State of California
Department of Transportation

Storm Water Quality Handbooks

Project Planning and Design Guide

Storm Water Pollution Prevention Plan (SWPPP)
and Water Pollution Control Program (WPCP) Preparation Manual

Construction Site Best Management Practices (BMPs) Manual

November 2000

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Section 1
Construction Site
Best Management Practices (BMPs)

1.1 Introduction

On July 15, 1999, the State Water Resources Control Board (SWRCB) issued the "*National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)*" (Order No. 99-06-DWQ, NPDES No. CAS000003) hereby called "Permit". The Permit regulates storm water discharges from Caltrans properties, facilities and activities, and requires that Caltrans' construction program complies with the requirements of the "*NPDES General Permit, Waste Discharge Requirements (WDRs) for Discharges of Storm Water Runoff Associated with Construction Activity*" (Order No. 99-08-DWQ, NPDES No. CAS000002) (General Permit) issued by the SWRCB, to regulate discharges from construction sites that disturb 5 acres (ac) or more.

1.2 Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Prevention Program (WPCP)

Caltrans requires contractors to prepare and implement a program to control water pollution effectively during the construction of all projects (see Section 7-1.01G Water Pollution, of the Standard Specifications). Projects resulting in 2 hectares (ha) [5 ac] or more of soil disturbance are subject to the General Permit. Caltrans Special Provisions require that for larger projects, defined as those resulting in 2 ha (5 ac) or more of soil disturbance, Contractors prepare and submit a Storm Water Pollution Prevention Plan (SWPPP). When a SWPPP is required for a project, it will satisfy the requirements of Section 7-1.01G, in addition to meeting other permit requirements.

Construction projects with a disturbed area of less than 2 ha (5 ac) are not covered under the General Permit at this time and thus do not require a SWPPP. However, Caltrans requires that a Water Pollution Control Program (WPCP) addressing control measures be prepared and implemented by the construction contractor. For detailed step-by-step procedures, instructions and templates to prepare a SWPPP or a WPCP, refer to the Caltrans *Storm Water Quality Handbooks, Storm Water Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual*.

In some cases, the Regional Water Quality Control Board (RWQCB) may view two (2) or more small projects (less than 5 ac of soil disturbance) in the same corridor to be parts of a larger common plan of development, thus making the small projects subject to the requirements of the General Permit to develop and implement a SWPPP. After March 10, 2003, U.S. Environmental Protection Agency (EPA) regulations will require a SWPPP for projects with soil disturbance of 1 acre or more – although the SWRCB may impose an earlier date by amending the General Permit and thus including coverage of projects with soil disturbance of 1 acre or more.

1.3 Organization of this Manual

This *Storm Water Quality Handbooks, Construction Site Best Management Practices Manual* (manual) is intended to provide Contractors and Caltrans staff with detailed information of construction site BMPs. This manual is organized as follows:

- Section 1 provides an introduction to the Construction Site Best Management Practices (BMPs) Manual.
- Section 2 provides instructions for the selection and implementation of construction site BMPs
- Section 3 provides listing and working details for Caltrans construction site BMPs for Temporary Soil Stabilization.
- Section 4 provides listing and working details for Caltrans construction site BMPs for Temporary Sediment Control.
- Section 5 provides listing and working details for Caltrans construction site BMPs for Wind Erosion Control.
- Section 6 provides listing and working details for Caltrans construction site BMPs for Tracking Control
- Section 7 provides listing and working details for Caltrans construction site BMPs for Non-Storm Water Management.
- Section 8 provides listing and working details for Caltrans construction site BMPs for Waste Management and Materials Pollution Control.
- Appendix A provides a listing of frequently used abbreviations, acronyms, and definitions of terms used throughout this Manual.

1.4 Caltrans Construction Site BMPs

This section lists those BMPs considered during the construction of Caltrans projects. Construction site BMPs (also called temporary control practices) are best conventional technology/best available technology (BCT/BAT)-based BMPs that are consistent with the BMPs and control practices required under the General Permit. Caltrans construction site BMPs are divided into the following groups (see Table 1-1):

Approved Construction Site BMPs for Statewide Use

Approved construction site BMPs are BMPs that have been approved by Caltrans Deputy Directors or Program Managers for statewide implementation. Implementation is dependent on conditions/applicability of deployment described as part of the BMP. These BMPs are typically implemented in all Caltrans construction projects; they include practices for soil stabilization, sediment control, wind erosion control, tracking control, non-storm water management and waste

management. Some of the approved construction site BMPs have been designated as "minimum requirements"; these BMPs will be implemented in all highway construction projects statewide when they are applicable to a project.

Approved Construction Site BMPs for Use on a Project-by-Project Basis

These are other construction site BMPs have not been approved for statewide use by the Statewide Storm Water Management Plan (SWMP), but may be implemented, on a project-by-project basis, in addition to required approved BMPs and when determined necessary and feasible by the Resident Engineer (RE). Caltrans may, on a project-by-project basis, specify or require Contractors to implement some of these construction site BMPs. Additionally, Caltrans will consider a Contractor's recommendation to implement some of these construction site BMPs on a project, subject to headquarters approval.

