

Maintenance Stormwater Field Guide

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Chapter 1. INTRODUCTION

Scope and Objective

Highways and other transportation-related sites can be a source of sediment and other pollutants to rivers, lakes, and coastal waters. Best management practices (BMPs) can be used by maintenance workers to reduce the discharge of pollutants from highway storm drain systems.

The intent of this guide is to be a quick reference for maintenance staff on topics related to BMP inspection and common operational practices. Good housekeeping and other pollution source control measures are presented. Using the tips in this guide will help in complying with federal and state regulations for stormwater quality. It will also help achieve a greater level of environmental stewardship. This guide is not a design manual or a substitute for a pollution prevention plan.

Preface to Readers

This publication includes descriptions of BMPs and how to maintain them. It is organized based on common highway and facility operational practices. Oftentimes a single BMP can be used for many different operations (e.g., street sweeping can be part of normal road maintenance, clean-up required after winter application of sand, and specialized bridge maintenance practices).

The information presented in this guide is based on techniques and control measures considered generally effective in many areas of the country. Local conditions may require that the practices discussed in this guide be altered, or used with other measures. This guide may also be augmented by DOTs to provide more information to suit local practices and field conditions.

The information provided for each BMP includes maintenance frequencies and performance standards. In all cases, this information is to provide guidance specific to highway and DOT facility operation. In no case is such information

meant to supersede, substitute for, or make more stringent well-defined practices or regulatory standards.

Clean Water Goals

DOTs conduct activities that can pose a threat to water quality if BMPs are not used. These activities include road maintenance, application of traction aides and de-icers, minor road and bridge repairs, fleet maintenance, landscaping, and facility maintenance. DOTs also conduct activities that remove pollutants from the storm drain when done properly, such as street sweeping and storm drain system cleaning.

Follow your DOT procedures for:

- Using BMPs to treat pollutants from highway areas, transportation infrastructure, maintenance areas, storage yards, weigh stations, rest stops, and welcome centers, among others;
- Developing inspection and maintenance procedures and schedules for stormwater BMP implementation;
- Properly disposing of pollutants; and
- Identifying ways to reduce water quality impacts associated with the most common maintenance and operational practices.

This guide provides practical information to DOT staff for selecting and using the most appropriate BMPs for each activity or situation.

General Tips

Assessment and Planning

Maintenance staff can benefit from general site and activity assessment, as well as planning before using BMPs. Particular aspects that should be considered include:

- Identify and understand basic drainage patterns of your site, including locations of storm drain inlets, pipes, and other conveyances.

- Identify areas of your site that are most likely sources of sediment and other typically encountered pollutants. Common pollutants associated with roadside activities and facility areas are shown in the tables on the next pages.
- Identify areas that may also be environmentally sensitive to ensure that a stormwater maintenance activity does not disturb an environmental requirement. Obtain any necessary permits before the work.

Table 1-1. Potential Pollutants Likely Associated with Specific DOT Facilities

DOT Facility Activity	Potential Pollutants								
	Sediment	Nutrients	Trash	Metals	Bacteria	Oil and Grease	Organics	Pesticides	Oxygen Demand- ing Sub- stances
Building and Grounds Maintenance and Repair	X	X	X	X	X	X	X	X	X
Parking/Storage Area Maintenance	X	X	X	X	X	X	X		X
Waste Handling and Disposal	X	X	X	X	X	X	X	X	X
Vehicle and Equipment Fueling			X	X		X	X		
Vehicle and Equipment Maintenance and Repair				X		X	X		
Vehicle and Equipment Washing and Steam Cleaning	X	X	X	X		X	X		
Outdoor Loading and Unloading of Materials	X	X	X	X		X	X	X	X
Outdoor Container Storage of Liquids		X		X		X	X	X	X
Outdoor Storage of Raw Materials	X	X	X			X	X	X	X
Outdoor Process Equipment	X		X	X		X	X		
Irrigation	X	X	X		X		X	X	X
Landscape Maintenance	X	X	X		X			X	X

Source: California Stormwater BMP Handbook (slightly modified).

