Stormwater Manual

Vol. Source Control Technical Requirements Manual

Director's Rules for Seattle Municipal Code Chapters 22.800 - 22.808

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Note:

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Preface

Background

This Directors' Rule, the *Source Control Technical Requirements Manual*, presents approved methods, criteria, details, and general guidance for controlling pollutants at their source and reducing pollution in stormwater runoff pursuant to the Seattle Municipal Code, Chapters 22.800 – 22.808, the *Stormwater Code*.

Purpose of the Stormwater Code

In addition to meeting the specific stormwater needs of the City of Seattle, the Stormwater Code also meets certain requirements of the City's Phase I National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Discharges from Municipal Separate Storm Sewer Systems. Issued to the City under the federal Clean Water Act by the Washington State Department of Ecology, one of the conditions of this permit requires Seattle to regulate activities that impact the quality and quantity of stormwater runoff. This is accomplished, in large measure, through the Stormwater Code and its associated Directors' Rules, which Ecology has determined to be equivalent to the minimum requirements contained in the City's Phase I NPDES Municipal Stormwater Permit and the *Stormwater Management Manual for Western Washington* (Ecology 2005).

The City of Seattle's Stormwater Code is contained in the Seattle Municipal Code (SMC) Chapters 22.800 - 22.808. The Stormwater Code contains regulatory requirements that provide for and promote the health, safety, and welfare of the general public. The provisions of the Stormwater Code are designed to accomplish the following:

- 1. Protect, to the greatest extent practicable, life, property and the environment from loss, injury, and damage by pollution, erosion, flooding, landslides, strong ground motion, soil liquefaction, accelerated soil creep, settlement and subsidence, and other potential hazards, whether from natural causes or from human activity.
- 2. Protect the public interest in drainage and related functions of drainage basins, watercourses, and shoreline areas.
- 3. Protect receiving waters from pollution, mechanical damage, excessive flows and other conditions that will increase the rate of downcutting, stream bank erosion, and/or the degree of turbidity, siltation, and other forms of pollution, or which will reduce their low flows or low levels to levels which degrade the environment, reduce recharging of ground water, or endanger aquatic and benthic life within these receiving waters and receiving waters of the state.

- 4. Meet the requirements of state and federal law and the City's Phase I NPDES Municipal Stormwater Permit.
- 5. Protect the functions and values of environmentally critical areas as required under the state's Growth Management Act and Shoreline Management Act.
- 6. Protect the public drainage system from loss, injury, and damage by pollution, erosion, flooding, landslides, strong ground motion, soil liquefaction, accelerated soil creep, settlement and subsidence, and other potential hazards, whether from natural causes or from human activity.
- 7. Fulfill the responsibilities of the City as trustee of the environment for future generations.

To support implementation of the Stormwater Code, the Director of Seattle Public Utilities (SPU) and the Director of the Department of Planning and Development (DPD) promulgate rules that provide specific technical requirements, criteria, guidelines, and additional information. There are currently four joint Directors' Rules:

- Volume 1: Source Control Technical Requirements Manual (Directors' Rule 2009-003 [SPU], 15-2009 [DPD]) provides information to help individuals, businesses, and public agencies in Seattle implement best management practices (BMPs) for controlling pollutants at their source and preventing contamination of stormwater runoff.
- Volume 2: Construction Stormwater Control Technical Requirements Manual (Directors' Rule 2009-004 [SPU], 16-2009 [DPD]) contains temporary erosion and sediment control technical requirements, which are required to prevent contaminants from leaving projects during construction. It also provides submittal requirements for drainage control review to help ensure stormwater controls are appropriately implemented during construction projects.
- Volume 3: Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual (Directors' Rule 2009-005 [SPU], 17-2009 [DPD]) presents approved methods, criteria, and details for analysis and design of stormwater flow control and water quality treatment BMPs. It also provides information regarding hydrologic modeling for stormwater designs
- Volume 4: Stormwater Code Enforcement Manual (Directors' Rule 2009-006 [SPU], 18-2009 [DPD]) provides standards, guidelines, and requirements for enforcing the Stormwater Code.

Chapter 1 - Introduction

1.1 What Is the Purpose of This Manual?

This manual is designed to help businesses, individuals, responsible parties, and public agencies in Seattle implement best management practices (BMPs) for source control, to prevent pollutants from contaminating stormwater runoff and entering our rivers, lakes, and streams. Polluted stormwater can pose risks to the health, safety, and welfare of humans and the environment.

Some BMPs in this manual are required for all real property in Seattle (see Chapter 2). Others are required only for properties and public agencies conducting specific activities in areas with separated storm drains (see Chapter 3). As required by the Stormwater Code (SMC Chapters 22.800 – 22.808), BMPs from this manual must be implemented to minimize contamination and discharge of stormwater from pollution-generating activities.

1.2 How Does this Manual Apply to Businesses and Properties?

Some BMPs are required for all real property in the City of Seattle (see Chapter 2). The implementation of additional BMPs applies to all businesses and public agencies in Seattle for specific pollution-generating activities that could result in pollutants entering receiving waters (see Chapter 3). This manual combines source control goals and requirements of many programs and regulations, including the following:

- Federal Clean Water Act
- Federal Coastal Zone Management Act
- City of Seattle Phase I NPDES Municipal Stormwater Permit coverage
- Puget Sound Water Quality Action Team's Puget Sound Water Quality Management Plan (PSWQAT 2000)
- Seattle's Stormwater Code (SMC Chapters 22.800 22.808).

Owners, operators, and occupants of property, and anyone causing or contributing to a violation of the City Code are considered a "responsible party" for purposes of a code violation (SMC 22.801.190).

If a commercial property is owned, leased, or rented to tenants, the owner is also responsible for any pollution from the property and can be held responsible for water quality problems caused by tenants. Make sure tenants are informed of their responsibilities as described in this manual.

1.3 What is Stormwater and Where Does it Go?

Stormwater is water from rainfall and snowmelt. In urban areas, rainfall lands on impervious surfaces such as roads, parking lots, and rooftops. When stormwater

does not infiltrate the soil, it must be managed to control flooding and to prevent pollutants it may contain from washing into receiving waters.

Although most stormwater in Seattle ultimately ends up in receiving waters in the Seattle area, it is conveyed to the receiving waters in different ways. It can flow directly into streams, through ditch and culvert drainage systems, or via public storm drain pipes. About half of Seattle (especially older areas) drains into combined sewers that typically convey both stormwater and sanitary waste to the West Point Treatment Plant, where the stormwater is treated before being discharged to Puget Sound. However, during heavy rains, combined sewers sometimes overflow, causing stormwater and sanitary waste to discharge without treatment into our lakes and Puget Sound.

1.4 Which Pollutants Are Targeted in This Manual?

The following provides descriptions of typical pollutants targeted by the source control BMPs outlined in this manual, including explanations of why the pollutants can be harmful and some of the common sources of these pollutants. See Appendix A for definitions of technical terms used in this manual.

1.4.1 pH

The pH value of a substance is a measurement of its acidity or alkalinity. The pH of a body of water is vitally important, because most aquatic life survives within a relatively narrow range of pH values (6.5 to 8.5). A pH that is lower than 6.5 can be too acidic to support aquatic life. A pH that is higher than 8.5 can be too alkaline to support aquatic life. Some sources that can contribute to a change in the pH of stormwater and receiving waters are the cement in poured concrete, cement dust, materials used in paving and recycling operations, solutions used in metal plating operations, chemicals from printing and other industrial processes, and common cleaners such as bleaches and deck cleaners.

1.4.2 Total Suspended Solids

Total suspended solids can include particles such as sand, silt, soil, iron precipitates, and biological solids, all of which can increase the turbidity in receiving waters (make the water cloudy) and can settle out in streams as sediment. This can destroy fish habitat and other aquatic life because excess sediment not only has the potential to smother aquatic organisms including developing fish eggs, but also coat them with toxic substances such as petroleum and metals which can adhere to the sediment in surface water.

Excess sediment in drainage systems and waterways can also increase the need for maintenance and increase the potential for local flooding.

1.4.3 Chemical and Biochemical Oxygen Demanding Substances

Chemical wastes and degradable organic matter (such as landscaping waste and food waste) can drastically affect water quality if it is allowed to enter stormwater.

As these substances are broken down by bacteria, the oxygen in the water is depleted. The resulting decrease in oxygen supply can stress or eventually kill fish and other aquatic species. Chemical oxygen demand (COD) and biological oxygen demand (BOD) are two parameters that indicate the amount of oxygen that is used up by various pollutants.

1.4.4 Metals

Metals are used in many products. Certain metals wear off vehicle brakes, tires, and galvanized surfaces and are released from paint, scrap metal, and protective coatings used on buildings. These metals can be carried by stormwater runoff into receiving waters where they have been linked to severe health and reproductive problems in fish and other aquatic animals.

1.4.5 Bacteria and Viruses

Bacteria and viruses from animal wastes, urban wildlife, cross connections, and leaking sewer lines can contaminate surface water and result in the closure of swimming and shellfish areas. Concentrations of bacteria called fecal coliform bacteria, and enterococci (in marine water) and *Escherichia coli* (in fresh water) are typically used as indicators of pollution.

1.4.6 Nutrients

In the context of water quality, the nutrients of concern are primarily compounds that contain nitrogen and phosphorus. Excess nutrients allowed to enter receiving waters can lead to undesirable effects, such as overgrowth of algae, depletion of oxygen from the water, and channel clogging due to the overgrowth of vegetation. The water can also become unattractive for recreational use and unsuitable for use by fish and wildlife. Sources of nutrients include fertilizers, leachate from trash, leaking sewer lines, and yard and animal wastes.

1.4.7 Toxic Organic Compounds

A number of organic compounds are toxic to the aquatic environment. Many pesticides, herbicides, rodenticides, and fungicides contain organic compounds that can be deadly to aquatic life. The same is true of organic compounds included in antifreeze, wood preservatives, cleansers, and a host of other more exotic organic compounds that result from industrial operations or past industrial practices (such as phthalates, polychlorinated biphenyls [PCBs], dioxins, and chlordane). These toxic organic compounds can remain in the sediment for a long time. Recently, a group of compounds referred to as polycyclic aromatic hydrocarbons (PAHs), which are components of exhaust residue from motor vehicles, have been recognized as a pollutant of concern that is found in sediments throughout the Puget Sound area.

1.4.8 Other Chemicals and Substances

There are a host of other chemicals and substances that can cause problems if they are allowed to enter the aquatic environment. Even compounds classified as *biodegradable or environmentally friendly* can have devastating effects on aquatic life. Some of the most common chemicals and substances that pollute stormwater are oils, greases, soaps, and detergents.

1.4.8.1 Oils and Greases

Oil and grease can be generated from either petroleum-based or food-based sources. Petroleum-based and food-based oils and greases conveyed in stormwater can accumulate in surface water and contaminate soil. Petroleum-based oils and greases can be immediately toxic to fish and wildlife. Food-based oils and greases can coat insects and fish gills, leading to suffocation.

1.4.8.2 Soaps and Detergents

Vehicles and structures are commonly washed with soaps and other detergents mixed with water. If not managed proactively, the resulting washwater flows to a storm drain or ditch, which discharges the polluted water directly to the nearest stream or lake, or to Puget Sound. Soaps and detergents, even the biodegradable ones, can have immediate and long-term effects on aquatic life in the surface water ultimately receiving drainage water. Sediment and oil released when vehicles and structures are washed with soaps and detergents can also collect in the washwater, causing further harm to fish and other aquatic wildlife.

The term "biodegradable" on a product label does not mean that the product is safe or environmentally friendly. The product may degrade faster than alternative products, but can still be harmful to the environment.

1.5 What Are Best Management Practices?

Best management practices (BMPs) for managing stormwater quality are a series of actions designed to prevent and reduce stormwater pollution, and are divided into two broad categories: *source control* BMPs and *treatment* BMPs.

1.5.1 Source Control and Treatment BMPs

Source control BMPs are methods used on site to prevent pollutants from getting into stormwater. Many of these BMPs are common sense housekeeping practices; for example, dust and debris can be swept or vacuumed from a work area and put into the garbage instead of using a hose to wash it into a storm drain or other drainage conveyance. The use of source control BMPs is the first line of defense in stormwater pollution prevention for several reasons:

- In most cases, source control BMPs are sufficient to correct stormwater pollution problems.
- Most source control BMPs are relatively inexpensive and easy to implement.

Treatment BMPs remove pollutants after they have entered stormwater. They are typically more expensive and often cannot remove 100 percent of the

pollutants. It is far better to use source control BMPs where possible to prevent pollution.

At times, the types of pollutants present or the condition of a site requires the use of treatment BMPs. Additional information about treatment BMPs is provided in Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual.

1.5.2 Source Control BMPs

Source control BMPs prevent contaminants from entering stormwater runoff by controlling them at their source. Source control BMPs are options that prevent or reduce stormwater contamination with or without the aid of permanent structures. They can include process changes, such as changes in raw material and products, and the recycling of wastes.

Examples of source control BMPs include:

- Implementing good housekeeping practices
- Implementing preventive maintenance procedures
- Writing and implementing a spill plan, including:
 - Performing inspections to detect leaks or spills
 - Preventing and cleaning up spills
 - Conducting employee training and raising awareness
- Covering material with tarpaulins or plastic
- Isolating pollutant sources to prevent run-on of uncontaminated stormwater
- Moving pollution generating activities inside or under a covered area
- Using a berm or deflector curb to keep contaminated water from entering the drainage system.

Some source control BMPs are physical, structural, or mechanical devices or facilities. These BMPs are intended to prevent pollutants from entering stormwater and can be costly to construct, operate, and maintain but can be more effective in preventing pollution. They also usually involve an update to the existing facility and/or an expenditure of resources. An example is breaking ground to install a settling pond or installing a washwater holding tank.

Other examples of physical, structural, or mechanical devices or facilities include:

- Erecting a permanent roof or structure over storage and working areas
- Providing valves or switches that direct only contaminated stormwater to sewer lines or appropriate treatment BMPs (if allowed by the local sewer utility)
- Installing a wash pad that is connected to the sanitary sewer.

1.5.3 Treatment BMPs

Treatment BMPs are used to treat stormwater that is already contaminated. They can also be required for some new or redeveloped sites. Refer to Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual to determine if a new or redeveloped site requires treatment BMPs.

Most treatment BMPs require planning, design, permitting, and construction, and none can remove 100 percent of the contaminants in stormwater. These factors, added to the typical expense of treatment BMPs, make source control BMPs the preferred choice. However, if source control BMPs cannot be applied to an existing site or if source control BMPs are inadequate to prevent pollution, treatment BMPs may be required.

This manual sometimes identifies specific treatment BMPs that apply to particular pollutant sources such as fueling stations; railroad yards; and the outdoor storage and transfer of materials, byproducts, or finished products. Examples of treatment BMPs are oil/water separators, wet vaults, and biofilters. After identifying the required treatment BMPs, refer to Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual for additional information about treatment BMPs.

1.6 Already Implementing Best Management Practices?

Properties and site owners may already be implementing BMPs in accordance with other federal, state, or local requirements (i.e., businesses that may have an NPDES permit from the Department of Ecology). In some cases, the City's requirements may be more stringent than other applicable requirements. Anyone with questions about how to meet all the source control requirements for stormwater should contact the City of Seattle Stormwater Source Control Unit ((206) 684-7666). City inspectors will work with responsible parties to ensure the requirements are being met.

Entities that conduct specific industrial activities are required to obtain an NPDES Industrial Stormwater General Permit for their stormwater discharges. For more information about whether an entity needs an NPDES permit, refer to the Department of Ecology's website (http://www.ecy.wa.gov/programs/wq/stormwater/index.html) or call the

Department of Ecology at (360) 407-6000.

What If the BMPs Are Not Preventing Pollution?

If the City determines that the BMPs being implemented are not effectively addressing the discharge of contaminants, additional BMPs may be required, including treatment and source control BMPs.

1.7 Getting Started

To understand the source control requirements addressed by this manual, the first step is to determine if your property drains to the combined sewer or to the drainage system. If you are unable to make this determination, call the Resource Venture – an SPU funded technical assistance resource – at (206) 343-8505.

If your property drains to the combined sewer, implement the citywide BMPs outlined in Chapter 2.

If your property drains to the drainage system, implement the citywide BMPs outlined in Chapter 2 **and** the activity specific BMPs pertinent to your property activities outlined in Chapter 3. The worksheet provided in Chapter 3 is designed to help identify additional BMPs required for specific activities.

Chapter 2 - Citywide Best Management Practices

This chapter describes the BMPs required for all real property in Seattle. Required BMPs in this chapter must be implemented. Then, for a business or public agency that drains to the separated sewer, the Chapter 3 worksheet must be completed to identify any additional BMPs required for the specific activities occurring at the property.

This chapter also lists additional recommended BMPs to further minimize potential stormwater pollution resulting from activities. Using these additional BMPs is encouraged to further protect the quality of the surface water ultimately receiving drainage water.

2.1 Required Citywide Best Management Practices

Per SMC 22.803.030, all real property must implement and maintain the following source control BMPs to prevent or minimize pollutants from leaving a site or property. Owners, operators, and occupants of property, and anyone causing or contributing to a violation of the City Code is considered a "responsible party" relative to a code violation (SMC 22.801.190).

2.1.1 BMP 1: Eliminate Illicit Connections to Storm Drains

Some properties and residences have internal building drains, sump overflows, process wastewater discharges, and even sanitary sewer and septic system pipes that are incorrectly plumbed to the storm drain. These storm drain connections allow a variety of pollutants to flow directly to the surface water ultimately receiving drainage water instead of to the sanitary sewer or septic system. Frequently, such connections are not intentional, but can be very harmful to the environment and must be eliminated.

For all real properties, responsible parties must examine their plumbing systems to identify any illicit connections. A good place to start is an examination of the site plans. If any toilets, sinks, appliances, showers and bathtubs, floor drains, industrial process waters, or other water-using equipment are connected to the drainage system, these connections must either be permanently plugged or disconnected and rerouted as soon as possible. If it is not obvious through observation or examination of site plans, one method of determining where a pipe or structure drains is to perform a dye test with a nontoxic dye or a smoke test. These tests are typically best performed by qualified personnel such as a plumbing contractor.

If it is found that sanitary facilities, such as toilets and sinks, are hooked up to the drainage system, a side sewer permit must be obtained from the City Department of Planning and Development (DPD) to reroute them to the sanitary sewer.

Other options for correcting discharges to the drainage system include using a holding tank or installing a process treatment system.

Restrictions on certain types of discharges, particularly industrial process waters, may require pretreatment of discharges before they enter the sanitary sewer. It is the responsibility of the property owner or business operator to obtain the necessary permits and to follow through on rerouting the connection from the storm drain to the sanitary sewer.

2.1.2 BMP 2: Perform Routine Maintenance for Drainage System

Sediment and pollutants can accumulate over time in various components of drainage collection, conveyance, and treatment systems, such as catch basins, ditches, storm drains, and oil/water separators. These pollutants can include sediment and other substances such as oils, debris, and sludge. When a storm event occurs, the pollutants can become mobilized and carried into the surface water ultimately receiving drainage water.

Regular maintenance of the drainage system decreases the amount of pollutants available to contaminate the stormwater. The required elements of this citywide BMP are described below.

2.1.2.1 Catch Basins

Routine cleaning of catch basins is one of the most important stormwater source control measures that can be implemented (Figure 1). Catch basins are typically located beneath low spots in parking lots, along curbs and roadway edges, and where flows from more than one storm drain pipe are combined. Most catch basins have some storage in the bottom to trap sediments, debris, and other particles that can settle out of stormwater, thereby preventing clogging of downstream pipes and washing of these solids into the surface water ultimately receiving drainage water.



Figure 1. Catch Basin Cleaning with a Vacuum Truck.

When catch basins are about 60 percent full of sediment, they stop removing sediment from stormwater. Oils and grease, petroleum hydrocarbons, debris, metals, sediment, and contaminated water are found in catch basins, oil/water separators, and settling basins. Outlet traps (downturned elbow), similar to City of Seattle Standard Plan No. 267, are required to trap oil and other floatables and must be replaced or repaired when damaged or missing.

Clean catch basins when they are more than half full or when the sediment is within 18 inches of the bottom of the outlet pipe.

2.1.2.2 Other Facilities

Other facilities can include both structural and non-structural stormwater facilities, such as green stormwater infrastructure elements such as trees, vegetation, and soil. All of these facilities require routine maintenance to ensure their functionality is maintained. Frequency and level of maintenance varies based on the facility location, function, and exposure to impacts. Facilities should be maintained according to the operation and maintenance procedures in Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual, other applicable guidelines as they are developed by the City, and the following actions:

- Promptly repair or replace all substantially cracked or otherwise damaged secondary containment and any deterioration that threatens the structural integrity of the facilities, and replace cleanout gates, catch basin lids, and rock in emergency spillways, etc as needed.
- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine whether improvements in operation and maintenance procedures are needed.
- Ensure that storm drain capacities are not exceeded and that heavy sediment discharges to the drainage system are prevented.
- Regularly remove debris and sludge from BMPs used for peak-rate control and treatment. Dewater, transport, and dispose of the material as solid waste as approved by the local or state government, or have it professionally removed by a contractor. If visual or olfactory indications of pollution are noted, the waste must be characterized to ensure it is disposed of properly.
- Clean organic and woody debris that has accumulated in a catch basin as frequently as needed to ensure proper operation of the catch basin.
- Post warning signs that say "Dump No Waste—Drains to Streams", or ground water or lakes, or emboss on or adjacent to all storm drain inlets where practical (Figure 2).

Select additional required BMPs from Chapter 3 according to the pollutant sources and activities conducted at the site.

BMP 2



Figure 2. "Dump No Waste" Storm Drain Stencil.

Several companies or vendors offer cleaning services for drainage systems and drainage control facilities. Pertinent equipment dealers and cleaning services can be found in the Yellow Pages of the telephone book, under entries such as "Sewer Cleaning Equipment and Supplies" and "Sewer Contractors." All of the solids and stagnant water that is collected must be disposed of properly and cannot be flushed into the catch basin outflow pipe. Depending on the nature of the pollutants and the associated types of activities on the site, the waste material may need to be disposed of as hazardous waste. Contractors that perform drainage system cleaning will be required to comply with specified disposal requirements.

Remember, it is the owner's and other responsible party's responsibility that a contractor disposes of the material properly.

2.1.3 BMP 3: Dispose of Fluids and Wastes Properly

For all real properties, responsible parties must properly dispose of solid and liquid wastes and contaminated stormwater. There are generally four options for disposal, depending on the type of waste:

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

Many liquid wastes and contaminated stormwater (depending on the pollutants and associated concentrations) can be discharged to the sanitary sewer system, but are subject to approval by the local sanitary sewer operator or district.

If wastes cannot be legally discharged to a sanitary sewer, one of the other three disposal options must be used. Sumps or holding tanks may be useful for storing liquid wastes temporarily. The contents must be disposed of properly. Dangerous and hazardous wastes must be properly transported to an appropriate hazardous waste disposal, treatment, and storage facility.

2.1.4 BMP 4: Proper Storage of Solid Wastes

This BMP applies to properties that store solid wastes, including food wastes and ordinary garbage, outdoors. If improperly stored in our climate, these wastes can contribute a variety of pollutants to stormwater.

