STATE OF OREGON
DEPARTMENT OF ENVIRONMENTAL QUALITY

RECOMMENDED BEST MANAGEMENT PRACTICES FOR STORM WATER DISCHARGES

Guidance for Eliminating or Reducing
Pollutants in Storm Water Discharges
Associated With Industrial Activity

August 1997

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RECOMMENDED BEST MANAGEMENT PRACTICES FOR STORM WATER DISCHARGES

1 INTRODUCTION

Best Management Practices (BMPs) are instrumental in developing the management portion of the Storm Water Pollution Control Plan (SWPCP) required by the National Pollutant Discharge Elimination System (NPDES) General Storm Water Discharge Permits.

BMPs are measures or controls that reduce pollutants at the source to prevent the pollution of storm water runoff discharged from the site. These practices can also be used to divert runoff away from areas of exposure to pollutants, such as raw materials, intermediate products, or finished products. In addition, BMPs can be used to direct polluted runoff to natural or other types of treatment. The storm water discharge permits do not require specific BMPs because the practices should be selected on a case-by-case basis depending on the particular activities ongoing at the industrial facility and other factors. These factors might include the quantity of rainfall reaching the site, the area of land available for constructing management practices, costs in implementing the practices, etc.

In selecting a BMP for the facility's storm water program, the permittee should choose "source reduction" practices as much as practicable. These are practices that reduce the amount of pollution that is generated at the site and prevent contaminants from being exposed to storm water in the first place. If this is not possible, practices that recycle or reuse the runoff on the site should be considered. Treating contaminated storm water to remove pollutants before the runoff leaves the site is the next option, although this may transfer the pollution problem from one place or medium to another since treatment will not be completely effective. Source reduction methods are the most desirable BMPs because they keep storm water away from pollutants and are frequently less costly than treatment alternatives.

There a variety of treatment mechanisms available for treating storm water. Many of the references mentioned in the appendix contain a description of storm water treatment facilities. It should be noted that treatment mechanisms are not a substitute for the BMPs mentioned in this document. Storm water treatment menchanisms should be considered in instances where source reduction BMPs are not sufficient.

2 STORM WATER BEST MANAGEMENT PRACTICES BY ACTIVITY

The BMPs included in this guidance document are related to source reduction and treatment methods for specific processes and activities ongoing at the industrial site. The permittee should consider the recommended practices in developing and/or revising their Storm Water Pollution Control Plan if these activities are ongoing at the facility. In addition, the preventive measures mentioned may assist the facility in achieving storm water discharge benchmarks and limitations through pollution prevention.

All of the BMPs recommended in this guidance are intended to complement, not conflict with, existing state and federal regulations regarding the handling, containment, or treatment of any material or waste.

The following BMPs relate to specific activities that are common for industrial facilities:

- Outside Storage of Raw Materials, Intermediate Products, By-Products or Finished Products
- Outside Container Storage and Waste Disposal
- Loading and Unloading Liquid Materials
- Emergency Spill Response and Cleanup Plan
- Above-Ground Tank Storage
- Outside Manufacturing Activity
- Fueling Stations
- Vehicle and Equipment Washing
- Vehicle and Equipment Maintenance
- Sandblasting and Painting Operations
- Inspection and Monitoring Activities
- Dust Control
- Erosion Control
- Treatment Alternatives

2.1 Outside Storage of Raw Materials, Intermediate Products, By-Products, or Finished Products

This BMP applies to facilities that store or stockpile raw or finished materials or products used in manufacturing or processing on their site. Materials frequently stockpiled may include sand, gravel, topsoil, wood chips, sawdust, compost, lumber and building products, or metal products.

The permittee should select from among the following practices that would be appropriate for the type of material stored outdoors and exposed to storm water runoff:

1. Build a covered area with a paved floor for storing materials to prevent contact with storm water runoff. This practice could be used for significant materials that may seriously contaminate storm water runoff (and ultimately surface water bodies) should contact occur. While this practice may prove expensive, the permittee could weigh the costs of constructing the storage area versus treating the contaminated runoff, or consider the other practices. *See Figure 2.1.A.*

2. Place a temporary plastic film or sheeting over the material. If small quantities of materials are stored outdoors, it may be economical to cover them in this manner. *See Figure 2.1.A.*

3. For new storage areas on the site containing significant materials, pave the area where the material will be stored and install a drainage system to collect the storm water runoff.

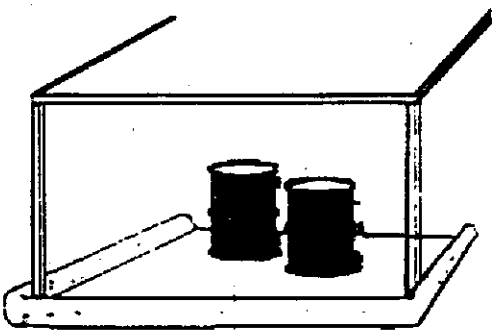
The paved area should be sloped to minimize the pooling of water on the site, particularly with materials that could leach pollutants into the storm water. Curbing should be placed along the perimeter of the area to prevent contaminated runoff from leaving the site. The drainage system should minimize the use of catch basins in the interior of the paved area since the catch basins could fill with the stored material and clog.

The drain from the paved area can be connected to the sanitary sewer if allowed by the local public works department. If this is not possible, then the runoff may need treatment to remove pollutants using a process appropriate for the nature of the contaminants. If a wastewater treatment system is located on the site, this system may be capable of treating the contaminated runoff. The Department's approval would be required for connection of contaminated storm water to the facility's system.

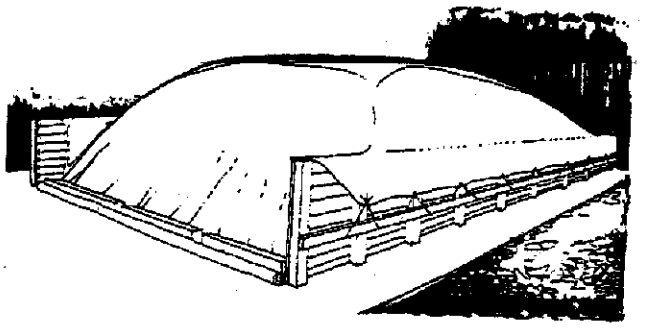
4. For existing unpaved areas on the site with large quantities of materials stockpiled, determine whether or not the rainfall infiltrates, or passes into, the grass cover and/or soil through visual observations during rainfall events. If the runoff passes into the soil, no further work is needed **provided** there is no contamination of groundwater sources resulting from the infiltration of the runoff.

If the quantity of storm water falling on the storage area is greater than the soil can absorb during the storm event, construct a berm around the storage area to both collect and divert the excess runoff either to the sanitary sewer or for treatment, as noted above in Practice 3.

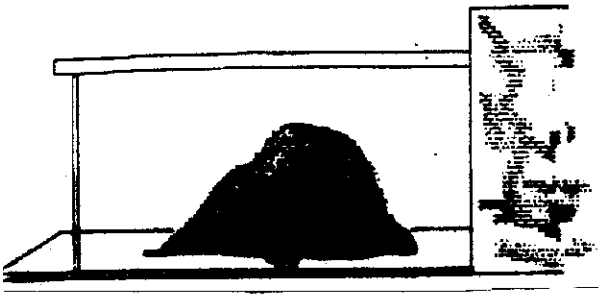
5. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).



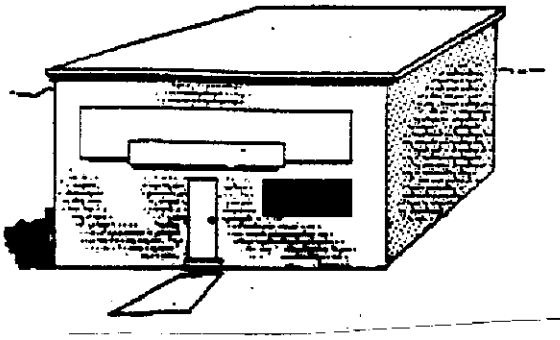
Small Chemical Storage Area
with Curbing and Cover



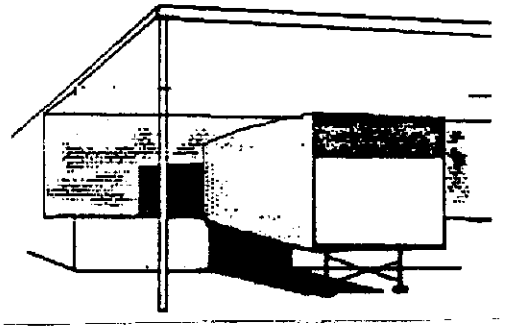
Raw Material Storage Covered
with Tarpaulin



Covered Area for Raw Materials



Enclosed Area for Storage of
Raw Material or Chemicals



Covered Area for Loading and
Unloading

Figure 2.1.A: Outside Storage Details
(Modified from U.S. Environmental Protection Agency, Storm Water Management for Industrial Activities, September 1992)

2.2 Outside Container Storage and Waste Disposal

This BMP refers to containers located outdoors and used to temporarily store materials, such as accumulated food wastes, paints, oils, vegetable or animal grease, solvents, and waste materials (e.g., used batteries.)

If the industrial facility has container storage of materials in an outdoor location, the following practices are recommended to prevent contact between the container and storm water runoff:

1. Designate the location of the container area on the site and install a paved floor with bermed or curbed sides within this area to contain and keep spills of materials and contaminated storm water runoff from leaving the bermed area.

The berm or curb should be of adequate height to contain an amount equal to the volume of the largest single storage tank, plus additional volume to account for potential rainfall accumulation. A good approximation of the needed volume would be 110% of the largest storage tank, but additional volume may be needed depending on the quantity of rainfall reaching the site. Slope the paving on the floor of the designated area to a lined sump that will prevent the transfer of spilled liquids and/or contaminated runoff to surface water or groundwater.

2. If at all possible, cover the designated area for container storage or bring the containers indoors to prevent contact with rainfall.

If the entire area cannot be covered, it is important to cover containment bins, tanks, or hoppers to prevent rainfall from entering the container and percolating through the stored materials. Waste liquids should be covered with tarpaulins or roofed structures. The covers should be large enough to keep rainfall out of the containment berm surrounding the stored liquids.