Construction site BMPs within each of these categories are described throughout Sections 3 through 8 of this Manual. Table 1-1 lists the construction site BMPs. It is important to note that some BMPs were grouped in order to show that a combination of those BMPs will enhance protection over the use of only one BMP.

Table 1-1

CONSTRUCTION SITE BMPs				
ID	**BMP NAME**	**APPROVED FOR STATEWIDE USE ON ALL PROJECTS (1)**	**APPROVED FOR USE ON A PROJECT-BY-PROJECT BASIS**	**MINIMUM REQUIREMENT**
TEMPORARY SOIL STABILIZATION				
SS-1	Scheduling	X		✓
SS-2	Preservation of Existing Vegetation	X		✓
SS-3	Hydraulic Mulch	X		✓(2)
SS-4	Hydroseeding	X		✓(2)
SS-5	Soil Binders	X		✓(2)
SS-6	Straw Mulch	X		✓(2)
SS-7	Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats	X		✓(2)
SS-8	Wood Mulching	X		
SS-9	Earth Dikes/Drainage Swales & Ditches	X		
SS-10	Outlet Protection/Velocity Dissipation Devices	X		
SS-11	Slope Drains	X		
TEMPORARY SEDIMENT CONTROL				
SC-1	Silt Fence	X		✓
SC-2	Desilting Basin	X		
SC-3	Sediment Trap		X	
SC-4	Check Dam		X	
SC-5	Fiber Rolls		X	
SC-6	Gravel Bag Berm		X	
SC-7	Street Sweeping and Vacuuming			✓
SC-8	Sandbag Barrier		X	
SC-9	Straw Bale Barrier		X	
SC-10	Storm Drain Inlet Protection		X	✓

Table 1-1

CONSTRUCTION SITE BMPs				
ID	**BMP NAME**	**APPROVED FOR STATEWIDE USE ON ALL PROJECTS [1]**	**APPROVED FOR USE ON A PROJECT-BY-PROJECT BASIS**	**MINIMUM REQUIREMENT**
WIND EROSION CONTROL				
WE-1	Wind Erosion Control	X		✓
TRACKING CONTROL				
TC-1	Stabilized Construction Entrance/Exit	X		
TC-2	Stabilized Construction Roadway		X	
TC-3	Entrance/Outlet Tire Wash		X	
NON-STORM WATER MANAGEMENT				
NS-1	Water Conservation Practices	X		
NS-2	Dewatering Operations	X		
NS-3	Paving and Grinding Operations	X		
NS-4	Temporary Stream Crossing	X		
NS-5	Clear Water Diversion	X		
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting	X		✓
NS-7	Potable Water/Irrigation	X		
NS-8	Vehicle and Equipment Cleaning	X		✓
NS-9	Vehicle and Equipment Fueling	X		✓
NS-10	Vehicle and Equipment Maintenance	X		✓
WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL				
WM-1	Material Delivery and Storage	X		✓
WM-2	Material Use	X		✓
WM-3	Stockpile Management	X		
WM-4	Spill Prevention and Control	X		✓
WM-5	Solid Waste Management	X		✓
WM-6	Hazardous Waste Management	X		
WM-7	Contaminated Soil Management	X		
WM-8	Concrete Waste Management	X		
WM-9	Sanitary/Septic Waste Management	X		✓
WM-10	Liquid Waste Management	X		

[1] Implementation depends on applicability to a project

[2] The Contractor shall select one of the five measures listed or a combination thereof to achieve and maintain the contract's rainy season disturbed soil area (DSA) requirements

Section 2
Selecting and Implementing Construction Site Best Management Practices

This section provides instructions for the selection and implementation of construction site best management practices (BMPs). It is important to note that the requirements of this Section are Caltrans minimum requirements, and that Caltrans Districts may impose more stringent requirements on a project-by-project basis, and that the Contractor implements additional construction site BMPs if deemed necessary. Changes in field implementation of construction site BMPs require written approval of the Resident Engineer (RE). Any additional requirements will be included in the project's Standard Special Provisions (SSPs). Working details of construction site BMPs are presented in Sections 3 through 8 of this Manual.

2.1 Definitions

2.1.1 Disturbed Soil Area (DSA)

Disturbed soil areas (DSAs) are areas of exposed, erodible soil that are within the construction limits and that result from construction activities. The following are not considered DSAs:

1. Areas where soil stabilization, erosion control, highway planting, or slope protection are applied and associated drainage facilities are in place and functional.

2. Roadways, construction roads, access roads or contractor's yards that have been stabilized by the placement of compacted subbase or base material or paved surfacing.

3. Areas where construction has been completed in conformance with the contract plans and permanent erosion control is in place and functional.

Erosion control is considered functional when a uniform vegetative cover equivalent to 70 percent of the native background vegetation coverage has been established or equivalent stabilization measures have been employed.

2.1.2 Active Areas and Non-Active Areas

Active Areas are construction areas where soil-disturbing activities have already occurred and continue to occur or will occur during the ensuing 21 days.