Table 1-2. Potential Pollutants Likely Associated with Specific DOT Roadside Activities

DOT Roadside Activity	Potential Pollutants								
	Sediment	Nutrients	Trash	Metals	Bacteria	Oil and Grease	Organics	Pesticides	Oxygen Consuming Substances
Road, Street, and Highway Operation and Maintenance	Sweeping and Cleaning	X	X	X	X	X	X	X	X
	Street Repair, Maintenance, and Striping/Painting	X	X	X	X	X	X	X	X
	Bridge and Structure Maintenance	X	X	X	X	X	X	X	X
	Surface Cleaning	X	X	X	X	X	X	X	X
Plaza, Sidewalk, and Parking Lot Maintenance and Cleaning	Graffiti Cleaning	X	X	X	X	X	X	X	X
	Sidewalk Repair	X	X	X	X	X	X	X	X
	Controlling Litter	X	X	X	X	X	X	X	X
	Fountain and Pool Draining	X	X	X	X	X	X	X	X
Fountain, Pool, Lake, and Lagoon Maintenance	Lake and Lagoon Maintenance	X	X	X	X	X	X	X	X
	Mowing/Trimming/Planting	X	X	X	X	X	X	X	X
	Fertilizer and Pesticide Management	X	X	X	X	X	X	X	X
	Managing Landscape Waste	X	X	X	X	X	X	X	X
Landscape Maintenance	Erosion Control	X	X	X	X	X	X	X	X

DOT Roadside Activity	Potential Pollutants								
	Sediment	Nutrients	Trash	Metals	Bacteria	Oil and Grease	Organics	Pesticides	Oxygen Demanding Substances
Drainage System Operation and Maintenance	Inspection and Cleaning of Stormwater Conveyance Structures	X	X	X		X		X	X
	Controlling Illicit Connections and Discharges	X	X	X	X	X	X	X	X
	Maintenance of Inlet and Outlet Structures	X		X	X		X		X
	Solid Waste Collection		X	X	X	X	X		X
Waste Handling and Disposal	Waste Reduction and Recycling			X	X				X
	Hazardous Waste Collection			X	X		X	X	
	Controlling Litter			X	X		X		X
	Controlling Illegal Dumping	X	X	X	X	X	X	X	X
Water and Sewer Utility Operation and Maintenance	Roadside Animal Remains				X		X		
	Water Line Maintenance	X			X	X			
	Sanitary Sewer Maintenance	X			X	X	X		X
	Spill/Leak/Overflow Control, Response, and Containment	X	X		X		X		X

Source: California Stormwater BMP Handbook (slightly modified).

Ensuring Clean Water

Effective water pollution control must come from a culture of environmental stewardship, similar to a safety program. All staff must have the means to change work efforts, where necessary, to meet environmental protection goals. Good documentation must be kept so that the level of information for required reports is accurate and defensible. A few suggestions to help ensure success:

- Set a point of contact for each activity type and/or facility location. This includes DOT staff, participating contractors, and sub-contractors.
- Monitor weather conditions and adjust plans accordingly to avoid working during storms.

Work Management

Stormwater pollution prevention is handled by more than one person. Roles and responsibilities should be clearly defined, communicated, and documented prior to work activity. Those should generally include:

- Who is overall lead on stormwater pollution prevention issues at each activity or facility area
- Who is responsible for monitoring changes in weather conditions
- Who is responsible for inspecting and maintaining structural BMPs
- Who is responsible for supervising and implementing good housekeeping practices
- Who is in charge of spill response
- Who is responsible to manage expected and approved non-stormwater discharges
- Who is responsible for record keeping and reporting
- Who is responsible for training of other maintenance personnel on stormwater management and pollution prevention issues

General BMP Inspection and Troubleshooting

Each BMP presented in this guide has information on inspection, maintenance, and corrective actions. Many of the problems occurring in the field fall into the following general categories and are not associated specifically with any one BMP.

Table 1-3. General BMP Troubleshooting

If Your BMP or Site Is Experiencing...		...Then Consider
Erosion		• Additional erosion control/soil stabilization BMPs • Diversion using temporary runoff management practices (clear water diversion) • Modifying your maintenance sequence or schedule
Sediment and Debris Build Up		• Additional erosion control/soil stabilization BMPs • More frequent maintenance and clean out • Diversion using temporary runoff management practices (clear water diversion) • Modifying your maintenance sequence or schedule
Trash Accumulation		• Staff training • More covered dumpsters • More frequent trash pickup • Signs for employees • Controlled access to site to limit illegal dumping
Standing Water		• Inspecting inlets and pipes for blockage from trash and debris • Reducing the drainage area to each BMP using runoff management practices • Increasing the size (surface area) of your BMP • Providing additional erosion and sediment control BMPs within the contributing drainage area
Bypass of Flow		• Increasing the size of your BMP • Verifying the size and physical adequacy of inflow and outflow structures, conduits, etc.