3. Segregate and securely store incompatible or reactive materials in separate containment areas in order to prevent the mixing of chemicals should spills occur.

4. For containers that are mounted for direct removal of a liquid chemical by employees, install a paved, bermed, and covered area as described above in Practices 1 and 2. Allow 110% of the container size, or some higher approximation, for the containment volume. A drip pan should be placed under the mounted container for use during transfers of the liquid. *See Figure 2.2.A*

5. Install overfill protection on storage tanks and drums to minimize the risk of spilling liquids during transfer and loading. Install guards around tanks and piping to prevent damage from forklifts or vehicles.

6. Secure the designated storage area to prevent unauthorized persons from accessing storage containers and causing spills. Examples of such measures include using a locked storage building to house the containers, or using a locking system for drum lids. Also provide warning signs, such as: AUTHORIZED PERSONNEL ONLY, DANGER - HAZARDOUS MATERIALS, FLAMMABLE MATERIALS, TOXIC MATERIALS, etc.

7. Inspect all containers at least monthly for deterioration to make sure leakage of the substance is not occurring. This is crucial to prevent contamination of storm water runoff that will come in contact with containers that are not covered. Also inspect the lids of drums or containers to ensure that they are in place and properly

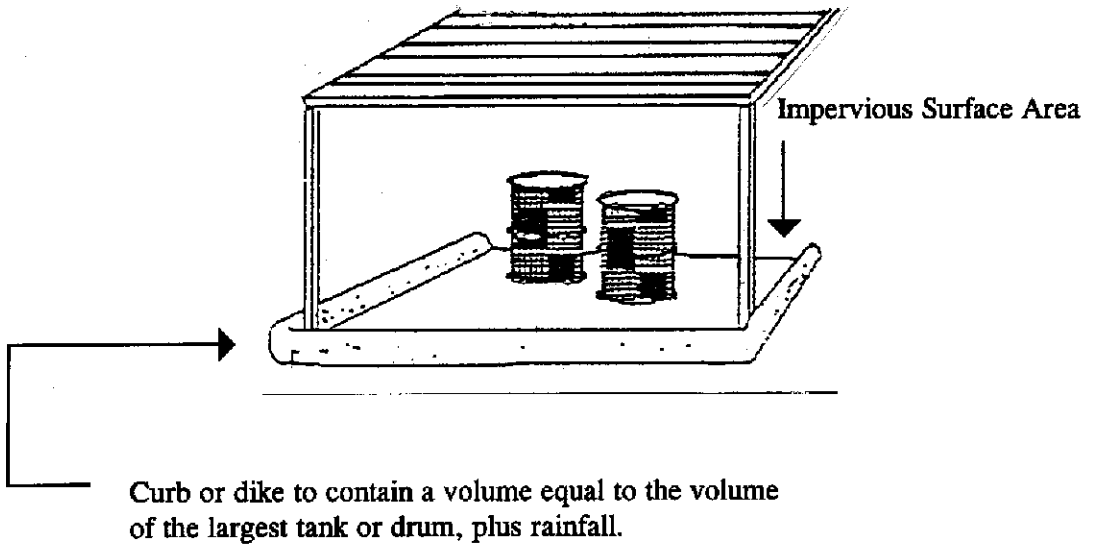
secured. A drum that contains materials with a specific gravity less than water may fill with rainfall from the bottom of the drum and allow the stored material to leak or spill out the top.

It may also be helpful to obtain a storm sewer map from the local public works department to identify potential surface water discharge points on and around the site and their location in relation to containers or the storage area if spills should occur.

8. If the material stored is a hazardous waste, the permittee shall comply with any additional DEQ or federal regulations and requirements not mentioned in this guidance.

9. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

Covered Storage Area With Berm



Mounted Container with Drip Pan

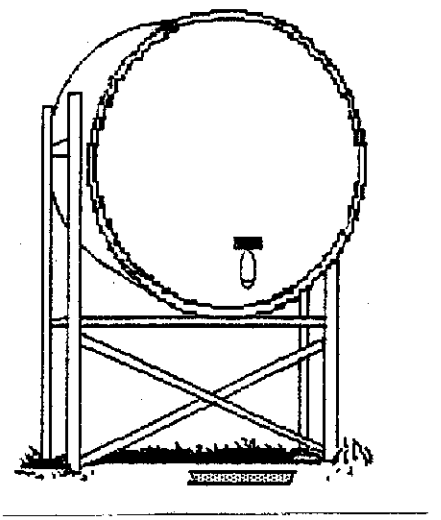


Figure 2.2.A: Container Storage
(Modified from Washington Department of Ecology, WA, Stormwater Management Manual for the Puget Sound Basin, February, 1992.)

2.3 Loading And Unloading Materials

This BMP applies for both the loading or unloading of materials stored in containers and direct liquid or gas transfers from tanks. The loading or unloading of materials should take place in the facility's operations building so that both spills and the residual materials resulting from the cleanup can be discharged to the sanitary sewer or the process wastewater treatment system.

If the transfer of materials occurs outdoors, the facility should consider the following practices to prevent the contamination of storm water runoff from spilled materials:

1. With truck transfer of materials, use loading docks with overhangs or door skirts to enclose the end of the trailer. The loading/unloading area should be designed to prevent storm water runoff from entering the transfer area with curbing or berming. The permittee should have the appropriate materials available for rapid cleanup of spills. *See Figure 2.3.A.*

2. For tanker truck transfer to above-ground or underground storage tanks, pave and slope the floor of the transfer area to a sump or a secondary containment system to prevent leakage from spills.

The paving material used needs to be suitable for the type of liquid that is transferred. For example, gasoline should not be transferred over an asphalt surface because gas will react with and slowly dissolve the asphalt. In this case, a Portland cement concrete surface should be used.

3. Place drip pans as needed when making and breaking connections for the transfer, and under hose connections, hose reels, and filler nozzles. *See Figure 2.3.A*

With the rail transfer of materials to above-ground or underground storage tanks, use drip pans at locations where spills may occur, as noted above in Practice 2. A drip pan system should be installed within the rails to collect spills from tank cars.

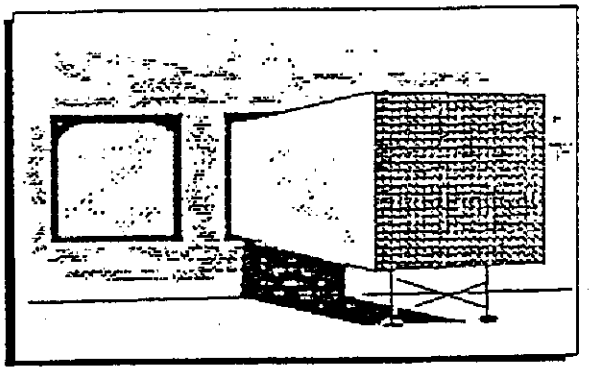
4. Follow Coast Guard Requirements found in 33 Code of Federal Rules (CFR) Titles 153, 154, and 155 for transfers to and from marine vessels. These regulations cover spill response, spill prevention at marine transfer facilities, and spill prevention for vessels. Technical requirements are specified for loading arms, transfer hoses, closure and monitoring devices, and small discharge containment. In addition, the regulations also require an operations plan and specify its general contents as follows: description of the responsibilities of personnel, nature of the facility, hours of operation, sizes and numbers of vessels using the facility, nature of the cargo, procedures if spills occur, petroleum transfer procedures, and a description and location of equipment for monitoring, containment, and fire fighting.

5. Examine loading/unloading areas for dust or fumes or stains to determine if materials are being lost during these operations. Check vehicles and equipment frequently for leaks and repair them promptly. Clean up any leaks to the ground appropriately.

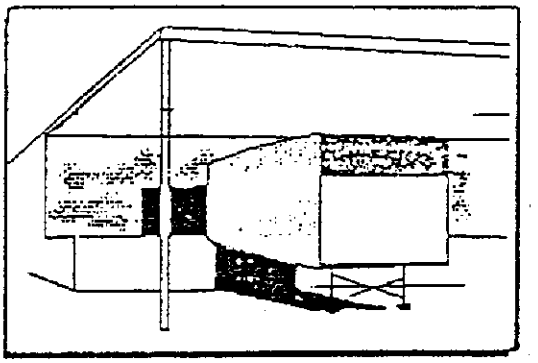
It may also be helpful to obtain a storm sewer map from the local public works department to identify potential surface water discharge points on and around the site and their location in relation to containers or the storage area if spills should occur.

6. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

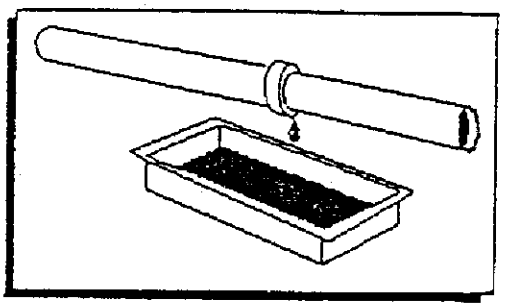
Dock with Door Skirt



Dock with overhang



Drip Pan



Drip Pan within Rails

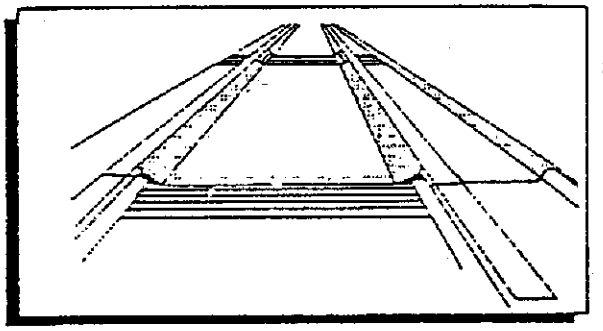


Figure 2.3.A: Loading and Unloading Liquid Materials
(From City of Seattle, WA, Water Quality Best Management Practices Manual for Commercial and Industrial Businesses, June 30, 1989.)