Non-Active Areas are construction areas (formerly active areas) that will be idle for at least 21 days.

The RE will conduct a review of the existing active areas on a regular basis to determine if a non-active status should be applied to some DSAs.

2.1.3 Slope Length and Benches

Slope length is measured or calculated along the continuous inclined surface. Each discrete slope is between one of the following: top to toe, top to bench, bench to bench, and bench to toe.

Benches are drainage facilities that intercept surface flow and convey the resulting concentrated flow away from a slope. For the purpose of determining slope lengths, fiber rolls or other appropriate BMPs (used for temporary sediment control) can be considered equivalent to a bench.

2.1.4 Rainy Season

The average rainfall in California varies greatly from region to region. To account for the various rainfall patterns (time frame, intensities, and amounts) the state is separated into several rainy seasons. Shown in Figure 2-1 is a map identifying the rainy seasons throughout the state. These rainy seasons are used to identify the appropriate level of soil stabilization and sediment control protection.

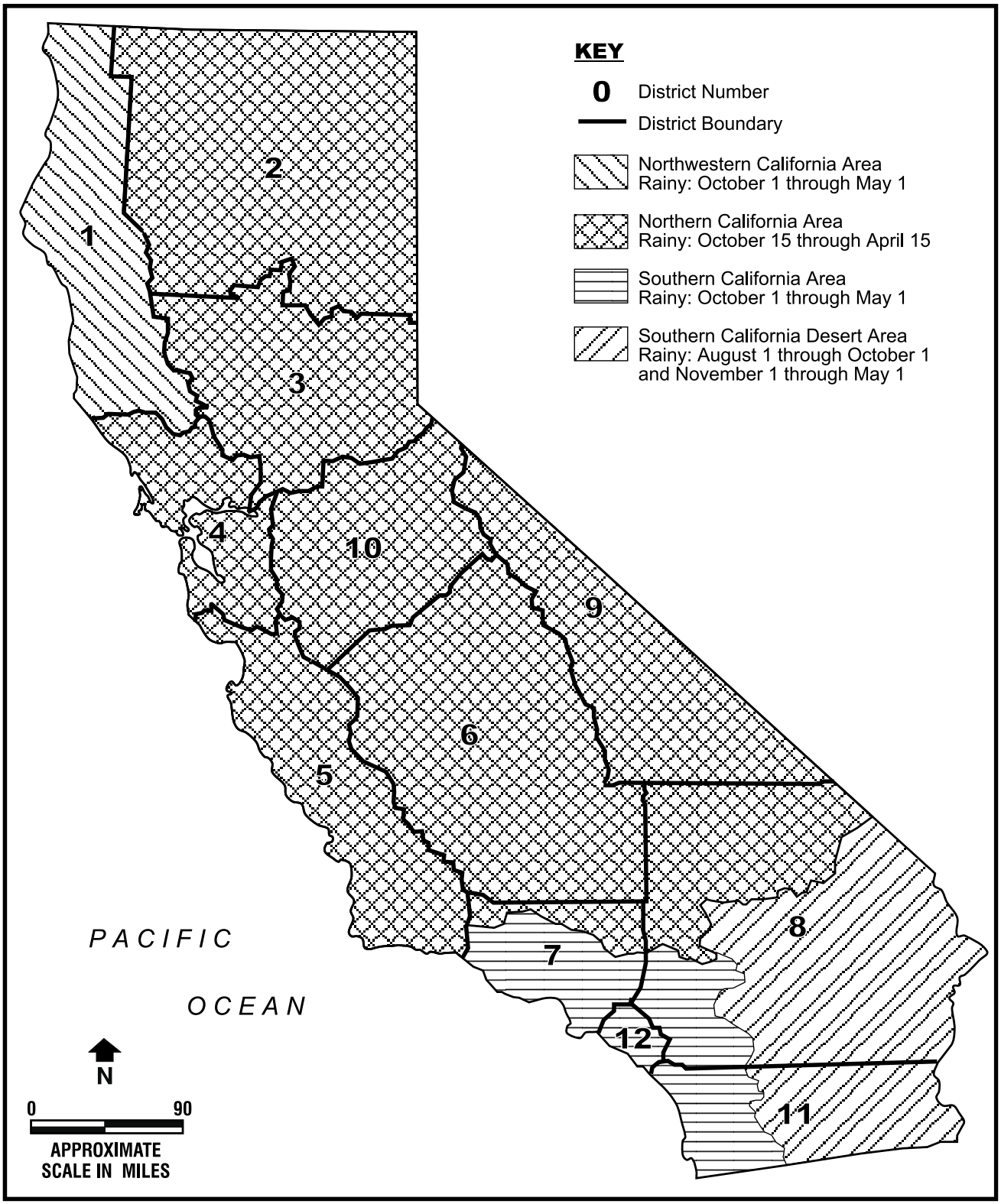


Figure 2-1
DESIGNATION OF RAINY SEASONS

2.2 Temporary Soil Stabilization and Sediment Control Implementation Guidance

Storm water pollution control requirements are intended to be implemented on a year-round basis at an appropriate level. The requirements must be implemented in a proactive manner during all seasons while construction is ongoing. California has varied rainfall patterns throughout the state; therefore, the appropriate level of BMP implementation will also vary throughout the state. The temporary sediment controls and soil stabilization specified in this section are based on rainfall patterns (time frames, intensities, and amounts), general soil types, the seasons, slope inclinations and slope lengths. Appropriate water pollution control includes the implementation of an effective combination of both soil stabilization and sediment controls.