Chapter 2. ROADSIDE MAINTENANCE ACTIVITIES

Storm Drain Cleaning and Repair

General Description

Drain inlet and culvert maintenance includes the removal of accumulated sediment, trash, and natural debris from under drains, horizontal drains, down drains, gutters, overside drains, scuppers, and deck drains. Drains are maintained to prevent flooding and remove pollutants. Cleaning typically involves traffic control and the use of a backhoe or vactor truck.



Fig. 2-1. Crews clean a culvert.

Source: Idaho Transportation Department

Maintenance and Inspection

- Culverts and drain inlets should be inspected annually in the Fall and throughout the Winter as needed to determine if cleaning or repairs are required. Storm drain inlets, culverts, and ditches should be cleaned when sediment impairs function, or when 50 percent of the flow area is blocked.
- Downdrains should be inspected annually.

General Practices for Ditch Maintenance

- Ditches should be cleaned prior to the rainy season. Permitting may be required prior to any work operations. Do not change engineered ditch conditions.
- Ditches and gutters should be sealed or repaired when structural integrity is endangered.
- Dispose of removed material properly.
- Cleaned ditches should be seeded and mulched, if appropriate, as soon as possible. Monitor closely for subsequent erosion until area is stable. Repair as necessary.
- Removed material that has been contaminated with oil, gasoline, or other chemicals must be disposed of by a licensed hazardous materials hauler.

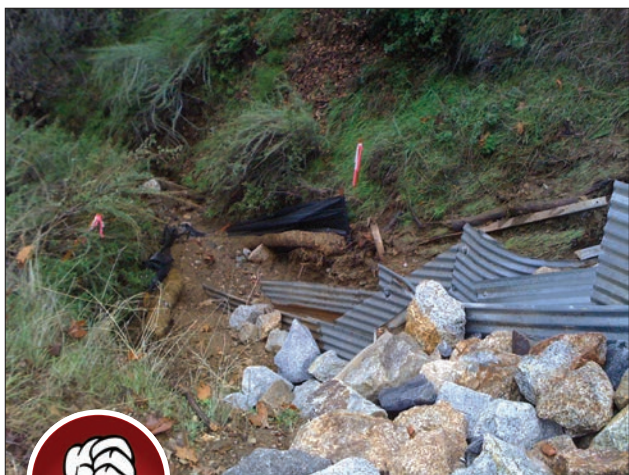


Fig. 2-2. Failure to provide routine maintenance at pipe outfalls can lead to larger failures.

Source: RBF Consulting

General Practices for Culvert Maintenance

- Culverts should only be cleaned or repaired during non-storm periods. If culvert maintenance must be done while water is flowing through the culvert, then clear water diversion should be installed.

- Disturbance of the bed and banks adjacent to the pipe should be limited to that necessary to repair the culvert.
- The work area should be fully restored upon completion with a mix of native, locally adapted, vegetation, if appropriate.
- Wastewater from dewatering activity should be routed to an area that will not drain directly into any stream channel. Consult the appropriate dewatering permit.



Disturbance of the bed and banks adjacent to the pipe should be limited to that necessary to repair the culvert.

Fish Passage and Aquatic Species Protection

- Coordinate with your DOT fish and wildlife specialists or local fish and wildlife agencies for assistance in scheduling to avoid aquatic impacts.
- If pumps are used to temporarily divert a stream to facilitate construction, a fish screen should be used to prevent trapping of small fish.

Drift Removal

- Cut and turn driftwood to allow it to flow through and under the structure only where doing so would not endanger any other crossing structures downstream.
- Repair and restore riparian areas temporarily impacted by machinery during drift removal. Coordinate long-term access for drift removal with the appropriate staff and agencies.

Vacuum (Vactor) Waste Disposal

Vactor waste is considered to have a high environmental risk. This risk is due to its makeup of easily transported silts and potentially contaminated liquid fraction.

- Vactor liquids should be disposed to an approved sanitary sewer only with permission.
- Where sanitary sewers are not available, the DOT hazardous materials coordinator should specify areas suitable for field decanting of vactor solids or liquids under a state permit. Disposal lands should also maintain controls to prevent public access.
- Dispose of vactor waste only in locations approved by the DOT environmental division.



Dispose of vactor waste only in locations approved by the DOT environmental division.

Other General Practices

- DO** Do dispose of solid and liquid wastes generated by the cleaning of stormwater facilities in accordance with federal, state, and local regulations.
- DO** Ensure timely inspection and removal of debris for culverts to continue to effectively move water, fish, sediment, and debris.
- DO** Be sure that all appropriate regulatory permits have been obtained prior to performing storm drain maintenance.
- DO NOT** Perform maintenance of storm drains, culverts, or ditches during rainfall, except when emergency conditions warrant.