2.4 Emergency Spill Response And Cleanup Plans

Every facility should maintain an appropriate **Emergency Spill Response and Cleanup Plan** for all material handling activities on the site. Areas where spilled materials can impact storm water runoff and their associated drainage points should be clearly identified. Methods to prevent spills along with cleanup and notification procedures should be identified in the plan and made available to appropriate personnel. The required cleanup equipment must be on site or readily available. An employee trained in spill containment and cleanup should be present during loading and unloading of materials.

In addition, owners of certain non-transportation related facilities must prepare a Spill Prevention Control and Countermeasure Plan. These facilities include those involved in storing, processing, or refining oil and oil products which have above-ground storage capacity in excess of 1,320 gallons or a single container in excess of 660 gallons, or have underground storage capacity in excess of 42,000 gallons, or due to location could reasonably expect spilled oil to reach waters of the United States or adjoining shorelines. Please see 40 Code of Federal Regulations (CFR) Part 112 or call EPA at 1-800-424-4EPA for more information about this requirement.

The NPDES storm water discharge permits also require that spill prevention and response procedures for any significant material present at the site be described in the facility's storm water pollution control plan. In addition Oregon Administrative Rule (OAR) 340-108, *Oil and Hazardous Material Spills and Releases*, further specifies spill reporting requirements, cleanup standards and liabilities for an actual or threatened spill or release involving oil or hazardous material.

The DEQ, EPA and U.S. Coast Guard all require that spill contingency plans be prepare for oil transferring and storage facilities according to the specific requirements set forth in their rules. DEQ rules may be found in OAR 340-47, *Regulations Pertaining to Oil Spills Into Public Waters*. The EPA requirements may be found in 40 CFR Part 112. In response to the Oil Pollution Act of 1990, EPA recently proposed amendments to 40 CFR Part 112 which may be found in Federal Register Volume 58, No. 30, February 17, 1993. The U.S. Coast Guard's interim rules may be found in Federal Register Volume 58, No. 23, February 5, 1993. Although the requirements from each agency are somewhat similar there are differences in planning volumes for worst case spills, initial response times, and recovery standards. For more information please contact the Department of Environmental Quality.

The following guidelines are recommended in preparing a Spill Prevention Control and Countermeasure Plan and are also useful when preparing the section of the storm water pollution control plan that addresses spills:

1. Describe the facility, provide the owner's name and address, describe the nature of the activities at the facility, and indicate the general types of chemicals used on the site.

2. Provide a site plan showing the location of chemical storage areas, the location of storm drains, the direction of the slope of the site toward the drains, and the location and description of any structures or devices on the site, such as control valves or lined sumps, to prevent spills from leaving the site.

3. Provide notification procedures that will be used in the event of a spill for contacting key personnel and local and state government agencies.

4. Provide detailed instructions regarding cleanup procedures, including how to handle fires and explosions should they occur.

5. List the designated person with overall spill response cleanup responsibility.

6. Describe the training program that will be implemented for key personnel. All employees at the facility should have basic knowledge of spill control procedures.

7. Provide a summary of the spill cleanup plan that will be posted at appropriate points throughout the work place. The summary should identify the spill cleanup coordinators, the location of cleanup kits, and phone numbers of regulatory agencies to be contacted in the event of a spill.

8. If a spill occurs, cleanup should begin **immediately**. No emulsifier or dispersant shall be used. If the spill could reach sanitary or storm sewers or surface waters, local and state government officials should be notified **immediately**.

9. Provide information about the cleanup kit(s) located at the site. The contents of the kit should be appropriate for the type and quantities of chemicals stored at the facility. The kit may contain the following: lined drums, absorbent pads, and granular or powdered materials for neutralizing acids or alkaline liquids. The kits should be located in a manner that allows easy access and use by employees, and drills should be practiced to ensure quick and effective response.

2.5 Above-Ground Tank Storage

These best management practices are recommended for tank storage systems that many facilities maintain on their sites. The following practices should complement any special requirements for these systems, such as any additional restrictions imposed by the Fire Marshall's Office.

1. Install an overfill protection on the storage tank to minimize the risk of spilling liquids during transfer and loading. Install guards around the tanks and piping to prevent damage from forklifts or vehicles.

2. For permanently installed tank storage systems, use curbing or diking to contain spills and leaks. The curbing should be of adequate height to contain a volume equal to the volume of the largest single storage tank plus rainfall, if the storage area is uncovered. A good approximation of the needed volume would be 110% of the largest storage tank, but additional volume may be needed depending on the quantity of rainfall reaching the site.

The floor area enclosed by the curbing needs to be covered with an impervious surface and sealed to prevent spills from contaminating groundwater. The paved floor should also be sloped to a lined sump for collection of small spills. Weekly cleaning of the sump is needed to minimize the contamination of storm water. *See Figure 2.5.A.*

3. If no contaminants are present, collect and remove or discharge accumulated rainfall from the curbed area frequently during the wet season.

4. Install and maintain an oil/water separator for treating storm water that is discharged from a petroleum tank farm for removal of contaminants.

5. Train employees in operating procedures, and label valves and piping to reduce human error.

6. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

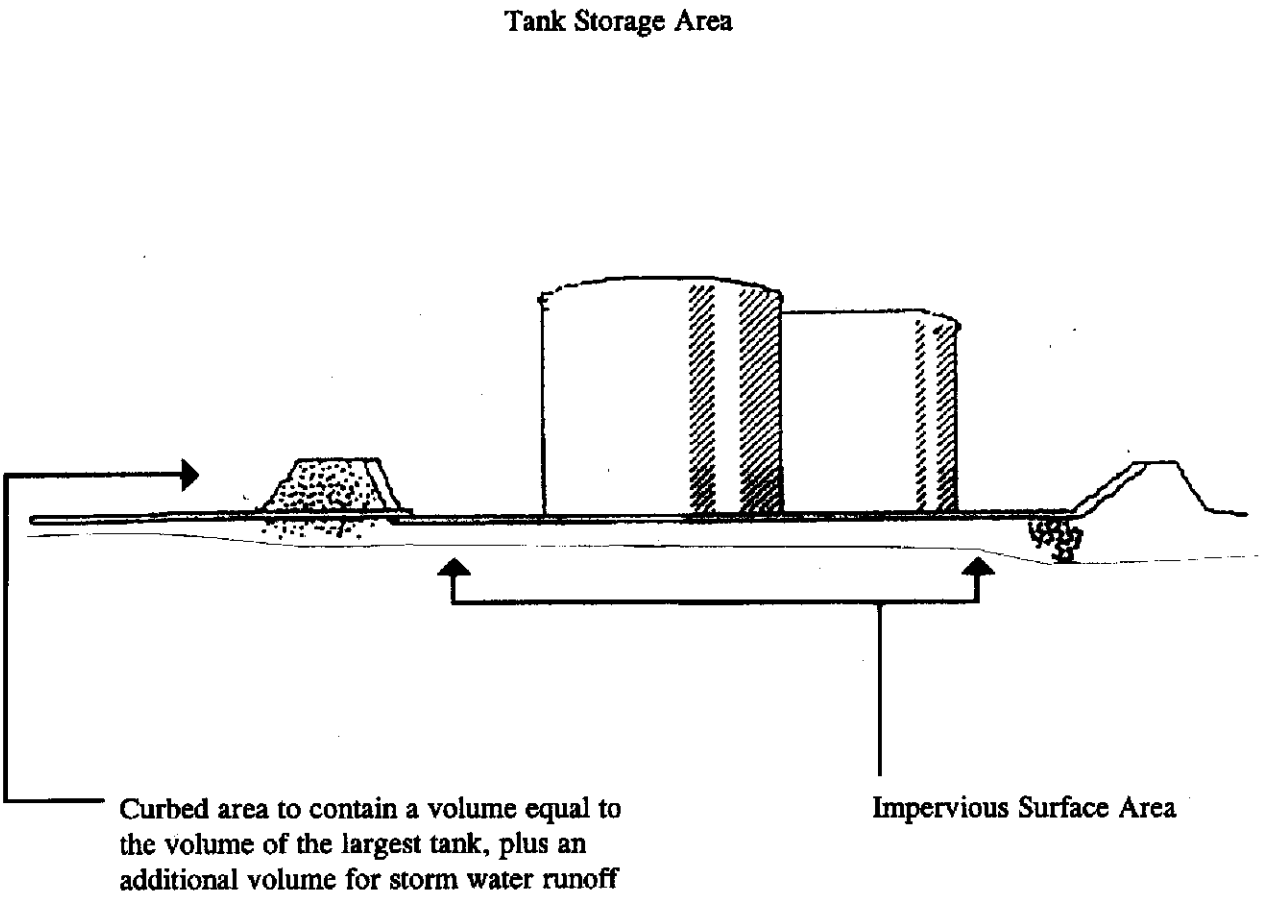


Figure 2.5.A: Tank Storage System
(Modified from City of Seattle, WA, Water Quality Best Management Practices for Commercial and Industrial Businesses, June 30, 1989)

2.6 Outside Manufacturing Activity

Some industrial facilities may carry out manufacturing activities in outdoor areas and produce pollutants that will contaminate storm water runoff. Particularly serious activities that occur outdoors and produce contaminants include rock grinding or crushing, parts grinding or sanding, painting or coating, degreasing or parts cleaning, or operations using hazardous materials.

The following practices are recommended to prevent contamination of storm water from such activities:

1. Alter or change the activity so that pollutants are not discharged.

2. Enclose the activity, if practical and cost-effective or bring it indoors. If the manufacturing activity is enclosed within a structure, floor drains can be installed to transport wastewaters to the sanitary sewer system if allowed by the local public works department. Contact with storm water would be prevented.

3. Cover the activity. If enclosing the manufacturing activity within a structure is too costly, construct a cover over the site (without walls). Floor drains can be installed to carry wastewaters to the sanitary sewer system if allowed by the local public works department. Berms or dikes would need to be constructed around the floor of the activity area to retain rainfall that is carried into this area by wind. If contained on the floor, the contaminated storm water would then be discharged to the sanitary sewer for treatment.

In addition, waste piles can be covered temporarily with reinforced tarpaulins, polyethylene, polyurethane, Hypalon or polypropylene to prevent contamination of runoff.

4. Segregate the activity. If parts of the manufacturing process are the worst source of pollutants, these parts can be covered or enclosed to prevent contact with storm water. Floor drains can be installed, if allowed by the local public works department, to transfer wastewaters to the sanitary sewer system.