Described in this section are general principles and specific guidance for selecting and implementing temporary soil stabilization and sediment control BMPs. Sections 2.2.1, 2.2.2, and 2.2.3 provide key principles for preventing erosion on construction sites. Sections 2.2.4 and 2.2.5 provide the specific guidance for selecting and implementing temporary soil stabilization and sediment control BMPs to manage disturbed soil areas. It is important to note that the Districts may require implementation of additional construction site BMPs if deemed necessary.

2.2.1 Scheduling

Construction scheduling shall consider the amount and duration of soil exposed to erosion by wind, rainfall, runoff and vehicle tracking and seek to minimize disturbed soil area in the rainy season. A schedule shall be prepared that shows the sequencing of construction activities with the installation of soil stabilization and sediment control BMPs. See BMP SS-1, Scheduling in this Manual for BMP details.

2.2.2 Preservation of Existing Vegetation

Preserving existing vegetation to the maximum extent possible and for as long as possible on a construction site reduces or eliminates erosion in those areas. To facilitate this practice, on a year-round basis temporary fencing shall be provided prior to commencement of clearing and grubbing operations or other soil-disturbing activities in areas where no construction activity is planned or will occur at a later date. See BMP SS-2, Preservation of Existing Vegetation, for BMP details.

2.2.3 Storm Water Run-on and Concentrated Flows

The diversion of storm water run-on and conveyance of concentrated flows must be considered in determining the appropriateness of the BMPs chosen. BMPs to divert or manage concentrated flows in a non-erodible fashion may be required on a project-by-project basis to divert off-site drainage through or around the construction site or to properly manage construction site storm water runoff. See BMPs SS-9, Earth Dikes, Drainage Swales and Lined Ditches; SS-10, Outlet Protection/ Velocity Dissipation Devices; and SS-11, Slope Drains, for BMP details.

2.2.4 Disturbed Soil Area Management

The DSA management guidelines are based on rainfall patterns (time frames, intensities, and amounts), general soil types, the seasons, slope inclinations, and slope lengths. All of these factors

are considered in developing the appropriate levels of soil stabilization and sediment control, and will be considered by the RE when directing specific site-by-site actions.

2.2.4.1 Disturbed Soil Area Size Limitations

Limiting the amount of disturbed soil is a critical component in conducting an effective storm water management program. Section 7-1.01G, Water Pollution, of the Standard Specifications states *"Unless otherwise approved by the Engineer in writing, the Contractor shall not expose a total area of erosible earth, which may cause water pollution, exceeding 70,000 m^2 for each separate location, operation or spread of equipment before either temporary or permanent erosion control measures are accomplished"*. The RE has the option of increasing the size of disturbed soil areas beyond 70,000 square meters (17 acres) if appropriate control practices and an implementation plan are included in an approved SWPPP.

Furthermore, District design teams may elect to further restrict the size of the project's total disturbed soil area to 2 hectares (5 acres) during the rainy season. The RE has the option of increasing the limit of the total disturbed soil area during the rainy season beyond 5 acres if appropriate control practices and an implementation plan are included in an approved SWPPP.

2.2.5 DSA Protection by Temporary Soil Stabilization and Temporary Sediment Controls

To account for rainfall patterns (time frames, intensities, and amounts) and to a lesser extent general soil type differences, the state has been divided into seven areas requiring common protection requirements. These rainfall areas are described in Table 2-1. The specific temporary soil stabilization and sediment control practices for DSA protection in each area are determined from Tables 2-2 and 2-3. Based on consultation with experts, the slope length and slope inclination are seen as the most important criteria for soil stabilization and sediment control requirements, as these factors have the largest potential impact on the erosion rate. As indicated on these tables, the temporary soil stabilization and sediment controls at a construction site will increase with increasing slope length and slope inclination combination.

DSAs shall be protected as follows:

- Construction site BMPs (temporary control practices) as required in Table 2-2 shall be performed on non-active DSAs within 14 days from the cessation of soil-disturbing activities or one day prior to the onset of precipitation, whichever occurs first.

- Construction site BMPs for active DSAs as required in Table 2-3 shall be performed prior to the onset of precipitation and throughout each day for which precipitation is forecasted.

- For non-active DSAs, limit the erosive effects of storm water flow on slopes by implementing BMPs such as fiber rolls or gravel bag berms to break up the slope lengths as follows:

    - Slope inclination between 1:20 (V:H) and 1:2 (V:H): BMPs shall be placed on slopes 30m and greater at intervals no greater than 15m.

- Slope inclination 1:2 (V:H) or greater: BMPs shall be placed on slopes 15m and greater at intervals no greater than 7.5m.