2.1.4.1 Description of Pollutants

Pollutants of concern include toxic organic compounds; fats, oils, and greases; metals; nutrients; suspended solids; substances that increase COD; and substances that increase BOD. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Dangerous solid wastes must be stored and handled according to special guidelines and may require a permit. Businesses and public agencies that store dangerous wastes must follow specific regulations outlined by the Department of Ecology and in some cases, King County. For the specific requirements and permitting information contact the Department of Ecology at (425) 649-7000 and King County at (206) 263-8899.

2.1.4.2 Pollutant Control Approach

Store wastes in suitable containers with leak proof lids. Sweep or shovel loose solids. Educate employees about the need to check for and replace leaking containers.

2.1.4.3 Required BMPs

The following BMPs or equivalent measures are required of all properties engaged in the storage of solid wastes:

- Implement all citywide BMPs from Chapter 2.
- All solid wastes must be stored in suitable containers (Figure 3).
- Storage containers must:
 - Be checked for leaks and replaced if they are leaking, corroded, or otherwise deteriorating.
 - Have leak proof lids or be covered by some other means, and lids must be kept closed at all times.
- The waste storage area must be swept or otherwise cleaned frequently to collect all loose solids for proper disposal in a storage container. Do not hose the area to collect or clean solids.
- Drain dumpsters, dumpster pads and trash compactors to the sanitary sewer.
- Use spill cleanup materials to clean up fats, oil, and grease or other contaminants.



Figure 3. Covered Outdoor Storage of Solid Wastes.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

• Do not allow accumulated waste to exceed the capacity of the storage container. If this occurs, obtain and use another storage container. Do not overfill containers.

2.1.4.4 Recommended BMPs

The following BMPs are recommended to further prevent and reduce the contamination of stormwater resulting from the storage of solid wastes:

- Store containers such that wind will not be able to knock them over.
- Use waterproof liners to prevent leaks from the solid waste container.
- Designate a storage area, pave the area, and slope the drainage to a holding tank or sanitary sewer drain. If a holding tank is used for the storage of wastewater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.
- Compost appropriate wastes or recycle solid wastes.

The Industrial Materials Exchange program facilitates the transfer of excess materials and wastes to those who can use them. Contact the Industrial Materials Exchange at (206) 296-4899, or through the Industrial Materials Exchange website (www.govlink.org/hazwaste/business/imex).

Additional information on reuse of food waste can be found through the Resource Venture program website at (<u>http://www.resourceventure.org/</u>).

2.1.5 BMP 5: Spill Prevention and Cleanup

Note: BMP 5 also applies to business and public agencies required to comply with the spill prevention requirements outlined in SMC 22.803.040.B (Minimum Requirements for Source Controls for all Businesses and Public Agencies).

Spills can contribute a variety of pollutants to the drainage system and nearby waterways and are often preventable if appropriate practices for chemical and waste handling and spill response are implemented.

Promptly contain and clean up leaks and spills of solid and liquid pollutants including oils, solvents, fuels, and dust from manufacturing operations on any exposed soil, vegetation, or paved area. The specific requirements for complying with this citywide BMP are described below.

A spill can be a one-time event, a continuous leak, or frequent small spills. All types must be addressed.

2.1.5.1 Spill Prevention

Figure 4 shows a property with good spill prevention BMPs. To reduce the potential for spills, implement the following practices and have spill cleanup kits (Section 2.1.5.3) available at activity locations where spills may occur:

- Clearly label all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tightfitting lids.
- Place drip pans underneath all containers, fittings, valves, where materials are likely to spill or leak.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and encourage them to check for leaks and spills.

2.1.5.2 Spill Plan

Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at appropriate points in the building, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be required to be posted at multiple locations.

• Describe the facility including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals used in the facility.

- Designate spill response employees to be on the site during business activities. Provide a current list of the names, addresses, and telephone numbers (office and home) of designated spill response employee(s) who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals, storm drains and other relevant drainage or materials information.
- Describe the emergency cleanup and disposal procedures.
- List the names and telephone numbers of public agencies to contact in the event of a spill.
- All employees must have annual training of spill control procedures. New employees must be trained upon hiring. All training must be documented.



Figure 4. Waste Storage Area with Spill Kit and Posted Spill Plan.

2.1.5.3 Spill Cleanup Kit

Store spill cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the types and quantities of materials stored or otherwise used at the facility and refilled when the materials are used. For example (Figure 5):

- Absorbent pads
- Sorbent booms, or socks
- Absorbent granular material such as kitty litter
- Protective clothing such as latex gloves and safety goggles

- Thick plastic garbage bags
- Drain cover.



Figure 5. Example of Spill Kit Contents.

2.1.5.4 Spill Cleanup and Proper Disposal of Material

In the event of a spill, implement the following procedures:

- Implement your spill plan immediately.
- Contact the employee(s) responsible for implementing the spill plan.
- Block off and seal the nearby inlet(s) to the drainage system to prevent materials from entering the drainage system.
- Use an appropriate material to clean up spills. Do not use emulsifiers or dispersants such as liquid detergents or degreasers.
- Immediately report all spills that could reach storm drains, the sanitary sewer, streams, rivers, lakes, or Puget Sound to the appropriate agency.
- Do not wash absorbent material into interior floor drains or exterior storm drains.
- Dispose of used spill control materials in accordance with the Seattle Solid Waste Code (Seattle Municipal Code, Chapter 21.36), state Dangerous Waste Regulations (Washington Administrative Code, Chapter 173-303), and applicable laws.
2.1.6 BMP 6: Provide Oversight and Training for Staff

Train all team members annually in the operation, maintenance, and inspections of BMPs. This training must be documented. Training staff about good housekeeping expectations is one of the most effective methods for keeping sediment and other pollutants out of stormwater and the surface water ultimately receiving drainage water.

Further actions include assigning one or more qualified individuals to be responsible for the oversight and training of staff regarding stormwater pollution control. Hold regular meetings to review the overall operation of the BMPs, establish responsibilities for inspections and operation and maintenance, and determine responsibilities for emergency situations.

2.2 Recommended Citywide Best Management Practices

This section describes recommended BMPs. These BMPs are not required, but can support the required BMPs to make them more efficient and effective. They also will help you make decisions that reduce costs, reduce environmental risk and liability, and make your operations more environmentally friendly.

2.2.1 Avoid the Polluting Activity or Reduce Its Occurrence

If possible, avoid the activity or engage in the activity less frequently. Is there a substitute process or a different material that can get the job done? Can a larger run of a process be done, thereby reducing the number of times per week or month it needs to be repeated? For example, raw materials could be delivered close to the time of use, eliminating the necessity for stockpiling them and exposing them to the weather. Perhaps a particular process could be avoided altogether.

2.2.2 Move the Activity Indoors

Sometimes it is fairly easy to move an activity indoors out of the weather. The benefits are twofold: contaminated stormwater is prevented, and an easier, more controlled cleanup occurs if there is a spill. An example would be unloading and storing barrels of chemicals inside a garage instead of outdoors. One caution is that moving storage areas indoors may require the installation of fire suppression equipment or other building modifications as required by the Uniform Building Code, the Seattle Fire Code, or other local ordinances.

2.2.3 Use Less Material

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

Non-hazardous recyclable items have not been allowed in the garbage since January 1, 2005.

2.2.4 Use the Least Toxic Materials Available

Investigate the use of materials that are less toxic than what is currently used. Perhaps a caustic-type detergent or a solvent could be replaced with a more environmentally friendly product. Such a change might allow the discharge of process water to the sanitary sewer instead of paying for expensive disposal. Remember that even biodegradable products are considered pollutants if discharged to the drainage system. Even biodegradable products can be harmful to the environment.

2.2.5 Create and Maintain Vegetated Areas near Activity Locations

Trees and vegetation can provide stormwater management functions by intercepting rainfall, promoting infiltration, and improving the water quality of

runoff. Consideration for the value of retaining and protecting existing vegetation is an important step in the development of a stormwater management plan. In addition, onsite vegetation can also provide erosion control benefits. Protective measures to sustain the long term health of trees and other vegetation will provide both temporary (erosion control) and long term stormwater benefits.

Vegetation of various kinds can help filter pollutants out of stormwater that is routed through it. Designers should look for opportunities to create space for stormwater to pass through a vegetated facility within a parking lot or service yard. Designs providing both higher elevation areas to accommodate the healthy development of trees with broadly spreading canopies to shade pavement and intercept rainfall, and lower elevation areas to collect runoff and filter it through appropriate vegetated systems are ideal. For high-use sites, conveyance to an oil removal system may be required as a component of the stormwater design. See SMC 22.805.090.B.3 and 22.801.090 for specific high-use and oil treatment requirements.

2.2.6 Locate Activities as Far as Possible from Surface Drainage Paths

Activities located far from known drainage paths, ditches, streams, other receiving waters, and drains may be less likely to pollute stormwater. It will take longer for material to reach the drainage feature, allowing more time to react in the event of a spill. For "housekeeping" issues, the distance may protect the local waters long enough for clean up in the area around the activity. Regardless of the location of the activity, the protection of ground water is also a prominent issue; therefore, the day-to-day actions of prompt cleanup are always important to prevent pollutants from escaping, even in dry weather.

2.2.7 Report Violators

Allowing anyone to pollute our water resources is wrong. To protect water, fish, wildlife, and our own health we must all do our part, by using proper BMPs and reporting those who are causing pollution. Call the City of Seattle Surface Water Quality Hotline at (206) 684-7587 to report incidents involving storm drain or surface water pollution.

2.2.8 Maintain Good Housekeeping Practices

All businesses and public agencies should set up maintenance schedules for all of their BMPs so that coordinated BMP maintenance efforts result in reduced catch basin cleaning frequencies. Sweep paved areas used for material handling and storage as needed to collect and dispose of dust and debris that could contaminate stormwater. Do not hose down any area in which pollutants could reach the ground, storm drain, conveyance ditch, or receiving water unless necessary for dust control purposes to comply with air quality regulations and unless the pollutants are conveyed to a treatment system that is approved by the City.

Chapter 3 - Commercial and Industrial Activity Best Management Practices

Chapter 2 presented the citywide BMPs that apply to all real property throughout the city. In addition, there are many other source control BMPs that may be required or recommended, depending on the specific commercial and industrial activities that occur or will occur on particular private or public properties. This chapter provides a worksheet (Table 1) for use in determining which BMPs are required for specific activities, including activities planned for project sites proposed for development. The associated source control requirements are outlined in SMC 22.803.040.A (source controls applicable to all businesses and public agencies) and SMC 22.805.020.K (source controls applicable to all projects).

Before reading this chapter, fill out the worksheet on the next page to identify which of your specific activities require BMPs.

The worksheet contains BMPs organized by the different activities that businesses and public agencies perform. If the listed activity is performed indoors and all discharges are controlled (e.g., process water, washwater, lubricants, solvents, fugitive dust, granular material, and blowdown waste) such that there is no exposure of stormwater to pollutants, then additional BMPs do not have to be implemented for that activity.

- 1. Complete all sections of the worksheet, checking the appropriate boxes for all activities that take place at the work place.
- 2. If any of the activities were checked as being performed outdoors (or indoors in areas that might drain outdoors), go to the subsection of this manual identified in the first column for a description of the BMPs required.

Questions can be answered by leaving a message on the SPU Water Quality hotline at (206) 684-7587 or by visiting the Pollution Control Inspection website (www.seattle.gov/util/Services/Drainage & Sewer/Stormwater Related Inspections/Pollution_Control_Inspections/index.asp).

Staff will provide assistance over the phone and are also available for consultations at the business site. For confidential assistance, please contact the Resource Venture at (206) 343-8505.

1		
Manual Sub-section		Location of Activity, If Performed
Number	Type of Activity	Outdoors ¹
Are discharges	s to a separated storm drainage system or a receiving water?	
 If yes, 	continue filling out the remainder of the worksheet.	
 If no, r 	nake sure Chapter 2 BMPs are implemented.	
If the a	answer isn't clear, call Resource Venture at (206) 343-8505 to clarify v	vhere discharges go.
	SECTION 3.1 – CLEANING AND WASHING ACTIVITIES	
3.1.1	BMP 7 Cleaning or washing of tools, engines, and manufacturing equipment	
	 Applies to cleaning or washing, including pressure 	
	washing, parts or equipment outside or where the	
	PMD 8 Cleaning or washing of food convice establishment	
3.1.2	equipment	
	 Applies to vents, filters, pots and pans, grills, floor mats, and related items. 	
	BMP 9 Washing, pressure washing, and steam cleaning of	
313	Applies to cleaning and washing at all types of	
0.1.0	establishments, including fleet vehicle vards, car	
	dealerships, car washes, and maintenance facilities.	
	BMP 10 Collection and disposal of wastewater from mobile interior	
3.1.4	washing operations	
	 Applies to carpet cleaners, upnoistery cleaners, and other interior items, including ventilation systems 	
	SECTION 3.2 - TRANSEED OF LIQUID OP SOLID MATERIAL	9
	BMP 11 Loading and unloading of liquid or solid material	L J
0.0.4	Applies to loading and unloading of liquid of solid material	
3.2.1	materials at industrial, commercial, and transportation	
	facilities.	
	BMP 12 Fueling at dedicated stations	
3.2.2	 Applies to gas stations, pumps at fleet vehicle yards or 	
	snops, and other privately owned pumps, including	
	BMP 13 Automotive repair and maintenance	
3.2.3	Applies to oil changes and other engine fluids at	
	permanent or temporary sites.	
2.2.4	BMP 14 Mobile fueling of vehicles and heavy equipment	
3.2.4	 Applies to fleet fueling, wet fueling, and wet hosing. 	
	SECTION 3.3 – PRODUCTION AND APPLICATION ACTIVITII	ES
3.3.1	BMP 15 Concrete and asphalt mixing and production at stationary	
	sites	
	 Applies to mixing of raw materials on the site to produce concrete or asphalt or making concrete or asphalt 	
	products.	
3.3.2	BMP 16 Concrete pouring, concrete/asphalt cutting, and asphalt	
	application at temporary sites	
	 Applies to construction sites and driveway and parking lot resurfacing 	

Table 1. Worksheet for Identifying Applicable BMPs.

Manual Sub-section Number	Type of Activity	Location of Activity, If Performed Outdoors ¹		
SECTION 3.3 – PRODUCTION AND APPLICATION ACTIVITIES (continued)				
3.3.3	 BMP 17 Manufacturing and post-processing of metal products Applies to machining, grinding, soldering, cutting, welding, quenching, rinsing, etc. 			
3.3.4	 BMP 18 Wood treatment Applies to wood treatment by means of pressure processes, dipping, or spraying. 			
3.3.5	 BMP 19 Commercial composting Applies to commercial composting facilities that operate outside without cover. 			
3.3.6	 BMP 20 Landscaping and lawn and vegetation management Applies to businesses and public agencies involved in vegetation removal, including moss control; application of herbicides, pesticides, and insecticides; application of fertilizer; irrigation, watering, gardening, and lawn care. 			
3.3.7	 BMP 21 Painting, finishing, and coating of vehicles, boats, buildings, and equipment Applies to surface preparation and the applications of paints, finishes, and/or coatings. 			
3.3.8	 BMP 22 Commercial printing operations Applies to materials used in the printing process. 			
3.3.9	BMP 23 Outdoor manufacturing activitiesApplies to manufacturing activities in outdoor areas.			
SECTION 3.4 – STORAGE AND STOCKPILING ACTIVITIES				
3.4.1	 BMP 24 Outdoor storage or transfer of solid raw materials, byproducts, or finished products Includes sand, topsoil, lumber, and other products. 			
3.4.2	 BMP 25 Storage and treatment of contaminated soils Applies to contaminated soils that are excavated and left on the site. 			
3.4.3	 BMP 26 Temporary storage or processing of fruits or vegetables Applies to storage of fruits and vegetables outdoors, processing activities at wineries, by fresh and frozen juice makers, and other food and beverage processing operations. 			
3.4.4	 BMP 27 Recycling, wrecking yard, and scrap yard operations Applies to scrapped equipment, vehicles, construction materials, and assorted recyclables. 			
3.4.5	 BMP 28 Outdoor portable container storage Applies to containers located outside a building and used for temporary storage. 			
3.4.6	BMP 29 Storage of liquids in permanent aboveground tanksApplies to all liquids in aboveground tanks.			
3.4.7	 BMP 30 Parking lot maintenance and storage of vehicles and equipment Applies to public and commercial parking areas. Storage of automobile parts, vehicles, or equipment. 			

Manual Sub-section Number	Type of Activity	Location of Activity, If Performed Outdoors ¹		
SECTION 3.5 – DUST CONTROL AND SOULAND SEDIMENT CONTROL				
3.5.1	BMP 31 Dust control in disturbed land areas and on unpaved roadways and parking lots			
3.5.2	 BMP 32 Dust control at manufacturing sites Applies to grain dust, sawdust, coal, gravel, crushed rock, cement, boiler fly ash and other airborne polluting materials. 			
3.5.3	 BMP 33 Soil erosion and sediment control at industrial sites Applies to industrial activities that take place on soil. 			
	SECTION 3.6 – OTHER ACTIVITIES			
3.6.1	 BMP 34 Commercial animal care and handling Applies to operations at kennels, fenced pens, veterinary clinics, and businesses and public agencies that board animals. 			
3.6.2	 BMP 35 Log sorting and handling Applies to log yards typically located at sawmills, ports, and pulp mills. 			
3.6.3	 BMP 36 Boat building, mooring, maintenance, and repair Applies to all types of maintenance, repair, and building operations at shipyards, ports, and marinas. 			
3.6.4	 BMP 37 Logging and tree removal Applies to logging activities that fall under Class IV general forest practices. 			
3.6.5	 BMP 38 Mining and quarrying of sand, gravel, rock, peat, clay, and other materials Applies to excavation and storage of mined materials. 			
3.6.6	 BMP 39 Cleaning and maintenance of swimming pools and spas Applies to swimming pool and spas, including all commercial pool cleaners. 			
3.6.7	 BMP 40 Deicing and anti-icing operations for airports and streets Applies to highways, aircraft, runways and taxiways, and streets. 			
3.6.8	BMP 41 Maintenance and management of roof and building drains at manufacturing and commercial buildings			
3.6.9	BMP 42 Maintenance and operation of railroad yards			
3.6.10	 BMP 43 Maintenance of public and private utility corridors and facilities Applies to maintenance activities related to public and private utilities, including pipelines, pump stations, rights-of-way and transmission corridors. 			
3.6.11	BMP 44 Maintenance of roadside ditches			

Notes:

¹ If this activity occurs outdoors or in an area that might drain outdoors at the property, see the description of BMPs in the corresponding section of this chapter (identified in the first column).

3.1 Cleaning and Washing

Despite what is on a product label, the term biodegradable does not mean that the product is safe or environmentally friendly. The product may degrade faster than alternative products, but can be harmful to the environment.

The cleaning or washing of vehicles, aircraft, vessels, engines, tools, cooking or manufacturing equipment, and buildings are pollution generating activities when not conducted properly. When these activities are performed, the resulting washwater usually contains soap or detergents, and can contain a variety of pollutants that contaminate stormwater. All cleaning and washing activities must comply with the following requirements for prevention, minimization, and management of pollutants:

- Implement all required citywide BMPs from Chapter 2.
- Conduct the activity inside a building. Make sure the floor drain is connected to the sanitary sewer.
- Separate the uncontaminated stormwater from the pollutant sources.
- Cover and/or contain the cleaning activity.
- Handle washwater using one of the following methods to ensure that there is no discharge of washwater to the ground, a storm drain, or surface water:
 - Convey washwater to a sanitary sewer after approval from the City of Seattle Department of Planning and Development and King County

OR

• Temporarily store washwater before proper disposal

OR

• Recycle washwater.

A side sewer permit is needed to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In some cases, washwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

Washwater must not be discharged to a storm drain, the ground, or to surface water, unless treatment approval is obtained from the Department of Ecology. For more information, contact the Department of Ecology at (425) 649-7000.

3.1.1 BMP 7: Cleaning or Washing of Tools, Engines, and Manufacturing Equipment

This BMP applies to businesses and public agencies that clean or wash manufacturing equipment such as saws, grinders, screens, and other processing devices outside of buildings. It also refers to businesses and public agencies engaged in pressure washing of non-vehicular engines, equipment, and portable objects. See BMP 9 for related activities.

3.1.1.1 Description of Pollutants

Source pollutants include surfactants, petroleum hydrocarbons, toxic organic compounds, oils and greases, nutrients, metals, pH, suspended solids, substances that increase BOD, and substances that increase COD. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.1.1.2 Pollutant Control Approach

Cleaning or washing wastewater must be discharged into a sanitary sewer drain at a site that is approved for discharge. It is illegal to discharge the dirty solution to the drainage system; however, the activity may be permitted for disposal in the sanitary sewer system if approved by King County. For more information and to determine whether a type of chemical and an amount of water are permitted for discharge to the sanitary sewer system, contact the King County Industrial Waste Program at (206) 263-3000. If the discharge is approved, a permit will be issued for the activity.

If sanitary sewer disposal is not available or not allowed, the collected cleaning or washing wastewater must be treated or transferred to a holding tank, where it must be picked up for disposal by a licensed waste hauler.

3.1.1.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in cleaning or washing of tools, engines, equipment, and portable objects:

- Implement all citywide BMPs from Chapter 2.
- All washwater must be discharged to a sanitary sewer, process treatment system, or holding tank and must never be discharged to the drainage system. If a holding tank is used for the storage of washwater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.
- Pressure washing must be conducted in a designated area (such as a wash pad) that is provided with a sump drain connected to a sanitary sewer or treatment system, or a blind sump or holding tank. The wash area must have a means for stormwater run-on prevention (such as a

berm or sump) (Figures 6a, 6b, and 7). Department of Ecology Publication WQ-R-95-56, *Vehicle and Equipment Washwater Discharges: Best Management Practices Manual* (Ecology 1995) (http://www.ecy.wa.gov/pubs.shtm), can be used for guidance on sumps, holding tanks, and the prevention of run-on. Contact the SPU Source Control Unit at (206) 684-7666 for policies related to washing operations.



Figure 6a. Covered Wash Pad for Tool and Equipment Washing.



Figure 6b. Schematic of Wash Pad with Sump.



Figure 7. Uncovered Washing Area for Tools, Engines, Equipment, and Portable Objects, with Drains to a Sanitary Sewer, Process Treatment, or a Dead-End Sump.

- For wash pads that discharge directly to the separated sanitary sewer, the uncovered portion of the wash pad must be no larger than 200 square feet or must have an overhanging roof. This is to prevent excess stormwater from entering the sanitary sewer. An uncovered washing area (Figure 7) often experiences limits to the amount of rainwater that may drain to the sewer due to the potential for overflows. Covering may be required in many situations.
- If a holding tank is used for the storage of washwater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.

A side sewer permit is needed to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In some cases, washwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

3.1.1.4 Recommended BMPs

Although not required, the following BMPs can provide additional pollution control for businesses or properties that drain to the sanitary sewer system. To reduce

the potential overall pollution load to the sanitary sewer from washing operations for tools, engines, and manufacturing equipment:

- Minimize water and detergent use in all washing operations.
- Use phosphate-free detergents when practical.
- Consider recycling the washwater by installing a closed-loop water recycling system.