5. Establish a waste reduction program at the facility to eliminate or reduce the quantity of waste generated. Consider the following in establishing such a program: production planning and sequencing, process or equipment modifications, raw material substitutions or elimination, housekeeping measures and loss prevention, waste segregation and separation, closed-loop recycling, and employee training and education in waste reduction.

6. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

2.7 Fueling Stations

Fueling may occur at warehouses or businesses that maintain fleets of vehicles, or at port facilities. Fuels contain organic compounds and metals that adversely affect aquatic life. The following BMPs are recommended to prevent contamination of storm water runoff that will ultimately reach surface water bodies.

1. Cover the island to prevent contact with storm water runoff. *See Figure 2.7.A.*

2. Install curbing or grade the area around the fueling island to prevent storm water from flowing onto the area and becoming contaminated.

3. Pave the fuel island with Portland cement concrete, not asphalt, because gasoline will react with the asphalt and slowly dissolve it.

The paving should be sloped on one side with a drain installed at the bottom of the slope to trap all spills from the fueling operation. The drain needs to be connected to the sanitary sewer if allowed by the local public works department, or discharged to a lined sump that will prevent spillage or leakage of spills to surface waters or groundwater. The drain also needs a control valve, such as a locked drainage valve or plug, to prevent the release of large spills into the sanitary sewer. *See Figure 2.7.A.*

If connections to sanitary sewage systems are not allowed, install an oil/water separator or an oil and grease trap to reduce the quantity of oil leaving the island with the storm water runoff. **The separators or traps will need routine inspection, cleaning, and maintenance for effective operation.**

4. Do not clean the fueling island with water and detergents. Spilled fuels, oils and grease will leave the site and contaminate surface waters if this method is used. Clean the fueling island using dry methods like spot cleaning with adsorbents or mechanical sweepers. Use a damp cloth for the pumps and a damp mop on the paved area.

5. Retain suitable cleanup materials on the site for prompt cleaning of all spills. Sorbent materials like spill pads, spill booms, or kitty litter will be effective in containing certain spills. **Do not wash any spill into the storm drain.** Dispose of the absorbent materials appropriately.

6. Post signs to educate employees. Personnel responsible for fueling vehicles should avoid overtopping fuel tanks.

7. If the fueling facility serves very large mobile equipment, such as log loaders, construct a curb or berm around the fueling area both to collect rainfall falling on the pad and prevent the run-on of storm water from the surrounding area. Follow the procedures given in Section 2.3 for loading and unloading materials.

8. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

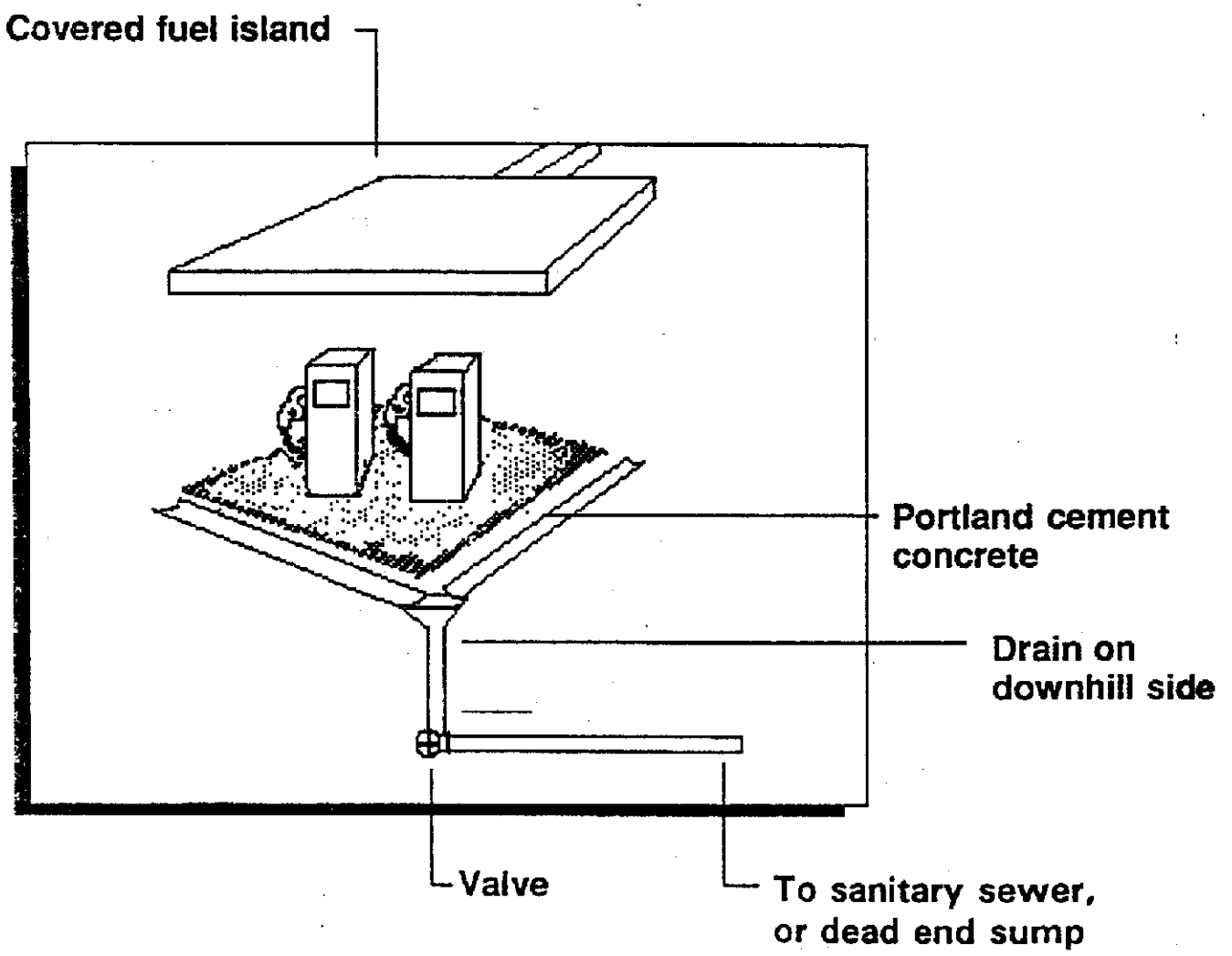


Figure 2.7.A: Covered Fuel Island
(From Washington Department of Ecology, WA, Storm Water Management Manual for the Puget Sound Basin, February 1992.)

2.8 Vehicle and Equipment Washing

Wash water from vehicle and equipment cleaning operations contains a variety of contaminants which can be harmful to aquatic life and the quality of surface water bodies. These contaminants include detergents, degreasing chemicals, oils, suspended solids, heavy metals, and organics that can cause serious pollution problems.

The disposal of wash waters from vehicle and equipment cleaning activities to the ground or to surface waters is prohibited by Oregon Administrative Rule 340-45-015 unless a permit is first obtained from the DEQ. This is a different permit from the storm water discharge permit.

Options for disposal of wash water include:

1. Installing a washing system that **recycles** all wastewater. Recycling systems remove oil and solids from the wastewater so that the water may be reused. installation may require approval or a permit from the local planning department. A full recycle system, which has no discharge, does not require a DEQ permit.

2. Discharging wastewater to **sanitary sewer**. This usually requires the permission of your local sanitary authority or public works department. Also, certain jurisdictions may require pre-treatment of the wastewater before discharge to sanitary sewer is allowed. You may also be able to connect to the sanitary system through existing floor drains if the drains are already connected to sanitary sewer. Discharging to a sanitary sewer does not require a DEQ permit.

3. Washing your vehicles at a commercial vehicle washing operation with an approved disposal system. Check to make sure that the facility you choose has an appropriate permit. Not all wash facilities dispose of their wastewater properly.

4. If none of the above options are feasible, you may be able to discharge to the storm drainage system or to the ground if you first obtain a permit from DEQ. There is a fee for this permit. Please contact the appropriate DEQ Water Quality Program in the appropriate regional office for information about the permit (see Figure 3.3.A).

2.9 Vehicle and Equipment Maintenance

Since many industrial facilities maintain vehicles and equipment, storm water can easily become contaminated with solvents, oil, grease, waste automotive fluids, acids, and caustic wastes. These substances are harmful to aquatic life, and measures should be implemented to prevent storm water contamination.

The following practices are recommended:

1. Clean vehicle and equipment parts without using solvents. This will save on disposal costs since many solvents must be disposed of as hazardous wastes. Parts can be scraped with a wire brush or placed in a bake oven for cleaning. If solvents are used, designate a centralized cleaning station to keep solvents and residues in one location. Use drip pans, drain boards, and drying racks to direct drips and spills into a fluid holding tank for reuse.

2. Use nontoxic or less toxic solvents and cleaners. Examples include using non-caustic detergents for parts cleaning and using detergent-based or water-based cleaning systems instead of organic solvent degreasers.

Replace chlorinated organic solvents, such as 1,1,1-trichloroethane or methylene chloride, with non-chlorinated solvents such as kerosene or mineral spirits. If the list of active ingredients on the solvent container includes the term "chlor," then the solvent is chlorinated.

Use cleaners that can be recycled if possible. The supplier of the cleaners and solvents along with trade journals for the industry can provide information regarding waste minimization for these activities.

3. Do not use running water from a hose to clean the work areas because the contaminated water could enter the storm drainage system and ultimately surface water bodies. Rags or spill pads can be used for cleaning small spills and a damp mop can be used for general cleaning. Contact the local public works department before discharging the mop water into the sanitary sewer. Sorbent materials including kitty litter, sawdust, spill pads and spill booms may be used for containing large spills. Dispose of clean up materials appropriately.

4. Place a drip pan underneath vehicles and equipment when performing maintenance such as removing parts, unscrewing filters, or unclipping hoses. Promptly transfer the used fluids to the proper waste or recycling drums. Open containers, including full drip pans, should not be left lying around on the site.