- For non-active DSAs, permanent erosion control shall be applied to areas deemed substantially complete during the project's defined seeding window.

- Provide construction site BMPs in addition to those specified in Tables 2-2 and 2-3 to convey concentrated flows in a non-erodible fashion.

Table 2-1

AREA DEFINITIONS		
AREA	DESCRIPTION	
	Applicability	Elevation
1	**District 1** in the following areas: all of Del Norte and Humboldt Counties within 20 miles of the coast in Mendocino County	≤1200m
2	**District 1** (except within Area 1) **District 2** within the North Coast and Central Valley RWQCB jurisdictions **Districts 3, 4** and **5**	<250 m
3	**District 1** (except within Area 1) **District 2** within the North Coast and Central Valley RWQCB jurisdictions **Districts 3, 4** and **5**	250m – 1200m
4	**District 6** within the Central Valley RWQCB jurisdiction **District 7** within the Central Coast, Los Angeles, and Central Valley RWQCB jurisdictions **District 8** within the Santa Ana and San Diego RWQCB jurisdictions **District 10** **District 11** within the San Diego RWQCB jurisdiction **District 12**	<500m
5	**District 6** within the Central Valley RWQCB jurisdiction **District 7** within the Central Coast, Los Angeles, and Central Valley RWQCB jurisdictions **District 8** within the Santa Ana and San Diego RWQCB jurisdictions **District 10** **District 11** within the San Diego RWQCB jurisdiction **District 12**	500m - 1200m
6	Statewide	>1200m
7	**District 6** within the Lahontan RWQCB jurisdiction **District 7** within the Lahontan RWQCB jurisdiction **District 8** within the Lahontan and Colorado River Basin RWQCB jurisdictions **District 9** within the Lahontan RWQCB jurisdiction **District 11** within the Colorado River Basin RWQCB jurisdiction	≤1200m

Table 2-2

RECOMMENDED COMBINATION OF TEMPORARY SOIL STABILIZATION AND TEMPORARY LINEAR SEDIMENT BARRIERS (7)

NON-ACTIVE DISTURBED SOIL AREAS

SEASON	AREA DESIGNATION	TEMPORARY BMP	SLOPE (V:H) (1)			
			• 1:20	> 1:20 • 1:4	> 1:4 • 1:2	> 1:2
RAINY	AREAS 1 & 6	SOIL STABILIZATION (5)	X	X	X	X
		LINEAR SEDIMENT BARRIER (2) (5)	X	X	X	X
		DESILTING BASIN (3)		X	X	X
	AREAS 2, 3, 4 & 5	SOIL STABILIZATION (5)	X	X	X	X
		LINEAR SEDIMENT BARRIER (2)		X	X	X
		DESILTING BASIN				
	AREA 7	SOIL STABILIZATION				
		LINEAR SEDIMENT BARRIER (2) (6)	X	X	X	X
		DESILTING BASIN				
NON-RAINY	AREA 1	SOIL STABILIZATION (5)	X(4)	X(4)	X	X
		LINEAR SEDIMENT BARRIER (2)		X(4)	X	X
		DESILTING BASIN				
	AREAS 2, 4 & 7	SOIL STABILIZATION				
		LINEAR SEDIMENT BARRIER				
		DESILTING BASIN				
	AREAS 3&5	SOIL STABILIZATION				
		LINEAR SEDIMENT BARRIER (2)				X
		DESILTING BASIN				
	AREA 6	SOIL STABILIZATION (5)	X(4)	X(4)	X	X
		LINEAR SEDIMENT BARRIER (2)		X(4)	X	X
		DESILTING BASIN (3)				X

(1) Unless otherwise noted, the temporary BMP is required for the slope inclinations indicated on slope lengths greater than 3 meters. The maximum slope length is 30 meters for slope inclinations between 1:20 (V:H) and 1:2 (V:H) and 15 meters for steeper slopes.

(2) Temporary desilting basin may be implemented in lieu of temporary linear sediment barrier if both are not specifically required by note 3.

(3) Required in addition to the temporary linear sediment barrier, where feasible. Feasibility will depend on site-specific factors such as available right-of-way within the project limits, topography, soil type, disturbed soil area within watershed, and climate conditions.

(4) Implementation of controls not required except directly prior to predicted rain.

(5) The indicated temporary BMP required on all slope lengths.

(6) For disturbed soil areas that are within 5 miles of the Salton Sea or the Colorado River and also within 150 meters of a permanent or intermittent stream as identified on an USGS quad map, the temporary BMPs indicated will be required.

(7) Linear barrier systems are equivalent to what are sometimes referred to as perimeter systems. The intent is to provide a barrier to the transport of sediment at the downslope edge of soil disturbed areas.