3.1.2 BMP 8: Cleaning or Washing of Food Service Establishment Equipment

This BMP applies to businesses and establishments owned by public agencies, such as restaurants or retail food stores that provide food and beverage services or products to the general public and wash or clean their cooking equipment, such as vent filters, grills, floor mats, and grease and pretreatment devices. Such washing and cleaning should always occur inside, with discharges to the sanitary sewer, a holding tank for shipment to an offsite disposal facility, or an approved treatment system.

3.1.2.1 Description of Pollutants

Washwater resulting from the washing and cleaning of cooking equipment contains soaps and detergents, fats, oils, and grease; metals; nutrients; suspended solids; substances that increase BOD; and substances that increase COD. These pollutants must not be discharged to the drainage system.

3.1.2.2 Pollutant Control Approach

Washwater must be discharged into a sanitary sewer drain at a site that is approved for discharge. It is illegal to discharge the dirty washwater to the drainage system. Cleaning and washing wastewater from food service establishment equipment may be permitted for disposal in the sanitary sewer system if approved by King County. For more information and to determine whether a type of chemical and an amount of water are permitted for discharge to the sanitary sewer system, contact the King County Industrial Waste Program at (206) 263-3000. If the discharge is approved, a permit will be issued for the activity.

If sanitary sewer disposal is not available or not allowed, the collected washwater must be treated or transferred to a holding tank, where it must be picked up for disposal by a licensed waste hauler.

3.1.2.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in cleaning or washing of cooking equipment:

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, washwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

- Implement all citywide BMPs from Chapter 2.
- Wipe off the equipment before washing to remove fats, oil, grease and food waste.

- Do not pour cooking grease down the drain. Collect and dispose of all grease properly.
- Move the activity indoors (Figure 8) in an existing building with drainage to a sanitary sewer, holding tank, or process treatment system.



Figure 8. Cleaning and Washing Cooking Equipment Indoors.

• If a holding tank is used for the storage of washwater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.

OR

• Use a tub or similar device to contain the washwater. This water must be recycled for subsequent washing, deposited into a holding tank for later disposal, or discharged to a sanitary sewer. If a holding tank is used for the storage of washwater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.

OR

• If the washing activity cannot be moved indoors or contained in a tub, the washing area must drain to a sanitary sewer, holding tank, or process treatment system, and provisions must be made to prevent the flow of stormwater onto the washing area. For detailed drainage requirements and schemes for run-on prevention, see BMP 9 for washing, pressure

washing, and steam cleaning of vehicles, equipment, and building structures in Section 3.1.3. If a holding tank is used for the storage of washwater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.

• If roof equipment or hood vents are cleaned, ensure that no wastewater or process water is discharge to the roof drains or storm water system.

In some cases, washwater may need to be pretreated to remove fats, oils, and grease before the washwater is discharged to the sanitary sewer. Discharges of wastewater containing fats, oils, and grease or other food waste to the sanitary sewer are regulated under the Seattle Side Sewer Code (Seattle Municipal Code, Chapter 21.16). For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Before discharging washwater to the sanitary sewer, contact SPU Customer Service at (206) 684-3000 for information about fats, oils, and grease.

3.1.2.4 Recommended BMPs

Although the following BMPs are not required when washing inside, they can prevent excess grease from clogging sanitary sewers and reduce pollutant loads to the wastewater treatment plant:

- Minimize water and detergent use in all washing operations.
- Use phosphate-free detergents when practical.
- Use the least hazardous cleaning products available.

3.1.3 BMP 9: Washing, Pressure Washing, and Steam Cleaning of Vehicles, Equipment, and Building Structures

This BMP applies to the washing of vehicles, aircraft, vessels, industrial equipment, and large buildings. "Charity" car washes at commercial establishments and parking lots, hand washing, scrubbing, sanding, pressure washing, and steam cleaning are also included in this category of cleaning and washing activities.

3.1.3.1 Description of Pollutants

Washwater from cleaning activities can contain soaps and detergents, oils and greases, suspended solids, metals, and soluble organic compounds that can contaminate stormwater. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.1.3.2 Pollutant Control Approach

Cleaning, pressure washing, and steam cleaning wastewater must be discharged into a sanitary sewer drain at a site that is approved for discharge. It is illegal to discharge the dirty solution to the drainage system; however, the activity may be permitted for disposal in the sanitary sewer system if approved by King County. For more information and to determine whether a type of chemical and an amount of water are permitted for discharge to the sanitary sewer system, contact the King County Industrial Waste Program at (206) 263-3000. If the discharge is approved, a permit will be issued for the activity.

If sanitary sewer disposal is not available or not allowed, the collected wastewater must be treated or transferred to a holding tank, where it must be picked up for disposal by a licensed waste hauler.

3.1.3.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in washing, pressure washing, or steam cleaning of vehicles, equipment, and building structures:

- Implement all citywide BMPs from Chapter 2.
- Conduct indoor vehicle and equipment washing operations in an area that drains to the sanitary sewer and that prevents the washwater from running outside and entering the drainage system (Figure 9).

Conduct outdoor vehicle and equipment washing operations in a designated wash area that drains to a sump (like a grit separator) or a catch basin and then to the combined sewer (if allowed by SPU or King County) or another appropriate wastewater treatment or recycling system (Figure 10).



Figure 9. Car Wash Building with Drain to the Sanitary Sewer.



Figure 10. Vehicle Washing Being Conducted in a Paved Area with a Containment Pad.

- For wash pads that discharge directly to the separated sanitary sewer, the uncovered portion of the wash pad must be no larger than 200 square feet or must have an overhanging roof. This is to prevent excess stormwater from entering the sanitary sewer.
- If the washpad cannot be less than 200 square feet, a shut off valve may be installed which will direct washwater to the sanitary sewer when the washpad is in use and stormwater to the drainage system when the wash pad is not in use. The valve on the positive control outlet may be

manually operated; however, a pneumatic or electrical valve system is preferable. The valve may be on a timer circuit, where it is opened upon completion of a wash cycle. The timer would then close the valve after the sump or separator is drained. Signage and training is required for this system.

- For further building code specifications related to clearance, refer to Seattle Municipal Code Section 23.53.035.
- If adjacent to a building or constructed over hazardous material storage areas, roofs and covers are also regulated by the Seattle Fire Code (Seattle Municipal Code, Chapter 22.600). For setback requirements and other requirements related to weather protection for outdoor storage areas, refer to the Seattle Fire Code.
- At gasoline stations, multifamily residences, and any other business and public agency where vehicles are washed, clearly mark the washing area.

A side sewer permit is required to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In some cases, washwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

3.1.3.4 Recommended BMPs

Although not required, the following BMPs can provide additional pollution control for businesses and public agencies that perform washing operations for vehicles, equipment, and building structures.

- To reduce potential overall pollution load to the sanitary sewer:
 - Minimize water and detergent use in all washing operations.
 - Use phosphate-free detergents when practical.
 - Consider recycling the washwater by installing a closed-loop water recycling system.

3.1.3.5 Exceptions

• For intermittent uses, such as at commercial parking lots and at gasoline stations used for charity car washes where it is not possible to discharge the washwater to an indoor sanitary connection (such as to a indoor toilet or utility sink), a temporary plug or a temporary sump pump can be used at the storm drain to collect the washwater for offsite disposal, such as discharge to a nearby sanitary sewer.

- At industrial sites, contact the Department of Ecology Northwest Regional Office for NPDES permit requirements related to washing trucks.
- New and used car dealerships may wash vehicles in the parking stalls as long as a temporary plug system is used to collect the washwater for disposal as stated above or an approved treatment system for the washwater is in place.

3.1.4 BMP 10: Collection and Disposal of Wastewater in Mobile Interior Washing Operations

This BMP applies to mobile businesses and mobile public agency operations that wash carpets and other interior items, including ventilation systems. Washing interior surfaces that have been treated with pesticides or chemicals for insect or odor control are also covered under this category of cleaning and washing activities.

3.1.4.1 Description of Pollutants

Pollutants of concern consist of soaps and detergents, nutrients, pH, oil, grease, suspended solids, toxic organic compounds (such as pesticides and chemicals used for flea and odor control), substances that increase BOD, and substances that increase COD. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.1.4.2 Pollutant Control Approach

Wastewater must be discharged into a sanitary sewer drain at a site that is approved for discharge. It is illegal to discharge the dirty solution to the drainage system. Wastewater from mobile washing operations may be permitted for disposal in the sanitary sewer system if approved by King County. For more information and to determine whether a type of chemical and an amount of water are permitted for discharge to the sanitary sewer system, contact the King County Industrial Waste Program at (206) 263-3000. If the discharge is approved, a permit will be issued for the activity.

If sanitary sewer disposal is not available or not allowed, the collected wastewater must be treated or transferred to a holding tank, where it must be picked up for disposal by a licensed waste hauler.

3.1.4.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in mobile interior washing operations:

- Implement all citywide BMPs from Chapter 2.
- Label all mobile cleaning equipment "Properly dispose of all wastewater. Do not discharge to a storm drain, drainage ditch, stream, or on the ground."
- Dispose of sludges left in tanks, containers, or trucks in accordance with the Seattle Solid Waste Code (Seattle Municipal Code, Chapter 21.36), state Dangerous Waste Regulations (Washington Administrative Code, Chapter 173-303), and other applicable laws.
- Provide training to all employees regarding proper disposal of wastewater. This training must be documented.

3.1.4.4 Recommended BMPs

Although not required, the following BMPs can provide additional pollution protection for discharges to the sanitary sewer system:

- Use the least toxic detergents and cleaners available.
- Minimize water and detergent use in all wash operations.
- Use phosphate-free detergents when practical.
- Consider recycling the washwater by installing a closed-loop water recycling system.

3.2 Transfer of Liquid or Solid Materials

The transfer of liquid or solid materials, including the loading and unloading of such material, fueling of vehicles or equipment at mobile or designated locations, and engine repair and maintenance are activities that have a high risk for spills or leaks of toxic material. However, both required and recommended BMPs can help to prevent, minimize, and manage the effects of accidental spills or leaks. The specific BMPs that apply to the transfer of particular types of liquid and solid materials are presented below.

Remember to also implement all required citywide BMPs from Chapter 2.

3.2.1 BMP 11: Loading and Unloading of Liquid or Solid Material

This BMP applies businesses and public agencies engaged in the loading and unloading of liquid or solid materials at a commercial or industrial loading dock or the transfer of non-containerized bulk liquids from truck or rail car. These activities are typically conducted at shipping and receiving areas, outside storage areas, and fueling areas. The transferred materials can include products, raw materials, intermediate products, waste materials, fuels, and scrap metals.

3.2.1.1 Description of Pollutants

Leaks and spills of fuels, oils, powders, organic compounds, nutrients, metals, salts, acids, alkalis during transfer are potential sources of stormwater contamination. Spills from breaks in hydraulic lines are a common problem at loading docks. Because many storm drains in Seattle discharge directly to local streams and waterways, spilled or leaked products can adversely affect water quality and harm both people and aquatic organisms that come in contact with the contaminated water. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.2.1.2 Pollutant Control Approach

The approach to pollutant control in areas used for loading and unloading of liquid and solid materials should comply with the following requirements, including conducting the activity inside a building, separating the uncontaminated stormwater from the pollutant sources, preventing run-on of stormwater and runoff of contaminated stormwater, and sweeping debris and disposing of in the solid waste.

3.2.1.3 Required BMPs

The following BMPs or equivalent measures are required in all loading and unloading areas:

- Implement all citywide BMPs from Chapter 2.
- Frequently sweep surfaces, including those that have been covered with containers, logs, or other material, to remove accumulated debris and other material that could otherwise be washed off by stormwater. Do not sweep this debris into storm drains.
- Place drip pans or other appropriate temporary containment devices in locations where leaks or spills may occur, such as hose connections, hose reels, and filler nozzles.
- Always use drip pans when making and breaking connections. Clean drip pans after each use to remove any residual material, and dispose of any residual material in accordance with the Seattle Solid Waste Code

(Seattle Municipal Code, Chapter 21.36) and the state Dangerous Waste Regulations (Washington Administrative Code, Chapter 173-303).

- Check loading and unloading equipment such as valves, hoses, pumps, flanges, and connections regularly for leaks, and repair as needed. Document and keep all inspection records.
- If possible, prevent clean stormwater from entering the loading/unloading area and conduct the activity under cover (Figure 11) or indoors.



Figure 11. Drip Pan for Connections at Loading and Unloading Areas for Liquid Material.

- Place curbs along the edge or slope the edge of the loading and unloading area such that the stormwater can flow to an internal drainage system that leads to an approved treatment BMP. This will prevent contaminated stormwater from passing directly over paved surfaces and into surface water.
- Pave and slope loading and unloading areas to prevent the pooling of water. The use of catch basins and drain lines in the interior of the paved area should be minimized as they frequently become covered by material. Catch basins are preferred in designated "alleyways" that will not be covered by material, containers, or equipment.

Consistent with the requirements of this manual and the Seattle Fire Code (SMC Chapter 22.600) and to the extent practical, unload and load solids and liquids in a manufacturing building or under a roof, lean-to, or other appropriate cover.

The following BMPs or equivalent measures are required in areas of transfer from **tanker trucks and rail cars** to aboveground or underground storage tanks:

- Construct a slope, berm, or dike to direct runoff from the transfer area to a dead-end sump, spill containment sump, a spill control oil/water separator, or other spill control device. The minimum spill retention time should be 15 minutes at the flow rate of the fuel dispenser nozzle with the highest through-put rate or at the peak flow rate of the 6-month, 24-hour storm event over the surface of the containment pad, whichever is greater. The volume of the spill containment sump should be a minimum of 50 gallons with an adequate grit sedimentation volume.
- Install and maintain a drip pan system as illustrated (Figure 11) within the rails to collect spills and leaks from tank cars and hose connections, hose reels, and filler nozzles.

The following BMPs or equivalent measures are required in areas of loading and unloading from or to **marine vessels**:

• Facilities and procedures for the loading or unloading of petroleum products must comply with U.S. Coast Guard requirements; see specifications in the Department of Ecology *Stormwater Management Manual for Western Washington*, Vol. IV, Appendix IV-D R.5 [Ecology 2005]).

For requirements related to the **transfer of small quantities** from tanks and containers:

• Refer to BMP 28 outdoor storage of portable containers of liquid or dangerous waste containers (Section 3.4.5) and BMP 29 for storage of liquids in permanent aboveground tanks (Section 3.4.6).

3.2.1.4 Recommended BMPs

Although not required, the following BMPs can provide additional pollution protection:

- Wherever possible, choose less toxic materials for use in facility operations.
- For the transfer of pollutant liquids in areas that cannot contain a catastrophic spill, install an automatic shutoff system in case of an unanticipated interruption in off-loading (e.g., a coupling break, hose rupture, or overfill).
- Install and maintain overhangs (Figure 12) or door skirts (Figure 13) that enclose the trailer end to prevent contact with rainwater.

The following BMP is recommended in areas of transfer from **tanker trucks** to aboveground or underground storage tanks:

• Pave the area on which the transfer takes place. If any transferred liquid, such as gasoline, is reactive with asphalt, pave the area with portland cement concrete.



Figure 12. Loading Docks with an Overhang to Prevent Material Contact with Rainwater.



Figure 13. Door Skirts to Enclose the Trailer End of a Truck to Prevent Material Contact with Rainwater.

3.2.2 BMP 12: Fueling at Dedicated Stations

This BMP applies to businesses and public agencies that operate a facility used exclusively for the transfer of fuels from a stationary pumping station to vehicles or equipment. This type of fueling station includes aboveground or underground fuel storage facilities, which may be permanent or temporary. Permanent fueling stations include facilities, such as, but not limited to, commercial gasoline stations, 24-hour convenience stores, car washes, warehouses, manufacturing establishments, maintenance yards, port facilities, marinas and boatyards, and private fleet fueling stations. Temporary fueling stations include facilities, such as, but not limited to, construction sites and any other site on which fuel is temporarily stored and dispensed into vehicles or equipment.

A spill can be a one-time event, a continuous leak, or frequent small spills. All kinds must be prevented.

3.2.2.1 Description of Pollutants

Typically, stormwater contamination at fueling stations is caused by leaks or spills of fuels, lubrication oils, radiator coolants, and vehicle washwater. These materials contain organic compounds, oils and greases, and metals that can be harmful to humans and aquatic life. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Direct or indirect discharges of antifreeze, oil, gasoline, grease, and all other automotive and petroleum products and flammable or explosive materials into the drainage system are prohibited discharges under the Seattle's Stormwater Code (SMC Chapters 22.800 – 22.808). Such discharges are also prohibited according to state regulations (Washington Administrative Code, Section 173.216.060 and Revised Code of Washington, Section 70.105.010).

3.2.2.2 Pollutant Control Approach

All new or substantially remodeled fueling stations must be constructed on an impervious concrete pad under a roof to keep out rainfall and to prevent stormwater run-on. A treatment BMP must be used for contaminated stormwater and wastewaters in the fueling containment area.

Substantial remodeling of fueling stations includes replacing the canopy or relocating or adding one or more fuel dispensers in such a way that the portland cement concrete (or equivalent) paving in the fueling area is modified. For further guidance on determining the actions considered substantial remodeling, contact the Department of Planning and Development (DPD).

3.2.2.3 Required BMPs

All BMPs related to fueling at dedicated stations must be consistent with the requirements of the Seattle Fire Code (Seattle Municipal Code, Chapter 22.600). The water quality requirements presented in this manual are separate from and in addition to the requirements of the Seattle Fire Code, which relate to fuel storage tanks, fuel dispensing equipment, area lighting, spill control and secondary containment, signage, maintenance, and operations. For current requirements, refer to the Seattle Fire Code.

The following BMPs or equivalent measures are required for all fueling stations.

- Implement all citywide BMPs from Chapter 2.
- Train employees on the proper use of fuel dispensers.
- Post signs related to the operation of fuel dispensers in accordance with the Seattle Fire Code. For example, post "No Topping Off" signs near fuel dispensers (topping off gasoline tanks results in spillage and vents gasoline fumes to the air).
- Ensure that the person conducting the fuel transfer is present at the fueling dispenser/fueling pump during fuel transfer, particularly at unattended or self-service stations. Post "Stay with Vehicle during Fueling" signage near fuel dispensers.
- Ensure that the automatic shutoff on the fuel nozzle is functioning properly.
- Ensure that at least one designated trained person is available either on the site or on call at all times to promptly and properly implement spill prevention and cleanup. If the fueling station is unattended, the spill plan must be visible to all customers using the station and the spill kit must also be accessible and fully stocked at all times.
- Keep suitable cleanup materials, such as dry adsorbent materials, on the site to enable employees to promptly clean up spills.
- Transfer the fuel from the delivery tank trucks to the fuel storage tank in impervious contained areas and ensure that appropriate overflow protection is used. Alternatively, cover nearby storm drains during the filling process and use drip pans under all hose connections.
- Design the fueling island (Figure 14) to minimize stormwater contamination, to control spills, and to collect and direct contaminated stormwater and/or wastewater to a pretreatment facility that will achieve the required level of treatment. Drains from the fueling island should discharge to the sanitary sewer. The fueling island must be designed in compliance with the Seattle Fire Code and comply with the following requirements:



Figure 14. Roof at Fueling Island to Prevent Stormwater Run-on.

- The fueling island must be designed with a spill containment pad that has a sill or berm raised to a minimum of 4 inches to contain spilled liquids and to prevent the run-on of stormwater from the surrounding area.
- The fueling island/containment pad must be paved with portland cement concrete or the equivalent. Asphalt is not considered an equivalent material.
- The concrete containment pad must be sloped around the fueling island toward the drains. The drain system must include trench drains, catch basins, a spill control separator, and/or a dead-end sump. The slope of the drains must not be less than 1 percent.
- Drains that convey contaminated stormwater to a treatment system must have an automatic shutoff valve and spill control sump at the discharge point of the treatment system, which must be closed in the event of a spill. The spill control sump must be sized in compliance with the Seattle Fire Code and the Uniform Fire Code. For more information, contact the Seattle Fire Department (206) 386-1400).
- The fueling island must have a roof or canopy to prevent precipitation from falling directly onto the spill containment pad (Figure 13). The roof or canopy must, at a minimum, cover the spill containment pad (within the grade break or fuel dispensing area) and preferably extend several additional feet to reduce the introduction of windblown rain.
- Runoff collected in roof or canopy drains must be conveyed to storm drains outside the fueling containment area. This will prevent the

mixing of uncontaminated runoff from the roof with contaminated runoff from the fueling island.

- Collect stormwater on the fuel island containment pad and convey it to either a sanitary sewer system, if approved by SPU and/or King County, or an approved pre-treatment system such as an oil/water separator and a basic treatment BMP. Alternatively, stormwater collected on the fuel island containment pad may be collected and held for proper offsite disposal.
 - Convey any fuel-contaminated stormwater to a sanitary sewer, as approved by SPU and/or King County, and comply with pretreatment regulations prohibiting discharges that could cause a fire or explosion (Washington Administrative Code, Section 173-216-060).
 - For further requirements and guidance related to the storage and offsite transfer of fuel-contaminated stormwater, refer to BMP 28 in Section 3.4.5.

A side sewer permit is required to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In most cases, stormwater collected on fuel containment pads will need to be pretreated before it is discharged to the sanitary sewer. Contact the Industrial Waste Program at (206) 263-3000 for approval before conveying discharges from pretreatment systems to the sanitary sewer.

The following additional BMPs or equivalent measures are required for **vehicles 10 feet in height** or more:

- A roof or canopy may not be practical at fueling stations that regularly fuel vehicles 10 feet in height or more, particularly at industrial or transportation sites. At these types of fueling facilities, the following BMPs apply, and as all of the other required BMPs and fire prevention requirements (Seattle Fire Code and Uniform Fire Code):
 - If a roof or canopy is impractical, the concrete fueling pad must be equipped with an emergency spill control device, which includes a shutoff valve for the drainage from the fueling area.
 - The shutoff valve must be closed in the event of a spill. An automatic shutoff valve is preferred to minimize the time lapse between spill and containment.

The following additional BMPs or equivalent measures are required for fueling over open water, such as at **marinas or boatyards**:

• Have an employee supervise the fuel dock.
- Use automatic shut-off nozzles and promote the use of "whistles" and fuel/air separators on air vents or tank stems of inboard fuel tanks to reduce the amount of fuel spilled into receiving waters during fueling of boats.
- During fueling operations, visually monitor the liquid level indicator to prevent the tank from being overfilled.
- The maximum amount of product received shall not exceed 95% capacity of the receiving tank.
- Spilled fuel and contaminated stormwater should be conveyed either to a sanitary sewer, if approved by SPU and/or King County, or to an oil removal treatment facility, such as an American Petroleum Institute (API) or coalescing plate oil/water separator, or equivalent treatment, and then to a basic treatment BMP.

Facilities and procedures for the loading or unloading of petroleum products must comply with U.S. Coast Guard requirements; see specifications in the Department of Ecology *Stormwater Management Manual for Western Washington*, Vol. IV, Appendix IV-D R.5 [Ecology 2005]).

3.2.2.4 Recommended BMPs

- Provide information to all appropriate parties on collection and recycling programs for oil, oil absorbing pads, and oil filters.
- Direct all appropriate parties to the proper disposal of all used hydrocarbon products through the use of signs, mailings, and other means.
- Educate staff, patrons, and employees about these BMPs.

3.2.3 BMP 13: Automotive Repair and Maintenance

This BMP applies to businesses and public agencies on whose premises oil, fuel, engine oil, and other fluids such as battery acid, coolants, and transmission and brake fluids are removed and replaced in vehicles and equipment. It also applies to mobile vehicle maintenance operations, such as those at construction sites.

