

**OPERATION AND
MAINTENANCE MANUAL
FOR
THE MURRAY RESIDENCE**

APRIL 14, 2023

OPERATION AND MAINTENANCE MANUAL

FOR

THE MURRAY RESIDENCE

A portion of the southeast quarter of the northwest quarter of Section 48 in Township 19 North,
Range 2 East of the Willamette Meridian, Pierce County, Washington

Prepared for:

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April 14, 2023

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OPERATIONS AND MAINTENANCE MANUAL

The project site includes private storm facilities. The maintenance tasks for each of the storm systems and frequency of each task is included. A sample maintenance activity log indicating emergency and routine actions taken is included with the O&M Manual.

Project Description

The improvements proposed for this single-family residence include construction of a single-family residence and associated driveway, walkway, and loggia.

Runoff from the developed site will to be collected and conveyed to the existing conveyance system and then to Lake Washington. Existing drainage patterns are to remain, and no new drainage patterns are proposed. The proposed conveyance system will consist of catch basins, 6-in roof drain lines and 12-inch stormwater pipes, which will be privately maintained by the owner.

Plan Goal

The goal of this plan is to provide means of ensuring that the drainage leaving the site will not introduce harmful pollutants into the groundwater/surface waters.

Facility:	Purpose:
Catch Basin:	To allow access for general maintenance and ease construction between pipe size transitions and bends.
Conveyance System:	To convey stormwater to Lake Washington.

Preventative BMP's

All catch basins are to have sumps to allow large particulates to settle without being introduced to the main conveyance lines. Also, the sumps will facilitate maintenance and cleaning of the system.

Treatment BMP's

Water quality treatment should not be required as the proposed pollution generating impervious surfaces are less than the 5,000-sf threshold requiring treatment.

Flow Control and Treatment Facilities

Flow control should not be required as the project discharges directly to a flow control exempt water body (Lake Washington).

Maintenance Responsibility

The property owner will be responsible for the maintenance of the private storm drainage facilities located on the project site, including but not limited to roof drains and catch basins.

Included in this plan are Maintenance Checklists for the storm drainage components. The maintenance checklists include a description of the maintenance needed and frequency of long-term maintenance for the drainage facilities. Maintenance activities will begin with a visual assessment of the drainage system components and then appropriate actions (cleaning, clearing, removing, etc) to preserve the integrity of the drainage system components.

The Operation and Maintenance (O&M) Manual will be kept by the property owner.

The maintenance tasks for the site's storm system and frequency of each task is included in this chapter. A sample maintenance activity log indicating emergency and routine actions taken is included with the O&M Manual.

Specific maintenance schedule is difficult to anticipate at this time, but it is recommended that inspection of the facilities be worked into the regular schedule of the proposed site and other general maintenance, in addition to inspections being made following large storm events. Proper correction to observed problems shall be as outlined in the following maintenance standards.

A typical schedule "ATTACHMENT A" has been provided for your convenience. Using photocopies of these pages check off problems found, and action taken. Keep these "checked" sheets in your files. Some items do not need to be looked at every time an inspection is done. Use the suggested frequency at the left of each item as a guideline for your inspection.

Estimated Maintenance Costs

The following is a conservative estimate of annual costs, based on an assumption of normal usage for the site. Frequency of maintenance is at a minimum per attached maintenance checklist and is of course site specific and dependent upon usage, storm frequency and intensity and ownership responsibility.

The closed conveyance system, catchbasin sumps, and trench drain should require an annual cleaning and removal of sedimentation. This should require a vector truck at an estimated annual cost of \$1,000.

Annual sweeping/cleaning of street areas and on-site driveways is expected. This would require an acceptable sweeper or vacuum sweeps. Estimated annual cost is \$500.

Estimated maintenance cost is \$1,500.

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ATTACHMENT "A"

MAINTENANCE PROGRAM

Inspection Period: _____

Number of Sheets Attached: _____

Date Inspected: _____

Name of Inspector _____

Inspector's Signature: _____

INSTRUCTIONS FOR USE OF MAINTENANCE CHECKLISTS

The following pages contain maintenance needs for most of the components that are part of the drainage system, as well as for some components that may not be included. Ignore the requirements that do not apply. Plan to complete a checklist for all system components on the following schedule:

1. Monthly from November through April
2. Once in late summer (preferably September)
3. After any major storm (Use 1 inch in 24 hours as a guideline)

Using photocopies of these pages, check off and date the conditions looked for each time an inspection was completed. Add comments on problems found and actions taken. Keep these "checked" sheets in your files, as they will be used to write your annual report.

This O&M Manual/Checklist shall be kept by the apartment complex. The photocopies shall be kept in a binder and the checklists updated as required.

NO. 5 – CATCH BASINS AND MANHOLES			
Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Structure	Sediment	Sediment exceeds 60% of the depth from the bottom of the catch basin to the invert of the lowest pipe into or out of the catch basin or is within 6 inches of the invert of the lowest pipe into or out of the catch basin.	Sump of catch basin contains no sediment.
	Trash and debris	Trash or debris of more than ½ cubic foot which is located immediately in front of the catch basin opening or is blocking capacity of the catch basin by more than 10%.	No Trash or debris blocking or potentially blocking entrance to catch basin.
		Trash or debris in the catch basin that exceeds 1/3 the depth from the bottom of basin to invert the lowest pipe into or out of the basin.	No trash or debris in the catch basin.
		Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No dead animals or vegetation present within catch basin.
		Deposits of garbage exceeding 1 cubic foot in volume.	No condition present which would attract or support the breeding of insects or rodents.
	Damage to frame and/or top slab	Corner of frame extends more than ¾ inch past curb face into the street (If applicable).	Frame is even with curb.
		Top slab has holes larger than 2 square inches or cracks wider than ¼ inch.	Top slab is free of holes and cracks.
		Frame not sitting flush on top slab, i.e., separation of more than ¾ inch of the frame from the top slab.	Frame is sitting flush on top slab.
	Cracks in walls or bottom	Cracks wider than ½ inch and longer than 3 feet, any evidence of soil particles entering catch basin through cracks, or maintenance person judges that catch basin is unsound.	Catch basin is sealed and is structurally sound.
		Cracks wider than ½ inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	No cracks more than ¼ inch wide at the joint of inlet/outlet pipe.
	Settlement/ misalignment	Catch basin has settled more than 1 inch or has rotated more than 2 inches out of alignment.	Basin replaced or repaired to design standards.
	Damaged pipe joints	Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering the catch basin at the joint of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of inlet/outlet pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Inlet/Outlet Pipe	Sediment accumulation	Sediment filling 20% or more of the pipe.
Trash and debris		Trash and debris accumulated in inlet/outlet pipes (includes floatables and non-floatables).	No trash or debris in pipes.
Damaged		Cracks wider than ½-inch at the joint of the inlet/outlet pipes or any evidence of soil entering at the joints of the inlet/outlet pipes.	No cracks more than ¼-inch wide at the joint of the inlet/outlet pipe.

NO. 5 – CATCH BASINS AND MANHOLES			
Maintenance Component	Defect or Problem	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Metal Grates (Catch Basins)	Unsafe grate opening	Grate with opening wider than $\frac{7}{8}$ inch.	Grate opening meets design standards.
	Trash and debris	Trash and debris that is blocking more than 20% of grate surface.	Grate free of trash and debris.
	Damaged or missing	Grate missing or broken member(s) of the grate. Any open structure requires urgent maintenance.	Grate is in place and meets design standards.
Manhole Cover/Lid	Cover/lid not in place	Cover/lid is missing or only partially in place. Any open structure requires urgent maintenance.	Cover/lid protects opening to structure.
	Locking mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts cannot be seated. Self-locking cover/lid does not work.	Mechanism opens with proper tools.
	Cover/lid difficult to Remove	One maintenance person cannot remove cover/lid after applying 80 lbs. of lift.	Cover/lid can be removed and reinstalled by one maintenance person.