(8) Permanent erosion control seeding shall be applied during the defined seeding window to all non-active areas deemed substantially complete

Table 2-3

RECOMMENDED COMBINATION OF TEMPORARY SOIL STABILIZATION AND TEMPORARY LINEAR SEDIMENT BARRIERS (8)

ACTIVE DISTURBED SOIL AREAS

SEASON	AREA DESIGNATION	TEMPORARY BMP	SLOPE (V:H) (1)		
			• 1:20	> 1:20 • 1:2	> 1:2
RAINY	AREAS 1 & 6	SOIL STABILIZATION		X	X
		LINEAR SEDIMENT BARRIER (2) (5)	X	X	X
		DESILTING BASIN (3)		X	X
	AREAS 2, 4 & 5	SOIL STABILIZATION			
		LINEAR SEDIMENT BARRIER (2)		X	X
		DESILTING BASIN (3)			X(6)
	AREA 3	SOIL STABILIZATION			X(6)
		LINEAR SEDIMENT BARRIER (2)		X	X
		DESILTING BASIN (3)			X(6)
	AREA 7	SOIL STABILIZATION			
		LINEAR SEDIMENT BARRIER (2) (7)	X	X	X
		DESILTING BASIN			
NON-RAINY	AREA 1	SOIL STABILIZATION			
		LINEAR SEDIMENT BARRIER (2)		X	X
		DESILTING BASIN			X(6)
	AREAS 2, 3, 4, 5 & 7	SOIL STABILIZATION			
		LINEAR SEDIMENT BARRIER			
		DESILTING BASIN			
	AREA 6	SOIL STABILIZATION			
		LINEAR SEDIMENT BARRIER (2)		X	X
		DESILTING BASIN (3)			X

(1) Unless otherwise noted, the BMP is required for the slope inclinations indicated on slope lengths greater than 3 meters.

(2) Temporary desilting basin may be implemented in lieu of temporary linear sediment barrier if both are not specifically required by note 3.

(3) Required in addition to the temporary linear sediment barrier, where feasible. Feasibility will depend on site-specific factors such available right-of-way within the project limits, topography, soil type, disturbed soil area within watershed, and climate conditions.

(4) Implementation of controls not required except directly prior to predicted rain.

(5) The indicated temporary BMP required on all slope lengths.

(6) The indicated temporary BMP required on slope lengths greater than 15 meters where feasible (see Note 3).

(7) For disturbed soil areas that are within 5 miles of the Salton Sea or the Colorado River and also within 150 meters of a permanent or intermittent stream as identified on an USGS quad map, the temporary BMPs indicated will be required.

(8) Linear barrier systems are equivalent to what are sometimes referred to as perimeter systems. The intent is to provide a barrier to the transport of sediment at the downslope edge of soil disturbed areas.

The practices described herein are typical of those that will be implemented on a project-by-project basis. However, it is important to note that there will be instances where project and site conditions require deviation from the BMPs and the descriptions provided in this manual. For instance, the proposed implementation of desilting basins (see BMP SC-2, Desilting Basin) is a new commitment that has not been incorporated into existing designs. In addition, the nature of linear projects and constrained rights-of-way inherent to Caltrans work may prohibit the use of desilting basins at some locations on certain projects and on some projects altogether. Implementation of desilting basins will be considered on a project-by-project basis. Caltrans is committed to refining the desilting basin implementation criteria during the term of the Permit while implementing the desilting basins on projects as practicable.

2.2.6 Stockpile Management

Soil stabilization and sediment control requirements as they apply to stockpiles of various materials are presented in BMP WM-3, Stockpile Management, in Section 8 of this Manual.

2.3 Guidance for Implementation of Other BMPs

2.3.1 Mobile Operations

Mobile operations common to the construction of a project include asphalt recycling, concrete mixing, crushing and the storage of materials. BMPs shall be implemented, as appropriate, to control the individual situations these mobile operations can create.

2.3.2 Wind Erosion Controls

Wind erosion controls shall be considered for all disturbed soils on the project site that are subject to wind erosion and when significant wind and dry conditions are anticipated during construction of the project. See BMP WE-1, Wind Erosion, for BMP details.

2.3.3 Tracking Controls

Tracking controls shall be implemented as needed to reduce the tracking of sediment and debris from the construction site. At a minimum, entrances and exits shall be inspected daily, and controls implemented as needed. See Section 6 of this manual for BMP details.

2.3.4 Non-Storm Water and Waste Management and Materials Pollution Controls

The objective of the non-storm water and waste management and materials pollution controls is to reduce the discharge of materials other than storm water to the storm water drainage system or to receiving waters. These controls shall be implemented for all applicable activities, material usage, and site conditions. Sections 7 and 8 of this manual provide guidance on implementation of BMPs related to the specific activity being conducted.

2.4 BMP INSPECTIONS

The construction site BMPs deployed on construction sites will be regularly inspected. Improperly installed or damaged practices shall be corrected immediately, or by a later date and time if

requested by the Contractor and approved by the Resident Engineer (RE) in writing, but not later than the onset of subsequent rain events. Inspections of the construction site for construction site BMPs are conducted as follows:

1. Prior to a forecast storm;
2. After a rain event that causes runoff from the construction site; and
3. At 24-hour intervals during extended rain events; and
4. As specified in the project Special Provisions

Section 3
Temporary Soil Stabilization
Best Management Practices

3.1 Temporary Soil Stabilization

Temporary soil stabilization consists of preparing the soil surface and applying one of the best management practices (BMPs) shown in Table 3-1, or combination thereof, to disturbed soil areas. Temporary soil stabilization shall be applied to disturbed soil areas of construction projects in conformance with the criteria presented in Section 2, Selecting and Implementing Construction Site BMPs, of this Manual.