A spill can be a one-time event, a continuous leak, or frequent small spills. All kinds must be prevented.

3.2.3.1 Description of Pollutants

Pollutants of concern are toxic petroleum hydrocarbons, toxic organic compounds, oils and greases, pH, and metals. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.2.3.2 Pollutant Control Approach

Leaks and spills of fluids can be prevented and contained by the use of good housekeeping measures and the use of cover and containment BMPs.

Compliance can be achieved more easily with sewer and stormwater requirements by running a "dry shop," thereby reducing consumption and discharge of liquids. Soiled rags and other cleanup material must be properly managed in accordance with Seattle Fire Code and Solid Waste regulations or cleaned and reused by a professional cleaning service.

3.2.3.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in automotive repair and maintenance activities:

- Implement all citywide BMPs from Chapter 2.
- Employees must be educated annually about the need for careful handling of automotive fluids. New employees must be trained upon hiring. Employees at businesses or public agencies that routinely change or handle these fluids must be trained in spill prevention and cleanup. All training must be documented.
- Spill cleanup materials, such as rags and absorbent materials, must always be kept close at hand when changing oil and other fluids (Figure 15). Soiled rags and other cleanup material must be properly disposed of or professionally cleaned and reused.
- Maintenance and repair activities must be conducted indoors.
- Drain all fluids that have the potential to leak from wrecked vehicles, and equipment when they arrive. Store and dispose of fluids properly.
- If the work must be performed outdoors or at a mobile location, (such as a construction site), drip pans or other containment devices (Figure 16) must be used beneath the vehicle or equipment to capture all spills and drips.



Figure 15. Spill Kit on Construction Site Mobile Repair Truck.



Figure 16. Drip Pan for Capturing Spills and Drips during Engine Repair and Maintenance.

- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- Maintenance and repair areas cannot be hosed down. Instead, they must be swept weekly or more often as needed to collect dirt, and spills must be wiped up with rags and other absorbent materials. If pressure washing is necessary, the wastewater must be collected and disposed of properly. It cannot be discharged to the stormwater drainage system.
- Drains located inside buildings must be connected to the sanitary sewer. Do not allow drains inside maintenance buildings to connect to the sanitary sewer without prior approval by SPU and King County.

A side sewer permit is needed to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In most cases, stormwater collected on fuel containment pads will need to be pretreated before it is discharged to the sanitary sewer. Contact the Industrial Waste Program at (206) 263-3000 for approval before conveying discharges from pretreatment systems to the sanitary sewer.

- If floatable components are present, use an oil/water separator or other appropriate treatment to treat all runoff from the fluid changing area prior to discharge to the sanitary sewer.
- If extensive staining and oily sheen is present, absorbent pillows or booms must be used in or around catch basins and properly maintained to prevent oil from entering the stormwater drainage system.

3.2.3.4 Recommended BMPs

Although not required, the following BMPs can provide additional pollution protection:

- Recycle oil, antifreeze, batteries, and air conditioning coolant.
- Recover air conditioning gases.
- Use reusable cloth rags to clean up drips and small spills instead of disposable materials.
- Use absorbent pillows or booms in or around storm drains and catch basins to absorb oil and fuel.

3.2.4 BMP 14: Mobile Fueling of Vehicles and Heavy Equipment

This BMP applies to businesses and public agencies that practice filling fuel tanks of vehicles and equipment by means of tank trucks driven to the sites where the vehicles are located (also known as mobile fueling, fleet fueling, wet fueling, or wet hosing). Mobile fueling is allowed only for diesel fuel; as mobile fueling for gasoline is prohibited.

A spill can be a one-time event, a continuous leak, or frequent small spills. All kinds must be prevented.

3.2.4.1 Description of Pollutants

Typically, stormwater contamination at mobile fueling stations is caused by leaks or spills of fuels and automotive fluids. These materials contain organic compounds, oils and greases, and metals that can be harmful to humans and aquatic life. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Direct or indirect discharges of antifreeze, oil, gasoline, grease, and all other automotive and petroleum products, and flammable or explosive materials into the drainage system are considered prohibited discharges under the Seattle's Stormwater Code (SMC Chapters 22.800 – 22.808). Such discharges are also prohibited according to state regulations (Washington Administrative Code, Section 173.216.060; and Revised Code of Washington, Section 70.105.010).

3.2.4.2 Pollutant Control Approach

Pollution control at mobile fueling operations should be approached the same as at fixed fueling facilities. As is practical, the fueling should be conducted on an impervious concrete pad, under cover, with appropriate secondary containment. Otherwise, pollutant control is obtained using temporary measures such as drip pans, awnings, and other methods to keep out rainfall and prevent stormwater run-on to the area.

3.2.4.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in mobile fueling of vehicles and heavy equipment:

- Implement all citywide BMPs from Chapter 2.
- Ensure that all mobile fueling operations are approved by the Seattle Fire Department and comply with both the Seattle Fire Code and the Washington state fire codes.

In fueling locations near sensitive aquifers, designated wetlands, wetland buffers, or other waters of the state, compliance with additional local requirements may be required.

- Train the driver/operator annually in spill prevention and cleanup. Ensure that all employees are aware of the significant liability associated with fuel spills. New employees must be trained upon hiring. Document and keep all training records.
- Develop a written fuel operation plan that is:
 - Properly signed and dated by the responsible manager
 - Retained at headquarters and kept in all fueling vehicles, along with the spill plan.
 - Made available in the event that an authorized government agency requests a review.
- Ensure that the driver/operator is present and constantly observing/monitoring the fuel transfer location during fuel transfer and ensure that the following procedures are implemented at the fuel transfer locations:
 - To the extent practical, locate the point of fueling at least 25 feet from the nearest storm drain or cover the storm drain to ensure there is no inflow of spilled or leaked fuel.
 - Place a drip pan or an absorbent pad under each fueling location prior to and during all dispensing operations. The pan must be water tight and must have a capacity of 5 gallons.
 - Handle and operate fuel transfer hoses and nozzles, drip pan(s), and absorbent pads to prevent fuel spills and leaks from reaching the ground, storm drains, and the surface water ultimately receiving drainage water.
 - Do not allow vehicles to drive over fuel hoses
- Use automatic shutoff nozzles for dispensing the fuel. Replace automatic shutoff nozzles as recommended by the manufacturer.
- Inspect, maintain and replace equipment on fueling vehicles, particularly hoses and nozzles, at established intervals to prevent failures. Document and keep all inspection records on file.
- Use an adequate lighting system at the filling point.
- Do not "top off" fuel tanks.
- Ensure that the requirements of the Washington state fire codes and U.S. Department of Transportation are met:
- At a minimum, maintain the following spill cleanup materials in a readily accessible location in all fueling vehicles:
 - Non-water-absorbent materials capable of absorbing 15 gallons of diesel fuel

- A storm drain plug or cover
- A non-water absorbent containment boom at least 10 feet long with a 12-gallon absorbent capacity
- A nonmetallic shovel
- Two 5-gallon buckets with lids.

Ensure that the Seattle Fire Department (911) and the Department of Ecology Northwest Regional Office (425) 649-7000) are immediately notified in the event of any spill that enters surface water or ground water. Establish a "call down list" to ensure the rapid and proper notification of management and government officials if any significant amount of product is discharged from the site. Keep the list in a protected but readily accessible location in the mobile fueling truck. The "call down list" should also identify spill response contractors available in the area to ensure the rapid removal of significant product spills into the environment.

 Immediately remove and properly dispose of soils with visible surface contamination to prevent the spread of chemicals to ground water or surface water via stormwater runoff.

3.3 **Production and Application**

Production and application activities are associated with a high risk for spills or leaks of toxic material. Required and recommended BMPs can help to prevent, minimize, and manage accidental spills or leaks so that there are minimal environmental impacts. The specific BMPs that apply to particular types of production and application activities are presented below.

Remember to also implement all required citywide BMPs from Chapter 2.

3.3.1 BMP 15: Concrete and Asphalt Mixing and Production at Stationary Sites

This BMP applies to businesses and public agencies that mix raw materials onsite to produce concrete or asphalt. It also applies to subsequent uses such as making concrete or asphalt products.

3.3.1.1 Description of Pollutants

Pollutants of concern include petroleum hydrocarbons, toxic organic compounds, oils and greases, metals, and pH. Not only can concrete pouring activities severely alter the pH of the surface water ultimately receiving drainage water, but slurry from aggregate washing can harden in storm pipes, thereby reducing their capacity and result in flooding. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.1.2 Pollutant Control Approach

Cover and contain processes wherever possible to prevent stormwater run-on and contamination and separate process areas from non-process areas to help keep the site clean.

3.3.1.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to concrete and asphalt mixing and production at stationary sites:

- Implement all citywide BMPs from Chapter 2.
- Employees must be educated annually on the pollution hazards of concrete and asphalt application and cutting. Document and keep all training records on hand.
- Cover production and pouring areas to protect them from contact with stormwater.
- Recycle all process water from production, pouring, and equipment cleaning or discharge it to a dead-end sump, process water treatment system, or sanitary sewer.

A side sewer permit is needed to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In most cases, stormwater collected from concrete and asphalt mixing and production areas will need to be pretreated before it is discharged to the sanitary sewer. Contact the Industrial Waste Program at (206) 263-3000 for approval before conveying discharges from pretreatment systems to the sanitary sewer.

- Never discharge washout from fresh concrete or concrete mixing into streets, sidewalks, drainage systems, streams, or other receiving waters. Such discharge is considered a prohibited discharge under Seattle's Stormwater Code (SMC Chapters 22.800 – 22.808).
- Any stormwater that mixes with production areas must also be discharged to the sanitary sewer.
- Establish a BMP maintenance schedule and educate employees annually about the need to prevent stormwater contamination through regular BMP maintenance. Document and keep all maintenance training records on hand.
- Use absorbent materials or catch basin filters (as shown in Figure 17) in and around storm drains and catch basins to help filter out solids. If catch basin filters are used, maintain the filters regularly (weekly or as needed) to prevent plugging.



Figure 17. Commercially Available Catch Basin Filter Being Cleaned and Replaced.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with concrete and asphalt mixing and production.

- Sweep the production and pouring area, driveways, gutters and all other outdoor areas daily or more often as necessary to collect fine particles and aggregate for recycling or proper disposal.
- Do not wash or hose down areas that drain to the drainage system.

 Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.

For information about water quality treatment BMPs for activities related to concrete and asphalt mixing and production at stationary sites, refer to Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual. For accepted methods of water quality treatment, consult the Department of Ecology's website (http://www.ecy.wa.gov/programs/wq/stormwater/index.html). Water discharged from treatment BMPs must not result in the violation of ground water, surface water, or drinking water standards.

3.3.1.4 Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from concrete and asphalt mixing and production activities:

- Pave the mixing, production, and pouring areas. A sump drain in these areas is not advisable due to potential clogging problems, but could be used in a curing area. Sweep these areas to remove loose aggregate and recycle or dispose of the aggregate properly.
- Use storm drain covers or similarly effective containment devices to prevent runoff from entering the drainage system. Accumulations of contaminated runoff must be disposed of properly.

3.3.2 BMP 16: Concrete Pouring, Concrete/Asphalt Cutting, and Asphalt Application

This BMP applies to businesses and public agencies that apply asphalt or pour or cut concrete or asphalt for building construction and remodeling; road construction; repair and construction of sidewalks, curbs, and gutters; sealing of driveways and roofs, and other applications.

3.3.2.1 Description of Pollutants

Pollutants of concern include petroleum hydrocarbons, toxic organic compounds, oils and greases, metals, suspended solids, and pH. Not only can concrete pouring activities severely alter the pH of the surface water ultimately receiving drainage water, but slurry from aggregate washing can harden in stormwater pipes, thereby reducing their capacity, resulting in flooding. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.2.2 Pollutant Control Approach

Train employees on proper procedures, sweep or shovel aggregate chunks, collect accumulated runoff and solids, and wash equipment in designated areas.

3.3.2.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to concrete pouring and cutting and asphalt application:

- Implement all citywide BMPs from Chapter 2.
- Employees must be trained annually on the pollution hazards of concrete and asphalt application and cutting. Document and keep all training records on file.
- Loose aggregate chunks and dust must be swept or shoveled and collected (not hosed down a storm drain) for recycling or proper disposal at the end of each workday or as needed, especially at work sites such as streets, driveways, parking lots, sidewalks, curbs, and gutters where rain can readily pick up the loose material and carry it to the nearest stormwater conveyance system.
- Storm drain covers or similarly effective containment devices must be placed over all nearby drains at the beginning of each day. Shovel or vacuum all slurry and remove from the site. All accumulated runoff and solids must be collected and properly disposed of at the end of each workday, or more often if necessary.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.

- Exposed aggregate washing, where the top layer of unhardened concrete is hosed or scraped off to leave a rough finish, must be performed with a mechanism for containment and collection of the discarded concrete slurry and disposed of properly.
- Use a catch basin filter to remove solid materials from storm drains. Maintain the filter regularly (weekly or more often as needed) to prevent plugging.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with concrete pouring, cutting and application.

- Cleaning of concrete application and mixing equipment or concretedelivery vehicles on the work site must be performed in a designated area where the rinse water is controlled. The rinse water must either be collected for proper disposal or put into a hole in the ground on private property where the water can percolate through the soil and the solids later covered with soil or recovered and disposed of or recycled.
- Runoff that comes in contact with diesel or coatings used in asphalt applications must be collected, treated and disposed of properly.

For information about water quality treatment BMPs related to concrete and asphalt mixing and production activities, refer to Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual. For accepted methods of water quality treatment, consult the Department of Ecology's website (<u>http://www.ecy.wa.gov/programs/wq/stormwater/index.html</u>). Water discharged from treatment BMPs must comply with ground water, surface water, or drinking water standards.

3.3.2.4 Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from concrete pouring and cutting and asphalt application at temporary sites:

- Avoid the activity when rain is falling or expected.
- If possible, portable asphalt mixing equipment should be covered by an awning, a lean-to, or other simple structure to avoid contact with rain.
- Recycle broken concrete and asphalt. Look under "Recycling Services" in the Yellow Pages of the telephone book to find a local recycler.

The Industrial Materials Exchange program facilitates the transfer of excess materials and wastes to those who can use them. Contact the Industrial Materials Exchange at (206) 296-4899, or through the Industrial Materials Exchange website (www.govlink.org/hazwaste/business/imex).

3.3.3 BMP 17: Manufacturing and Post-Processing of Metal Products

This BMP applies to businesses and public agencies such as mills, foundries, and fabricators that manufacture or process metal products. A variety of activities such as machining, grinding, soldering, cutting, welding, quenching, cooling, and rinsing may take place.

3.3.3.1 Description of Pollutants

Pollutants of concern include toxic organic compounds, metals, oils and greases, pH, suspended solids, and substances that increase COD. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.3.2 Pollutant Control Approach

Cover and contain operations and apply good housekeeping and preventive maintenance practices to prevent the contamination of stormwater.

3.3.3.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to manufacturing and processing of metal products:

- Implement all citywide BMPs from Chapter 2.
- Process wastewater (including contact cooling water, filter backwash, or cooling tower blowdown) from this activity and stormwater runoff from activity areas must be discharged to a sanitary sewer, holding tank, or process treatment system. If a holding tank is used for the storage of wastewater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or process treatment system. Contact SPU or King County to obtain permits for discharge to the sewer.

A side sewer permit is needed to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In most cases, stormwater collected from activities related to the manufacturing and post-processing of metal products will require pretreatment before it is discharged to the sanitary sewer. Contact the Industrial Waste Program at (206) 263-3000 for approval before conveying discharges from pretreatment systems to the sanitary sewer.

• Cover the activity area to prevent rain from contacting the process and to reduce the amount of runoff that may require treatment.

- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- The activity area must be swept at the end of each workday or more often as needed to collect and properly dispose of metal fragments and product residues.
- Employees must be educated about controlling their work with metal products to minimize stormwater pollution. Document and keep all training records on hand.
- Businesses and public agencies who engage in these activities may be required to obtain an NPDES permit from the Department of Ecology.

Washwater must not be discharged, even after onsite treatment, to a storm drain or to surface water, unless an NPDES Industrial Stormwater General Permit is obtained from the Department of Ecology. Contact the Department of Ecology at (425) 649-7000 for an NPDES permit application.

3.3.3.4 Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from the manufacturing and processing of metal products:

- Limit the amount of water used in quenching and rinsing. Recycle used water where possible.
- Use a catch basin filter to capture stray metal particles. Maintain the filter regularly (weekly or as needed) to prevent plugging.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with the manufacturing and processing of metal products.

• Implement a program to track the purchase and consumption of lubricants, solvents, and additives. If consumption increases, check with the operating managers for an explanation. Recommend action if significant equipment leaks or spills are identified.

For information about water quality treatment BMPs for operations related to the manufacturing and post-processing of metal products, refer to Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual. Consult the Department of Ecology's website for accepted methods of water quality treatment

(http://www.ecy.wa.gov/programs/wq/stormwater/index.html).

3.3.4 BMP 18: Wood Treatment

This BMP applies to businesses and public agencies that perform wood treatment including both anti-staining and preserving using pressure processes, dipping, or spraying.

3.3.4.1 Description of Pollutants

Pollutant sources include drips of condensate or preservative after pressurized treatment, product washwater (in the treatment or storage areas), spills and leaks from process equipment and preservative tanks, fugitive emissions from vapors in the process, blowouts and emergency pressure releases, and kick-back from lumber (leakage of preservative as it returns to normal pressure).

Potential pollutants typically include the wood treating chemicals, substances that increase BOD, suspended solids, oils and greases, benzene, toluene, ethylbenzene, phenol, chlorophenols, nitrophenols, metals, and polycyclic aromatic hydrocarbons, depending on the chemical additive used. Wood preservatives and antistaining chemical additives include creosote, creosote/coal tar, pentachlorophenol, copper naphthenate, arsenic trioxide, malathion, and inorganic arsenicals. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.4.2 Pollutant Control Approach

Cover and contain all wood treating areas and prevent all leaching of and stormwater contamination by wood treating chemicals.

All wood-treatment facilities in Washington state are required to be covered under an NPDES permit. Contact the Department of Ecology at (425) 649-7000 for an NPDES permit application.

3.3.4.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to wood treatment, according to the individual NPDES permit regulations:

- Implement all citywide BMPs from Chapter 2.
- Cover and/or enclose, and contain with impervious surfaces:
 - All wood treatment areas
 - Storage areas for freshly treated wood.
- Segregate clean stormwater from process water. Ensure that all process water is conveyed to an approved treatment system and discharged to the sanitary sewer.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

- Dedicate equipment that is used for treatment activities to prevent the tracking of treatment chemicals to other areas on the site.
- Immediately remove and properly dispose of soils with visible surface contamination to prevent the spread of chemicals to ground water or surface water via stormwater runoff.
- For treated wood products:
 - Elevate treated wood products to prevent contact with stormwater runon and runoff
 - Place over the dip tank or on an inclined ramp for a minimum of 30 minutes to allow excess chemical to drip back to the dip tank
 - Place in a covered paved storage area for at least 24 hours before placement in outside storage. Use a longer storage period during cold weather unless the temporary storage building is heated
 - Ensure that the wood is drip free and dry on the surface before it is moved outside
 - If any wood is observed to be contributing chemicals to the environment in the treated wood storage area, relocate it on a concrete chemical containment structure until the surface is clean and the wood is drip free and dry on the surface.
 - For areas around dip tanks, spray booths, and retorts:
 - Eliminate non-process traffic on the drip pad
 - Scrub down nondedicated lift trucks on the drip pad
 - Construct a slope and direct the drainage in a manner that allows treatment chemicals to flow back to the wood treatment process
 - Seal any holes or cracks in the asphalt areas subject to contamination with wood treatment chemicals.

3.3.5 BMP 19: Commercial Composting

This BMP applies to commercial composting facilities that operate outside without cover. These facilities require large areas for the decomposition of wastes and other feedstocks.

3.3.5.1 Description of Pollutants

When stormwater is allowed to seep through active composting areas, including waste receiving and processing areas, it becomes leachate. Pollutants in leachate include nutrients, substances that increase BOD, organic compounds, coliform bacteria, low (acidic) pH, color, and suspended solids. Runoff from areas at the facility that is not associated with active processing and curing, such as product storage areas, vehicle maintenance areas, and access roads, can also contain contaminants. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.5.2 Pollutant Control Approach

Commercial composting facilities should be designed to separate stormwater from leachate (i.e., industrial wastewater).

Discharge of leachate from a composting facility requires a NPDES permit from the Department of Ecology, depending on the disposal method chosen for managing leachate at the facility. For state regulations related to composting facilities, refer to Washington Administrative Code, Section 173-350-220.

3.3.5.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in commercial composting activities:

Contact other federal and state agencies, SPU, and King County regarding environmental or zoning authority for applicable permit and regulatory information.

- Implement all citywide BMPs from Chapter 2.
- Ensure that the compost feedstocks do not contain dangerous wastes regulated under Washington Administrative Code, Chapter 173-303, hazardous products of a similar nature.
- Train employees to screen incoming wastes for undesirable materials. Document and keep all training records.
- Clean up and sweep debris from yard areas daily and more often as needed.

- Prevent and minimize stormwater contamination by storing finished compost on a concrete pad that is:
 - Curbed to separate leachate from uncontaminated stormwater
 - Sloped sufficiently to direct leachate to the collection device
 - Designed with one or more sumps or catch basins capable of collecting all leachate generated by the design storm and conveying it to the leachate holding structure.
- Convey all leachate to a sanitary sewer, holding tank, or an onsite treatment system that is designed to treat the leachate and remove suspended solids. If a holding tank is used for the storage of leachate, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.
- Ponds used to collect, store, or treat leachate and other contaminated waters associated with the composting process must be lined to prevent ground water contamination. Apply all known available and reasonable methods of prevention, control, and treatment (AKART) to all pond liners, regardless of the construction materials.

3.3.5.4 Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from commercial composting activities:

• Locate stored residues in areas designed to collect leachate and limit storage times to prevent degradation and generation of leachate.

3.3.6 BMP 20: Landscaping and Lawn and Vegetation Management

This BMP applies to businesses and public agencies that perform landscaping including grading, landscape materials storage piles, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests by means of chemical pesticides and is conducted commercially at commercial, industrial, and residential sites. Examples of landscaping and lawn and vegetation management include weed control on golf courses, access roads, and utility corridors; removal of moss from rooftops; killing of nuisance rodents; application of fungicides on patio decks; and residential lawn and plant care.

3.3.6.1 Description of Pollutants

Stormwater contaminants from landscaping and lawn and vegetation management activities include toxic organic compounds, metals, oils, suspended solids, pH, coliform bacteria, fertilizers, and pesticides.

Pesticides such as pentachlorophenol, carbonates, and organometallics can be released to the environment as a result of leaching and dripping from treated plants, container leaks, product misuse, and outside storage of pesticide-contaminated materials and equipment. Inappropriate management of vegetation and improper application of pesticides or fertilizers can result in stormwater contamination. These pollutants must not be discharged to the drainage system or directly into receiving waters, except as permitted by the Department of Ecology.

3.3.6.2 Pollutant Control Approach

Avoid fertilizer and pesticide application, soil erosion, and site debris. Cover and contain exposed, erodible soils.