NO. 6 – CONVEYANCE PIPES AND DITCHES			
Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Pipes	Sediment & debris accumulation	Accumulated sediment or debris that exceeds 20% of the diameter of the pipe.	Water flows freely through pipes.
	Vegetation/roots	Vegetation/roots that reduce free movement of water through pipes.	Water flows freely through pipes.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Damage to protective coating or corrosion	Protective coating is damaged; rust or corrosion is weakening the structural integrity of any part of pipe.	Pipe repaired or replaced.
	Damaged	Any dent that decreases the cross section area of pipe by more than 20% or is determined to have weakened structural integrity of the pipe.	Pipe repaired or replaced.
Ditches	Trash and debris	Trash and debris exceeds 1 cubic foot per 1,000 square feet of ditch and slopes.	Trash and debris cleared from ditches.
	Sediment accumulation	Accumulated sediment that exceeds 20% of the design depth.	Ditch cleaned/flushed of all sediment and debris so that it matches design.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Vegetation	Vegetation that reduces free movement of water through ditches.	Water flows freely through ditches.
	Erosion damage to slopes	Any erosion observed on a ditch slope.	Slopes are not eroding.
	Rock lining out of place or missing (If Applicable)	One layer or less of rock exists above native soil area 5 square feet or more, any exposed native soil.	Replace rocks to design standards.

NO. 11 – GROUNDS (LANDSCAPING)			
Maintenance Component	Defect or Problem	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Site	Trash or litter	Any trash and debris which exceed 1 cubic foot per 1,000 square feet (this is about equal to the amount of trash it would take to fill up one standard size office garbage can). In general, there should be no visual evidence of dumping.	Trash and debris cleared from site.
	Noxious weeds	Any noxious or nuisance vegetation which may constitute a hazard to County personnel or the public.	Noxious and nuisance vegetation removed according to applicable regulations. No danger of noxious vegetation where County personnel or the public might normally be.
	Contaminants and pollution	Any evidence of contaminants or pollution such as oil, gasoline, concrete slurries or paint.	Materials removed and disposed of according to applicable regulations. Source control BMPs implemented if appropriate. No contaminants present other than a surface oil film.
	Grass/groundcover	Grass or groundcover exceeds 18 inches in height.	Grass or groundcover mowed to a height no greater than 6 inches.
Trees and Shrubs	Hazard	Any tree or limb of a tree identified as having a potential to fall and cause property damage or threaten human life. A hazard tree identified by a qualified arborist must be removed as soon as possible.	No hazard trees in facility.
	Damaged	Limbs or parts of trees or shrubs that are split or broken which affect more than 25% of the total foliage of the tree or shrub.	Trees and shrubs with less than 5% of total foliage with split or broken limbs.
		Trees or shrubs that have been blown down or knocked over.	No blown down vegetation or knocked over vegetation. Trees or shrubs free of injury.
		Trees or shrubs which are not adequately supported or are leaning over, causing exposure of the roots.	Tree or shrub in place and adequately supported; dead or diseased trees removed.

ATTACHMENT "B"

POLLUTION SOURCE CONTROL PROGRAM

Introduction

The pollution source control program for this project site has been compiled from the 2014 Stormwater Management Manual for Western Washington, Volume V. It contains control information, in the form of Best Management Practices (BMPs) for various activities performed on site, at the time of this writing.

Pollution source controls are needed because of the contamination found in runoff from urban areas and the effect of this contamination on aquatic life and human health. Research on urban runoff in the Puget Sound area and elsewhere has found oil and grease, nutrients, organic substances, toxic metals, bacteria, viruses, and sediments at unacceptable levels. Effects of contaminated runoff include closure of shellfish harvesting areas and swimming areas, mortality of young fish and other aquatic organisms, tumors on fish, and impairment of fish reproduction

Reduction or the elimination of stormwater pollutants can be achieved by implementing "operational source control Best Management Practices (BMPs)" including good housekeeping, employee training, spill prevention and cleanup, preventive maintenance, regular inspections, and record keeping. These BMPs can be combined with impervious containments and covers, i.e., structural source control BMPs. Several applicable BMPs have been attached within this plan as Figure 1.

Included for convenience as Figures B.2 through B.5, are Appendices A through D from Volume IV of the DOE SWMMWW. These appendices provide suggestions and information which could be beneficial.

General Description

Located within the project are the following improvements:

- Single family residential house
- Driveway and walkways
- Garage
- Loggia
- Preservation of existing trees

Storm Drainage System

Stormwater is discharged as follows:

- Runoff from the developed site will be directed to the existing stormwater conveyance system that drains to Lake Washington at the western boundary of the site.

Stormwater treatment, including source controls, is important so as not to pollute subsurface and surface water.

Materials Used and Wastes Generated

Of particular concern is runoff from driveway. The stormwater from the driveway may contain concentrations of oils and greases, suspended particulates and metals. Additionally, yard debris (leaves, clippings, etc) and the use of fertilizers and pesticides for the care of landscaping could enter the storm drain system and be a potential pollution source.

FIGURE B.1

BMPs

S411 BMPs for Landscaping and Lawn/ Vegetation Management

Description of Pollutant Sources: Landscaping can include grading, soil transfer, vegetation removal, pesticide and fertilizer applications, and watering. Stormwater contaminants include toxic organic compounds, heavy metals, oils, total suspended solids, coliform bacteria, fertilizers, and pesticides.

Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests with pesticides. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks, and residential lawn/plant care. It is possible to release toxic pesticides such as pentachlorophenol, carbamates, and organometallics to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation and poor application of pesticides or fertilizers can cause appreciable stormwater contamination.

Pollutant Control Approach: Control of fertilizer and pesticide applications, soil erosion, and site debris to prevent contamination of stormwater.

Develop and implement an Integrated Pest Management Plan (IPM) and use pesticides only as a last resort. Carefully apply pesticides/ herbicides, in accordance with label instructions. Maintain appropriate vegetation, with proper fertilizer application where practicable, to control erosion and the discharge of stormwater pollutants. Where practicable grow plant species appropriate for the site, or adjust the soil properties of the subject site to grow desired plant species.

Applicable Operational BMPs for Landscaping:

- Install engineered soil/landscape systems to improve the infiltration and regulation of stormwater in landscaped areas.
- Do not dispose of collected vegetation into waterways or storm sewer systems.

Recommended Additional Operational BMPs for Landscaping:

- Conduct mulch-mowing whenever practicable
- Dispose of grass clippings, leaves, sticks, or other collected vegetation, by composting, if feasible.
- Use mulch or other erosion control measures on soils exposed for more than one week during the dry season or two days during the rainy season.
- Store and maintain appropriate oil and chemical spill cleanup materials in readily

accessible locations when using oil or other chemicals. Ensure that employees are familiar with proper spill cleanup procedures.

- Till fertilizers into the soil rather than dumping or broadcasting onto the surface. Determine the proper fertilizer application rate 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 drought-resistant plants.
- Use manual and/or mechanical methods of vegetation removal rather than applying herbicides, where practical.

Applicable Operational BMPs for the Use of Pesticides:

- Develop and implement an IPM (See section on IPM in Applicable Operational BMPs for Vegetation Management) and use pesticides only as a last resort.
- Implement a pesticide-use plan and include at a minimum: a list of selected pesticides and their specific uses; brands, formulations, application methods and quantities to be used; equipment use and maintenance procedures; safety, storage, and disposal methods; and monitoring, record keeping, and public notice procedures. All procedures shall conform to the requirements of [Chapter 17.21 RCW](#) and [Chapter 16-228 WAC \(Appendix IV-D: Regulatory Requirements That Impact Stormwater Programs \(p.723\) R.7\)](#).
- Choose the least toxic pesticide available that is capable of reducing the infestation to acceptable levels. The pesticide should readily degrade in the environment and/or have properties that strongly bind it to the soil. Conduct any pest control activity at 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, apply it to the material before the caterpillars cocoon or it will be ineffective. Any method used should be site-specific and not used wholesale over a wide area.
- Apply the pesticide according to label directions. Do not apply pesticides in quantities that exceed manufacturer's instructions.
- Mix the pesticides and clean the application equipment in an area where accidental spills will not enter surface or ground waters, and will not contaminate the soil.
- Store pesticides in enclosed areas or in covered impervious containment. Do not discharge pesticide contaminated stormwater or spills/leaks of pesticides to storm sewers. Do not hose down the paved areas to a storm sewer or conveyance ditch. Store and maintain appropriate spill cleanup materials in a location known to all near the storage area.
- Clean up any spilled pesticides. Keep pesticide contaminated waste materials in

designated covered and contained areas.

- The pesticide application equipment must be capable of immediate shutoff in the event of an emergency.
- Spraying pesticides within 100 feet of open waters including wetlands, ponds, and rivers, streams, creeks, sloughs and any drainage ditch or channel that leads to open water may have additional regulatory requirements beyond just following the pesticide product label. Additional requirements may include:
 - Obtaining a discharge permit from Ecology.
 - Obtaining a permit from the local jurisdiction.
 - Using an aquatic labeled pesticide.
- Flag all sensitive areas including wells, creeks, and wetlands prior to spraying.
- Post notices and delineate the spray area prior to the application, as required by the local jurisdiction or by Ecology.
- Conduct spray applications during weather conditions as specified in the label direction and applicable local and state regulations. Do not apply during rain or immediately before expected rain.

