticide management

11. Know what pest you are spraying for. Use the pesticide according to the manufacturer's instructions and buy only the quantity needed. Many pesticides have a limited shelf life and may be useless or degrade into even more toxic compounds if kept on the shelf.
1. Do not apply more than the specified amount. Overuse can be dangerous to your health as well as 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".
1. Do not spray on windy days, in the morning of what will be a very hot day, or when rain is likely to occur. Herbicides can drift and injure valuable ornamental plants in either yours or your neighbor's back yard. Do not water heavily after application. Plants should be lightly watered BEFORE application to prevent burning the foliage, and to help evenly spread the chemical.
1. Never apply pesticides near streams, ponds, or wetlands (exception: approved applications for aquatic weeds). Do not apply them to bare eroded ground (exception: use of low toxicity herbicides such as Round-up to allow growth of desired planting in small areas). Many pesticides bind to soil particles and can be easily carried into a stream or storm drain.
1. 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 in tact. Labels often corrode and become illegible in this climate and may have to be taped onto the container.
1. Federal law requires all pesticides to be labeled with an appropriate disposal method. Leftovers should never be dumped anywhere, including a landfill. Take unwanted pesticides to the County's "Hazardous Waste Collection Days" or Hazo House at the landfill. Call the Thurston County Waste Line at 1-800-624-1234, ext. 4348 for more information.
1. Empty containers should be triple-rinsed and the rinse water used as spray. Once containers are triple-rinsed, they are not considered hazardous waste and may be disposed of in most landfills. However, call your local landfill before putting the container in the garbage.
0. If a pesticide is spilled onto pavement, it can be absorbed using kitty litter or sawdust. The contaminated absorbent should be bagged and labeled and taken to Hazo House.
9. If a 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.

A. Stormwater control

Your neighborhood has a stormwater control system that includes wetponds to treat stormwater runoff and a detention pond to infiltrate all runoff before discharging to the City's stormwater system. Both facilities require certain types of maintenance to assure that they function as intended. A Stormwater Maintenance Agreement has been recorded with the title on all properties within your subdivision, binding the Homeowners Association to implementing the specified maintenance. Copies of the maintenance agreement is included in the covenants filed with the plat and should be included as part of your title policy on your lot.

Stormwater facilities for this project include an extensive conveyance system of catch basins and piping, a wet pond for water quality, and two detention ponds. The stormwater system is being implemented in accordance with the 1994 Drainage and Erosion Control Manual for the City of Lacey and as modified by the LID 13 Storm Drainage System Project.

The western portion of the site (approximately 10.1 acres) will be collected and discharged through the metering device of the western pond of the Stonegate at Avonlea (originally called the Villages at Avonlea 1) project. We are proposing to construct a detention pond on the south side of 45th across from the pond that serves Basin 4 of the Stonegate at Avonlea project. As a result of this, both ponds will release through one metering device that directs the water to the east and into the City's system located adjacent to the 45th Avenue and College Street roundabout. The orifices on the metering device will be modified to accomodate the additional storm drainage from the proposed project. This point of connection to the City's system was originally proposed to help alleviate the downstream stormwater problems located to the west of this site. The storm drainage was designed per the City of Lacey's Drainage design and Erosion Control Manual.

The eastern portion of the site (approximately 10.1 acres) will be collected and discharged through a pond located at the southeastern corner of the subject property into the College Street system. This release point and release rate is in compliance with the LID 13 requirements that this portion of the project contributed towards.

All above ground stormwater facilities will be hydroseeded upon completion. In addition, the water quality wet pond will be planted with a variety of wetland species both in the permanent pool along the fringes of the permanent water

surface. Additional landscaping shall also be provided throughout the project in conformance with the approved landscaping and tree restoration plan, as applicable, and otherwise required by the approving authority.



3804304

Page: 74 of 83

01/30/2008 11:09A

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IV. RELATED DOCUMENTS

Resources

A. Contact Numbers

Lacey Water Resources	491-5600
Thurston County Storm & Surface Water Management	754-4681
WSU Cooperative Extension	786-5445

Developer Information:

Avonlea Two, LLC
1868 State Avenue NE
Olympia, WA 98506
(360) 754-7010

Engineer's Information:

Hatton Godat Pantier
1840 Barnes Blvd, SW
Tumwater, WA 98512
(360) 943-1599

A. Reference material

Puget Sound Water Quality Authority, Managing Nonpoint Pollution - an Action Plan for Puget Sound Watersheds, 88-31, June 1989.