Develop and implement an integrated pest management (IPM) plan (Appendix B) and use pesticides prudently. If pesticides or herbicides are used, they must be carefully applied in accordance with label instructions and the Federal Insecticide, Rodenticide and Fungicide Act (FIFRA) and applicable State laws.

To control erosion and the discharge of stormwater pollutants, maintain appropriate vegetation, properly apply fertilizer where necessary, or consider the use of pest resistant varieties when possible. Also where practical, grow plant species appropriate for the site.

3.3.6.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in landscaping or lawn and vegetation management activities:

• Implement all citywide BMPs from Chapter 2.

Landscaping

- Do not dispose of collected vegetation in drainage systems, waterways, receiving waters, or greenbelt areas taking care to avoid contamination or site disturbance.
- Use mulch or other erosion control measures when soils are exposed for more than 1 week during the dry season (May 1 to September 30) or 2 days during the rainy season (October 1 to April 30).

Pesticides

- Develop an IPM program that, at a minimum, includes the requirements outlined in Appendix B, Example of Integrated Pest Management Program and Plan.
- Choose the least toxic pesticide that is capable of reducing the infestation to acceptable levels.
- Conduct any pest control during the life stage when the pest is most vulnerable. For example, if it is necessary to use a *Bacillus thuringiensis* application to control tent caterpillars, it must be applied before the caterpillars form their cocoons or it will be ineffective. The pest control method should be site-specific rather than using generic.
- When necessary to use, apply pesticides according to the directions on the label and use the following BMPs:
 - Conduct spray applications according to specific label directions and the applicable local and state regulations.
 - Do not apply pesticides if it is raining or immediately before expected rain (unless the label directs such timing).
 - Ensure that the pesticide application equipment is capable of immediate shutoff in the event of an emergency.
 - Do not apply pesticides within 100 feet of open waters including wetlands, ponds, streams, sloughs, or any drainage ditch or channel that leads to open water except when approved by the Department of Ecology or SPU (all sensitive areas including wells, streams, and wetlands must be flagged prior to spraying). Take care to avoid contamination or site disturbance during applications.
 - Never apply pesticides in quantities that exceed the manufacturer's instructions.
 - Mix pesticides and clean the application equipment under cover in an area where accidental spills will not enter surface water or ground water and will not contaminate the soil.

The Environmentally Critical Areas Ordinance (SMC 25.09) also restricts certain described pesticide use within buffer zones of certain sensitive areas.

- Storage:
 - Store pesticides in enclosed areas or in covered impervious containment.
 - Do not hose down the paved areas to a storm drain or conveyance ditch.
 - Ensure that pesticide-contaminated waste materials are kept in designated covered and contained areas, and disposed of properly.
- Rinsate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.

Vegetation Management

- Fertilizer:
 - Ensure that all fertilizers are applied by properly trained personnel. Document and keep all training records.
 - For commercial and industrial facilities, ensure that fertilizers are not applied to grass swales, filter strips, or buffer areas that drain to sensitive receiving waters.

3.3.6.4 Recommended BMPs

For more details on landscaping and vegetation management, refer to the Department of Ecology Stormwater Management Manual for Western Washington, Volume IV, Source Control, BMPs for Landscaping and Lawn/Vegetation Management (Ecology 2005).

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from landscaping and lawn and vegetation management activities:

Landscaping

- Install engineered soil and landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Mulch and mow whenever practical.
- Dispose of grass clippings, leaves, sticks, and other collected vegetation, by composting, if feasible.
- Till fertilizers into the soil where practical rather than dumping or broadcasting them on the surface. Determine the proper fertilizer application for the types of soil and vegetation encountered.
- Till a topsoil mix or composted organic material into the soil to create a well-mixed transition layer that encourages deeper root systems and greater drought-tolerance.

• Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

Pesticides

- Consider alternatives to the use of pesticides, such as covering or harvesting weeds, substituting other species, and manual weed control and moss removal.
- Consider the use of soil amendments, such as compost, that are known to control some common diseases in plants, such as Pythium root rot (caused by the pathogen *Pythium* spp.), ashy stem blight, and parasitic nematodes. The following are possible mechanisms for disease control by compost addition (U.S. EPA 1997):
 - Successful competition for nutrients by antibiotic production
 - Successful predation against pathogens by beneficial microorganisms
 - Activation of disease-resistant genes in plants by composts.

An amended soil and landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil and landscape system with adequate depth, permeability, and organic matter to sustain itself and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.

Vegetation Management

- Material:
 - Use topsoil layer that is at least 8 inches thick and consists of at least 8 percent organic matter to provide a sufficient growing medium for the vegetation.
 - Select the appropriate turfgrass mixture for the applicable climate and soil type.
- Fertilizer:
 - Use slow-release fertilizer and organic materials for the best availability for turf grass.
 - Time the fertilizer application to periods of maximum plant uptake. Fertilizers should be applied in amounts appropriate for the target vegetation and at the time of year that minimizes losses to surface water and ground water.
 - Do not fertilize during a drought or when the soil is dry.

3.3.7 BMP 21: Painting, Finishing, and Coating of Vehicles, Boats, Buildings, and Equipment

This BMP applies to businesses and public agencies that perform outdoor surface preparation and application of paints, finishes and coatings to vehicles, boats, buildings, and equipment.

3.3.7.1 Description of Pollutants

Potential pollutants include organic compounds, oils and greases, metals, and suspended solids. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.7.2 Pollutant Control Approach

Cover and contain exterior surface preparation, painting and sanding operations and apply good housekeeping and preventive maintenance practices to prevent the contamination of stormwater with paint overspray and grit from sanding. Conduct activities indoors whenever possible.

3.3.7.3 Required BMPs

Activities associated with boatyard and shipyard operations may require an NPDES permit from the Department of Ecology. Call (425) 649-7000 to determine if your site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities related to the painting, finishing, and coating of vehicles, boats, buildings, and equipment.

• Implement all citywide BMPs from Chapter 2.

Preparation and Application

- Train employees in the application and cleanup of paints, finishes, and coatings to reduce misuse and overspraying. Document and keep all training records.
- Use ground cloths or drop cloths underneath outdoor painting, scraping, sandblasting work, and properly clean and temporarily store collected debris (Figure 18). Porous drop cloths are recommended for exterior surface preparation work to capture solids and allow rainwater to seep through.
- Use a storm drain cover, catch basin filter, or similarly effective runoff control device if dust, sediment or other pollutants may escape the work area. If a catch basin filters are used onsite, maintain the filter regularly (weekly or as needed) to prevent plugging.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with painting, finishing and coating activities.



Figure 18. Drop Cloth and Personal Protective Equipment Used During Hull Sanding.

- Do not conduct spraying, blasting, or sanding activities over open water or where wind may blow paint into water. If windy conditions are present, use a curtain to contain the activity.
- While using a spray gun or conducting sand blasting, enclose and/or contain all work in compliance with applicable air pollution control requirements and those of the Occupational Safety and Health Administration, the Washington Industrial Safety and Health Act, and Puget Sound Clean Air.

Cleanup

- Wipe up spills with rags and other absorbent materials immediately. Do not hose down the area.
- On marine dock areas, sweep rather than hose down debris. Collect any water that is generated and convey it to an appropriate treatment and disposal facility.
- Use a ground cloth, pail, drum, drip pan, tarpaulin, or other protective device for activities such as paint mixing and tool cleaning outside or where spills can contaminate stormwater. Whenever possible, conduct these activities inside or in an enclosed area.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain.

• Collect solvents used to clean brushes and tools covered with non-waterbased paints, finishes, or other materials. Used solvents (e.g., paint thinner, turpentine, and xylol) must be recycled or be disposed of properly.

Material Storage and Disposal

- Dispose of all wastes and prevent all uncontrolled releases to the air, ground, or water.
- Store all paints, finishes or solvents inside a building or in covered secondary containment.
- All containers must have tight fitting lids.

3.3.7.4 Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from activities related to the painting, finishing, and coating of vehicles, boats, buildings, and equipment:

- Recycle paints, paint thinner, solvents, washwater from pressure washers, and any other recyclable materials.
- Use efficient spray equipment such as electrostatic, air-atomized, high-volume/low-pressure, or gravity-feed spray equipment.
- Purchase recycled paints, paint thinner, solvents, and other products if feasible.
- Dispose of unused paint promptly.

3.3.8 BMP 22: Commercial Printing Operations

This BMP applies to businesses and public agencies that perform commercial printing. Materials used in the printing process include inorganic and organic acids, resins, solvents, polyester film, developers, alcohol, vinyl lacquer, dyes, acetates, and polymers.

3.3.8.1 Description of Pollutants

Waste products from commercial printing processes may include waste inks and ink sludge, resins, photographic chemicals, solvents, acid and alkaline solutions, chlorides, chromium, zinc, lead, spent formaldehyde, silver, plasticizers, and used lubricating oils. These pollutants must not be discharged to the drainage system or directly into receiving waters.

Printing operations are conducted indoors; therefore, the only likely points of potential contact with stormwater are outside areas in which waste materials are temporarily stored and the external loading bays where chemicals are offloaded. Pollutants can include suspended solids, pH, metals, oils and greases, and substances that increase COD.

3.3.8.2 Pollutant Control Approach

Ensure appropriate disposal and permitting of process wastes. Cover and contain stored raw and waste materials.

3.3.8.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in commercial printing activities:

- Implement all citywide BMPs from Chapter 2.
- Discharge process wastewaters to a sanitary sewer or to an approved process wastewater treatment system, if approved by SPU and/or King County.

A side sewer permit is needed to connect to the City's sanitary sewer system. For information about side sewer permits, call the Seattle Department of Planning and Development, Drainage and Sewer Review Desk, at (206) 684-5362. Discharges to the sanitary sewer are also regulated by the King County Industrial Waste Program. In some cases, stormwater collected from activities related to commercial printing will require pretreatment before it is discharged to the sanitary sewer. Contact the Industrial Waste Program at (206) 263-3000 for approval before conveying discharges from pretreatment systems to the sanitary sewer.

- Determine whether any of these wastes qualify for regulation as dangerous wastes and dispose of them accordingly.
- Store materials inside a building or in covered secondary containment.

3.3.8.4 Recommended BMPs

The following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from activities related to commercial printing operations:

• Try to use press washes that have no listed solvents and the lowest possible content of volatile organic compounds. Don't allow the contents of ink cleanup trays to evaporate to the outside atmosphere.

For additional information on pollution prevention related to commercial printing operations, the following Department of Ecology publications are recommended: *A Guide for Screen Printers* (Publication 94-137R) and *A Guide for Lithographic Printers* (Publication 94-139R) (Ecology 1994a, 1994b.)

3.3.9 BMP 23: Outdoor Manufacturing Operations

This BMP applies to businesses and public agencies that perform any type of processing, fabrication, mixing, milling, or refining. This also includes areas where historical contamination may currently be contaminating stormwater.

3.3.9.1 Description of Pollutants

Pollutant sources from outside manufacturing operations include outside process areas, stack emissions, and areas in which manufacturing activity has taken place in the past and significant pollutants remain and are exposed to stormwater. Pollutants can include suspended solids, pH, metals, oils and greases, a variety of organic compounds and substances that increase COD. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.3.9.2 Pollution Control Approach

Cover and contain outside manufacturing activities and prevent stormwater runon and contamination, where feasible.

3.3.9.3 Required BMPs

Outdoor activities associated with industrial manufacturing may require an NPDES permit from the Department of Ecology. Call (425) 649-7000 to determine if your site activities trigger permit coverage.

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in outdoor manufacturing activities:

- Implement all citywide BMPs from Chapter 2.
- If possible, move the manufacturing activity into a building (Figure 19).



Figure 19. Structure Used to Cover Manufacturing Operations.

- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- If moving the activity is not possible, cover the activity and connect floor drains to a sanitary sewer, if approved by the Department of Planning and Development and King County. Construct a berm or a sloped floor as needed to prevent drainage of pollutants to outside areas and to prevent run-on of uncontaminated rainwater.
- Sweep paved areas daily and more often as needed to prevent contamination of stormwater.
- Modify the activity to eliminate or minimize the contamination of stormwater.
- Isolate and segregate pollutants as feasible. Convey the segregated pollutants to a sanitary sewer, process treatment, or a dead-end sump, depending on the available methods and applicable permit requirements.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater from manufacturing operations may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.
3.4 Storage and Stockpiling

Activities related to the storage and stockpiling of liquid or solid materials are potentially associated with a high risk for spillage or leakage of toxic hazardous material. However, both required and recommended BMPs can help to prevent, minimize, and manage the effects of accidental spills or leaks. The specific BMPs that apply to various types of storage and stockpiling activities are presented below.

Remember to also implement all required citywide BMPs from Chapter 2.

3.4.1 BMP 24: Outdoor Storage or Transfer of Solid Raw Materials, Byproducts, or Finished Products

This BMP applies to businesses and public agencies on whose premises there will be outdoor storage and transfer of solid raw materials, byproducts, or products such as but not limited to gravel, sand, salts, topsoil, compost, logs, sawdust, wood chips, lumber and other building materials, concrete, and metal products typically stored outside in large piles or stacks at commercial or industrial establishments.

3.4.1.1 Description of Pollutants

If stormwater comes in contact with the stockpiled materials listed above, pollutants can be leached or erosion of the stored materials may occur. Potential pollutants include suspended solids, substances that increase BOD, organic compounds, and dissolved salts (e.g., sodium chloride, calcium chloride, and magnesium chloride). These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.4.1.2 Pollutant Control Approach

Cover and contain materials to prevent erosion. Erosion results in stormwater contamination and loss of valuable product.

3.4.1.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in the outdoor storage or transfer of solid raw materials, byproducts, or finished products:

- Implement all citywide BMPs from Chapter 2.
- Do not hose down the contained stockpile area if the discharge will flow into a storm drain or a drainage conveyance.
- Sweep paved storage areas daily or more often as necessary to collect and dispose of loose solid materials.
- For stockpiles containing more than 5 cubic yards of erodible or watersoluble materials such as soil, deicing salts for roads, compost, unwashed sand and gravel, and sawdust; and for outside storage areas for solid materials such as logs, bark, lumber, and metal products, choose one or more of the following BMPs:
 - Store in a building or a covered, paved area, preferably surrounded by a berm, as shown in Figure 20.
 - Place temporary plastic sheeting (polyethylene, polypropylene, hypalon, or equivalent material) over the material as illustrated in Figure 21. Anchor sheeting to prevent contact with rainfall.



Figure 20. Covered and Secured Storage Area for Bulk Solids.



Figure 21. Covered Storage Area for Erodible Material (gravel).

- Pave the area and install a drainage system:
 - Place curbs or berms along the perimeter of the area to prevent the run-on of uncontaminated stormwater and to collect and convey runoff to a treatment system.
 - Slope the paved area in a manner that minimizes the contact between stormwater (e.g., pooling) and leachable materials in compost, logs, bark, or wood chips.

- For large stockpiles that cannot be covered:
 - Install containment devices such as a berm or a low wall around the perimeter of the site and at any catch basins as needed to prevent erosion of the stockpiled material and to prevent discharge of leachate from the stockpiled material off the site or to a storm drain.
 - Ensure that contaminated stormwater is not discharged directly to catch basins without being conveyed through a treatment BMP.
 - Inspect and maintain catch basins on a regular basis (weekly or more often as needed).
- Convey stormwater contaminated with solids from the stockpile area to a wet pond, wet vault, settling basin, media filter, catch basin filter, or other appropriate settling system Maintain all settling systems regularly (weekly or as needed) to prevent plugging.

3.4.1.4 Recommended BMPs

The following BMPs are recommended to further prevent and minimize the contamination of stormwater resulting from activities related to the outdoor storage or transfer of solid raw materials, byproducts, or finished products:

- Maintain drainage areas in and around storage areas for solid materials with a minimum slope of 2 percent to prevent pooling and minimize leachate formation. Slope storage areas to drain stormwater to a collection area at the perimeter of the storage area, where it can be collected, or to internal drainage "alleyways" between storage areas, where material is not stockpiled.
- If and when feasible, collect and recycle materials and leachate to the stockpile.
- Stock cleanup materials, such as brooms, dustpans, and vacuum sweepers, near the storage area.
- Keep on hand the minimum amount of materials necessary to prevent large stockpiles and loss of valuable materials through erosion.

3.4.2 BMP 25: Storage and Treatment of Contaminated Soils

This BMP applies to businesses and public agencies that store or treat soils contaminated with toxic organic compounds, petroleum products, or metals.

3.4.2.1 Description of Pollutants

Contaminated soils can be discovered when an environmental audit or investigation is completed or when underground tanks are removed, for instance. The soils may be excavated and transported off the site for treatment via aeration and perhaps chemical stabilization. Stormwater that comes in contact with the contaminated soil can carry those contaminants along with loose dirt into the surface water ultimately receiving drainage water. Potential pollutants of concern include toxic organic compounds, oils and greases, metals, suspended solids, and turbidity from the soil itself. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.4.2.2 Pollutant Control Approach

Businesses and public agencies that store or treat contaminated soil must follow the requirements established by the state Model Toxics Control Act (Washington Administrative Code, Chapter 173-340). The specific handling of contaminated soil depends on the contaminants in the soil and the amount of contamination. In addition, a permit from the Puget Sound Clean Air Agency is required if the treatment method for removing soil contaminants involves forcing air through or sucking air from the soil. Contact the Department of Ecology or the Puget Sound Clean Air Agency for additional information regarding the appropriate pollutant control approach.

3.4.2.3 Required BMPs

The BMPs included here are intended as a supplement to other regulations. The following BMPs or equivalent measures are required of all businesses and public agencies engaged in storage or treatment of contaminated soils:

- Implement all citywide BMPs from Chapter 2.
- Educate employees on these BMPs to prevent contaminated stormwater from leaving the site.
- Cover or enclose the storage area for the contaminated soils and contain it with a curb, dike, or berm constructed around the material storage area if possible.
- Sweep paved storage areas daily or more often as needed. Stock cleanup materials such as brooms, dust pans, and vacuum cleaners near the storage area.

• Regularly inspect and maintain catch basins and other drainage systems on the site to prevent contaminated materials from entering stormwater and leaving the site. Sediment from such cleaning must be disposed of properly in accordance with applicable law, which may include Washington State Dangerous Waste Regulations.

3.4.2.4 Recommended BMPs

Although not required, the following BMP is recommended to further prevent and minimize the contamination of stormwater resulting from activities related to the storage and treatment of contaminated soils:

• Utilize a stormwater treatment device that targets the pollutants of concern for the site.

The use of any treatment BMP must not result in the violation of ground water, surface water, or drinking water quality standards.

3.4.3 BMP 26: Temporary Storage or Processing of Fruits or Vegetables

This BMP applies to businesses and public agencies that temporarily store fruits and vegetables outdoors before processing or sale or that crush, cut, or shred fruits or vegetables for wines, frozen juices, or other food and beverage products.

3.4.3.1 Description of Pollutants

Activities involving the storage or processing of fruits and vegetables can potentially result in the delivery of pollutants to stormwater and the surface water ultimately receiving drainage water. For instance, water that washes the soil and nutrients from fruits and vegetables can have a detrimental effect on the surface water ultimately receiving drainage water. Potential pollutants of concern from all fruit and vegetable storage and processing activities include nutrients, suspended solids, substances that increase BOD, and color. These pollutants must not be discharged to the drainage system or directly into receiving waters.

3.4.3.2 Pollutant Control Approach

Store and process fruits and vegetables indoors or under cover whenever possible. Cover and contain operations and apply good housekeeping and preventive maintenance practices to prevent the contamination of stormwater.

3.4.3.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in the temporary storage or processing of fruits and vegetables:

- Implement all citywide BMPs from Chapter 2.
- Employees must be educated on the benefits and requirements of maintaining a clean processing area. Document and keep all training records.
- No water used to clean produce can enter the drainage system. Minimize the use of water when cleaning produce to avoid excess runoff.
- Sweep paved storage areas daily or more often as needed.
- The processing area must be enclosed in a building or shed, or covered, with provisions for stormwater run-on prevention. Alternatively, it must be paved and sloped to a sanitary sewer drain, holding tank, or process treatment system collection drain, and stormwater run-on protection must be provided for the processing area. If a holding tank is used for the storage of wastewater, the contents must be pumped out before the tank is full and disposed of appropriately to a sanitary sewer or wastewater treatment system.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

3.4.3.4 Recommended BMPs

Although not required, the following BMPs are recommended to further prevent and reduce the contamination of stormwater resulting from the temporary storage or processing of fruits or vegetables:

- Cover storage areas for fruits and vegetables.
- Use one or more of the following treatment BMPs (treatment):
 - Wet pond or wet vault to treat runoff from the storage area
 - Vegetated biofilter to treat runoff from the storage area
 - Catch basin with an appropriate catch basin filter for the targeted pollutants to treat runoff from the storage area. Maintain the filter regularly (weekly or as needed) to prevent plugging.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with storage and processing of vegetables.

3.4.4 BMP 27: Recycling, Wrecking Yard, and Scrap Yard Operations

This BMP includes businesses and public agencies that reclaim various materials for resale or for scrap, such as vehicles, parts of vehicles and equipment, construction materials, metals, beverage containers, and papers. Activities that can generate pollutants include the following: transfer, dismantling, and crushing of vehicles and scrap metal; transfer and removal of fluids; maintenance and cleaning of vehicles, parts, and equipment; and storage of fluids, parts for resale, solid wastes, scrap parts, and materials, equipment, and vehicles that contain fluids.

A spill can be a one-time event, a continuous leak, or frequent small spills. All kinds must be prevented.

3.4.4.1 Description of Pollutants

Potential sources of pollutants include paper, plastic, metal scrap debris, engines, transmissions, radiators, batteries, and other materials that contain fluids or are contaminated with fluids. Other pollutant sources include leachate from metal components, contaminated soil, and eroded soil.

Potential pollutants typically found at vehicle recycling and scrap yards include oils and greases, ethylene glycol, propylene glycol, suspended solids, substances that increase BOD, metals (including mercury), and low (acidic) pH.

An updated guidance document for vehicle recycling facilities by the Department of Ecology is available and posted on the Department of Ecology's stormwater webpage (<u>http://www.ecy.wa.gov/biblio/94146.html</u>).

Facilities may be subject to Department of Ecology's Industrial Stormwater General Permit. If the business or public agency activity requires this permit, refer to Department of Ecology Publication 94-146, *Best Management Practices to Prevent Stormwater Pollution at Vehicle Recycler Facilities* (Ecology 2006), for guidance with the selection of BMPs.

3.4.4.2 Pollutant Control Approach

Minimize exposure of rain and runoff to impound, dismantling, crushing, and storage areas by using cover and containment. In and around these areas, use good housekeeping to minimize the generation of pollutants. Make stormwater pollution prevention BMPs a part of standard operating procedures and the employee training program.

3.4.4.3 Required BMPs

At a minimum, the below BMPs or equivalent measures are required for activities related to recycling, wrecking yard, and scrap yard operations. Additional BMPs

may be required for businesses and public agencies subject to the Department of Ecology's Industrial Stormwater General Permit.