Recommended Additional Operational BMPs for the use of pesticides:

- Consider alternatives to the use of pesticides such as covering or harvesting weeds, substitute vegetative growth, and manual weed control/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, ashy stem blight, and parasitic nematodes. The following are three possible mechanisms for disease control by compost addition (USEPA Publication 530-F-9-044):
 1. Successful competition for nutrients by antibiotic production;
 2. Successful predation against pathogens by beneficial microorganism; and
 3. Activation of disease-resistant genes in plants by composts.

Installing an amended soil/landscape system can preserve both the plant system and the soil system more effectively. This type of approach provides a soil/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.

- Once a pesticide is applied, evaluate its effectiveness for possible improvement. Records should be kept showing the effectiveness of the pesticides considered.
- Develop an annual evaluation procedure including a review of the effectiveness of

pesticide applications, impact on buffers and sensitive areas (including potable wells), public concerns, and recent toxicological information on pesticides used/proposed for use. If individual or public potable wells are located in the proximity of commercial pesticide applications, contact the regional Ecology hydrogeologist to determine if additional pesticide application control measures are necessary.

- Rinseate from equipment cleaning and/or triple-rinsing of pesticide containers should be used as product or recycled into product.

For more information, contact the Washington State University (WSU) Extension Home-Assist Program, (253) 445-4556, or Bio-Integral Resource Center (BIRC), P.O. Box 7414, Berkeley, CA.94707, or EPA to obtain a publication entitled "Suspended, Canceled, and Restricted Pesticides" which lists all restricted pesticides and the specific uses that are allowed.

Applicable Operational BMPs for Vegetation Management:

- Use at least an eight-inch "topsoil" layer with at least 8 percent organic matter to provide a sufficient vegetation-growing medium. Amending existing landscapes and turf systems by increasing the percent organic matter and depth of topsoil can substantially improve the permeability of the soil, the disease and drought resistance of the vegetation, and reduce fertilizer demand. This reduces the demand for fertilizers, herbicides, and pesticides. Organic matter is the least water-soluble form of nutrients that can be added to the soil. Composted organic matter generally releases only between 2 and 10 percent of its total nitrogen annually, and this release corresponds closely to the plant growth cycle. Return natural plant debris and mulch to the soil, to continue recycling nutrients indefinitely.
- Select the appropriate turfgrass mixture for the climate and soil type. Certain tall fescues and rye grasses resist insect attack because the symbiotic endophytic fungi found naturally in their tissues repel or kill common leaf and stem-eating lawn insects. However, they do not, repel root-feeding lawn pests such as Crane Fly larvae, and are toxic to ruminants such as cattle and sheep. The fungus causes no known adverse effects to the host plant or to humans. Endophytic grasses are commercially available; use them in areas such as parks or golf courses where grazing does not occur. Local agricultural or gardening resources such as Washington State University Extension office can offer advice on which types of grass are best suited to the area and soil type.
- Use the following seeding and planting BMPs, or equivalent BMPs to obtain information on grass mixtures, temporary and permanent seeding procedures, maintenance of a recently planted area, and fertilizer application rates: [BMP C120: Temporary and Permanent Seeding \(p.278\)](#), [BMP C121: Mulching \(p.284\)](#), [BMP C123: Plastic Covering \(p.294\)](#), and [BMP C124: Sodding \(p.296\)](#).
- Adjusting the soil properties of the subject site can assist in selection of desired

plant species. For example, design a constructed wetland to resist the invasion of reed canary grass by layering specific strata of organic matters (e.g., composted forest product residuals) and creating a mildly acidic pH and carbon-rich soil medium. Consult a soil restoration specialist for site-specific conditions.

- Aerate lawns regularly in areas of heavy use where the soil tends to become compacted. Conduct aeration while the grasses in the lawn are growing most vigorously. Remove layers of thatch greater than $\frac{3}{4}$ -inch deep.
- Mowing is a stress-creating activity for turfgrass. Grass decreases its productivity when mown too short and there is less growth of roots and rhizomes. The turf becomes less tolerant of environmental stresses, more disease prone and more reliant on outside means such as pesticides, fertilizers, and irrigation to remain healthy. Set the mowing height at the highest acceptable level and mow at times and intervals designed to minimize stress on the turf. Generally mowing only $\frac{1}{3}$ of the grass blade height will prevent stressing the turf.

Irrigation:

- The depth from which a plant normally extracts water depends on the rooting depth of the plant. Appropriately irrigated lawn grasses normally root in the top 6 to 12 inches of soil; lawns irrigated on a daily basis often root only in the top 1 inch of soil. Improper irrigation can encourage pest problems, leach nutrients, and make a lawn completely dependent on artificial watering. The amount of water applied depends on the normal rooting depth of the turfgrass species used, the available water holding capacity of the soil, and the efficiency of the irrigation system. Consult with the local water utility, Conservation District, or Cooperative Extension office to help determine optimum irrigation practices.

Fertilizer Management:

- Turfgrass is most responsive to nitrogen fertilization, followed by potassium and phosphorus. Fertilization needs vary by site depending on plant, soil, and climatic conditions. Evaluation of soil nutrient levels through regular testing ensures the best possible efficiency and economy of fertilization. For details on soils testing, contact the local Conservation District, a soils testing professional, or a Washington State University Extension office.
- Apply fertilizers in amounts appropriate for the target vegetation and at the time of year that minimizes losses to surface and ground waters. Do not fertilize when the soil is dry. Alternatively, do not apply fertilizers within three days prior to predicted rainfall. The longer the period between fertilizer application and either rainfall or irrigation, the less fertilizer runoff occurs.
- Use slow release fertilizers such as methylene urea, IDBU, or resin coated fertilizers when appropriate, generally in the spring. Use of slow release fertilizers is especially important in areas with sandy or gravelly soils.

- Time the fertilizer application to periods of maximum plant uptake. Ecology generally recommends application in the fall and spring, although Washington State University turf specialists recommend four fertilizer applications per year.
- Properly trained persons should apply all fertilizers. Apply no fertilizer at commercial and industrial facilities, to grass swales, filter strips, or buffer areas that drain to sensitive water bodies unless approved by the local jurisdiction.

Integrated Pest Management

An IPM program might consist of the following steps:

Step 1: Correctly identify problem pests and understand their life cycle

Step 2: Establish tolerance thresholds for pests.

Step 3: Monitor to detect and prevent pest problems.

Step 4: Modify the maintenance program to promote healthy plants and discourage pests.

Step 5: Use cultural, physical, mechanical or biological controls first if pests exceed the tolerance thresholds.

Step 6: Evaluate and record the effectiveness of the control and modify maintenance practices to support lawn or landscape recovery and prevent recurrence.

For an elaboration of these steps, refer to [Appendix IV-F: Example of an Integrated Pest Management Program \(p.739\)](#).

S412 BMPs for Loading and Unloading Areas for Liquid or Solid Material

Description of Pollutant Sources: Operators typically conduct loading/unloading of liquid and solid materials at industrial and commercial facilities at shipping and receiving, outside storage, fueling areas, etc. Materials transferred can include products, raw materials, intermediate products, waste materials, fuels, scrap metals, etc. Leaks and spills of fuels, oils, powders, organics, heavy metals, salts, acids, alkalis, etc. during transfer may cause stormwater contamination. Spills from hydraulic line breaks are a common problem at loading docks.

Pollutant Control Approach: Cover and contain the loading/unloading area where necessary to prevent run-on of stormwater and runoff of contaminated stormwater.

health department for disposal options.

- Examine culverts on a regular basis for scour or sedimentation at the inlet and outlet, and repair as necessary. Give priority to those culverts conveying perennial and/or salmon-bearing streams and culverts near streams in areas of high sediment load, such as those near subdivisions during construction.

Recommended Treatment BMPs:

Install biofiltration swales and filter strips – (See [Chapter V-9 - Biofiltration Treatment Facilities \(p.1029\)](#)) to treat roadside runoff wherever practicable and use engineered topsoils wherever necessary to maintain adequate vegetation. These systems can improve infiltration and stormwater pollutant control upstream of roadside ditches.