Do not perform maintenance of storm drains, culverts, or ditches during rainfall, except when emergency conditions warrant.



Documents

Document Sharing Hub

Eroding Slope and Channel Areas

General Description

Slope repair involves repairing erosion, fire, or seismic damage to roadway slopes to prevent pollution discharge to storm drains or surface waters. Such work may involve removal of debris, buttressing, grading, construction of minor drainage improvements, and re-vegetation. Practices to control erosion during repair work include the use of rolled erosion control products (RECPs), tackifiers or binding agents, and mulching. Channels are maintained to remove trash, debris, and excessive vegetation. Channel maintenance can involve minor grading or replacement of riprap, rock, or gabions to reduce erosion.



Fig. 2-3. This slope is exhibiting signs of rill erosion and additional BMPs are needed.

Source: RBF Consulting

Slope Preparation

Surface roughening is used as a temporary BMP to reduce the speed of runoff, increase infiltration, reduce erosion, trap sediment, and prepare the soil for seeding and planting by capturing moisture for seed. Surface roughening may be accomplished by furrowing, scarifying, ripping, or disking the soil to create a 2- to 4-inch variation in soil surface.



Surface roughening should be used in conjunction with other BMPs such as mulching, seeding, or tackifier and should be parallel to the contour of slopes.

Surface roughening should be used in conjunction with other BMPs such as mulching, seeding, or tackifier and should be parallel to the contour of slopes. Track walking is a method of surface roughening that involves roughening a bare soil with horizontal grooves using tracked construction equipment.

Soil roughening can be done over an entire slope face or channel or just along the contour slope at regular intervals.



Fig. 2-4. Track walking is among the most common techniques used to roughen a slope. Grooves should be created parallel to the slope contour line.

Source: RBF Consulting

Slope Stabilization Using Compost

The use of compost can be effective at stabilizing slopes, at preventing erosion, and in helping vegetation to grow. Unlike other erosion control best practices, compost can be left in place as a soil amendment. Compost can be effectively used on slopes up to a 2:1 (horizontal to vertical) ratio.

- Use Seal of Testing Assurance (STA) certified weed-free compost.
- High-quality, mature compost will provide the most effective results. A low-grade, immature, or unstable compost can contribute to water quality impacts.
- Use compost that is relatively dry (40 percent water content or less) for greater erosion control and water quality benefit.
- Install compost generally at a thickness of 3 inches.
- Extend compost cover for 2 to 3 feet above slope.

Slope Stabilization Using Rolled Erosion Control Products

Rolled erosion control products (RECPs) include geotextiles and straw blankets. They are manufactured or fabricated into rolls and designed to protect soil from erosion and assist in the growth, establishment, and protection of vegetation. Routine maintenance of RECPs should include:

- Re-anchor loosened matting, and
- Replace missing matting and staples as required.



Fig. 2-5. This jute netting is physically deteriorating and requires replacement.

Source: RBF Consulting

Slope Stabilization Using Tackifiers and Binders

Tackifiers are synthetic bonding agents used to adhere seeding and straw mulch to the soil surface. Wind and surface water flow can displace straw. Tackifiers provide immediate and extended protection from wind and rain, allowing vegetation enough time to grow.

Soil binders are chemical stabilizers that provide temporary soil stabilization for stockpiles, berms, haul roads, or slopes. Soil binders are sprayed onto exposed soil surfaces to hold them in place and minimize wind and runoff erosion.

Common tackifiers and binders include plant-based binders, poly-acrylamide (PAM), and gypsum.



Fig. 2-6. No signs of surface depressions or erosion indicate that the binder used here has been adequately applied.

Source: RBF Consulting



Fig. 2-7. The binder used in this situation requires a greater application rate, as visibly evident by signs of rill erosion.

Source: RBF Consulting

Slope Stabilization Using Mulch and Temporary Seed Mixtures

Mulching consists of the application of a protective layer of certified weed-free straw, other plant residue, compost or organic waste, wood mulch, or synthetic material to the soil surface to provide short-term soil protection. Mulch helps protect newly placed soil and seed by absorbing rainfall energy. Mulch can be applied by hand, mechanical, or hydraulic methods.

Mulch enhances plant establishment by conserving moisture and moderating soil temperatures. Mulch should be used in combination with temporary seeding, as well as permanent seeding when conditions may be drier than optimal. On sloping ground, mulching can be used alone, or in combination with seeding and other BMPs, as an added measure to prevent erosion.



Fig. 2-8. No visible signs of erosion within the mulch areas or clogging indicate that this storm drain outlet is functioning well. Maintenance is not currently needed.

Source: RBF Consulting