5. Do not pour used or leftover cleaning solutions, solvents, and automotive fluids into storm drain inlets or ditches, floor drains, sinks, or into the sanitary sewer. These substances are toxic. Floor drains, even those under cover, are frequently connected to the storm drainage system. Such drains should be plugged or, with the permission of the local sanitary authority, routed to sanitary sewer. Post signs at these potential discharge points to educate employees so that the wastes are not disposed of improperly.

Contact the distributor of leftover materials to see if unused portions can be returned. In the future purchase only the material needed, do not stockpile. Contact the DEQ Waste Reduction Assistance Program at the appropriate regional office for information about disposal and recycling options (see Figure 3.3.A).

6. Place used oil filters in funnels over the waste oil recycling or disposal collection tank to drain excess oil. Crush and recycle used oil filters if possible. Mark containers for used oil with the words “USED OIL.”

7. When vehicles are driven to the site for repair, examine them for discharge of leaks. Place drip pans under the vehicles to collect fluids for recycling or proper disposal. Designate a central area on the site for draining and replacing motor oil, coolant, and other fluids. This area should be cleaned of spills and leaks daily. Contaminated storm water runoff from this area should not be allowed to drain into the storm drainage system. If allowed by the local sanitary sewer system, contaminated runoff should be drained to the sanitary sewer. It is likely that a pretreatment system such as an oil/water separator may be required prior to discharging to the sanitary sewer.

8. If damaged equipment or wrecked vehicles arrive on the site, drain and collect all engine and transmission fluids. If the equipment or vehicles were drained prior to arrival at the site, place drip pans under them immediately to contain leakage since oils and other fluids may drip for several days. Dispose or recycle all fluids appropriately.

(Note: Air conditioning systems must be emptied by certified technicians. For more information about freon recovery regulations, please contact the EPA at 1-800-296-1996.)

9. Build a shed or roof over areas used for parking equipment or vehicles that need repair or are retained for parts supply.

10. Store **all** cracked batteries in a non-leaking secondary container to retain acid leaks.

11. Recycle used materials such as degreasers, used oil, oil filters, antifreeze, cleaning solutions, automotive batteries, used rags, and hydraulic fluid. Separate wastes to reduce treatment costs and make recycling efforts easier. For example, keep chlorinated solvents separate from non-chlorinated solvents, separate hazardous and non-hazardous wastes, and do not mix used oil and solvents. Discuss waste separation techniques with the waste hauler or recycling company for the site.

12. Discuss pollution prevention measures with employees and seek their suggestions on waste reduction. Consider incentives for employees, such as a reward program, to promote pollution prevention.

13. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

2.10 Sandblasting and Painting Operations

Sandblasting and painting operations use materials and produce waste that are potentially harmful to both human health and the environment. Overspray of paints, blasting without adequate containment, and uncovered grit piles may contribute to serious water pollution from toxic metals and highly toxic materials from antifouling paints. This pollution can lead to irreversible and lethal effects for many aquatic organisms. Dumping of paints, solvents, adhesives, oils, detergents, grit material, etc., not only damages the environment, but it is illegal and a violation of the federal Clean Water Act and Oregon Administrative Rule. If materials classified as hazardous wastes are discharged, the dumping also violates hazardous waste regulations.

Generators of blast waste are required to characterize, handle and dispose of such waste according to state and federal regulations. This means that generators are responsible for determining if their waste is hazardous. For assistance in determining if a waste is hazardous, contact the Waste Reduction Assistance Program in the appropriate DEQ regional office (see Figure 3.3.A).

Of particular concern is paint, grit or wastewater containing antifouling ingredients, such as tributyl tin (TBT) or cuprous oxide, which require special handling because of their impact to the environment. Recent studies indicate that even the abrasive material, before blasting, can be harmful to marine life. The following guidelines are general recommendations for blasting and painting operations. However, specific guidelines to be followed for management of paint or grit waste, with or without antifouling ingredients, are identified in *Best Pollution Prevention Practices for Sandblasting and Painting*. For copies of this document, please contact the appropriate DEQ regional office (see *Figure 3.3.A*).. The following are best management practices for sandblasting and painting:

1. Prevent paint chips, abrasive blast material (before blasting), and grit waste from coming in contact with storm water runoff and surface water bodies. Outdoor blasting and painting should be done in designated areas that provide adequate protection to prevent overspray and fugitive emissions to insure compliance with the state and federal air quality regulations.

2. Operate all designated sites for blasting and painting operations with containment doors and ventilation filtration equipment in good working order.

3. When operating outside permanent blasting facilities, use portable containment such as tarps, shrouds, or portable containment structures to minimize airborne fugitive emissions.

4. Give special attention to existing wind and weather conditions in order to further minimize the impact of airborne emissions. Do not operate in windy conditions.

5. Provide a thorough cleaning of spent paint, paint chips, protective coatings, grit waste, etc., to prevent the discharge of these wastes into state waters.

6. Segregate wastes whenever possible to reduce treatment, disposal, and management costs. It is particularly important to separate nonhazardous wastes from hazardous wastes because of different regulatory requirements, and different treatment and disposal costs. Dispose of wastes appropriately.

7. Recycle solvents and any other materials where recycling opportunities exist.

8. Maintain an Emergency Spill Response and Cleanup Plan (see Section 2.4).

2.11 Inspection and Monitoring Activities

Inspecting and monitoring the equipment used in industrial processes can be important in preventing problems that can lead to leaks or spills of potential contaminants for storm water runoff. These activities are also needed for proper maintenance of storm water facilities on the site. Without adequate maintenance, sediment and other debris can quickly clog storm water facilities and make them useless.

2.11.1 *Maintenance Practices for Equipment and Process Areas*

A. Perform frequent inspections for structural integrity of items such as piping, valves, controls, joints, welds, tanks, drums, roofs, pavement, or other sources of potential leaks and spills on the site that can contaminate runoff. These may be visual inspections or some form of nondestructive testing method, such as hydrostatic pressure or acoustic emission tests.

B. Consider the installation of monitoring systems for areas on the site where overflows, spills, and catastrophic leaks are possible. Train staff in the use of the monitoring equipment for proper operation.

C. Ensure that staff are present during material transfers both to prevent spills if possible and to clean up spills immediately. The personnel should be properly trained in spill containment methods including the use of sorbent materials, gelling agents and vacuum and pump systems.

D. Post signs and labels at areas where information is needed to prevent contaminants from being released to storm water discharges, such as material transfer, loading and unloading, or equipment areas. The names and phone numbers of both facility and regulatory staff should be posted with phone numbers for contact in case of an accidental discharge or fire.

2.11.2 *Maintenance Practices for Storm Water Facilities*

A. Inspect catch basins, drainage pipes, spillways, control valves and plugs, and related drainage structures at least annually to determine if maintenance is needed. It may be useful to inspect the storm sewer outfalls during a significant rainfall or snow melt event to determine how well the system is working.

B. Immediately repair any deterioration threatening the structural integrity of the facilities. Such repairs may include: replacing catch basin lids or control valves, removing rock and debris from spillways, clearing clogged pipes or drainage inlets, or removing excessive growth from drainage ditches for proper operation.

C. Sweep paved areas and remove debris as frequently as needed and, if possible, before a rainfall event to prevent clogging of drainage structures.

D. Post warning signs adjacent to all storm drain inlets to convey messages such as "Dump No Waste - Drains to Groundwater," "Streams," "Lakes," "Ocean," etc.

2.12 Dust Control

Dust controls may be needed on industrial sites for various reasons, including land disturbance, demolition, and material handling areas. If effective, dust controls can prevent pollutants from contaminating storm water runoff by reducing the surface and air transport of dust caused by these activities.

2.12.1 *Practices to Control Dust from Land Disturbance and Demolition Activities*

A. Use temporary controls such as palliatives, or chemical soil treatments, that are applied as spray-on adhesives. Common palliatives include calcium chloride, anionic asphalt emulsion, latex emulsion, and resin-water emulsions. Since certain chemicals may be inappropriate for some soil types or application areas, the permittee should check with the local government prior to application of the chemical treatments. Vehicles should not be driven over the treated area to prevent the tracking of the chemicals to other areas on or off the site.

In addition, irrigation is a temporary measure involving a light application of water to moisten the soil surface. The correct amount of water should be applied because an excess of water can cause erosion.

B. Minimize soil exposure by temporary or permanent soil stabilization controls, such as mulching, seeding, applying topsoil, spreading coarse gravel or crushed stone, or planting trees. If existing vegetation on the site can be maintained, this will help in controlling dust.

C. Install temporary or permanent wind breaks or barriers that reduce airborne particles by slowing wind velocities and causing the particles to drop. Large trees and shrubs left in place can provide wind barriers, while temporary measures include solid board fences, tarp curtains, sediment walls, crate walls, and bales of hay.

D. In arid regions, use tillage or deep plowing of soil to provide dust control. Large clumps of soil are deposited on top of the dust particles, preventing their movement by wind or water.

E. Inspect the sites requiring dust controls frequently and reapply materials or controls as needed.

2.12.2 *Practices to Control Dust from Material Handling, Process and Transfer Areas*

A. Install dust collection systems, such as negative pressure systems (vacuum systems), or collector systems (bag and cyclone), or filter systems.

B. Use water spraying and collect the dust-contaminated waters for treatment.

C. Use street sweepers to collect dusts. The vacuum type are more efficient and are most effective on dry areas. Brush sweepers can also be used.

D. Train employees in the proper operation of the equipment according to the manufacturers' recommendations and inspect the equipment regularly.

2.13 Erosion and Sediment Control

This section is intended for those industrial facilities which may have areas of landscaping or exposed soils that are subject to the erosive action of wind or water. It is not intended to be used as guidance for large scale construction projects.

Erosion is the process by which soil particles are loosened and displaced by the action of water or wind on the soil surface. The loosened particles are called sediment, and the deposition of this material in streams is called sedimentation. Sedimentation and turbidity associated with sediment laden flows degrade water quality. Turbidity in water interferes with photosynthesis and sediment silts in fish spawning beds and clogs the gill passages of fish.