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems

Description of Pollutant Sources: Facilities include roadside catch basins on arterials and within residential areas, conveyance systems, detention facilities such as ponds and vaults, oil/water separators, biofilters, settling basins, infiltration systems, and all other types of stormwater treatment systems presented in [Volume V \(p.765\)](#). Oil and grease, hydrocarbons, debris, heavy metals, sediments and contaminated water are found in catch basins, oil and water separators, settling basins, etc.

Pollutant Control Approach: Provide maintenance and cleaning of debris, sediments, and oil from stormwater collection, conveyance, and treatment systems to obtain proper operation.

Applicable Operational BMPs:

Maintain stormwater treatment facilities per the operations and maintenance (O&M) procedures presented in [V-4.6 Maintenance Standards for Drainage Facilities \(p.829\)](#) in addition to the following BMPs:

- Inspect and clean treatment BMPs, conveyance systems, and catch basins as needed, and determine necessary O&M improvements.
- Promptly repair any deterioration threatening the structural integrity of stormwater facilities. These include replacement of clean-out gates, catch basin lids, and rock in emergency spillways.
- Ensure adequacy of storm sewer capacities and prevent heavy sediment discharges to the sewer system.
- Regularly remove debris and sludge from BMPs used for peak-rate control, treatment, etc. and discharge to a sanitary sewer if approved by the sewer authority, or truck to an appropriate local or state government approved disposal site.

- Clean catch basins when the depth of deposits reaches 60 percent of the sump depth as measured from the bottom of basin to the invert of the lowest pipe into or out of the basin. However, in no case should there be less than six inches clearance from the debris surface to the invert of the lowest pipe. Some catch basins (for example, WSDOT Type 1L basins) may have as little as 12 inches sediment storage below the invert. These catch basins need frequent inspection and cleaning to prevent scouring. Where these catch basins are part of a stormwater collection and treatment system, the system owner/operator may choose to concentrate maintenance efforts on downstream control devices as part of a systems approach.
- Clean woody debris in a catch basin as frequently as needed to ensure proper operation of the catchbasin.
- Post warning signs; “Dump No Waste - Drains to Ground Water,” “Streams,” “Lakes,” or emboss on or adjacent to all storm drain inlets *where possible*.
- Disposal of sediments and liquids from the catch basins must comply with [Appendix IV-G: Recommendations for Management of Street Wastes \(p.743\)](#).

Additional Applicable BMPs: Select additional applicable BMPs from this chapter depending on the pollutant sources and activities conducted at the facility. Those BMPs include:

- [S425 BMPs for Soil Erosion and Sediment Control at Industrial Sites \(p.665\)](#)
- [S427 BMPs for Storage of Liquid, Food Waste, or Dangerous Waste Containers \(p.667\)](#)
- [S426 BMPs for Spills of Oil and Hazardous Substances \(p.666\)](#)
- [S410 BMPs for Illicit Connections to Storm Drains \(p.633\)](#)
- [S430 BMPs for Urban Streets \(p.684\)](#)

S418 BMPs for Manufacturing Activities - Outside

Description of Pollutant Sources: Manufacturing pollutant sources include outside process areas, stack emissions, and areas where manufacturing activity has taken place in the past and significant exposed pollutant materials remain.

Pollution Control Approach: Cover and contain outside manufacturing and prevent stormwater run-on and contamination, where feasible.

Applicable Operational BMP:

- Sweep paved areas regularly, as needed, to prevent contamination of stormwater.
- Alter the activity by eliminating or minimizing the contamination of stormwater.

Applicable Structural Source Control BMPs:

- Enclose the activity (see [Figure IV-2.2.6 Enclose the Activity \(p.656\)](#)): If possible, enclose the manufacturing activity in a building.
- Cover the activity and connect floor drains to a sanitary sewer, if approved by the local sewer authority. Berm or slope the floor as needed to prevent drainage of pollutants to outside areas. ([Figure IV-2.2.7 Cover the Activity \(p.657\)](#))
- Isolate and segregate pollutants as feasible. Convey the segregated pollutants to a sanitary sewer, process treatment, or a dead-end sump depending on available methods and applicable permit requirements.

FIGURE B.2

RECYCLING/DISPOSING OF VEHICLE
FLUIDS OTHER THAN WASTES

Appendix IV-C: Recycling/Disposal of Vehicle Fluids/Other Wastes*

	RECOMMENDED MANAGEMENT
Antifreeze	Store separately for resale. Separate ethylene glycol from propylene glycol for off-site recycling. If not recyclable, send to Treatment, Storage, and Disposal Facility (TSDF) for disposal.
Batteries	INTACT: Accumulate under cover prior to sale, deliver to recycler, or return to manufacturer. BROKEN: Accumulate acid from broken batteries in resistant containers with secondary containment. Send to TSDF for disposal.
Brake fluid	Accumulate in separate, marked, closed container. Do not mix with waste oil. Recycle.
Fuel	Store gasoline, and diesel separately for use or resale. Mixtures of diesel, gasoline, oil, and other fluids may not be recyclable and may require expensive disposal.
Fuel filters	Drain fluids for use as product. With approval of local landfill operator, dispose to dumpster, if needed.
Oil filters	Puncture the filter dome and drain it for 24 hours. Put oil drained from filters into a "USED OIL ONLY" container. Keep drained filters in a separate container marked "USED OIL FILTERS ONLY." Locate a scrap metal dealer who will pick up and recycle filters. With approval of local landfill operator, dispose of drained filters to dumpster.
Paint	Accumulate oil-based and water-based paints separately for use or resale. If not recyclable, send accumulations to TSDF for disposal.
Power steering fluid	Same as for used oils
Shop towels/oily rags	Use cloth towels that can be laundered and reused. Accumulate used shop towels in a closed container. Sign up with an industrial laundry service that can recycle towels.
Solvents	Consider using less hazardous solvents or switching to a spray cabinet that doesn't use solvent. Accumulate solvents separately. Consider purchasing a solvent still and recycling solvent on site.

	RECOMMENDED MANAGEMENT
	Do not mix with used oil. Do not evaporate as a means of disposal.
Transmission oil, differential and rear end fluids	Accumulate in a "USED OIL ONLY" container. Arrange for pickup for off-site recycling.
Used oils; including, crankcase oil, transmission oil, power steering fluid and differential/rear end oil	Keep used oil in a separate container marked "USED OIL ONLY." Do not mix with brake fluid, or used antifreeze. Do not mix with any other waste if burning for heating. Arrange for pickup for off-site recycling.
Windshield washer fluid	Accumulate separately for use or resale. Discharge to on-site sewage disposal, or, if acceptable by the local sewer authority, discharge to sanitary sewer.
* Ecology's Hazardous Waste Program developed this information. The Hazardous Waste Service Directory is now available online at: http://apps.ecy.wa.gov/hwsd/default.htm .	

FIGURE B.3

EXAMPLE OF AN INTEGRATED PEST
MANAGEMENT SYSTEM

Appendix IV-F: Example of an Integrated Pest Management Program

Integrated Pest Management (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.

A step-by-step comprehensive Integrated Pest Management (IPM) Program is provided below as a guide:

Introduction

This section provides a sound cultural approach to managing lawns and landscapes and minimizing runoff. Many homeowners or property managers will be able to implement most or all of this approach, others will wish to hire these services out. For the do-it-yourselfer, an array of resources are available to assist in the effort. Landscaping businesses, agricultural extensions, local agencies, master gardener programs, local nurseries and even the library can all provide assistance. Landscaping professionals (businesses) are particularly encouraged to practice IPM.

Definition

“Integrated pest management, or IPM, is an approach to pest control that uses regular monitoring to determine if and when treatments are needed, and employs physical, mechanical, cultural, and biological tactics to keep pest numbers low enough to prevent intolerable damage or annoyance. Least-toxic chemical controls are used as a last resort.”

True IPM is a powerful approach that anticipates and prevents most problems through proper cultural practices and careful observation. Knowledge of the life cycles of the host plants and both beneficial and pest organisms is also important. The IPM section of this study guide is adapted from Least Toxic Pest Management for Lawns by Sheila Daar. Following the IPM process gives you the information you need to minimize damage by weeds, diseases and pests and to treat those problems with the least toxic approaches.

The Integrated Pest Management 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 – 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% 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 waterings 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 grass-cycling 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. Refer to the Operational BMPs for the use of Pesticides below for guidelines on choosing, storing and using lawn and garden chemicals.

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.