- Implement all citywide BMPs from Chapter 2.
- All fluids should be drained upon arrival.
- If vehicles or vehicle parts are being recycled, everything should be inspected for leakage or potential leaks, promptly fixed, and all spills or releases cleaned up.
- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- Examine operations area weekly or more often as needed for contamination of surfaces; noting date, location, observations, corrective actions, and the manager or staff designee signature.
- Areas used for processing material to be recycled should be designed to stop run-on and contain all fluids that may be spilled or released using cover and containment options such as an enclosed building or roof, and berms or dikes. If there is a sump, dispose of waste properly or recycle accordingly.
- Cover and contain all storage areas using options listed above; label all containers/tanks with its contents; provide secondary containment with overflow protection; and examine the area regularly for contamination of paved and soil surfaces; noting date, location, observations, corrective actions, and the manager or staff designee signature. Handle all dangerous and/or hazardous materials and waste in accordance with King County and Ecology's requirements.
- Crushing activities should occur after all fluids have been removed; angle the crusher to allow fluids to drain, as necessary; empty the fluids when 75 percent full and the crusher is not in operation. All mercury switches must be removed before the vehicle is crushed. All runoff should be discharged to the sanitary sewer, with King County approval.
- Whenever possible, inventoried spare parts should be kept under cover or in an enclosed area.
- Cleanup leaks and spills as they occur.

Dangerous solid wastes must be stored and handled according to special guidelines and may require a permit. Businesses and public agencies that store dangerous wastes must follow specific regulations outlined by the Department of Ecology and, in some cases, King County. For the specific requirements and permitting information, contact the Department of Ecology at (360) 407-6300 and King County.

3.4.5 BMP 28: Outdoor Portable Container Storage

Steel and plastic drums with capacities of 55 gallons or less are typically used at industrial facilities for container storage of liquids and powders. The BMPs specified below apply to businesses and public agencies that keep containers on premises that may include, but are not limited to any of the following; accumulated food wastes, vegetable or animal grease, used automotive fluids, liquid feedstock or cleaning compounds, chemicals, or dangerous wastes (liquid or solid), and contaminated stormwater.

3.4.5.1 Description of Pollutants

Leaks and spills during handling and storage of potential dangerous or hazardous waste or food waste are the primary sources of pollutants. Potential pollutant constituents are oils and greases, low (acid) or high (alkaline) pH, surfactants, substances that increase BOD, substances that increase COD and toxic organic compounds.

Businesses and public agencies that treat, store, or dispose of dangerous wastes at a level that makes the facility a "TSD" facility must be permitted by the Department of Ecology. These facilities are regulated according to specific requirements, which may include the need for an NPDES permit. Detailed BMPs for the treatment, storage, or disposal of dangerous wastes at a "TSD facility" are not included in this manual because site requirements for these facilities are beyond the level of typical BMP applications.

3.4.5.2 Pollutant Control Approach

The pollutant control strategy for containers of liquid, food, or dangerous waste is to store containers in designated areas where any potential stormwater contamination can be minimized and managed and to be prepared for potential spills or leaks from these containers.

3.4.5.3 Required BMPs

The following required BMPs apply to all portable containers:

- Implement all citywide BMPs from Chapter 2.
- Wherever possible, store containers on a paved surface under a roof or other appropriate cover or in a building.
- Store materials in a leak-proof container with a tight-fitting lid.
- All containers must have labels identifying their contents. Apply labels and position containers so labels are clearly visible. If the material is hazardous waste it should have a hazardous waste label.
- Place drip pans beneath all taps on mounted containers and at all potential drip and spill locations during the filling and unloading of containers.
- Inspect container storage areas regularly for corrosion, structural failure, spills, leaks, overfills, and failure of piping systems. Check containers

daily for leaks and spills. Replace containers, and replace and tighten bungs in drums as needed.

- Secure drums in a manner that prevents accidental spillage, pilferage, or any unauthorized use (Figure 22 and Figure 23).
- Place containers mounted for direct removal of a liquid chemical for use by employees inside a containment area as described above. Use a drip pan during liquid transfer (Figure 24).



Figure 22. Covered and Secured Storage Area for Containers.



Figure 23. Containers Surrounded by a Berm in an Enclosed Area.



Figure 24. Mounted Container with a Drip Pan.

The following BMPs or equivalent measures are required for activities related to hazardous or dangerous material containers:

- Provide covered secondary containment. Alternatively, the storage area may be paved and surround by a berm or dike and covered. The dike must be high enough to hold a volume of either 10 percent of the total volume of the enclosed containers or 110 percent of the volume of the largest container, whichever is greater, or if a single container, 110 percent of the volume of that container. The area must be sloped to drain into a dead-end sump for the collection of leaks and small spills.
- Dangerous wastes that do not contain free liquids must be stored in a designated sloped area with the containers elevated or otherwise protected from stormwater run-on.
- Ensure that the storage of reactive, ignitable, or flammable liquids complies with the Seattle Fire Code and Uniform Fire Code.
- Keep containers with dangerous waste inside a building unless this is impractical due to site constraints or the requirements of the Seattle Fire Code or Uniform Fire Code.

If the material is a dangerous waste, the property owner must comply with any additional requirements of the Department of Ecology.

3.4.5.4 Recommended BMPs

The following BMPs are recommended to further prevent and reduce the contamination of stormwater resulting from the storage of liquid, hazardous, or dangerous waste containers:

- For containers containing liquids that are not dangerous or hazardous, provide secondary containment.
- Keep the minimum amount of materials necessary on hand to prevent large quantities of liquids on site.

3.4.6 BMP 29: Storage of Liquids in Permanent Aboveground Tanks

This BMP applies to businesses and public agencies that have on their premises aboveground tanks that contain liquids (excluding uncontaminated water). These tanks may be equipped with a valved drain, vent, pump, and bottom hose connection, and they may be heated with steam heat exchangers equipped with steam traps. These include, but are not limited to: commercials aboveground heating oil tanks, cement silos and gasoline and diesel tanks.

3.4.6.1 Description of Pollutants

Pollutants sources include leaks and spills that can occur at connections and during liquid transfer. Oils and greases, organic compounds, acids, alkalis, and metals in tank water and condensate drainage can also result in stormwater contamination at storage tanks.

3.4.6.2 Pollutant Control Approach

To prevent stormwater contamination, install secondary containment or a doublewalled tank. Add safeguards against accidental releases, including guards around the tanks to protect them from vehicle or forklift damage, and place tags on valves to reduce human error. Design containment areas around the tank so that potential stormwater contamination can be minimized and managed.

Tank water and condensate discharges are process wastewater that may require an NPDES permit. Contact the Department of Ecology at (425) 649-7000 to determine whether an NPDES permit is necessary or to obtain an NPDES permit application.

3.4.6.3 Required BMPs

The following BMPs or equivalent measures are required for activities related to the storage of liquids in permanent aboveground tanks:

- Implement all citywide BMPs from Chapter 2.
- Locate and design tanks to prevent and minimize stormwater contamination:
 - Locate permanent tanks in an impervious (portland cement concrete or equivalent) secondary containment area.
 - Surround the secondary containment area with dikes (as illustrated in Figure 25) or provide double walled tanks approved by the Underwriters Laboratory (UL). Design the dike to be of sufficient height to provide a containment volume of either 10 percent of the total volume of the enclosed tanks or 110 percent of the volume of the largest tank, whichever is greater, or if a single tank, 110 percent of the volume of that tank.



Figure 25. Aboveground Storage Tank with Secondary Containment.

- Secondary containment must be emptied regularly to prevent contaminated liquid from overflowing into the drainage system.
- If the tank containment area is not covered, equip the outlet from the spill-containment sump with a shutoff valve, which is normally closed. The valve should only be opened to convey contaminated stormwater to an approved treatment system or disposal facility or to convey uncontaminated stormwater to a storm drain.
- Place adequately sized drip pans beneath all mounted taps and locations where drips and spills might occur during the filling and unloading of tanks.
- Include a tank overfill protection system to minimize the risk of spillage during loading.

Evidence of contamination can include a visible sheen, color, or turbidity in the runoff, or existing or historical operational problems at the facility.

- Implement the following maintenance activities to prevent and minimize stormwater contamination:
 - Inspect tank containment areas regularly to identify problems (e.g., cracks, corrosion, leaks) with components such as fittings, pipe connections, and valves. Replace or repair tanks that are leaking, corroded, or otherwise deteriorating. Document and keep all inspection records.
 - Sweep and clean the tank storage area regularly.

 At petroleum tank farms, convey stormwater contaminated with floating oil or debris through an API or coalescing plate oil/water separator or other approved treatment system prior to discharge to the sanitary sewer.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

3.4.6.4 Recommended BMPs

The following BMPs are recommended for activities related to the storage of liquids in permanent aboveground tanks:

- Locate and design tanks to prevent and minimize stormwater contamination
- Slope the secondary containment to drain to a dead-end sump, or equivalent, for the collection of small spills.

3.4.7 BMP 30: Parking Lot Maintenance and Storage of Vehicles and Equipment

This BMP applies to businesses and public agencies that own or operate public and commercial parking lots and sidewalks, such as those associated with retail stores, apartment buildings, fleet vehicles (including car rental lots and car dealerships), and equipment sale and rental facilities. It also includes properties where vehicles or equipment are stored outside.

3.4.7.1 Description of Pollutants

Potential pollutants produced by the parking and storage of vehicles and equipment include petroleum hydrocarbons and other organic compounds, oils and greases, metals, and suspended solids.

3.4.7.2 Pollutant Control Approach

Prevent stormwater contamination by avoiding and reducing washing. Do not use soap or other chemicals unless the area drains to a sanitary sewer. When washwater is discharged to the sanitary sewer, check if pre-treatment is necessary before being discharged.

Despite what is on a product label, the term biodegradable does not mean that the product is safe or environmentally friendly. The product may degrade eventually, but can be harmful to the environment.

3.4.7.3 Required BMPs

The following BMPs or equivalent measures are required for activities related to the parking and storage of vehicles and equipment:

- Implement all citywide BMPs from Chapter 2.
- Sweep or vacuum parking lots, storage areas, sidewalks, and driveways regularly to collect dirt, waste, and debris and dispose as solid waste.
- Do not hose down or pressure wash areas that drain to a storm drain or to the surface water ultimately receiving drainage water.
- If a parking lot must be washed, discharge the washwater to a sanitary sewer or other approved wastewater treatment system, if allowed by SPU and/or King County, or collect it for offsite disposal. Cover storm drains to prevent washwater from entering the surface water ultimately receiving drainage water.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

- Make sure all outside materials that have the potential to leach or spill to the drainage system are covered, contained, or moved to an indoor location.
- An oil removal system such as an API or coalescing plate oil/water separator, catch basin filter, or equivalent BMP that is approved by SPU is required for parking lots that meet the threshold vehicle traffic intensity of a high-use site. Refer to Volume 3, the Stormwater Flow Control and Water Quality Treatment Technical Requirements Manual for information on traffic intensity thresholds. If a catch basin filter is used, maintain the filter regularly (weekly or as needed) to prevent plugging.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with parking lot maintenance.

3.5 Dust, Soil, and Sediment Control

Construction, manufacturing, and industrial activities have the potential to generate significant amounts of dust, soil, and sediment, which can pollute both air and stormwater. Control measures for dust, soil, and sediment are necessary to prevent pollution, but BMPs that are not properly implemented can be harmful to stormwater and the environment.

The required and recommended BMPs for these activities are presented below. First prevent the production of dust, soil, and sediment. Then implement BMPs to minimize their production. Finally, manage dust, soil, and sediment so that contaminated stormwater is not conveyed to storm drains or the surface water ultimately receiving drainage water.

Remember to also implement all required citywide BMPs from Chapter 2.

3.5.1 BMP 31: Dust Control in Disturbed Land Areas and on Unpaved Roadways and Parking Lots

This BMP applies to businesses and public agencies that pursue dust control measures in disturbed land areas or on unpaved roadways and parking lots. All land-disturbing activity must comply with the erosion and sediment controls described in the Stormwater Code (SMC Chapters 22.800 – 22.808).

3.5.1.1 Description of Pollutants

Dust can result in air and water pollution, particularly at demolition sites, in disturbed land areas, and on unpaved roadways and parking lots. Chemicals applied to dust-prone areas to minimize dust production also have the potential to pollute stormwater and the surface water ultimately receiving drainage water if they are not properly selected or applied.

3.5.1.2 Pollutant Control Approach

Minimize dust generation and apply environmentally friendly and governmentapproved dust suppressant chemicals, if necessary.

The use of motor oil or other oils for dust control on unpaved roadways and parking lots is prohibited.

3.5.1.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities that generate dust:

- Implement all citywide BMPs from Chapter 2.
- Street gutters, sidewalks, driveways, and other paved surfaces in the immediate area of the demolition must be swept regularly to collect and properly dispose of loose debris and garbage.
- Install catch basin filters onsite and in surrounding catch basins to collect sediment and debris. Maintain the filters regularly (weekly or as needed) to prevent plugging.
- Oil should never be used for dust control.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with parking lot maintenance.

3.5.1.4 Recommended BMPs

Although not required, the following BMPs can provide additional protection against pollution resulting from demolition activities:

- Water should be sprayed to help control dust from soil, concrete dust, and paint chips. The amount of water should be controlled so that runoff from the site does not occur, yet dust control is achieved.
- An amended soil and landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil and landscape system with adequate depth, permeability, and organic matter to both minimize soil loss and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle (see BMP 20 Landscaping and Lawn and Vegetation Management).

BMPs required for dust control, such as dust suppression by water spray, as shown in Figure 26, are provided in Volume 2, the Construction Stormwater Control Technical Requirements Manual.



Figure 26. Dust Suppression by Water Spray.

3.5.2 BMP 32: Dust Control at Manufacturing Sites

This BMP applies to all businesses and public agencies, but particularly industrial and manufacturing facilities that have the potential to generate dust, including gravel, crushed rock, cement, fly ash, and other airborne pollutants.

3.5.2.1 Description of Pollutants

Industrial material handling activities can generate a considerable amount of dust, which is typically removed by means of exhaust systems. The exhaust systems can generate air emissions and can contaminate stormwater. Dusts can be generated by mixing cement and concrete products and handling powdered materials. Particulate materials of concern to air pollution control agencies include sawdust, boiler fly ash, and dust from grain, coal, gravel, crushed rock, and cement.

3.5.2.2 Pollutant Control Approach

Prevent dust generation and emissions where feasible. Regularly clean up dust that can contaminate stormwater, and convey dust-contaminated stormwater to a proper treatment system.

3.5.2.3 Required BMPs

The following BMPs or equivalent measures are required of all businesses and public agencies engaged in activities that can generate dust:

- Implement all citywide BMPs from Chapter 2.
- Clean accumulated dust and residue from powdered material handling equipment and vehicles each day or more often as needed.
- Maintain onsite controls so that no vehicle track-out occurs.
- Regularly sweep areas of accumulated dust that can contaminate stormwater. Sweeping should be conducted with vacuum-filter equipment to minimize dust generation and ensure optimal dust removal.
- Maintain dust collection devices on a regular basis.

Facility operations that create or have the potential to create air pollution are regulated by the Puget Sound Clean Air Agency. For more information on necessary permits, contact the Puget Sound Clean Air Agency at (800) 552-3565.

3.5.2.4 Recommended BMPs

Although not required, the following BMPs can provide additional pollution protection for dust-generating areas:

 In manufacturing operations, train employees to carefully handle powders to prevent the generation of dust.

- Use dust filtration/collection systems such as baghouse filters or cyclone separators, to control vented dust emissions that could contaminate stormwater.
- Use a water spray to flush dust accumulations to the sanitary sewer where allowed by SPU and/or King County or to another appropriate treatment system.
- For removal of suspended solids in stormwater, use sedimentation basins, wet ponds, wet vaults, catch basin filters, vegetated filter strips, or other appropriate settling system. Maintain all settling systems to prevent plugging.
- An amended soil and landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil and landscape system with adequate depth, permeability, and organic matter to both minimize soil loss and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle (see BMP 20 Landscaping and Lawn and Vegetation Management).

Use approved dust suppressants such as those listed in the Department of Ecology Publication 96-433, *Techniques for Dust Prevention and Suppression* (Ecology 1996). Application of some products may not be appropriate near the surface water ultimately receiving drainage water or conveyances close to the surface water ultimately receiving drainage water. For more information, check with the Department of Ecology Northwest Regional Office.

3.5.3 BMP 33: Soil Erosion and Sediment Control at Industrial Sites

This BMP applies to business and public agency industrial facilities that operate in or near areas with exposed or disturbed soils or areas with steep grades. For information or construction related soil erosion and sediment control, reference the Construction Stormwater Control Technical Requirements Manual.

3.5.3.1 Description of Pollutants

Industrial activities in areas with exposed or disturbed soils or areas with steep grades can be sources of sediments that can contaminate stormwater runoff.

3.5.3.2 Pollutant Control Approach

Limit the exposure of erodible soil. Stabilize or cover erodible soil where necessary to prevent erosion, and/or provide treatment for stormwater that is contaminated with suspended solids.

3.5.3.3 Required BMPs

Implement one or more of the following cover practices:

- Implement all citywide BMPs from Chapter 2.
- Vegetative cover, such as grass, trees, or shrubs, in erodible soil areas
- Covering with mats, such as clear plastic, jute, or synthetic fiber
- Preservation of natural vegetation, including grass, trees, shrubs, and vines
- As an alternative to the above BMPs, one or more of the following source control BMPs can also be implemented: a vegetated swale, dike, silt fence, check dam (Figure 27), gravel filter berm, sedimentation basin, or proper grading.

Washington State Water Quality Standards have specific limits on turbidity discharges. For specific information, reference WAC Chapter 173-201A.

3.5.3.4 Recommended BMPs

• An amended soil and landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil and landscape system with adequate depth, permeability, and organic matter to both minimize soil loss and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle (see BMP 20 Landscaping and Lawn and Vegetation Management).



Figure 27. Hydroseeding Applied for Erosion Control.

3.6 Other Activities

Several activities that do not fall into the previously described categories have a high risk for generating pollutants and contaminating stormwater and receiving waters. The required and recommended BMPs for these activities are presented below, according to the type of activity and the potential pollutants. Regardless of the activity, an overall approach to pollutant control should first emphasize pollution prevention, then the minimization of pollution, followed by pollution management.

Remember to also implement all required citywide BMPs from Chapter 2.

3.6.1 BMP 34: Commercial Animal Care and Handling

This BMP applies to businesses and public agencies that perform animal care and handling including the management of animals at racetracks, kennels, day kennels, fenced pens, and veterinary offices and hospitals. It encompasses businesses or public agencies that provide boarding services for horses, dogs, cats, and other animals.

3.6.1.1 Description of Pollutants

Examples of animal handling activities that can generate pollutants are the cleanup of manure deposits, animal washing, and grazing. Potential pollutants include coliform bacteria, nutrients, soap, substances that increase BOD and suspended solids.

3.6.1.2 Pollutant Control Approach

The approach to pollutant control is to prevent, to the maximum extent practical, the discharge of contaminated stormwater from animal handling and boarding areas.

3.6.1.3 Required BMPs

The following source control BMPs or equivalent measures are required for all commercial animal handling activities:

- Implement all citywide BMPs from Chapter 2.
- Regularly sweep and clean animal-holding areas to collect and properly dispose of droppings, uneaten food, and other potential stormwater contaminants.
- If storm drains are in areas where animals are concentrated, close these drains and redirect water or cover area to prevent contact with stormwater.
- Do not hose down areas that contain potential stormwater contaminants if the water will drain to storm drains or the surface water ultimately receiving drainage water or allow washwater to be discharged to storm drains/receiving water without proper treatment.
- If animals are not leashed or in cages, the animal-keeping area must be surrounded by a fence or other means of preventing animals from moving out of the controlled area where BMPs are used.
- For outside surface areas that must be disinfected, use an unsaturated mop to spot clean the area. Do not allow wastewater runoff to enter the stormwater drainage system.

3.6.1.4 Recommended BMPs

Areas where animals are kept or exercised should be located where runoff will infiltrate and will not flow to catch basins or street drains.

3.6.2 BMP 35: Log Sorting and Handling

This BMP applies to businesses and public agencies with paved or unpaved areas where logs are transferred, sorted, debarked, cut, and stored to prepare them for shipment or for the production of dimensional lumber, plywood, chips, poles, or other products. Log yards are generally maintained at sawmills, shipping ports, and pulp mills.

3.6.2.1 Description of Pollutants

Typical pollutants resulting from log sorting and handling include oils and greases, substances that increase BOD, solids that can settle to the bottom of a water body or stream, suspended solids (including soil), high (alkaline) and low (acidic) pH, metals, pesticides, wood-based debris, and leachate.

The following specific log sorting and handling activities or areas are pollutant sources:

Logs

- Storage, rollout, sorting, scaling, and cutting areas
- Loading areas
- Debarking, bark bin and conveyor areas
- Bark, ash, sawdust, wood debris piles, and other solid wastes.

Vehicles

- Access areas for trucks, rail cars, ships, stackers, and loaders
- Log trucks, stackers, loaders, forklifts, and other heavy equipment
- Cleaning areas for vehicles, parts, and equipment.

Other Related Sources

- Metal salvage areas
- Maintenance shops and parking areas
- Storage and handling areas for hydraulic oils, lubricants, fuels, paints, liquid wastes, and other liquid materials
- Pesticide use for log preservation and surface protection or application of herbicides for weed control
- Contaminated soil resulting from leaks or spills of fluids.

3.6.2.2 Pollutant Control Approach

Implement good housekeeping practices, preventive maintenance, and utilize cover and containment BMPs in and around work areas.

3.6.2.3 Required BMPs

The following BMPs or equivalent measures are required for log sorting and handling activities:

• Implement all citywide BMPs from Chapter 2.

To prevent or reduce the erosion of soil and the generation of wood waste, bark debris, and leachate:

- Pave the high activity areas where practical to facilitate cleaning. Slope to minimize the formation of leachate and ponding under piles, and contact between bark/wood and stormwater.
- If feasible, cover the piles with roofs, buildings, canopies, silos, van trailers, sheds, or tarps to prevent contact with stormwater.
- Sweep and clean all areas.

Industries with log yards are required to obtain an NPDES Industrial Stormwater General Permit from the Department of Ecology for discharges to surface water of stormwater associated with industrial activities. Required and recommended source control and treatment BMPs are described in detail in Department of Ecology Publication 04-10-031, *Industrial Stormwater General Permit Implementation Manual for Log Yards* (Ecology 2004).
3.6.3 BMP 36: Boat Building, Mooring, Maintenance, and Repair

This BMP applies to businesses and public agencies that perform activities related to boat and shipbuilding and their repair and maintenance at boatyards, shipyards, ports, and marinas include pressure washing, surface preparation, paint removal, sanding, painting, engine maintenance and repairs, and material handling and storage. If conducted outdoors, all of these activities are associated with a high risk for contaminating water resources.

3.6.3.1 Description of Pollutants

Potential pollutants include spent abrasive grits, solvents, oils, ethylene glycol, washwater, paint overspray, cleaners and detergents, anticorrosion compounds, paint chips, scrap metal, welding rods, resins, glass fibers, dust, and miscellaneous trash. Pollutant constituents include suspended solids, oils and greases, organic compounds, copper, lead, tin, and zinc.

3.6.3.2 Pollutant Control Approach

Implement good housekeeping practices, preventive maintenance, and utilize cover and containment BMPs in and around work areas.

3.6.3.3 Required BMPs

Activities associated with boatyard and shipyard operations may require an NPDES permit from the Department of Ecology. Call (425) 649-7000 to determine if your site activities trigger permit coverage.