Washington State Dept. of Ecology, Water Quality Guide - Recommended Pollution Control practices for Homeowners and Small Farm Operators 87-30, revised June 1991.

Washington State Dept. of Ecology, Hazardous Waste Pesticides, 89-41, August 1989.

Gardening with Native Plants of the Pacific Northwest by Arthur Kruckeberg

A. Quick Reference List of Toxic Products and Alternative Products

Table 1 – Hazardous Household Substances

Table 2 - Non-Toxic or Less Toxic Alternatives to Toxic Products



3804304

Page: 75 of 83

01/30/2006 11:09A

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Table 1 Hazardous Household Substances

Auto, Boat and Equipment Maintenance	Repair and Remodelling	Cleansing Agents
<ol style="list-style-type: none"> 1. Batteries 2. Waxes and cleansers 3. Paints, solvents and thinners 4. Additives 5. Gasoline 6. Flushes 7. Auto repair materials 8. Motor oil 9. Diesel oil 10. Antifreeze 	<ol style="list-style-type: none"> 1. Adhesives, glues, cements 2. Roof coatings, sealants 3. Caulking and sealants 4. Epoxy resins 5. Solvent-based paints 6. Solvents and thinners 7. Paint removers and strippers 	<ol style="list-style-type: none"> 1. Oven cleaners 2. Degreasers and spot removers 3. Toilet, drain and septic tank cleaners 4. Polishes, waxes and strippers 5. Deck, patio and chimney cleaners 6. Solvent cleaning fluids
Pesticides	Hobby and Recreation	Miscellaneous
<ol style="list-style-type: none"> 1. Insecticides 2. Fungicides 3. Rodenticides 4. Molluscicides 5. Wood preservatives 6. Moss retardants 7. Herbicides 8. Fertilizers 	<ol style="list-style-type: none"> 1. Paints, thinners and solvents 2. Chemicals (photo and pool) 3. Glues and cements 4. Inks and dyes 5. Glazes 6. Chemistry sets 7. Bottled gas 8. White gas 9. Charcoal starter fluid 	<ol style="list-style-type: none"> 1. Ammunition 2. Asbestos 3. Fireworks

Source: Guidelines for Local Hazardous Waste Planning, Ecology, No. 87-18 1987.

Table 2 Non-Toxic or Less Toxic Alternatives to Toxic Products

Hazardous Product	Alternative(s)
Air fresheners	Set out a dish of vinegar or simmer cinnamon and cloves or set out herbal bouquets or potpourri in open dishes or burn scented candles.
Bleach	Borax or oxygen bleaches or reduce bleach by ½ and add ¼ - ½ C. baking soda, or let clothes dry in the sun.
Brass polish.	Worcestershire sauce.
Chrome polish	Apple cider vinegar or a paste of baking soda and water or a lemon
Coffee pot cleaner	Vinegar.
Coffee stains	Moist salt paste.
Copper cleaner	Mix lemon juice w/ salt or use ketchup
Drain cleaner	Use a plunger followed by ½ C. baking soda in ½ C. vinegar. Let sit 15 min. & pour down 2 qt. boiling water.
Furniture polish	Linseed, olive or almond oils or a mixture of 3 parts olive oil to 1 part white vinegar or a mixture of 1 Tbs. lemon oil and 1 pint mineral oil.
Garbage disposal deodorizer	Used lemon rind or baking soda.
Glass cleaner	Mix 2 Tbs. vinegar with 1 quart water.
Grease remover	Make a paste of borax on a damp cloth.
Ink stain remover	Spray with leftover non-aerosol hair spray before washing.
Laundry soap	Borax, baking soda or washing soda
Linoleum floor cleaner	1 C. white vinegar in 2 gals. water.
Mildew remover	Equal parts vinegar and salt.
Mothballs	Cedar chips or blocks, or use dried tansy, lavender or peppercorns in drawers and closets.
Oil spills	Kitty litter, sawdust.
Oil stain removal	White chalk rubbed into the stain prior to washing.
Oven cleaner	Pour lots of salt on fresh spills and scrape off after the oven cools. A soda water solution will cut grease. Paint ammonia on spills with a paintbrush, then rinse off.
Paint brush softener	Hot vinegar.