FIGURE B.4

MANAGEMENT OF
STREET WASTES

Appendix IV-G: Recommendations for Management of Street Wastes

Introduction

This appendix addresses waste generated from stormwater maintenance activities such as street sweeping and the cleaning of catch basins, and to a limited extent, other stormwater conveyance and treatment facilities. Limited information is available on the characteristics of wastes from detention/retention ponds, bioswales, and similar stormwater treatment facilities. The recommendations provided here may be generally applicable to these facilities, with extra diligence given to waste characterization.

These recommendations do not constitute rules or regulations, but are suggestions for street waste handling, reuse, and disposal using current regulations and the present state of knowledge of street waste constituents. The recommendations address the liquid and solid wastes collected during routine maintenance of stormwater catch basins, detention/retention ponds, ditches and similar storm water treatment and conveyance structures, and street and parking lot sweeping. In addition to these recommendations, end users and other authorities may have their own requirements for street waste reuse and handling.

"Street Wastes" include liquid and solid wastes collected during maintenance of stormwater catch basins, detention/retention ponds, ditches and similar storm water treatment and conveyance structures, and solid wastes collected during street and parking lot sweeping.

"Street Wastes," as defined here, does not include solids and liquids from street washing using detergents, cleaning of electrical vaults, vehicle wash sediment traps, restaurant grease traps, industrial process waste, sanitary sewage, mixed process, or combined sewage/stormwater wastes. Wastes from oil/water separators at sites that load fuel are not included as street waste. Street waste also does not include flood debris, landslide debris, and chip seal gravel.

Street waste does not ordinarily classify as dangerous waste. The owner of the storm water facility and/or collector of street waste is considered the waste generator and is responsible for determining whether the waste designates as dangerous waste. Sampling to date has shown that material from routine maintenance of streets and stormwater facilities does not classify as dangerous waste (See [Table IV-G.6 Pollutants in Catch Basin Solids - Comparison to Dangerous Waste Criteria \(p.751\)](#)). However, it is possible that street waste from spill sites could classify as dangerous waste. Street waste from areas with exceptionally high average daily traffic counts may contain contaminants - such as heavy metals, total petroleum hydrocarbons (TPH), and carcinogenic polycyclic aromatic hydrocarbons (c-PAH) - at levels that limit reuse options.

Contamination in Street Waste Solids

Street waste is solid waste. While street waste from normal street and highway maintenance is not dangerous waste, it is solid waste, as defined under The Solid Waste Management Act ([Chapter 70.95 RCW](#)) and under the Solid Waste Handling Standards ([Chapter 173 350 WAC](#)). The Solid Waste Management Act gives local health departments primary jurisdiction over solid waste management. Street waste solids may contain contaminants at levels too high to allow unrestricted reuse. There are no specific references in the Solid Waste Handling Standards to facilities managing street waste solids although these facilities typically fit under the section dealing with Piles Used for Storage and Treatment (Section 320). There are no specific references for reuse and disposal options for street wastes in the Solid Waste Handling Standards because they do not apply to clean soils. Clean soils are defined as “soils and dredged material which are not dangerous wastes, contaminated soils, or contaminated dredged material ...” ([WAC 173-350-100](#)). Whether or not a soil is a clean soil depends primarily upon the level of contaminants and, to a lesser degree, on the background level of contaminants at a particular location and the exposure potential to humans or other living organisms. Therefore, evaluate both the soil and potential land application sites to determine if a soil is a clean soil.

There is no simple regulatory mechanism available to classify street waste solids for uncontrolled reuse or disposal. Street wastes are defined simply as solid waste. Local health districts have historically used the Model Toxics Control Act Cleanup Regulation (MTCA) Method A residential soil cleanup levels to approximate "clean" and to make decisions on land application proposals. The MTCA regulation is not intended to be directly applied to setting contaminant concentration levels for land application proposals. However, they may provide human health and environmental threat information and a useful framework for such decisions, when used in conjunction with other health and environmental considerations. In addition to MTCA, Ecological Soil Screening Levels from EPA, ODEQ Risk-based concentrations, Toxicological benchmarks from Oak Ridge National Labs, and natural background levels can be considered. Contact the local health department to determine local requirements for making this determination.

Using the old MTCA regulations, many local health departments have set criterion of 200 mg/Kg Total Petroleum Hydrocarbons (TPH) for diesel and heavy fuel oils as a threshold level for clean soil. Using the new MTCA terrestrial ecological evaluation procedures, allowable TPH levels for land application could range from 200 – 460, depending on site characteristics and intended land use. Street waste sampling has historically yielded TPH values higher than 200 mg/kg for hydrocarbons in the diesel and heavy oil range. These values typically reflect interference from natural organic material and, to a lesser extent, relatively immobile petroleum hydrocarbons. The mobile hydrocarbons that are of concern for ground water protection are generally not retained with street waste solids. Ecology's Manchester Lab has developed an analytical method to reduce the problem of natural organic material being included in the TPH analysis for diesel and

heavier range hydrocarbons. This method, called NWTPH-Dx, reduces the background interference associated with vegetative matter by as much as 85% to 95%. However, even with the new methodology, TPH test results for street waste may still be biased by the presence of natural vegetative material and may still exceed 200 mg/kg. Where the laboratory results report no 'fingerprint' or chromatographic match to known petroleum hydrocarbons, the soils should not be considered to be petroleum contaminated soils.

[Table IV-G.1 Typical TPH Levels in Street Sweeping and Catch Basin Solids \(p.745\)](#)

lists Typical TPH levels in street sweeping and catch basin solids.

Table IV-G.1 Typical TPH Levels in Street Sweeping and Catch Basin Solids

Reference:	Street Sweeping (mg/kg)	Catch Basin Solid (mg/kg)
Snohomish County (1) (Landau 1995)	390 - 4300	
King County (1) (Herrera 1995)		123 - 11049 (Median 1036)
Snohomish County & Selected Cities (1) (W & H Pacific, 1993)	163 - 1500 (Median 760)	163 - 1562 (Median 760)
City of Portland (2) (Bresch)		MDL - 1830 (Median 208)
City of Seattle - Diesel Range (2) (Hererra 2009)	330 - 520	780 - 1700
City of Seattle - Motor Oil (2) (Herrera 2009)	2000 - 2800	3500 - 7000
Oregon (1) (Collins; ODOT 1998)	1600 - 2380	
Oregon (3) (Collins; ODOT 1998)	98 - 125	
(1) Method WTPH 418.1; does not incorporate new methods to reduce background interference due to vegetative material		
(2) Method NWTPH-Dx		
(3) Method WTPH - HCID		

Street waste solids frequently contain levels of carcinogenic PAHs (c-PAH) that make unrestricted use inappropriate. This is complicated further by analytical interference

caused by organic matter that raises practical quantitation or reporting limits. To greatly reduce the level of interference, the use of US EPA Test Method 8270, incorporating the silica gel cleanup step, is recommended. The calculated c-PAH value can vary greatly depending upon how non-detect values are handled. The new MTCA Method A criterion for c-PAH is 0.1 mg/kg (the sum of all seven c-PAH parameters multiplied by the appropriate toxicity equivalency factor) for unrestricted land uses. The MTCA criteria for soil cleanup levels for industrial properties is 2.0 mg/kg. Following this guidance, most sites where street wastes could be reused as soil will be commercial or industrial sites, or sites where public exposure will be limited or prevented. See [Table IV-G.2 Typical c-PAH Values in Street Waste Solids and Related Materials \(p.746\)](#) for typical c-PAH values in Street Waste Solids and Related Materials. See [Table IV-G.3 Typical Metals Concentrations in Catch Basin Sediments \(p.747\)](#) for typical metals concentrations in Catch Basin Sediments.