Over time, erosion control is more effective than sediment control in preventing water quality problems. Erosion control is less subject to failure due to high flows, requires less maintenance, and is also less costly. In some cases a combination of erosion control and sediment control may be required. The following best management practices can be used for areas on industrial sites with exposed soil due to steep slopes, soil stockpiles, heavy equipment traffic, or minor construction projects. Regular inspection and prompt maintenance are critical to the success of all the practices in this section. The selection of an appropriate measure will depend on the degree of slope on the site, sensitivity of the area to the intended use, stream or wetland features in the area, and type of soil encountered.

Please note that construction activities, including clearing, grading and excavation, which disturb five (5) or more acres require NPDES general storm water permits. The five acre limit is currently being reviewed by EPA and may be lowered. Please contact the DEQ for further information. See Figure 3.3.A.

2.13.1 *Erosion Control Practices*

The following are recommended erosion control practices:

A. ***The preservation of existing vegetation on the site.*** Preserving the existing vegetation is frequently the best preventative measure for erosion. Because native or existing vegetation is already established, it is usually a better cover species than introduced species. Where possible, establish "do not disturb" zones on your site. *See Figure 2.1.A.*

B. ***The implementation of vegetative and soil protection practices for soils that are already exposed.*** These practices reduce erosion potential in several ways. They shield the soil from the direct impact of rainfall or runoff, increase soil porosity and water storage capacity of the soil, reduce the energy of the runoff, and physically hold the soil in place with the root system of the vegetation. Vegetative erosion controls include:

   i) The establishment of ***vegetative cover***, either as a permanent cover or as a temporary measure prior to permanently stabilizing the area. Vegetative buffers or complete coverage can provide a significant reduction of erosion potential. This can be accomplished by seeding, seeding and mulching, seeding and matting, or sodding. Maintenance may be required to successfully vegetate an area. This practice is not suited for areas which carry heavy traffic.

   ii) The use of ***mulching or erosion control mats or netting*** to physically protect exposed soils. This is a

short term measure designed to provide immediate protection until a more permanent stabilization measure can be implemented. Heavy traffic areas are not well suited to this type of protection. This option requires close attention to installation procedures, and may be expensive in large scale applications. It can be very effective, however, if an appropriate medium is selected for a given site. *See Figure 2.13.B.*

C. ***The installation of structural controls to reduce the energy of the water flowing across soils, or to divert flows from exposed areas***. Reducing the energy of runoff streams is beneficial in that slower flows do not act as strongly in eroding the soils, and they do not carry as much sediment from the site. These controls are not generally successful as stand alone measures, but may enhance the effectiveness of other erosion reduction measures. Structural erosion control measures include the following:

i) The use of ***level spreaders or interceptor dikes and swales*** for long, exposed slopes or at the tops of shorter slopes. The velocity of the runoff can be reduced, and flows diverted from exposed areas by utilizing this type of structural control. Proper installation and use of outlet protection are critical to the success of this type of control. Choice of measure and spacing depend on the degree and length of the slope being addressed. *See Figure 2.13.C.*

ii) The use of ***pipe slope drains*** to remove excess water or divert runoff from slopes or saturated soil areas, reducing the potential for erosion. The inlets and outlets should be properly designed for adequate stabilization. The outlet area is particularly important, as the higher velocity water at the end of pipe can be an extremely erosive force. Outlet design and correct installation are the keys to the success of this type of control.

iii) The installation of ***outlet protection*** at all pipe, ditch or channel discharge points to help prevent scouring in the receiving stream or discharge area. Proper installation of stone, riprap, aprons or detention basins will allow the energy of the discharge to dissipate without eroding the surrounding soils. *See Figure 2.13.D.*

iv) The use of ***check dams*** to reduce scouring and gullying in small channels. Dams can be built from stone, logs, etc., and can be temporary measures or permanent installations. Dams should be spaced so that the top of the downstream dam is at the same elevation as the toe of the upstream dam. It is important that the center section of the dam be lower than edges. If the edges are lower or at the same elevation as the center the chance for washouts at the ends increases dramatically.

These structures also tend to act as sediment control structures, so it is important that they be inspected and maintained regularly to insure adequate performance. Excessive sediment build-ups must be removed in order for the dam to be most effective.

v) ***Stream bank stabilization*** to control erosion from the areas along streams where vegetative practices are not feasible. Riprap, gabions, reinforced concrete structures such as bulkheads or retaining walls, or other measures should be designed by a licensed professional engineer to insure adequacy and effectiveness.

vi) ***Paving or graveling of roadways and driveways*** to help reduce soil disturbance.

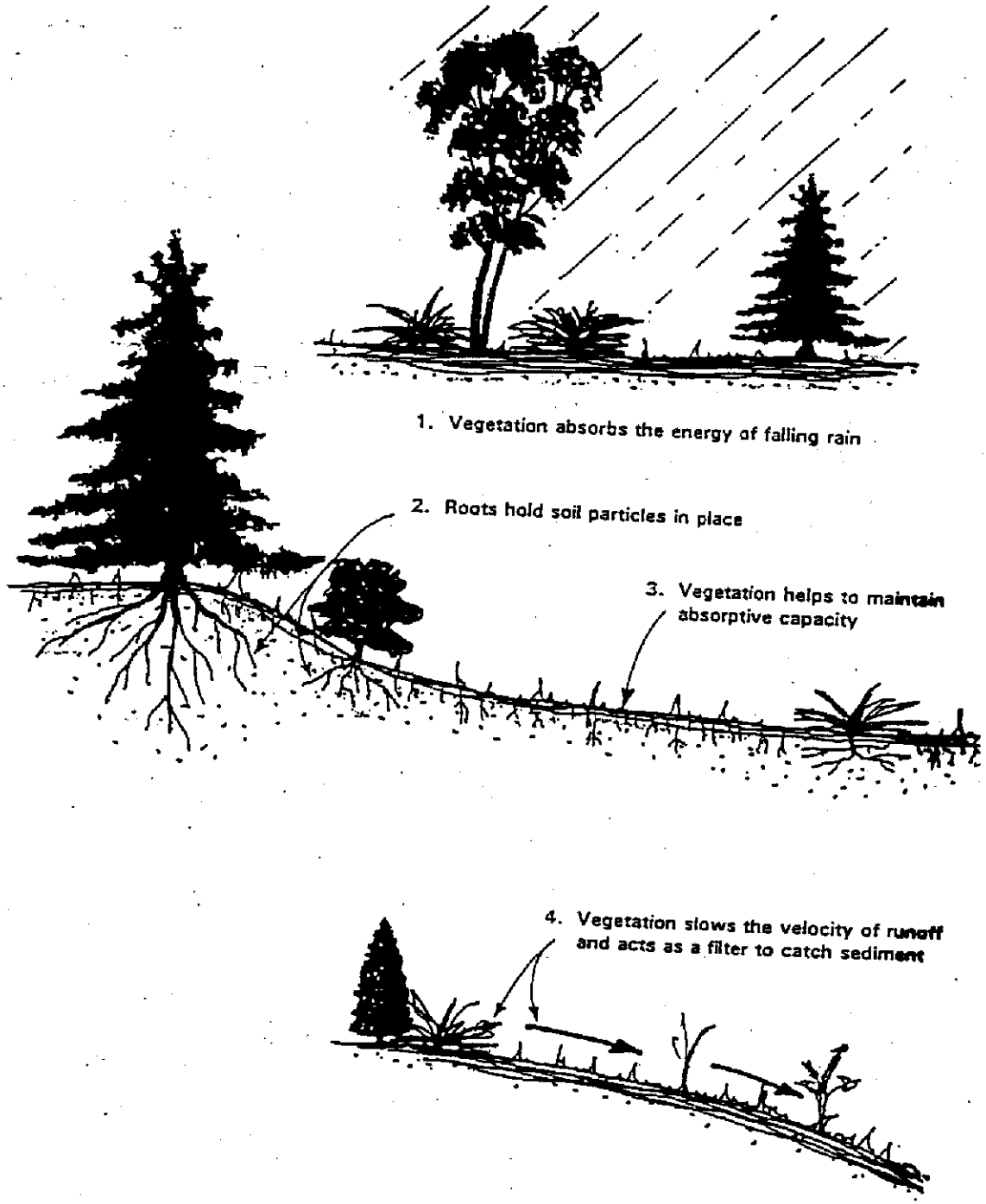


Figure 2.13.A: Effect of Vegetation on Storm Water Runoff
(From Washington Department of Ecology, WA, Stormwater Management Manual for the Puget Sound Basin, February 1992.)

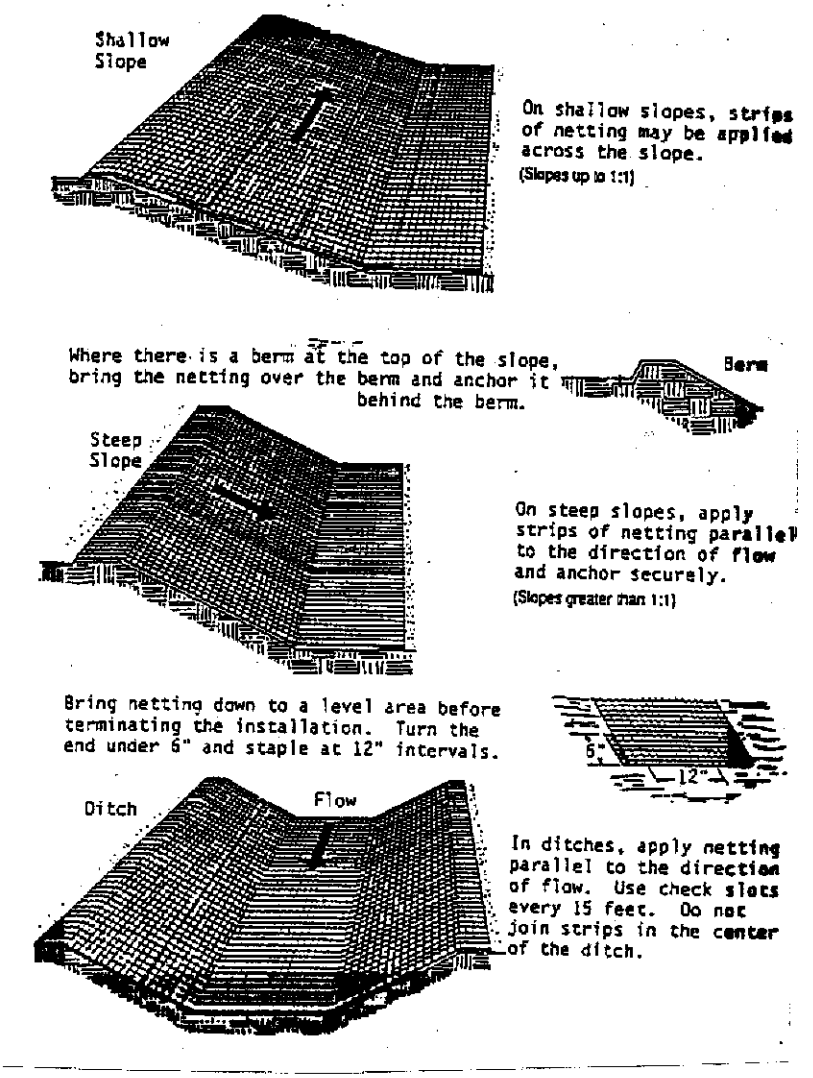


Figure 2.13.B: Orientation of Netting and Matting
(From Washington Department of Ecology, WA, Stormwater Management Manual for the Puget Sound Basin, February 1992.)