The following BMPs or equivalent measures are required for **boat and ship maintenance and repair activities**:

- Implement all citywide BMPs from Chapter 2.
- In addition to the City-wide spill control requirement, shipyards and boatyards must also include a marine containment boom in their spill kit.
- Spill kits must be located on all piers or docks.
- Immediately clean up any spills on dock, boat, or ship deck areas and dispose of the wastes properly.
- Immediately repair or replace leaking connections, valves, pipes, hoses, and equipment that can result in the contamination of stormwater.
- For maintenance and repair activities that can be moved onshore, relocate them to reduce the potential for direct pollution of receiving waters.
- Perform paint and solvent mixing, fuel mixing, and similar handling of liquids onshore or in a location with proper containment in which nothing can spill directly into receiving waters.

- Drain oil filters before disposal or recycling.
- Properly dispose of greasy rags, oil filters, air filters, batteries, spent coolant, and degreasers.
- All liquids stored over water or on docks must have covered secondary containment.
- Store all batteries, motors, and other oily parts in a covered container with a tight fitting lid.
- Store materials such as paints, tools, and ground cloths indoors or in a covered area when not in use.
- Collect spent abrasives regularly and contain and store them under cover until they can be disposed of properly.
- At least once each week or more often as needed, sweep and clean yard areas, docks, and boat ramps. Do not hose them down and properly dispose of the collected materials. Sweep dry docks before flooding.
- When washing a boat in the water, use no soaps or detergents. Brush the hull with water only.

Despite what is on the label, the term biodegradable does not mean that the product is safe or environmentally friendly. The product may degrade eventually, but can be harmful to the environment.

• Use fixed platforms with appropriate plastic or tarpaulin barriers as work surfaces and for containment when work is performed on a vessel in the water to prevent material or overspray from contacting stormwater or the receiving water. Use of the platform approach should be kept to a minimum. Only work that is done in compliance with NPDES requirements should be done over water.

The following BMPs or equivalent measures are required for **boat and ship blasting and spray painting activities**:

- Move the activity indoors if possible.
- Store materials such as paints, tools, and ground cloths indoors or in a covered area when not in use.
- Contain blasting and spray painting activities by hanging tarpaulins to block the wind and prevent dust and overspray from escaping. Do not perform uncontained spray painting, blasting, or sanding activities over open water without proper protection (e.g., overspray collection, drop clothes, booms).
- Use plywood and/or plastic sheeting to cover open areas between decks when sandblasting.

- Use ground cloths to collect drips and spills during painting and finishing operations, and paint chips, and used blasting sand during sand blasting.
- Do not paint or use spray guns on or above the deck.

The following BMPs or equivalent measures are required for activities related to **bilge and ballast water and the disposal of waste and spillage**:

- Collect bilge and ballast water and any water with an oily sheen for proper disposal. Do not discharge it on land or in the water.
- Use plastic or tarpaulin barriers beneath the hull and between the hull and drydock walls to contain and collect waste and spent materials.
- Convey sanitary sewage to pump-out stations, portable onsite pump-outs, or commercial mobile pump-out facilities or other appropriate onshore facilities. Do not discharge sewage into the water.
- Direct deck drainage to a collection system sump for settling and/or additional treatment.
- Do not dump or pour waste materials down floor drains, sinks, or outdoor storm drain inlets that discharge to surface water. Plug or block off floor drains connected to storm drains or surface water. If necessary, install a sump that is pumped regularly.

In the event of an accidental discharge of oil or hazardous material into waters of the state or onto land if there is a potential for entry into state waters, the responsible part must meet all notification requirements including but not limited to notifying the yard, port, or marina owner or manager; the Department of Ecology Northwest Regional Office at (425) 649-7000; and the National Response Center at (800) 424-8802 (24-hour). If the spill can reach or has reached marine water, call the U.S. Coast Guard at (206) 217-6232.

3.6.3.4 Recommended BMPs

Although not required, the following BMPs are encouraged to further reduce the potential for stormwater contamination:

- Select the least toxic antifouling paint available.
- Routinely clean boat interiors and properly dispose of collected materials so that accumulated water, which must be drained from the boat, does not become contaminated.
- Use sanders that have dust-containment bags and avoid sanding in windy conditions.
- Recycled all used oil, if feasible.
- Check with marinas for other BMPs they have developed.

- For marinas, in addition to the citywide spill control requirement, add a marine containment boom to the spill kit.
- Use one of the following treatment BMPs when paint chips or blasting grit are present in the work area:
 - Catch basin filter
 - Filtration with media designed for the pollutants that are present.
- If a catch basin filter is used, maintain the filter regularly (weekly or as needed) to prevent plugging.

Catch basin filters only remove solids and do not provide treatment for other pollutants associated with boat building and repair.

3.6.4 BMP 37: Logging and Tree Removal

This BMP applies to businesses and public agencies that perform logging operations that fall under the Washington State Forest Practices Act category of Class IV general forest practices. This category consists of situations in which timber harvesting is performed in the process of converting forest lands into other land uses, such as the construction of homes and businesses.

3.6.4.1 Description of Pollutants

Stormwater runoff from bare ground can pick up dirt and other pollutants. This material can clog ditches and stream channels, thereby reducing carrying capacity and increasing flooding, and smothering fish spawning beds. Controlling runoff and not allowing it to leave the site or leave the site at controlled velocities can reduce these harmful effects.

Pollutants of concern include suspended solids, oils and greases, substances that increase BOD, nutrients, organic compounds, and heavy metals and turbidity.

Compliance with the Department of Ecology's NPDES permit requirements, and applicable requirements of the Washington State Department of Natural Resources and local ordinances for sensitive areas, critical areas, and wetlands, must be demonstrated before logging may be performed.

3.6.4.2 Pollutant Control Approach

Maintain required buffers adjacent to critical areas, including streams and wetlands. Keep sediments from leaving the site and out of receiving waters and off paved areas.

3.6.4.3 Required BMPs

The following BMPs or equivalent measures are required for all logging practices:

- Implement all citywide BMPs from Chapter 2.
- If there are sensitive features on the site, preserve vegetation along stream corridors and adjacent to other receiving waters and wetlands. Maintenance of a vegetated buffer enables filtration of most of the pollutants of concern for this activity. Follow the specific requirements for buffer setbacks.
- Ensure that logging access roads have an entrance with a crushed rock or spall apron construction where they join the pavement to prevent sediments from being tracked onto the pavement, as shown in Figure 28.
- If there is the potential for erosion, refer to the Construction Stormwater Control Technical Requirements Manual.



Figure 28. Quarry Spall Apron at Logging Access Road to Prevent Vehicles from Tracking Sediments.

3.6.4.4 Recommended BMPs

Although not required, the following BMPs can further prevent stormwater contamination due to logging activities:

- Avoid logging on steep slopes to reduce the potential for erosion.
- If access roads are constructed for logging, provide them with drainage ditches that divert runoff into vegetated areas or stormwater treatment systems.
- To the extent practical, retain understory vegetation during logging and tree removal.
- Retain a perimeter buffer, or with sufficient lead time to allow effective growth, plant vegetated buffers down slope of proposed logging areas, in areas where they have already been lost.

3.6.5 BMP 38: Mining and Quarrying of Sand, Gravel, Rock, Peat, Clay, and Other Materials

This BMP applies to businesses and public agencies that perform surface excavation and associated onsite storage of sand, gravel, and other mined materials.

3.6.5.1 Description of Pollutants

Pollutants of concern are suspended solids, nutrients, pH, and metals.

3.6.5.2 Pollutant Control Approach

Provide containment and/or cover for any onsite storage areas to prevent stormwater run-on and discharge of suspended solids and other pollutants.

3.6.5.3 Required BMPs

All mining operations that have stormwater runoff from the site are required to apply for an NPDES Industrial Stormwater General Permit from the Department of Ecology. This permit requires specific BMPs. Some additional BMPs that will help in achieving the Department of Ecology's discharge performance standards are listed below.

• Implement all citywide BMPs from Chapter 2.

A permit is needed to conduct grading activities in Seattle. For information about grading permits, call the Seattle Department of Planning and Development, Applicant Services Center, at (206) 684-8850.

3.6.5.4 Recommended BMPs

In addition to the requirements of an NPDES permit, the following BMPs are recommended to further reduce the potential for stormwater contamination:

- If the material is appropriate, use excavated spoil material to form compacted berms along the down slope sides of the site to contain runoff.
- Seed berms to promote the growth of grass or other vegetation to limit erosion from the berms. Evaluate safety issues related to the prevention of flooding due to berm failure.
- Seed semi-permanent stockpiles to promote vegetation growth to limit erosion from the stockpiles.
- To clean up runoff before it leaves the site, use water quality wet ponds to promote the settling of suspended solids, or infiltration basins.
- If there is a potential for contaminated stormwater to leave the site, use anchored tarpaulins to cover stockpiles at small-scale mining operations.

3.6.6 BMP 39: Cleaning and Maintenance of Swimming Pools and Spas

This BMP applies to all public and commercial swimming pools and spas. Pools and spas at hotels, motels, apartments, and condominium complexes are also covered.

3.6.6.1 Description of Pollutants

Pollutants of concern include nutrients, suspended solids, chlorine, pH, and substances that increase COD.

3.6.6.2 Pollutant Control Approach

Dispose of pool or spa water to the sanitary sewer, if approved by SPU and/or King County.

3.6.6.3 Required BMPs

The following BMPs or equivalent measures are required for all swimming pool and spa cleaning and maintenance activities.

- Implement all citywide BMPs from Chapter 2.
- Discharge the water to the sanitary sewer.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater from swimming pool and spa cleaning and maintenance activities may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

- If chlorine levels do not exceed 3 parts per million, state law allows discharges of pool water to the ground, although not to a receiving water or drainage system. Discharge must be slow enough to allow infiltration of all water into the ground and not produce surface runoff.
- If discharge to the sanitary sewer is not possible, pool and spa water may be discharged to a ditch or drainage system, provided that the water has been de-chlorinated first. Neutralizing chemicals are available for dechlorinating water. Use a test kit to determine if the chlorine concentration has reached zero. If this option is used, you must first call the SPU Water Quality Hotline at (206) 684-7587 for prior approval.
- Diatomaceous earth used in pool filters cannot be discharged to receiving waters, drainage systems, septic systems, or the ground.

3.6.6.4 Recommended BMPs

Although not required, the following BMPs can further help to reduce the potential for stormwater contamination:

• Hire a professional pool-draining service to collect all pool water for offsite disposal.

3.6.7 BMP 40: Deicing and Anti-icing Operations for Airports and Streets

This BMP applies to businesses and public agencies that perform deicing and anti-icing operations used on highways, streets, airport runways, and aircraft to control ice and snow.

3.6.7.1 Description of Pollutants

Typically ethylene glycol and propylene glycol are used on aircraft as deicers. The deicers commonly used on highways and streets include calcium magnesium acetate, calcium chloride, magnesium chloride, sodium chloride, urea, and potassium acetate.

Deicing and anti-icing chemicals become pollutants when they are conveyed to storm drains or to surface water after application. Leaks and spills of these chemicals can also occur during their handling and storage.

3.6.7.2 Pollutant Control Approach

Discharges of spent glycol in aircraft application areas are process wastewaters regulated under the Department of Ecology NPDES permit. (Contact the Department of Ecology Northwest Regional Office for details.) BMPs for aircraft deicers and anti-icers must be consistent with aviation safety requirements and the operational needs of the aircraft operator.

On streets and highways, apply minimal amounts of deicers and anti-icers and promptly clean up accumulated materials and grit.

3.6.7.3 Required BMPs

The following BMPs or equivalent measures are required for deicing and antiicing activities related to aircraft:

- Implement all citywide BMPs from Chapter 2.
- Conduct aircraft deicing and anti-icing applications in impervious containment areas. Collect spent deicing liquids (e.g., ethylene glycol) and anti-icing chemicals (e.g., urea) that drain from aircraft in deicing or anti-icing application areas and convey them to a sanitary sewer, treatment, or other approved disposal or recovery method. Divert runoff of deicing chemicals from paved gate areas to appropriate collection areas or conveyances for proper treatment or disposal.
- Do not allow spent deicing and anti-icing chemicals or stormwater contaminated with aircraft deicing or anti-icing chemicals to be discharged directly or indirectly from application areas, including gate areas, to surface water or ground water.

Discharges to the sanitary sewer are regulated by the King County Industrial Waste Program. In some cases, contaminated stormwater may need to be pretreated before it is discharged to the sanitary sewer. For approval before discharging washwater to the sanitary sewer, contact the Industrial Waste Program at (206) 263-3000.

• Transfer deicing and anti-icing chemicals on an impervious containment pad, or an equivalent spill/leak containment area, and store them in secondary containment areas.

The following BMPs or equivalent measures are required for deicing and antiicing activities related to runways and taxiways:

- Select deicers and anti-icers that result in the least adverse environmental impact. Apply only as needed using minimum quantities.
- Collect any excess fluid and dispose of properly.

The following BMPs or equivalent measures are required for deicing and antiicing activities related to streets and highways:

- Select deicers and anti-icers that result in the least adverse environmental impact. Apply only as needed using minimum quantities.
- Where feasible and practical, use roadway deicers, such as calcium magnesium acetate, potassium acetate, or similar materials that cause less adverse environmental impact than urea, and sodium chloride.
- Increase maintenance of stormwater structures as necessary.
- Store and transfer deicing and anti-icing materials on an impervious containment pad in accordance with the BMPs in Section 3.4.1, BMP 24 Outdoor Storage or Transfer of Solid Raw Materials, Byproducts, or Finished Products.
- Sweep or clean up accumulated deicing and anti-icing materials and grit from roads as soon as possible after the road surface clears.

3.6.7.4 Recommended BMPs

Although not required, the following BMPs are recommended to further reduce the potential for the contamination of stormwater and the surface water ultimately receiving drainage water:

Aircraft

 Establish a centralized aircraft deicing and anti-icing facility, if feasible and practical, or conduct deicing and anti-icing in designated areas of the tarmac equipped with separate collection drains for the spent deicing liquids. • Consider installing a recovery system for aircraft deicing and anti-icing chemicals, or contract with a chemical recycler, if practical.

Airport Runways and Taxiways

- Include limits on toxic materials and phosphorus in the specifications for deicers and anti-icers, where applicable.
- Consider using anti-icing materials rather than deicers if they will result in less adverse environmental impact.
- Select cost-effective deicers and anti-icers that cause the least adverse environmental impact.

Streets and Highways

- Intensify roadway cleaning in early spring to help remove particulates from road surfaces.
- Include limits on toxic metals in the specifications for deicers and anti-icers.

3.6.8 BMP 41: Maintenance and Management of Roof and Building Drains at Manufacturing and Commercial Buildings

This BMP applies to businesses and public agencies that maintain the roofs and sides of manufacturing and commercial buildings, which can be sources of pollutants when stormwater runoff results in the leaching of roofing materials, materials from building vents, and air emissions. Flaking paint and caulking can also be a source of pollutants.

3.6.8.1 Description of Pollutants

Vapors and entrained liquid and solid droplets and particles have been identified as potential pollutants in roof and building runoff. The pollutants identified include metals, solvents, low (acidic) and high (alkaline) pH, substances that increase BOD, and organic compounds. Flaking paint or caulking may be a source of metals and organic compounds.

3.6.8.2 Pollutant Control Approach

Evaluate the potential sources of stormwater pollutants and apply source control BMPs. Keep paint and caulking in good repair, disposing of chipped or flaked material as solid waste.

3.6.8.3 Required BMPs

The following BMPs or equivalent measures are required for all commercial and manufacturing buildings to prevent and reduce stormwater pollution:

- Implement all citywide BMPs from Chapter 2.
- If leachates or emissions from buildings are suspected sources of stormwater pollutants, sample and analyze the stormwater draining from the building or sediment from nearby catch basins.
- If a roof or building is identified as a source of stormwater pollutants, implement appropriate source control measures, such as air pollution control equipment, selection of materials, operational changes, material recycling, or process changes, remediation or treatment.
- Replace materials containing pollutants with more environmentally friendly alternatives.

3.6.8.4 Recommended BMPs

See Section 3.1.3 on implementing BMP 9 for preparing building surfaces for painting.

3.6.9 BMP 42: Maintenance and Operation of Railroad Yards

This BMP applies to businesses and public agencies that perform activities at railroad yards not otherwise covered in this manual, including cleaning, maintenance, and repair of equipment and engines, fueling, waste disposal (including human waste), and all other yard maintenance activities, including vegetation management.

3.6.9.1 Description of Pollutants

Pollutant sources include litter, cleaning areas for locomotives, rail cars, and equipment, fueling areas, rail cargo, outside material storage areas, erosion and loss of soil particles from the railroad bed, maintenance and repair activities at railroad terminals, switching yards, and maintenance yards; and herbicides used for vegetation management. Potential pollutants include oils and greases, suspended solids, substances that increase BOD, fecal coliform, organic compounds, pesticides, and metals.

3.6.9.2 Pollutant Control Approach

Apply good housekeeping and preventive maintenance practices to control leaks and spills of liquids in railroad yard areas.

3.6.9.3 Required BMPs

The following BMPs or equivalent measures are required for railroad yards:

- Implement all citywide BMPs from Chapter 2.
- Do not allow discharge from toilets to outside areas. Pump-out facilities should be used to service these units.
- Use drip pans at hose and pipe connections during liquid transfer and other leak-prone areas (Figure 29).
- During maintenance, do not discard debris or waste liquids along the tracks or in railroad yards.
- In areas subject to leaks or spills of oils or other chemicals, convey the contaminated stormwater to an appropriate treatment system such as a sanitary sewer, if approved by SPU and/or King County, or to an API or coalescing plate oil/water separator for floating oils, or other appropriate treatment BMPs.
- Maintenance and repair areas cannot be hosed down. Instead, they must be swept weekly or more often as needed to collect dirt and spills must be wiped up with rags or other absorbent materials.



Figure 29. Drip Pan for Capturing Spills and Drips Under Hose Connections.

3.6.10 BMP 43: Maintenance of Public and Private Utility Corridors and Facilities

This BMP applies to businesses and public agencies that maintain utility corridors and associated equipment at petroleum product pipelines, natural gas pipelines, and water pipelines, and pump stations, electrical power transmission corridors, and rights-of-way.

3.6.10.1 Description of Pollutants

Corridors and facilities can be sources of pollutants, such as herbicides used for vegetation management and eroded soil particles generated from unpaved access roads. At pump stations, waste materials generated during maintenance activities are often temporarily stored outside, and thus be a source of pollution into storm drains and the surface water ultimately receiving drainage water.

Additional potential pollutant sources include the leaching of preservatives from wood utility poles, polychlorinated biphenyls (PCBs) in older transformers, water that is removed from underground transformer vaults, and leaks or spills from petroleum pipelines. Potential pollutants are oils and greases, suspended solids, substances that increase BOD, organic compounds, polychlorinated biphenyls, pesticides, and metals.

3.6.10.2 Pollutant Control Approach

Control fertilizer and pesticide applications, soil erosion, and site debris that can contaminate stormwater. Employ appropriate BMPs for any material stored outside.

3.6.10.3 Required BMPs

The following BMPs or equivalent measures are required for activities related to the maintenance of public and utility corridors and facilities:

- Implement all citywide BMPs from Chapter 2.
- When water or sediments are removed from electric transformer vaults, determine whether contaminants are present before disposing of the water and sediments.
 - This includes inspecting for the presence of oil or oil sheen and determining from records or testing whether the transformers contain polychlorinated biphenyls (PCBs).
 - If records or tests indicate that the sediment or water contains polychlorinated biphenyls at concentrations greater than the allowable levels, manage the sediment or water in accordance with applicable federal and state regulations, including the federal rules for polychlorinated biphenyls (Code of Federal Regulations, Title 40, Part 761) and the state Model Toxics Control Act cleanup regulations (Washington Administrative Code, Chapter 173-340).

- Water removed from the vaults can be discharged in accordance with Code of Federal Regulations, Title 40, Section 761.79, and state regulations (Washington Administrative Code, Chapters 173-201A and 173-200), or via the sanitary sewer if the requirements, including applicable permits, for such a discharge are met.
- Provide maintenance practices to prevent stormwater from accumulating and draining across and/or onto roadways. Stormwater should be conveyed through roadside ditches and culverts. The road should be crowned, outsloped, water barred, or otherwise left in a condition that is not conducive to erosion.
- Maintain ditches and culverts at an appropriate frequency to prevent plugging and flooding across the roadbed, with resulting overflow erosion.

3.6.10.4 Recommended BMPs

Although not required, the following BMPs can further prevent and minimize stormwater contamination:

- To prevent the erosion of soil within utility corridors, develop maintenance procedures and an implementation schedule that provides for vegetative, gravel, or equivalent cover that minimizes bare or thinly vegetated ground surfaces within the corridor.
- Maintain vegetation in roadside ditches that discharge to receiving waters to remove some pollutants associated with sediments carried by stormwater.
- When selecting utility poles for a specific location, consideration should be given to the potential environmental effects of the pole or poles during their storage, handling, and end use.
- If a wood product treated with chemical preservatives is used, it should be made in accordance with generally accepted industry standards such as the American Wood Preservers Association Standards.
- If the pole or poles will be placed in or near a drinking water well or an environmentally sensitive area, alternative materials or technologies should be considered. These include poles made of material(s) other than wood, such as fiberglass composites, metal, or concrete.
- Other technologies and materials, such as sleeves or caissons for wood poles, should be considered when they are determined to be practical and available.
- As soon as practical, remove all litter from wire cutting and replacement operations.

3.6.11 BMP 44: Maintenance of Roadside Ditches

This BMP applies to businesses and public agencies that perform activities related to the maintenance of roadside ditches, which can present a high risk of polluting stormwater because the ditches in which work is performed flow into the stormwater drainage network.

3.6.11.1 Description of Pollutants

Common road debris including particles from tire wear, dripped oil and other fluids, chemicals used in deicing, pesticides, herbicides, eroded or contaminated soil, and metals can be sources of stormwater pollutants.

3.6.11.2 Pollutant Control Approach

Roadside ditches should be maintained to preserve the condition and capacity for which they were originally constructed and to minimize bare or thinly vegetated ground surfaces.

3.6.11.3 Required BMPs

The following BMPs or equivalent measures are required for activities related to the maintenance of roadside ditches:

- Implement all citywide BMPs from Chapter 2.
- Inspect roadside ditches regularly, as needed to identify sediment accumulations and areas of localized erosion.
- Clean ditches on a regular basis, as needed:
 - Keep ditches free of rubbish and debris.
 - Conduct ditch maintenance (seeding, fertilizer application, and harvesting) when most effective, usually in late spring and/or early fall.
 - Do not apply fertilizer unless needed to maintain vegetative growth.
 - Do not leave material from the ditch cleaning on roadway surfaces.
 - Sweep and remove dirt and debris that remains on the pavement at the completion of ditch cleaning operations.
 - Segregate clean materials from suspect or contaminated materials. Non-contaminated soils may be handled as "clean soils" and noncontaminated vegetative matter can be composted or disposed of in a municipal waste landfill, if permitted. Suspected contaminated or contaminated material removed from ditches must be tested and handled according to the Dangerous Waste Regulations (Washington Administrative Code, Chapter 173-303) unless testing indicates that it is not dangerous waste.