Table 3-1

TEMPORARY SOIL STABILIZATION BMPs	
ID	**BMP NAME**
SS-1	Scheduling
SS-2	Preservation of Existing Vegetation
SS-3	Hydraulic Mulch
SS-4	Hydroseeding
SS-5	Soil Binders
SS-6	Straw Mulch
SS-7	Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats
SS-8	Wood Mulching
Temporary Concentrated Flow Conveyance Controls	
SS-9	Earth Dikes/Drainage Swales & Lined Ditches
SS-10	Outlet Protection/Velocity Dissipation Devices
SS-11	Slope Drains

3.1.1 Temporary Concentrated Flow Conveyance Controls

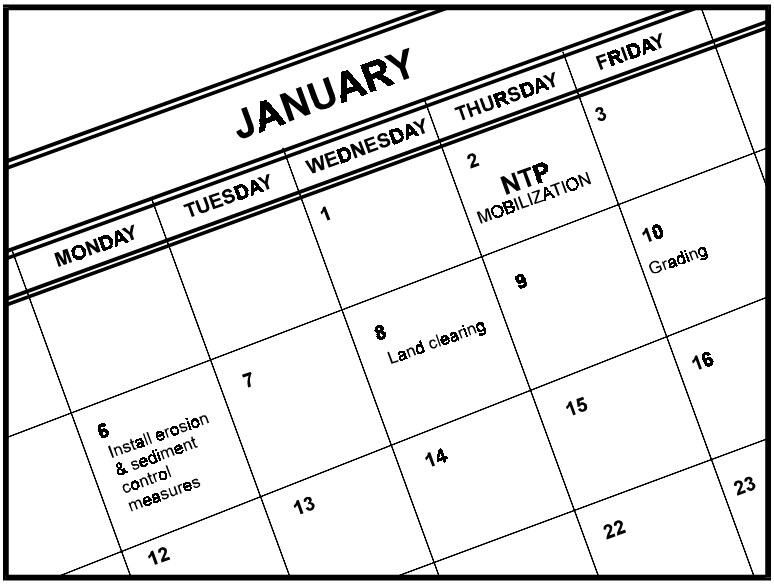
Temporary concentrated flow conveyance controls consist of a system of measures or BMPs that are used alone or in combination to intercept, divert, convey and discharge concentrated flows with a minimum of soil erosion, both on-site and downstream (off-site). Temporary concentrated flow conveyance controls may be required to direct run-on around or through the project in a non-erodible fashion. Temporary concentrated flow conveyance controls include the following BMPs:

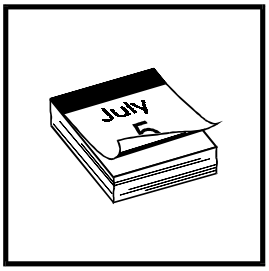
- Earth Dikes/Drainage Swales & Lined Ditches
- Outlet Protection/Velocity Dissipation Devices
- Slope Drains

The remainder of this Section shows the working details for each of the temporary soil stabilization BMPs.

Scheduling

SS-1





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

This best management practice (BMP) involves developing, for every project, a schedule that includes sequencing of construction activities with the implementation of construction site BMPs such as temporary soil stabilization (erosion control) and temporary sediment controls measures. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Appropriate Applications

Construction sequencing shall be scheduled to minimize land disturbance for all projects during the rainy season.

Limitations

None identified.

Standards and Specifications

Plan the project and develop a schedule or to layout the construction plan. The schedule shall clearly show how the rainy season relates to soil-disturbing and re-stabilization activities. The construction schedule shall be incorporated into the SWPPP or WPCP.

The schedule shall include detail on the rainy season implementation and deployment of:

- temporary soil stabilization BMPs,
- temporary sediment control BMPs,
- tracking control BMPs,
- wind erosion control BMPs,
- non-storm water BMPs, and

- waste management and materials pollution control BMPs.

Schedule shall also include dates for significant long-term operations or activities that may have planned non-storm water discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, bridge cleaning, etc.

Schedule work to minimize soil disturbing activities during the rainy season.

Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, pouring foundations, installing utilities, etc., to minimize the active construction area during the rainy season.

Schedule major grading operations for the non-rainy season when practical.

Stabilize non-active areas as soon as practical.

Monitor the weather forecast for rainfall.

When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment controls and sediment treatment controls on all disturbed areas prior to the onset of rain.

Be prepared year-round to deploy soil stabilization and sediment control and sediment treatment control practices as required by Section 2 of this Manual. Erosion may be caused during dry seasons by unseasonal rainfall, wind and vehicle tracking. Keep the site stabilized year-round, and retain and maintain rainy season sediment trapping devices in operational condition.