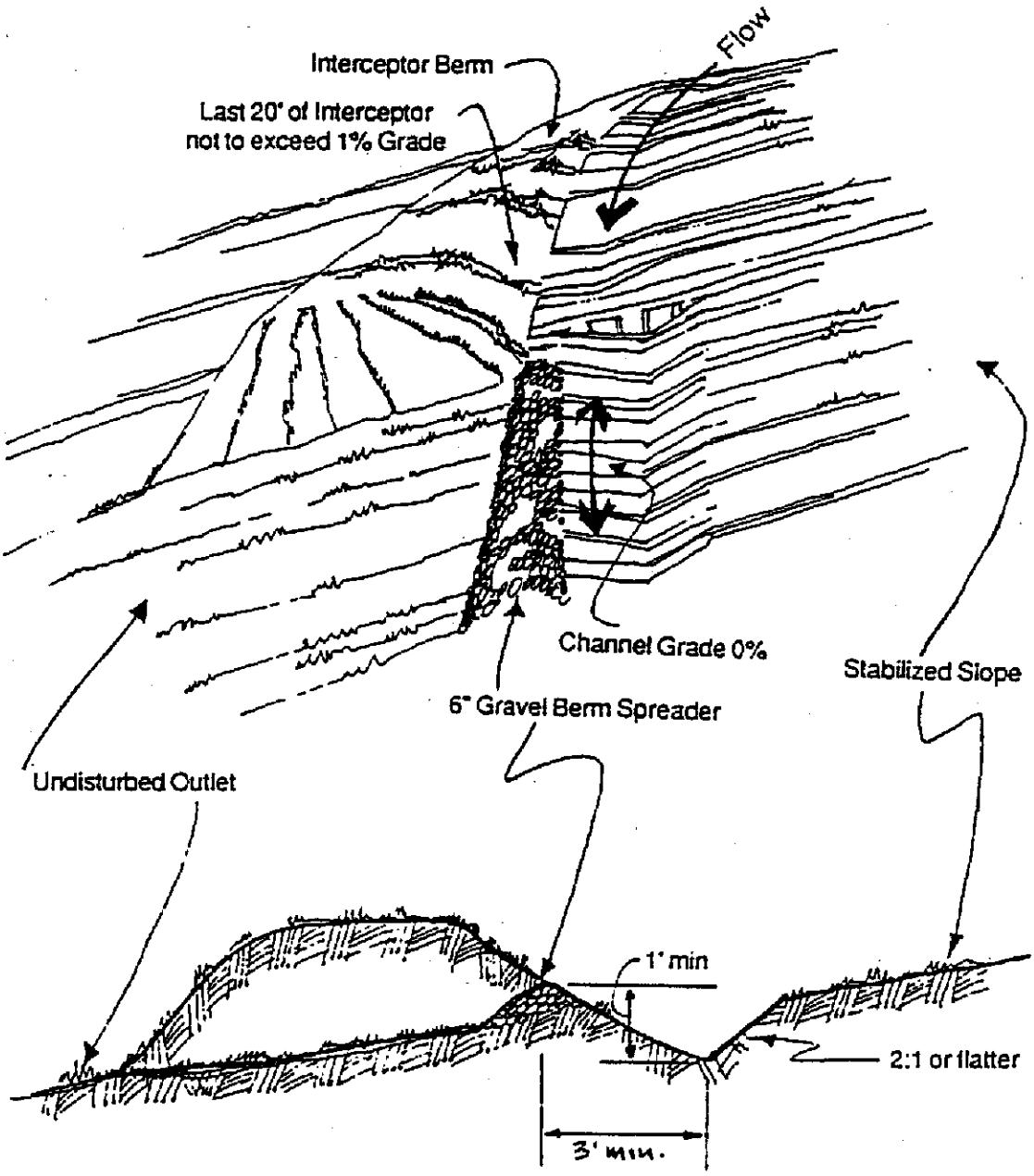


Figure 2.13.C: Level Spreader
(From Washington Department of Ecology, WA, Stormwater Management Manual for the Puget Sound Basin, February 1992.)

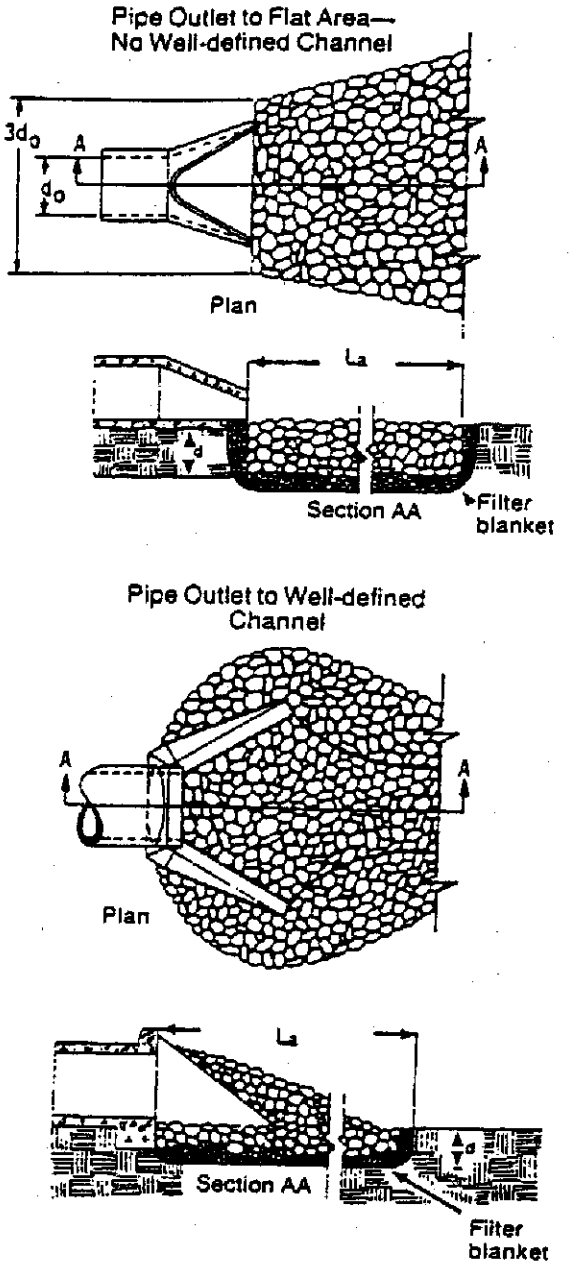


Figure 2.13.D: Rock Outlet Protection
(Modified from U.S. Environmental Protection Agency, Storm Water Management for Industrial Activities, September 1992)

2.13.2 *Sediment Control Practices*

The following are recommended sediment control practices:

A. ***The use of vegetation to retard the velocity of sediment laden flows.*** Using vegetated swales or vegetated buffer strips to intercept runoff helps reduce the energy of the stream, allowing sediment to settle out and be captured by the vegetation.

B. ***The installation of structural controls to trap sediment, reduce stream energy, and allow for settling of turbid waters.*** Structural controls include measures designed to physically trap sediment or allow sediment to settle out of runoff. Specific measures include the following.

i) ***Filter fabric silt fences*** are effective short term controls for trapping sediment and filtering sediment laden flows. However, they must be properly installed and maintained. Prompt maintenance and repair can extend the life span of fences until erosion control measures have been established. *See Figure 2.13.E*.

ii) ***Detention basins or settling basins*** can be used in conjunction with outlet protection, ditching and other measures to provide a way to slow down the velocity of a stream and allow the sediments to settle out of turbid flows. An appropriately designed outlet that filters the basin effluent is a very effective way to enhance the performance of such controls.

iii) ***Check dams***, mentioned in the erosion control section, can be used to reduce channel velocities and capture sediment as it settles out. These must be designed and built with care to insure that the structure will enhance the erosion and sediment control and not create additional problems.

iv) ***Constructing paved or rocked roads or entrances*** can reduce the amount of mud and sediment that is tracked onto areas where the material could be washed into the storm drainage system. *See Figure 2.13.F*.

Additional information or installation details can be found in a variety of documents. Please see Section 3.1 for more information.