Table IV-G.2 Typical c-PAH Values in Street Waste Solids and Related Materials

Sample Source	City of Everett					WSDOT	
	Street Sweepings	Soil	3-Way Topsoil	Vactor Solids	Leaf & Sand	Sweepings - Fresh	Sweepings - Weathered
Benzo(a)anthracene	0.1U	0.076U	0.074U	0.21	0.45	0.56	0.40
Chrysene	0.14	0.09	0.074U	0.32	0.53	0.35	0.35
Benzo(b)fluoranthene	0.11	0.076U	0.074U	0.27	0.52	0.43	0.51
Benzo(k)fluoranthene	0.13	0.076U	0.074U	0.25	0.38	0.39	0.40
Benzo(a)pyrene	0.13	0.076U	0.074U	0.26	0.5	0.41	0.33U
Indeno(1,2,3-cd)pyrene	0.1U	0.076U	0.074U	0.19	0.39	NR	NR
Dibenzo(a,h)anthracene	0.1U	0.076U	0.074U	0.081	0.12	0.39	0.33U
Revised MTCA							
Benzo(a)pyrene [ND=PQL]	0.215	0.134	0.134	0.388	0.727	0.708	0.597
Benzo(a)pyrene	0.185	0.069	0.067	0.388	0.727	0.708	0.366

Table IV-G.2 Typical c-PAH Values in Street Waste Solids and Related Materials (continued)

Sample Source	City of Everett					WSDOT	
Analyte	Street Sweepings	Soil	3-Way Topsoil	Vactor Solids	Leaf & Sand	Sweepings - Fresh	Sweepings - Weathered
[ND = 1/2 PQL]							
Benzo (a)pyrene [See * below]	0.185	0.069	0	0.388	0.727	0.708	0.366
Benzo (a)pyrene [ND = 0]	0.155	0.001	0	0.388	0.727	0.708	0.135
<p>* If the analyte was not detected for any PAH, then ND=0; If analyte was detected in at least 1 PAH, then ND=1/2PQL; If the average concentration (using ND=1/2 PQL) is greater than the maximum detected value, then ND=Maximum value.</p> <p>The new Method A soil cleanup level for unrestricted land use is 0.1 mg/Kg for BAP. (WAC 173-340-900, Table 740-1)</p> <p>The new Method A soil cleanup level for industrial properties is 2 mg/Kg for BAP. (WAC 173-340-900, Table 745-1)</p>							

Table IV-G.3 Typical Metals Concentrations in Catch Basin Sediments

PARAMETER	Ecology 1993	Thurston 1993	King County 1995	King county 1995	City of Seattle 2003 through 2011
Metals: Total (mg/kg)	(Min - Max)	(Min - Max)	(Min - Max)	Mean	Min - Max (Mean)
As	< 3 - 24	.39 - 5.4	4 -56	0.250	<5 - 50 (9.3)
Cd	0.5 - 2.0	< 0.22 - 4.9	0.2 - 5.0	0.5	
Cr	19 - 241	5.9 - 71	13 - 100	25.8	
Cu	18 - 560	25 - 110	12 - 730	29	9.1 - 3,280 (166)
Pb	24 - 194	42 - 640	4 - 850	80	3 - 3,690 (154)
Ni	33 - 86	23 - 51	14 - 41	23	
Zn	90 - 558	97 - 580	50 - 2000	130	44 - 4170 (479)
Hg	0.04 - 0.16	0.24 - 0.193			<0.03 - 3.8 (0.16)

Permitting of street waste treatment and storage facilities as solid waste handling facilities by the local health department is required. Under the Solid Waste Management Act, local health departments have primary jurisdiction over solid waste management.

Street waste handling facilities are subject to the requirements of the Solid Waste Handling Standards. Specific requirements depend upon the manner in which the waste is managed. Most facilities are permitted under the section dealing with Piles Used for Storage and Treatment (Section 320).

For most facilities, permit requirements include a plan of operation, sampling, record keeping and reporting, inspections, and compliance with other state and local requirements. The plan of operation should include a procedure for characterization of the waste and appropriate reuse and disposal options, consistent with the recommendations in this document and applicable federal, State and local requirements.

Ecology suggests a street waste site evaluation (see sample at end of this appendix) for all street waste as a method to identify spill sites or locations that are more polluted than normal. Ecology based the disposal and reuse options listed below on characteristics of routine street waste and are not appropriate for more polluted wastes. The collector of street waste should evaluate it for its potential to be classified as dangerous waste. The collector should also be aware that this waste may not meet end users requirements.

Street waste suspected to be dangerous waste should not be collected with other street waste. Material in catch basins with obvious contamination (unusual color, staining, corrosion, unusual odors, fumes, and oily sheen) should be left in place or segregated until tested. Base testing activities on probable contaminants. Street waste suspected to be dangerous waste should be collected and handled by someone experienced in handling dangerous waste. If collecting potential dangerous waste because of emergency conditions, or if the waste becomes suspect after it is collected, it should be handled and stored separately until a determination as to proper disposal is made. Street waste treatment and storage facilities should have separate "hot load" storage areas for such waste. **Dangerous Waste** includes street waste known or suspected to be dangerous waste. This waste must be handled following the Dangerous Waste Regulations ([Chapter 173 303 WAC](#)) unless testing determines it is not dangerous waste.

Spills should be handled by trained specialists. Public works maintenance crews and private operators conducting street sweeping or cleaning catch basins should have written policies and procedures for dealing with spills or suspected spill materials. Emergency Spill Response telephone numbers should be immediately available as part of these operating policies and procedures.

The end recipient of street waste must be informed of its source and may have additional requirements for its use or testing that are not listed here. This document is based primarily on average street waste's chemical constituents and their potential

affect on human health and the environment. There are physical constituents (for example, broken glass or hypodermic needles) or characteristics (for example, fine grain size) that could also limit reuse options. Additional treatment such as drying, sorting, or screening may also be required, depending on the needs and requirements of the end user.

Street waste treatment and storage facilities owned or operated by governmental agencies should be made available to private waste collectors and other governmental agencies on a cost recovery basis. Proper street waste collection and disposal reduces the amount of waste released to the environment. The operators of street waste facilities should restrict the use of their facilities to certified and/or licensed waste collectors who meet their training and liability requirements.

The use of street waste solids under this guidance should not lead to designation as a dangerous waste site, requiring cleanup under MTCA. Exceeding MTCA Method A unrestricted land use cleanup levels in street waste and products made from street waste, does not automatically make the site where street waste is reused a cleanup site. A site is reportable only if "-a release poses a threat to human health or the environment-" (Model Toxic Control Act). The reuse options proposed below are designed to meet the condition of not posing a threat to human health or the environment.

Testing of street waste solids will generally be required as part of a plan of operation that includes procedures for characterization of the waste. Testing frequency, numbers of samples, parameters to be analyzed, and contaminant limit criteria should all be provided as part of an approved plan of operation. However, street sweepings that consist primarily of leaves, pine needles, branches, and grass clippings do not require testing. [Table IV-G.4 Recommended Parameters and Suggested Values for Determining Reuse and Disposal Options \(p.750\)](#) and [Table IV-G.5 Recommended Sampling Frequency for Street Waste Solids \(p.751\)](#) below provide some recommended parameters and sampling frequencies for piles of street waste solids from routine street maintenance. These are provided as guidance only, and are intended to assist the utility and the local health department in determining appropriate requirements. Sampling requirements may be modified, over time, based on accumulated data. When the material is from a street waste facility or an area that has never been characterized by testing, the test should be conducted on a representative sample before co-mingling with other material. Testing in these instances would be to demonstrate that the waste does not designate as dangerous waste and to characterize the waste for reuse. At a minimum, the parameters in [Table IV-G.4 Recommended Parameters and Suggested Values for Determining Reuse and Disposal Options \(p.750\)](#) are recommended for these cases. Note that it will generally not be necessary to conduct TCLP analyses when the observed values do not exceed the recommended values in [Table IV-G.4 Recommended Parameters and Suggested Values for Determining Reuse and Disposal Options \(p.750\)](#). [Table IV-G.6 Pollutants in Catch Basin Solids - Comparison to](#)

[Dangerous Waste Criteria \(p.751\)](#) illustrates some observed relationships between total metals and TCLP metals values.

For further information on testing methods and sampling plans, refer to:

- SW 846 (US EPA, Office of Solid Waste, Test Methods for Evaluating Solid Wastes, 3rd Ed.) and
- Standard Methods for the Examination of Water and Wastewater (American Public Health Association, et al., 18th Edition 1992)

Table IV-G.4 Recommended Parameters and Suggested Values for Determining Reuse and Disposal Options

Parameter	Suggested Maximum Value
Arsenic, total	20.0 mg/kg (a)
Cadmium, Total	2.0 mg/kg (b)
Chromium, Total	42 mg/kg (c)
Copper, Total	100 mg/kg (e)
Lead, Total	250 mg/kg (d)
Nickel	100 mg/kg (e)
Zinc	270 mg/kg (e)
Mercury (Inorganic)	2.0 mg/kg (f)
PAHs (Carcinogenic)	0.1 - 2.0 mg/kg (see Note at (g) below)
TPH (Heavy Fuel Oil)	2,000 mg/kg (see Note at (h) below)
TPH (Diesel)	200 mg/kg (see Note at (i) below)
TPH (Gasoline)	100 mg/kg (j)
Benzene	0.03 mg/kg (j)
Ethylbenzene	6 mg/kg (j)
Toluene	7 mg/kg (j)
Xylenes (Total)	9 mg/kg (j)
(a) Arsenic: from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses	
(b) Cadmium: from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses.	
(c) Chromium; from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses	
(d) Lead; from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses	
(e) Copper, Nickel and Zinc; from MTCA Table 749-2: Protection of Terrestrial Plants and Animals	

Table IV-G.4 Recommended Parameters and Suggested Values for Determining Reuse and Disposal Options (continued)

Parameter	Suggested Maximum Value
(f) Mercury; from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses	
(g) PAH-Carcinogenic; from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses and Table 745-1, industrial properties, based on cancer risk via direct contact with contaminated soil (ingestion of soil) in residential land use situations and commercial/industrial land uses. Note: The local health department may permit higher levels as part of a Plan of Operation, where they determine that the proposed end use poses little risk of direct human contact or ingestion of soil.	
(h) TPH (Heavy Fuel Oil); from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses	
(i) TPH (Diesel); from MTCA Table 749-3: Protection of Terrestrial Plants and Animals.	
(j) BETX; from MTCA Method A - Table 740-1: Soil cleanup levels for unrestricted land uses.	