3804304

Page: 77 of 83

01/30/2006 11:09A

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Table 2 Non-Toxic or Less Toxic Alternatives to Toxic Products (Cont.)

Hazardous Product	Alternative(s)
Paint stripper	Use mechanical sanding instead of chemical strippers.
Paint/grease remover	Wear gloves or use baby oil.
Pet odor removal	Cider vinegar.
Pitch or sap remover	Butter, margarine or vegetable shortening.
Porcelain stain remover	Baking soda
Refrigerator deodorizer	Open box of baking soda.
Rug/carpet cleaner	(General) Use a soap-based non-aerosol rug shampoo, vacuum when dry. (Spots) Pour on club soda or sprinkle cornmeal or cornstarch on the rug, let sit for at least 30 minutes, then vacuum.
Rust removal	Lemon juice plus salt plus sunlight.
Rusty bolt remover	Carbonated beverage.
Scorch mark remover	Grated onion.
Scouring powder	Baking soda or a non-chlorine scouring powder.
Silver polish	Soak silver in warm water with 1 Tbs. soda, 1 Tbs. salt and a piece of aluminum foil.
Stainless steel polish	Mineral oil.
Toilet bowl cleaner	Paste of borax and lemon juice.
Tub and tile cleaner	¼ C. soda and ½ C. white vinegar mixed with warm water.
Upholstery spot remover	Club soda.
Water mark remover	Toothpaste.
Water softener	¼ C. vinegar.



3804304

Page: 78 of 83
01/30/2006 11:09A

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A. Glossary

BEST MANAGEMENT PRACTICE (BMP) - Structures, conservation practices, or regulations that improve quality of runoff or reduce the impact of development on the quantity of runoff.

BIOFILTER (SWALE) - A wider and flatter vegetated version of a ditch over which runoff flows at uniform depth and velocity. Biofilters perform best when vegetation has a thick mat of roots, leaves, and stems at the soil interface (such as grass).

BIOFILTRATION - The process through which pollutant concentrations in runoff are reduced by filtering runoff through vegetation.

BUFFER - The zone that protects aquatic resources by providing protection of slope stability, attenuation of runoff, and reduction of landslide hazards. An integral part of a stream or wetland ecosystem, it provides shading, input of organic debris, and coarse sediments to streams. It also allows room for variation in stream or wetland boundaries, habitat for wildlife, and protection from harmful intrusion.

CATCH BASIN - An inlet for stormwater set into the ground, usually rectangular and made of concrete, and capped with a grate that allows stormwater to enter.

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

COMPOST STORMWATER FILTER - A treatment facility that removes sediment and pollutants from stormwater by percolating water through a layer of specially prepared bigleaf maple compost. Clean water exits the bottom of the facility through a pipe, while stormwater flows in excess of the facility design overflow the compost bed and bypass the facility.

CONSTRUCTED WETLAND - A wet pond with dead storage at varied depths and planted with wetland plants to enhance its treatment capabilities.

CONTROL STRUCTURE OR FLOW RESTRICTOR - A manhole and/or pipe structure with a flow-regulating or metering device such as a weir or plates with small holes known as orifices. This structure controls the rate at which water leaves the pond.

CONVEYANCE - A mechanism or device for transporting water including pipes, channels (natural and man-made), culverts, gutters, manholes, etc.

CRITICAL AREA - Areas such as wetlands, streams, steep slopes, etc. as defined by ordinance or resolution by the jurisdiction. Also known as environmentally sensitive areas.



CULVERT - A conveyance device (e.g., concrete box, pipe) which conveys water from a ditch, swale, or stream under (usually across) a roadway or embankment.

DEAD STORAGE - The volume of storage in a pond below the outlet which does not drain after a storm event. This storage area provides treatment of the stormwater by allowing sediments to settle out.

DETENTION FACILITY - A facility (e.g., pond, vault, pipe) in which surface and storm water is temporarily stored.

DETENTION POND - A detention facility in the form of an open pond.

DISPERSION TRENCH - An open-top trench filled with riprap or gravel that takes the discharge from a pond, spreads it out, and spills (bubbles) the flow out along its entire length. Dispersion trenches are used to simulate "sheet flow" of stormwater from an area, and are often used to protect sensitive adjacent areas, such as wetlands.