- Vegetation in ditches often prevents erosion and cleanses runoff:
 - Remove vegetation only when flow is blocked or excess sediments have accumulated.
 - Use grass vegetation, unless specified otherwise by SPU (e.g., for natural drainage systems).
 - Establish vegetation from the edge of the pavement if possible or at least from the top of the slope of the ditch.
- Diversion ditches on top of cut slopes that are constructed to prevent slope erosion by intercepting surface drainage must be maintained to retain their diversion shape and capability.
- Inspect culverts on a regular basis for scour or sedimentation at the inlet and outlet, and repair as necessary. Give priority to culverts that are conveying perennial or salmon-bearing streams and to culverts near streams in areas of high sediment load, such as those near subdivisions during construction.

3.6.11.4 Recommended BMPs

The following BMPs can further prevent and minimize the pollution of stormwater:

 Install biofiltration swales and filter strips to treat roadside runoff wherever practical, and use amended soils wherever necessary to maintain adequate vegetation to improve infiltration and control of stormwater pollutants upstream of roadside ditches (see BMP 20 Landscaping and Lawn and Vegetation Management).

An amended soil can preserve both the plant system and the soil system more effectively. This type of approach provides a soil and landscape system with adequate depth, permeability, and organic matter to both minimize soil loss and continue working as an effective stormwater infiltration system and a sustainable nutrient cycle.

Chapter 4 - References

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Appendix A –

Definitions

Appendix A - Definitions

The following definitions are provided for reference and use with this manual. **All** projects must also refer to the definitions section of the Stormwater Code (SMC Chapter 22.801). Where any inconsistencies exist between this appendix and SMC Chapter 22.801, the SMC definitions shall be used. Aquatic In or of water. The term can be either a noun or an adjective; the implication is that of fresh water. The term marine (ocean) is typically substituted where reference to salt water is intended. Bacteria Bacteria are a major group of micro-organisms that live in soil, water, plants, organic matter, or the bodies of animals or people. They are microscopic and mostly unicellular, with a relatively simple cell structure. Stormwater can contain disease-causing bacteria and viruses. Baffle A device to check, deflect, or regulate flow. **Basic treatment** A drainage control facility designed to reduce concentrations of total facility suspended solids in drainage water. Best management A schedule of activities, prohibitions of practices, operational and practice (BMP) maintenance procedures, structural facilities, or managerial practice or device that, when used singly or in combination, prevents, reduces, or treats contamination of drainage water, prevents or reduces soil erosion, or prevents or reduces other adverse effects of drainage water on receiving waters. When the Directors develop rules and/or manuals prescribing best management practices for particular purposes, whether or not those rules and/or manuals are adopted by ordinance, BMPs prescribed in the rules and/or manuals shall be the BMPs required for compliance with SMC 22.800 – 22.808. **Biochemical oxygen** A water quality parameter that indicates the amount of free oxygen utilized by aerobic organisms. Also refer to Chemical Oxygen demand (BOD) Demand (COD). **Biodegradable** Capable of being readily broken down by biological means, especially by microbial action. Degradation can be rapid or may take many years depending upon such factors as the nature of the substance and available oxygen and moisture. **Biofilter** Biofilter means a designed treatment facility using a combined soil and vegetation system for filtration, infiltration, adsorption, and biological uptake of pollutants in stormwater when runoff flows over and through. Vegetation growing in these facilities acts as both a physical filter which causes gravity settling of particulates by regulating velocity of flow, and also as a biological sink when direct uptake of dissolved pollutants occurs.

Biofiltration	Biofiltration means the process of reducing pollutant concentrations in water by filtering the polluted water through biological materials.
Capacity-constrained system	A drainage system that the Director of SPU has determined to have inadequate capacity to carry drainage water.
Cause or contribute to a violation	Acts or omissions that create a violation, that increase the duration, extent or severity of a violation, or that aid or abet a violation.
Certified Erosion and Sediment Control Lead (CESCL)	An individual who has current certification through an approved erosion and sediment control training program that meets the minimum training standards established by the Washington State Department of Ecology.
Chemical oxygen demand (COD)	A water quality parameter that represents organic, nitrogenous and other materials that are consumed by bacteria present in receiving waters. Oxygen may be depleted in the process, threatening higher organisms such as fish. The COD test is used to determine the degree of pollution in water. Also refer to Biochemical Oxygen Demand (BOD).
Civil engineer, licensed	A person who is licensed by the State of Washington to practice civil engineering.
Clearing	Clearing means the removal of vegetation, and removal of roots or stumps that include ground disturbance.
Containment area	The area designated for conducting pollution-generating activities for the purposes of implementing source controls or designing and installing source controls or treatment facilities.
Compaction	The densification of earth material by mechanical means.
Construction Stormwater Control Plan	A document that explains and illustrates the measures to be taken on the construction site to control pollutants on a construction project.
Contaminate	The addition of sediment, any other pollutant or waste, or any illicit or prohibited discharge.
Creek	A Type 2-5 water as defined in WAC 222-16-031 and is used synonymously with "stream."
Designated receiving water	Designated receiving waters include the Duwamish River, Puget Sound, Lake Washington, Lake Union, Elliott Bay, Portage Bay, Union Bay, the Lake Washington Ship Canal, and other receiving waters determined by the Director of SPU and approved by Ecology as having sufficient capacity to receive discharges of drainage water such that a site discharging to the designated receiving water is not required to implement flow control.

Detention	Temporary storage of drainage water for the purpose of controlling the drainage discharge rate.
Development	Land disturbing activity or the addition or replacement of impervious surface.
Director	The Director of the Department authorized to take a particular action, and the Director's designees, who may be employees of that department or another City department.
Discharge point	The location from which drainage water from a site is released.
Drainage basin	The tributary area or subunit of a watershed through which drainage water is collected, regulated, transported, and discharged to receiving waters.
Drainage control	The management of drainage water. Drainage control is accomplished through one or more of the following: collecting, conveying, and discharging drainage water; controlling the discharge rate from a site; controlling the flow duration from a site; and separating, treating or preventing the introduction of pollutants.
Drainage control facility	Any facility, including best management practices, installed or constructed for the purpose of controlling the discharge rate, flow duration, quantity, and/or quality of drainage water.
Drainage control plan	A plan for collecting, controlling, transporting and disposing of drainage water falling upon, entering, flowing within, and exiting the site, including designs for drainage control facilities.
Drainage system	A system intended to collect, convey and control release of only drainage water. The system may be either publicly or privately owned or operated, and the system may serve public or private property. It includes constructed and/or natural components such as pipes, ditches, culverts, streams, creeks, or drainage control facilities.
Drainage water	Stormwater and all other discharges that are permissible per subsection 22.802.030 A.
Enhanced treatment facility	A drainage control facility designed to reduce concentrations of dissolved metals in drainage water.
Erosion	The wearing away of the ground surface as a result of mass wasting or of the movement of wind, water, ice, or other geological agents, including such processes as gravitational creep. Erosion also means the detachment and movement of soil or rock fragments by water, wind, ice, or gravity.
Excavation	The mechanical removal of earth material.

Existing grade	Existing grade means the current surface contour of a site, including minor adjustments to the surface of the site in preparation for construction, or the surface contour that existed immediately prior to grading done without a permit.
Fill	Fill means a deposit of earth material placed by artificial means.
Flow control	Controlling the discharge rate, flow duration, or both of drainage water from the site through means such as infiltration or detention.
Flow control facility	A drainage control facility for controlling the discharge rate, flow duration, or both of drainage water from a site.
Flow-critical receiving water	A surface water that is not a "designated receiving water" as defined in SMC 22.800 – 22.808.
Flow duration	The aggregate time that peak flows are at or above a particular flow rate of interest.
Geotechnical engineer	A professional civil engineer licensed by the State of Washington who has at least four (4) years of professional experience as a geotechnical engineer, including experience with landslide evaluation.
Grading	Excavation, filling, in-place ground modification, removal of roots or stumps that includes ground disturbance, stockpiling of earth materials, or any combination thereof, including the establishment of a grade following demolition of a structure.
Green stormwater infrastructure	A drainage control facility that uses infiltration, evapotranspiration, or stormwater reuse. Examples of green stormwater infrastructure include permeable pavement, bioretention facilities, and green roofs.
Groundwater	Water in a saturated zone or stratum beneath the land surface or a surface waterbody.
Impervious Surface	Any surface exposed to rainwater from which most water runs off. Common impervious surfaces include, but are not limited to, roof tops, walkways, patios, driveways, formal planters, parking lots or storage areas, concrete or asphalt paving, permeable paving, gravel surfaces subjected to vehicular traffic, compact gravel, packed earthen materials, and oiled macadam or other surfaces which similarly impede the natural infiltration of stormwater. Open, uncovered retention/detention facilities shall not be considered as impervious surfaces for the purposes of determining whether the thresholds for application of minimum requirements are exceeded. Open, uncovered retention/detention facilities shall be considered impervious surfaces for purposes of stormwater modeling.

Industrial activities	Activities such as material handling, transportation, or storage; manufacturing; maintenance; treatment; or disposal. Areas with industrial activities include plant yards, access roads and rail lines used by carriers of raw materials, manufactured products, waste material, or by-products; material handling sites; refuse sites; sites used for the application or disposal of process waste waters; sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas for raw materials, and intermediate and finished products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater.
Infiltration	The downward movement of water from the surface to the subsoil.
Infiltration facility	A drainage control facility that temporarily stores, and then percolates drainage water into the underlying soil.
Inspector	A City inspector, their designee, or licensed civil engineer performing the inspection work required by SMC 22.800 – 22.808.
Land disturbing activity	Any activity that results in a movement of earth, or a change in the existing soil cover, both vegetative and nonvegetative, or the existing topography. Land disturbing activities include, but are not limited to, clearing, grading, filling, excavation, or addition of new or the replacement of impervious surface. Compaction, excluding hot asphalt mix, which is associated with stabilization of structures and road construction shall also be considered a land disturbing activity. Vegetation maintenance practices are not considered land disturbing activities.
Listed creek basins	Listed creek basins include Blue Ridge Creek, Broadview Creek, Discovery Park Creek, Durham Creek, Frink Creek, Golden Gardens Creek, Kiwanis Ravine/Wolfe Creek, Licton Springs Creek, Madrona Park Creek, Mee-Kwa-Mooks Creek, Mount Baker Park Creek, Puget Creek, Riverview Creek, Schmitz Creek, Taylor Creek, or Washington Park Creek.
Maximum extent feasible	Maximum extent feasible means that the requirement is to be fully implemented, constrained only by the physical limitations of the site, practical considerations of engineering design, and reasonable considerations of financial costs and environmental impacts.
Metals	Metallic elements that can be beneficial or hazardous to the environment, depending on the type and concentration. Typical metals include copper, zinc, mercury, chromium, cadmium, arsenic, and lead.

Monitoring	The collection of data by various methods for the purposes of understanding natural systems and features, evaluating the impacts of development proposals on such systems, and assessing the performance of mitigation measures imposed as conditions of development.
Municipal stormwater NPDES permit	The permit issued to the City under the federal Clean Water Act for public drainage systems within the City limits.
NPDES	National Pollutant Discharge Elimination System, the national program for controlling discharges under the federal Clean Water Act.
NPDES permit	An authorization, license or equivalent control document issued by the United States Environmental Protection Agency or the Washington State Department of Ecology to implement the requirements of the NPDES program.
Nutrients	Essential chemicals, such as phosphorus and nitrogen, needed by plants or animals for growth. Excessive amounts of nutrients can lead to degradation of water quality and algal blooms. Some nutrients can be toxic at high concentrations.
Oil control treatment facility	A drainage control facility designed to reduce concentrations of oil in drainage water.
Outlet Trap	A tee section or turn down elbow designed to retain a limited volume of pollutant that floats on water, such as oil or antifreeze.
Pervious surface	A surface that is not impervious. See also "impervious surface."
Petroleum Hydrocarbons	This is a term used to refer to a broad range of petroleum products such as mineral oil, gasoline, diesel, heating oil, lubricant oil, and hydraulic fluid.
рН	The "pH" value is a measure of the alkalinity or acidity of a substance which is conducted by measuring the concentration of hydrogen ions in the substance. A pH of 7.0 indicates neutral water. A 6.5 reading is slightly acidic.
Plan	A graphic or schematic representation, with accompanying notes, schedules, specifications and other related documents, or a document consisting of checklists, steps, actions, schedules, or other contents that has been prepared pursuant to SMC 22.800 – 22.808, such as a drainage control plan, construction stormwater control plan, stormwater pollution prevention plan, and integrated drainage plan.

Pollution-generating activity	Any activity that is regulated by the joint SPU/DPD Directors' Rule titled "Source Control Technical Requirements Manual" or activities with similar impacts on drainage water. These activities include, but are not limited to: cleaning and washing activities; transfer of liquid or solid material; production and application activities; dust, soil, and sediment control; commercial animal care and handling; log sorting and handling; boat building, mooring, maintenance, and repair; logging and tree removal; mining and quarrying of sand, gravel, rock, peat, clay, and other materials; cleaning and maintenance of swimming pool and spas; deicing and anti-icing operations for airports and streets; maintenance and management of roof and building drains at manufacturing and commercial buildings; maintenance and operation of railroad yards; maintenance of public and utility corridors and facilities; and maintenance of roadside ditches.
Pollution-generating impervious surface	Those impervious surfaces considered to be a significant source of pollutants in drainage water. Such surfaces include those that are subject to: vehicular use; certain industrial activities; or storage of erodible or leachable materials, wastes, or chemicals, and which receive direct rainfall or the run-on or blow-in of rainfall. Erodible or leachable materials, wastes, or chemicals are those substances which, when exposed to rainfall, measurably alter the physical or chemical characteristics of the drainage water. Examples include: erodible soils that are stockpiled; uncovered process wastes; manure; fertilizers; oily substances; ashes; kiln dust; and garbage dumpster leakage. Metal roofs are also considered to be PGIS unless they are coated with an inert, non-leachable material (e.g., baked-on enamel coating).
	A surface, whether paved or not, shall be considered subject to vehicular use if it is regularly used by motor vehicles. The following are considered regularly-used surfaces: roads; unvegetated road shoulders; permeable pavement; bike lanes within the traveled lane of a roadway; driveways; parking lots; unfenced fire lanes; vehicular equipment storage yards; and airport runways.
	The following are not considered regularly-used surfaces: paved bicycle pathways separated from and not subject to drainage from roads for motor vehicles; fenced fire lanes; and infrequently used maintenance access roads.
Pollution-generating pervious surface	Any non-impervious surface subject to use of pesticides and fertilizers or loss of soil, and typically includes lawns, landscaped areas, golf courses, parks, cemeteries, and sports fields.

Pre-developed condition	The vegetation and soil conditions that are used to determine the allowable post-development discharge peak flow rates and flow durations, such as pasture or forest.
Project	The addition or replacement of impervious surface or the undertaking of land disturbing activity on a site.
Public combined sewer	A publicly owned and maintained system which carries drainage water and wastewater and flows to a publicly owned treatment works.
Public drainage system	A drainage system owned or used by the City of Seattle.
Public sanitary sewer	The sanitary sewer that is owned or operated by a City agency.
Public storm drain	The part of a public drainage system that is wholly or partially piped, owned or operated by a City agency, and designed to carry only drainage water.
Receiving water	The surface water or wetland receiving drainage water.
Recommended BMPs	Recommended BMPs are those source control BMPs that are not mandatory for activities or at new development and redevelopment sites. However, they may improve pollutant control efficiency, and may provide a more comprehensive and environmentally effective stormwater management program.
Replaced impervious surface	For structures, the removal and replacement of impervious surface down to the foundation. For other impervious surface, the impervious surface that is removed down to earth material and a new impervious surface is installed.
Required BMPs	Required BMPs are those BMPs that are required by the City of Seattle for applicable activities, in accordance with the City of Seattle Stormwater Code.
Secondary containment	Secondary containment provides a barrier between a container (e.g., fuel tank, drum, paint cans) and the environment. The barrier holds the leaked material until the leak is detected and fixed. The barrier also prevents stormwater from being polluted in the event of a spill or leak. Examples include an impervious dike, berm, or retaining wall; a temporary pan, tub, or absorptive pad can be used to contain incidental leaks.
Single-family residential project	A project, that constructs one Single-family Dwelling Unit per SMC 23.44.006.A located in land classified as being Single-family Residential 9,600 (SF 9600), Single-family Residential 7,200 (SF 7200), or Single-family Residential 5,000 (SF 5000) per SMC 23.30.010, and the total new plus replaced impervious surface is less than 10,000 square feet and the total new plus replaced pollution-generating impervious surface is less than 5,000 square feet.

Site	The lot or parcel, or portion of street, highway or other right-of-way, or contiguous combination thereof, where a permit for the addition or replacement of impervious surface or the undertaking of land disturbing activity has been issued or where any such work is proposed or performed. For roadway projects, the length of the project site and the right-of-way boundaries define the site.
Sludge	A generic term for solids separated from suspension in a liquid by a variety of processes.
Source controls	Structures or operations that prevent contaminants from coming in contact with drainage water through physical separation or careful management of activities that are known sources of pollution.
Stormwater	That portion of precipitation and snowmelt that does not naturally percolate into the ground or evaporate, but flows via overland flow, interflow, pipes and other features of a drainage system into a receiving water or a constructed infiltration facility.
Sump	A sump, commonly found in the home basement, is simply a hole to collect water that has entered because of rain or because of natural groundwater. Some businesses use sumps to collect liquids from their operations (e.g., oil change operation). A sump pump is commonly used to move the liquid to a disposal point or the liquid is pumped out and disposed separately.
Total suspended solids (TSS)	That portion of the solids carried by stormwater that can be captured on a standard glass filter.
Treatment Facility	A drainage control facility designed to remove pollutants from drainage water.
Turbidity	A measure of water clarity. Color or cloudiness in a liquid caused by the dispersion or scattering of light, caused by suspended solids and other factors; commonly used as a measure of suspended solids in a liquid.
Water quality	A term used to describe the chemical, physical, and biological characteristics of water, usually in respect to its suitability for a particular purpose.
Water Quality Standards	Surface Water Quality Standards, Chapter 173-201A WAC, Ground Water Quality Standards, Chapter 173-200 WAC, and Sediment Management Standards, Chapter 173-204 WAC.
Watershed	A geographic region within which water drains into a particular river, stream, or other body of water.

Wetland function

The physical, biological, chemical, and geologic interactions among different components of the environment that occur within a wetland. Wetland functions can be grouped into three categories: functions that improve water quality; functions that change the water regime in a watershed, such as flood storage; and functions that provide habitat for plants and animals.
Appendix B –

Example of Integrated Pest Management Program and Plan

Appendix B - Integrated Pest Management Plan

An Integrated Pest Management Plan (IPM) is a natural, long-term, ecologically based systems approach to controlling pest populations. This system uses techniques either to reduce pest populations or maintain them at levels below those causing economic injury, or to so manipulate the populations that they are prevented from causing injury.

The goals of IPM are to encourage optimal selective pesticide use (away from prophylactic, broad spectrum use), and to maximize natural controls to minimize the environmental side effects by creating and maintaining healthy landscapes:

- **Design for a healthy landscape.** A landscape should be designed to maximize intended uses of the land and to minimize potential pest problems. Design considers such plant health factors as site usage, soils, topography, hydrology and drainage, proximity to sensitive or critical areas and existing vegetation as well as known pest sensitivity.
- Awareness of potential pest problems. Certain plants have known pest problems. Likewise, certain cultural conditions or landscape situations can encourage the infestation of pests.
- **Maintenance for maximum landscape health.** A well-designed and maintained landscape dramatically reduces the need for pest control. Appropriate selection of plants, pruning, proper irrigation, applications of mulch and fertilizer, appropriate mowing techniques, and other practices all promote landscapes that resist pest pressures and support natural predators.
- Minimize disturbance of naturally occurring biological controls.
 Pests have natural predator and control operating on them at all times.
 Disruption of theses systems through poor maintenance practices can cause more of new pest problems to develop.

The step-by-step comprehensive Integrated Pest Management Plan (IPM) process is provided below as a guide.

The Integrated Pest Management Plan Process

Step One: Correctly identify problem pests and understand their life cycle.

Learn more about the pest. Observe it and pay attention to any damage that may be occurring. Learn about the life cycle. Many pests are only a problem during certain seasons, or can only be treated effectively in certain phases of the life cycle.

Step Two: Establish tolerance thresholds for pests.

Every landscape has a population of some pest insects, weeds, and diseases. This is good because it supports a population of beneficial species that keep pest numbers in check. Beneficial organisms may compete with, eat, or parasitize disease or pest organisms. Decide on the level of infestation that must be exceeded before treatment needs to be considered. Pest populations under this threshold should be monitored but don't need treatment. For instance, European crane flies usually don't do serious damage to a lawn unless there are between 25 and 40 larvae per square foot feeding on the turf in February (in normal weather years). Also, most people consider a lawn healthy and well maintained even with up to 20 percent weed cover, so treatment, other than continuing good maintenance practices, is generally unnecessary.

Step Three: Monitor to detect and prevent pest problems.

Regular monitoring is a key practice to anticipate and prevent major pest outbreaks. It begins with a visual evaluation of the lawn or landscape's condition. Take a few minutes before mowing to walk around and look for problems. Keep a notebook, record when and where a problem occurs, then monitor for it at about the same time in future years. Specific monitoring techniques can be used in the appropriate season for some potential problem pests, such as European crane fly.

Step Four: Modify the maintenance program to promote healthy plants and discourage pests.

A healthy landscape is resistant to most pest problems. Lawn aeration and overseeding along with proper mowing height, fertilization, and irrigation will help the grass out-compete weeds. Correcting drainage problems and letting soil dry out between watering in the summer may reduce the number of crane-fly larvae that survive.

Step Five: If pests exceed the tolerance thresholds.

Use cultural, physical, mechanical or biological controls first. If those prove insufficient, use the chemical controls described below that have the least non-target impact. When a pest outbreak strikes (or monitoring shows one is imminent), implement IPM then consider control options that are the least toxic, or have the least non-target impact. Here are two examples of an IPM approach:

1. **Red thread disease** is most likely under low nitrogen fertility conditions and most severe during slow growth conditions. Mow and bag the clippings to remove diseased blades. Fertilize lightly to help the grass recover, then begin grasscycling and change to fall fertilization with a slow-release or natural-organic fertilizer to provide an even supply of nutrients. Chemical fungicides are not recommended because red thread cannot kill the lawn. 2. **Crane fly damage** is most prevalent on lawns that stay wet in the winter and are irrigated in the summer. Correct the winter drainage and/or allow the soil to dry between irrigation cycles; larvae are susceptible to drying out so these changes can reduce their numbers. It may also be possible to reduce crane fly larvae numbers by using a power de-thatcher on a cool, cloudy day when feeding is occurring close to the surface. Studies are being conducted using beneficial nematodes that parasitize the crane fly larvae; this type of treatment may eventually be a reasonable alternative.

Only after trying suitable non-chemical control methods, or determining that the pest outbreak is causing too much serious damage, should chemical controls be considered. Study to determine what products are available and choose a product that is the least toxic and has the least non-target impact.

Step Six: Evaluate and record the effectiveness of the control, and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

Keep records! Note when, where, and what symptoms occurred, or when monitoring revealed a potential pest problem. Note what controls were applied and when, and the effectiveness of the control. Monitor next year for the same problems. Review your landscape maintenance and cultural practices to see if they can be modified to prevent or reduce the problem.

A comprehensive IPM Program should also include the proper use of pesticides as a last resort, and vegetation/fertilizer management to eliminate or minimize the contamination of stormwater.