Table IV-G.5 Recommended Sampling Frequency for Street Waste Solids

Cubic Yards of Solids	Minimum Number of Samples
0 - 100	3
101 - 500	5
501 - 1000	7
1001 - 2000	10
>2000	10 + 1 for each additional 500 cubic yards
<i>Modified from Ecology's Interim Compost Guidelines (no longer in effect)</i>	

Table IV-G.6 Pollutants in Catch Basin Solids - Comparison to Dangerous Waste Criteria

PARAMETER	Range of Values in Catch Basin Waste	Range of Values in Catch Basin Waste	Dangerous Waste Criteria
METALS	Total Metals (mg/kg)	TCLP Metals (mg/kg)	TCLP values (mg/l)
AS	<3 - 56	< 0.02 - 0.5	5.0
Cd	< 0.22 - 5	0.0002 - 0.03	1.0
Cr	5.9 - 241	0.0025 - 0.1	5.0
Cu	12 - 730	0.002 - 0.88	none

Table IV-G.6 Pollutants in Catch Basin Solids - Comparison to Dangerous Waste Criteria (continued)

PARAMETER	Range of Values in Catch Basin Waste	Range of Values in Catch Basin Waste	Dangerous Waste Criteria
METALS	Total Metals (mg/kg)	TCLP Metals (mg/kg)	TCLP values (mg/l)
Pb	4 - 850	0.015 - 3.8	5.0
Ni	23 - 86	< 0.01 - 0.36	none
Zn	50 - 2,000	0.04 - 6.7	none
Hg	0.02 - 0.19	0.0001 - 0.0002	0.2
<i>Data from Thurston County (Thurston County 1993), King County (Herrera 1995) and Ecology (Serdar; Ecology 1993)</i>			

For street waste not exceeding the suggested maximum values in Table G.4, Ecology recommends the following street waste solids reuse and disposal options:

- Compost street sweepings that consist primarily of leaves, pine needles and branches, and grass cuttings from mowing grassy swales. Remove litter and other foreign material prior to composting or the composting facility must provide for such removal as part of the process. Dispose of the screened trash is solid waste at an appropriate solid waste handling facility.
- It is possible to reuse coarse sand screened from street sweeping after recent road sanding, for street sanding, providing there is no obvious contamination from spills. The screened trash is solid waste and must be disposed of at an appropriate solid waste handling facility.
- Screen roadside ditch cleanings, not contaminated by a spill or other release and not associated with a stormwater treatment system such as a bioswale, to remove litter and separate into soil and vegetative matter (leaves, grass, needles, branches, etc.). The soils from these activities are typically unregulated as solid waste. Ditching material that may be contaminated must be stored, tested, and handled in the same manner as other street waste solids. It is the generator's responsibility to visually inspect and otherwise determine whether the materials may be contaminated.
- Construction street wastes; solids collected from sweeping or in storm water treatment systems at active construction sites - may be placed back onto the site that generated it, or managed by one on the methods listed below, provided that it has not been contaminated as a result of a spill. For concrete handling at construction site, refer to [BMP C151: Concrete Handling \(p.313\)](#).
- ~~Use screened street waste soils as feedstock materials for topsoil operations.~~
Reserve this option for street waste soils with very low levels of contaminants.

Evaluate the allowable level of contaminants based on the proposed use of the soil. At a minimum, the contaminate level in the soil should be below established action levels for in situ soils. Do not dilute street waste soils with clean soils or composted material as a substitute for treatment or disposal. There may be unscreened physical contaminants (for example, glass, metal, nails) in street waste. Where present, these contaminants in street waste could preclude its use as feedstock material for topsoil operations.

- Fill in parks, play fields, golf courses and other recreational settings, where direct exposure by the public is limited or prevented. One way to accomplish is to cover the fill with sod, grass or other capping material to reduce the risk of soil ingestion. Evaluate the level of contaminants in the street waste to ensure that the soils meet the definition of clean soils when used in this manner.
- Fill in commercial and industrial areas, including soil or top dressing for use at industrial sites, roadway medians, airport infields and similar sites, where there is limited direct human contact with the soil, and stabilize the soils with vegetation or other means. Evaluate the level of contaminants in the street waste to ensure that the soils meet the definition of clean soils when used in this manner.
- Top dressing on roadway slopes, road or parking lot construction material and road subgrade, parking lot subgrade, or other road fill. Evaluate the level of contaminants in the street waste to ensure that the soils meet the definition of clean soils when used in this manner.
- Daily cover or fill in a permitted municipal solid waste landfill provided the street waste solids have been dewatered. Street waste solids may be acceptable as final cover during a landfill closure. Consult the local health department and landfill operator to determine conditions of acceptance.
- Treatment at a permitted contaminated soil treatment facility.
- Recycling through incorporation into a manufactured product, such as Portland cement, prefabricated concrete, or asphalt. Consult the facility operator to determine conditions of acceptance.
- Other end-use as approved by the local health department
- Disposal at an appropriate solid waste handling facility.

For street waste that exceeds the suggested maximum values in [Table IV-G.4 Recommended Parameters and Suggested Values for Determining Reuse and Disposal Options \(p.750\)](#), Ecology recommends the following street waste solids reuse and disposal options:

- Treatment at a permitted contaminated soil treatment facility.
- Recycling through incorporation into a manufactured product, such as Portland

cement, prefabricated concrete, or asphalt. Consult the facility operator to determine conditions of acceptance.

- Other end-use as approved by the local health department
- Disposal at an appropriate solid waste handling facility.

Street Waste Liquids

General Procedures:

Street waste collection should emphasize retention of solids in preference to liquids. Street waste solids are the principal objective in street waste collection and are substantially easier to store and treat than liquids.

Street waste liquids require treatment before their discharge. Street waste liquids usually contain high amounts of suspended and total solids and adsorbed metals. Treatment requirements depend on the discharge location.

The entity responsible for operation and maintenance of the system must approve discharges to sanitary sewer and storm sewer systems. Ecology will not generally require waste discharge permits for discharge of stormwater decant to sanitary sewers or to stormwater treatment BMPs constructed and maintained in accordance with Ecology's Stormwater Management Manual for Western Washington (See [Chapter V-7 - Infiltration and Bioretention Treatment Facilities \(p.957\)](#) through [Chapter V-12 - Emerging Technologies \(p.1119\)](#) for further detail on approved BMPs).

Follow the following required order of preference, for disposal of catch basin decant liquid and water removed from stormwater treatment facilities.

1. **Discharge of catch basin decant liquids to a municipal sanitary sewer connected to a Public Owned Treatment Works (POTW).** Discharge to a municipal sanitary sewer requires the approval of the sewer authority. Approvals for discharge to a POTW will likely contain pretreatment, quantity, and location conditions to protect the POTW. Following the local sewer authority's conditions is a permit requirement.
2. **Discharge of catch basin decant liquids may be allowed into a Basic or Enhanced Stormwater Treatment BMP, if option 1 is not available.** Only discharge liquid collected from cleaning catch basins and stormwater treatment wetvaults back into the storm sewer system under the following conditions:
 - The preferred disposal option of discharge to sanitary sewer is not reasonably available.
 - The discharge is to a Basic or Enhanced Stormwater Treatment Facility. If pretreatment does not remove visible sheen from oils, the treatment facility must be able to prevent the discharge of oils causing a visible sheen.