DRAINAGE SYSTEM - The combination of Best Management Practices (BMPs), conveyances, treatment, retention, detention, and outfall features or structures on a project.

DROP STRUCTURE - A structure for dropping water to a lower elevation and/or dissipating energy. A drop may be vertical or inclined.

DRY POND - A detention facility that drains completely after a storm. This type of pond has a pipe outlet at the bottom.

EASEMENT - A right afforded a person to make limited use of another's real property. Typical easements are for pipes or access to ponds, and may be 15 to 20 feet wide.

EMERGENCY OVERFLOW OR SPILLWAY - An area on the top edge of the pond that is slightly lower in elevation than areas around it. This area is normally lined with riprap. The emergency overflow is used only if the primary and secondary outlets of the pond fail, in the event of extreme storms, or if the infiltration capability of the pond becomes significantly diminished. If the emergency overflow ever comes into play, it may indicate the pond needs to be upgraded.

ENERGY DISSIPATER - A rock pad at an outlet designed to slow the velocity, spread out the water leaving the pipe or channel, and reduce the potential for erosion.

FREEBOARD - The vertical distance between the design high water mark and the elevation of the top of the pond. Most ponds have one to two feet of freeboard to prevent them from overflowing.



INFILTRATION - The soaking of water through the soil surface into the ground (percolation is essentially the same thing). Many ponds are designed to infiltrate or retain stormwater, and thus do not have a regularly used discharge pipe.

INFILTRATION FACILITY (OR STRUCTURE) - A facility (pond or trench) which retains and percolates stormwater into the ground, having no discharge (to any surface water) under normal operating conditions.

JUNCTION - Point where two or more drainage pipes or channels converge (e.g., a manhole).

JURISDICTION - Olympia, Lacey, Tumwater, or Thurston County (as applicable).

LINED POND OR CONVEYANCE - A facility, the bottom and sides of which have been made impervious (using, for example, a plastic liner or clay/silt soil layer) to the transmission of liquids.

LIVE STORAGE - The volume of storage in a pond above the outlet which drains after a storm event. This storage area provides flood control and habitat protection for nearby streams.

MANHOLE - A larger version of a catch basin, often round, with a solid lid. Manholes allow access to underground stormwater pipes for maintenance.

NATURAL CHANNEL - Stream, creek, river, lake, wetland, estuary, gully, swale, ravine, or any open conduit where water will concentrate and flow intermittently or continuously.

OIL-WATER SEPARATOR - A structure or device used to remove oil and greasy solids from water. They operate by using gravity separation of liquids that have different densities. Many catch basins have a downturned elbow that provides some oil-water separation.

OUTFALL - The point where water flows from a man-made conduit, channel, or drain into a water body or other natural drainage feature.

RETENTION FACILITY - An infiltration facility.

RETENTION POND - A retention facility that is an open pond.

REVETMENTS - Materials such as rock or keystones used to sustain an embankment, such as in a retaining wall.

RIP RAP - Broken rock, cobbles, or boulders placed on earth surfaces, such as on top of a berm for the emergency overflow, along steep slopes, or at the outlet of a pipe, for protection against the action of water. Also used for entrances to construction sites.

RUNOFF - Stormwater.

SAND FILTER - A treatment facility that removes sediment and pollutants from stormwater by percolating water through a layer of sand. Clean water exits the bottom of the facility through a pipe, while stormwater flows in excess of the facility design overflow the sand bed and bypass the facility.

STORMWATER - That portion of precipitation that falls on property and that does not naturally percolate into the ground or evaporate, but flows via overland flow, channels or pipes into a defined surface water channel, or a constructed infiltration facility. Stormwater includes washdown water and other wastewater that enters the drainage system.

SWALE - A shallow drainage conveyance with relatively gentle side slopes, generally with flow depths less than one foot. This term is used interchangeably with "BIOFILTER".

TRASH RACK OR BAR SCREEN - A device (usually a screen or bars) that fits over a pipe opening to prevent large debris such as rocks or branches from entering and partially blocking the pipe.

WET POND - A stormwater treatment pond designed with a dead storage area to maintain a continuous or seasonal static water level below the pond outlet elevation.



3804304
Page: 82 of 83
01/30/2006 11:09A

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APPENDIX A – STORMWATER MAINTENANCE GUIDE



3804304

Page: 83 of 83

01/30/2006 11:09A

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