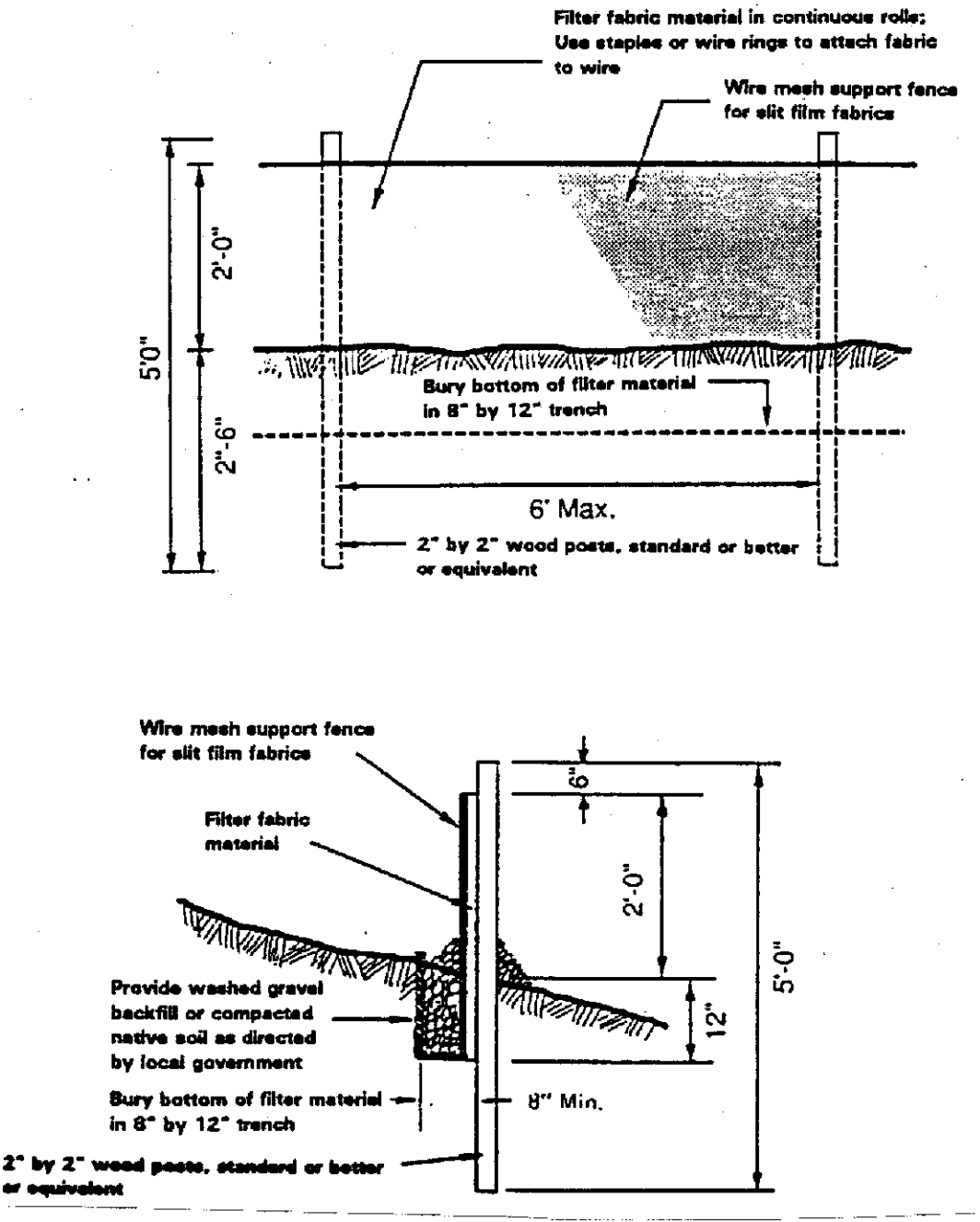


Figure 2.13.E: Filter Fabric Silt Fence
(From Washington Department of Ecology, WA, Stormwater Management Manual for the Puget Sound Basin, February 1992.)

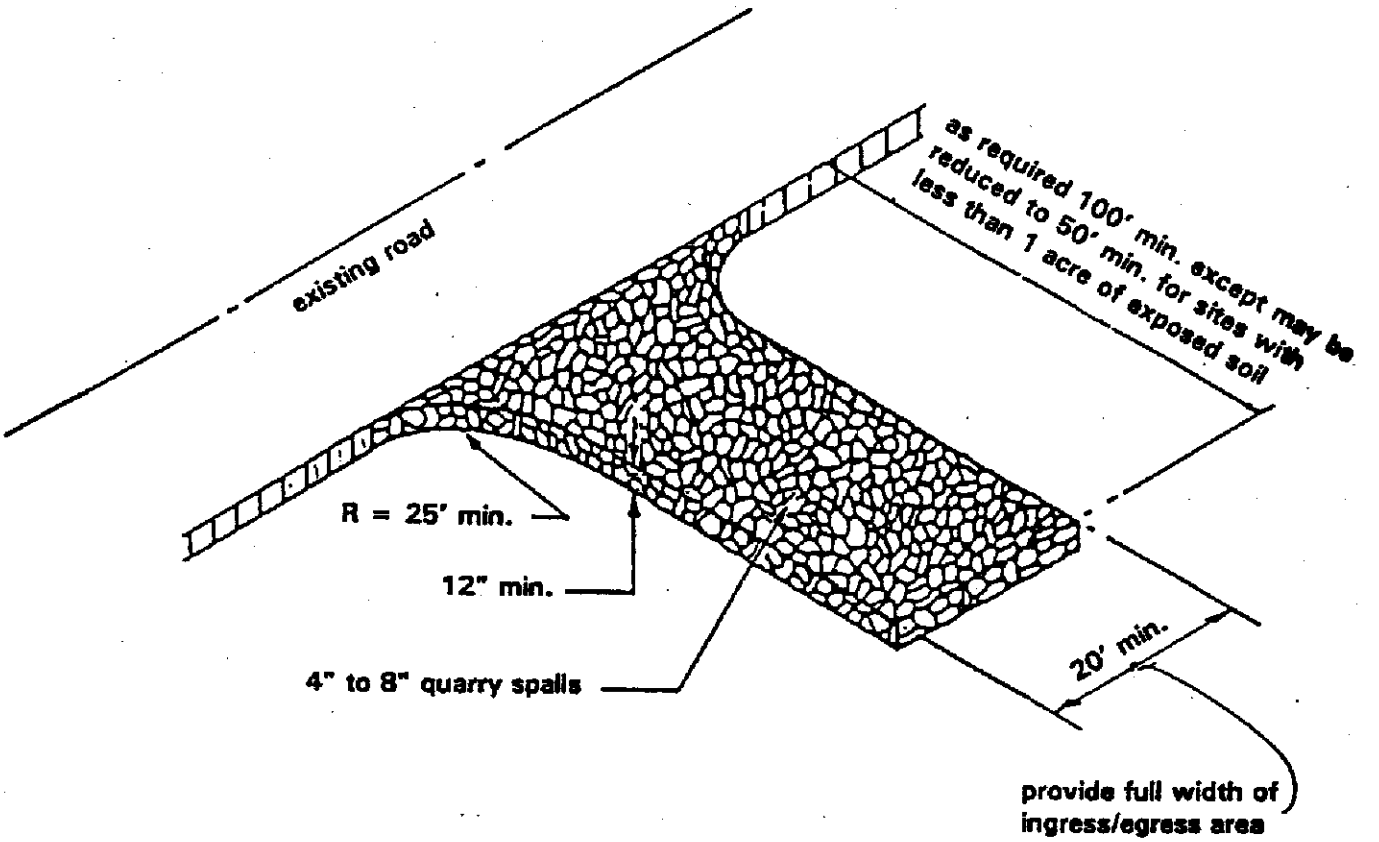


Figure 2.13.F: Stabilized Construction Entrance
(From Washington Department of Ecology, WA, Stormwater Management Manual for the Puget Sound Basin, February 1992.)

3 ADDITIONAL RESOURCES

3.1 Document List

- Code of Federal Regulations (CFR), Title 40-Protection of Environment, Parts 122, 123, 124, and Title 33, Parts 153, 154, and 155. ** Sections of rule available from*

- Erosion/Sedimentation Control Plan Technical Guidance Handbook, Clackamas County, OR, August 1994. ** Available from Clackamas County (503) 650-3737*

- Guidance Document for Preparation of the NPDES Storm Water Pollution Control Plan, Oregon Department of Environmental Quality, August 1997.

- Nonpoint Source Pollution Control Guidebook for Local Government, Oregon Department of Environmental Quality & Oregon Department of Land Conservation and Development, June 1994.

- Stormwater Quality Facilities, A Design Guidance Manual, City of Portland, Bureau of Environmental Services (BES), March, 1995.

** Available from City of Portland (503) 823-5600.*

- Stormwater Management Manual, City of Portland, Bureau of Environmental Services (BES), expected to be available in 1998. ** Available from City of Portland (503) 823-5600.*

- Stormwater Program Guidance Manual for the Puget Sound Basin, Volumes 1 & 2, Publication #92-32 and #92-33, Washington Department of Ecology, WA, July 1992. ** Available for fee from WA DOE (206) 438-7528.*

- Stormwater Management Manual for the Puget Sound Basin (The Technical Manual), Publication #91-75, Washington Department of Ecology, WA, February 1992. ** Available for fee from WA DOE (206) 438-7528.*

- Storm Water Management for Industrial Activities, U.S. Environmental Protection Agency (EPA), April 1992.

** Available for fee from Education Resource Information Center/Clearinghouse (614) 292-6717, order #447N.*

- Storm Water Management for Construction Activities, EPA, April 1992.

** Available for fee from Education Resource Information Center/Clearinghouse (614) 292-6717, order #482N.*

- Water Quality Best Management Practices Manual for Commercial and Industrial Businesses, City of Seattle, WA, June 1989.
  ** Available for fee from WA DOE (206) 438-7528.*

3.2 Department Of Environmental Quality (DEQ) Contacts

Please see the attached map for the address and phone number for the regional office serving your county.

3.3 Other Agencies

- **Environmental Protection Agency (EPA):**

Chlorofluorocarbons (CFC) Removal and Recycling Information 1-800-296-1996
Oregon Operations Office (503) 326-3250
Region 10 Storm Water Program (206) 553-8399
Spill Prevention Countermeasure and Control 1-800-424-4EPA

- **Clackamas County, Oregon**

Department of Utilities, (503) 650-3737

- **City of Eugene, Oregon**

Water Resources Team, (541) 682-2663

- **City of Portland, Oregon**

Bureau of Environmental Services, Industrial Stormwater Section, (503) 823-5600

- **City of Salem, Oregon**

Environmental Services, (503) 588-6228

- **Unified Sewerage Agency of Washington County (USA), Oregon**

Source Control Section, (503) 844-8931

- **Washington Department of Ecology (WA DOE):**

Industrial Storm Water Program (206) 438-7614
Municipal Storm Water Program (206) 438-7076

Figure 3.3.A: DEQ Locations