- The discharge is as near to the treatment facility as is practical, to minimize contamination or recontamination of the collection system.
- The storm sewer system owner/operator has granted approval and has determined that the treatment facility will accommodate the increased loading. Part of the approval process may include pretreatment conditions to protect the treatment BMP. Following local pretreatment conditions is a requirement of this permit.
- Ecology must approve in advance flocculants for the pretreatment of catch basin decant liquids. The liquids must be non-toxic under the circumstances of use.

The discharger shall determine if reasonable availability of sanitary sewer discharge exists, by evaluating such factors as distance, time of travel, load restrictions, and capacity of the stormwater treatment facility.

3. **Operators may return water removed from stormwater ponds, vaults, and oversized catch basins to the storm sewer system.** Stormwater ponds, vaults, and oversized catch basins contain substantial amounts of liquid, which hampers the collection of solids and poses problems in hauling the removed waste away from the site. Water removed from these facilities may be discharged back into the pond, vault, or catch basin provided:

- Operators may discharge clear water removed from a stormwater treatment structure directly to a down gradient cell of a treatment pond or into the storm sewer system.
- Turbid water may be discharged back into the structure it was removed from if the removed water has been stored in a clean container (eductor truck, Baker tank, or other appropriate container used specifically for handling stormwater or clean water); and there will be no discharge from the treatment structure for at least 24 hours.
- The storm sewer system owner/operator must approve the discharge.

Table IV-G.7 Typical Catch Basin Decant Values Compared to Surface Water Quality Criteria

PARAMETER	State Surface Water Quality Criteria		Range of Values Reported	
	Freshwater Acute (ug/l - dissolved metals)	Freshwater Chronic (ug/l - dissolved metals)	Total Metals (ug/l)	Dissolved Metals (ug/l)
Arsenic	360	190	100 - 43,000	60 - 100

Table IV-G.7 Typical Catch Basin Decant Values Compared to Surface Water Quality Criteria (continued)

PARAMETER	State Surface Water Quality Criteria		Range of Values Reported	
	Freshwater Acute (ug/l - dissolved metals)	Freshwater Chronic (ug/l - dissolved metals)	Total Metals (ug/l)	Dissolved Metals (ug/l)
Cadmium*	2.73	0.84	64 - 2,400	2 - 5
Chromium(total)			13 - 90,000	3 - 6
Chromium (III)*	435	141		
Chromium (VI)	0.5	10		
Copper*	13.04	8.92	81 - 200,000	3 - 66
Lead*	47.3	1.85	255 - 230,000	1 - 50
Nickel*	1114	124	40 - 330	20 - 80
Zinc*	90.1	82.3	401 - 440,000	1,900 - 61,000
Mercury	2.10	0.012	0.5 - 21.9	

**Hardness dependent; hardness assumed to be 75 mg/L*

Table IV-G.8 Typical Values for Conventional Pollutants in Catch Basin Decant

PARAMETER	Ecology 1993	(Min - Max)	King County 1995	(Min - Max)
Values as mg/l; except where stated	Mean		Mean	
pH	6.94	6.18 - 7.98	8	6.18 - 11.25
Conductivity (umhos/cm)	364	184 - 1,110	480	129 - 10,100
Hardness (mg/l CaCO3)	234	73 - 762		
Fecal Coliform (MPN/100 ml)	3,000			
BOD	151	28 - 1,250		
COD	900	120 - 26,900		
Oil & Grease	11	7.0 - 40	471	15 - 6,242
TOC	136	49 - 7,880	3,670	203 -

Table IV-G.8 Typical Values for Conventional Pollutants in Catch Basin Decant (continued)

PARAMETER	Ecology 1993	(Min - Max)	King County 1995	(Min - Max)
Values as mg/l; except where stated	Mean		Mean	
				30,185
Total Solids	1,930	586 - 70,400		
Total Dissolved Solids	212	95 - 550		
Total Suspended Solids	2,960	265 - 111,000		
Settleable Solids (ml/l/hr)	27	2 - 234	57	1 - 740
Turbidity (ntu)	1,000	55 - 52,000	4,673	43 - 78,000

Table IV-G.9 Catch Basin Decant Values Following Settling¹

PARAMETER; Total Metals in mg/l	Portland - Inverness Site Min - Max	King County - Renton Min - Max	METRO Pre-treatment Discharge Limits
Arsenic	0.0027 - 0.015	< MDL - 0.12	4
Cadmium	0.0009 - 0.0150	< MDL - 0.11	0.6
Chromium	0.0046 - 0.0980	0.017 - 0.189	5
Copper	0.015 - 0.8600	0.0501 - 0.408	8
Lead	0.050 - 6.60	0.152 - 2.83	4
Nickel	0.0052 - 0.10	0.056 - 0.187	5
Silver	0.0003 - 0.010	< MDL	3
Zinc	0.130 - 1.90	0.152 - 3.10	10
Settleable Solids; ml/L	No Data	0.02 - 2.0	7
Nonpolar FOG	5.7 - 25	5 - 22	100
Ph (std)	6.1 - 7.2	6.74 - 8.26	5.0 - 12.0
TSS	2.8 - 1310		
Recorded Total Monthly Flow; Gallons	Data not available	31,850 - 111,050	
Recorded Max. Daily Flow; Gallons	Data not available	4,500 - 18,600	25,000 GPD

**Table IV-G.9 Catch Basin Decant Values Following Settling1
(continued)**

PARAMETER; Total Metals in mg/l	Portland - Inverness Site Min - Max	King County - Renton Min - Max	METRO Pre-treatment Discharge Limits
Calculated Average Daily Flow; GPD	Data not available	1,517 - 5,428	
1) Data from King County's Renton Facility (data from 1998 - 1999) and the City of Portland's Inverness Site (data from 1999 - 2001); detention times not provided			

Site Evaluation

Ecology suggests use of a site evaluation as method to identify spill sites or locations that potentially contain dangerous wastes.

The site evaluation will aid in determining if waste is a dangerous waste and in determining what to test for if dangerous waste is suspected. The site evaluation will also help to determine if the waste does not meet the requirements of the end users.

There are three steps to a site evaluation:

1. An **historical review** of the site for spills, previous contamination and nearby toxic cleanup sites and dangerous waste and materials.

The historical review will be easier if done on an area wide basis prior to scheduling any waste collection. The historical review should be more thorough for operators who never collected waste at a site before. At a minimum, the historical review should include operator knowledge of the area's collection history or records kept from previous waste collections.

Private operators should ask the owner of the site for records of previous contamination and the timing of the most recent cleaning. Ecology's Hazardous Substance Information Office maintains a Toxic Release Inventory and a "Facility Site" webpage, tracking more than 15,000 sites. This information is available from Ecology through the Internet at http://www.ecy.wa.gov/epcra/chemical_summary_2008/tri_intro_numbers.html or by calling a toll-free telephone number (1-800-633-7585). The webpage allows anyone with web-access to search for facility information by address, facility name, town, zip code, and SIC code, etc. It lists why Ecology is tracking each one (NPDES, TSCA, RCRA, Clean Air Act, etc.), as well as who to call within Ecology to find out more about the given facility. EPA's toxic release website is http://iaspub.epa.gov/triexplorer/tri_release.chemical

2. An area visual inspection for potential contaminant sources such as a past fire, leaking tanks and electrical transformers, and surface stains.

Evaluate the area around the site for contaminant sources prior to collection of the waste. The area visual inspection may be done either as part of multiple or as single site inspections. If the inspection finds a potential contaminant source, delay the waste collection until the potential contaminant is assessed.

A second portion of the area visual inspection is a subjective good housekeeping evaluation of the area. Locations with poor housekeeping commonly cut corners in less obvious places. Inspect these sites in greater detail for illegal dumping and other contamination spreading practices.

3. **A waste and container inspection** before and during collection.

The inspection of the waste and catch basin or vault is the last and perhaps most critical step in the site evaluation.

For example, if the stormwater facility has an unusual color in or around it, then there is a strong possibility that someone dumped something into it. Some colors to be particularly wary of are yellow green from antifreeze dumping and black and rainbow sheen from oil and/or grease dumping. In addition, if the inspector observes any staining or corrosion, then a solvent may have been dumped.

Fumes are also good indicators of potential dangerous or dangerous waste. Avoid deliberate smelling of catch basins for worker safety, but suspicious odors may be encountered from catch basins thought to be safe. Some suspicious odors are rotten eggs (hydrogen sulfide is present), gasoline or diesel fumes, or solvent odors. If unusual odors are noted, contact a dangerous waste inspector before cleaning the basin.

Finally, operator experience is the best guide to avoid collection of contaminated waste.