Sequence trenching activities so that most open portions are closed before new trenching begins.

Incorporate staged seeding and re-vegetation of graded slopes as work progresses.

Consider scheduling when establishing permanent vegetation (appropriate planting time for specified vegetation).

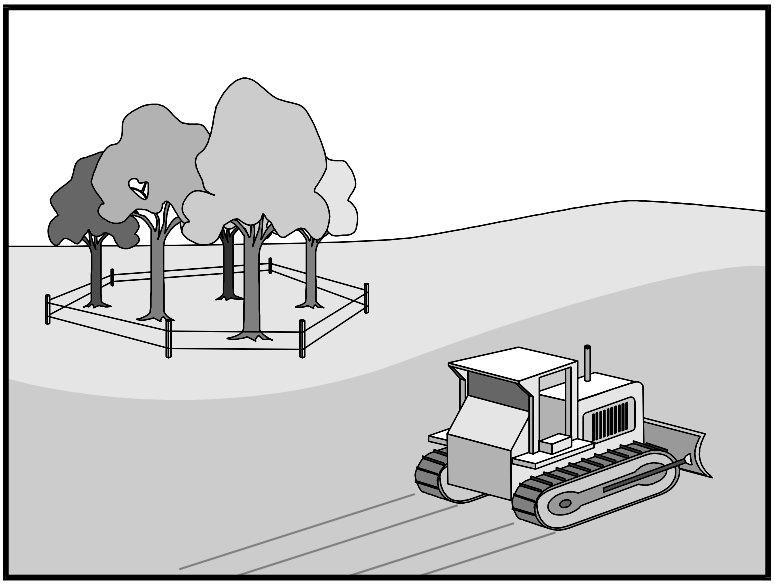
Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

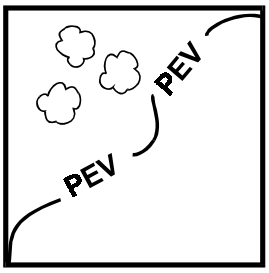
Maintenance and Inspection

- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted or when directed by the Resident Engineer (RE).
- The Special Provisions require annual submittal of rainy season implementation schedule. Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

Preservation of Existing Vegetation

SS-2





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Preservation of existing vegetation is the identification and protection of desirable vegetation that provides erosion and sediment control benefits.

Appropriate Applications

Preserve existing vegetation at areas on a site where no construction activity is planned or will occur at a later date.

On a year-round basis, temporary fencing shall be provided prior to clearing and grubbing operations or other soil-disturbing activities in areas where no construction activity is planned or will occur at a later date.

No grading or disturbances shall occur in areas identified on the plans to be preserved, especially on areas designated as Environmentally Sensitive Areas (ESAs).

Limitations

Protection of existing vegetation requires planning, and may limit the area available for construction activities.

Standards and Specifications

Timing

Preservation of existing vegetation shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas where no construction activity is planned or will occur at a later date.

Preservation of existing vegetation shall conform to scheduling requirements set forth in the special provisions.

Design and Layout

Mark areas to be preserved with temporary fencing made of orange polypropylene that is stabilized against ultraviolet light. The temporary fencing shall be at least one meter wide and shall have openings not larger than 50mm by 50mm.

Fence posts shall be either wood or metal, at the Contractor's discretion, as appropriate for the intended purpose. The post spacing and depth shall be adequate to completely support the fence in an upright position.

Minimize the disturbed areas by locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce cutting and filling.

Consider the impact of grade changes to existing vegetation and the root zone.

Installation

Construction materials, equipment storage, and parking areas shall be located where they will not cause root compaction.

Keep equipment away from trees to prevent trunk and root damage.

Maintain existing irrigation systems.

Employees and subcontractors shall be instructed to honor protective devices. No heavy equipment, vehicular traffic, or storage piles of any construction materials shall be permitted within the drip line of any tree to be retained. Removed trees shall not be felled, pushed, or pulled into any retained trees. Fires shall not be permitted within 30 m (100 ft) of the drip line of any retained trees. Any fires shall be of limited size, and shall be kept under continual surveillance. No toxic or construction materials - including paint, acid, nails, gypsum board, chemicals, fuels, and lubricants - shall be stored within 15 m (50 ft) of the drip line of any retained trees, nor disposed of in any way which would injure vegetation.

Trenching and Tunneling

Trenching shall be as far away from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching and/or tunneling near or under trees to be retained, tunnels shall be at least 450 mm (18 in) below the ground surface, and not below the tree center to minimize impact on the roots.

Preservation of Existing Vegetation

SS-2

- Tree roots shall not be left exposed to air; they shall be covered with soil as soon as possible, protected, and kept moistened with wet burlap or peat moss until the tunnel and/or trench can be completed.
- The ends of damaged or cut roots shall be cut off smoothly.
- Trenches and tunnels shall be filled as soon as possible. Careful filling and tamping will eliminate air spaces in the soil which can damage roots.
- Remove any trees intended for retention if those trees are damaged seriously enough to affect their survival. If replacement is desired or required, the new tree shall be of similar species, and of at least 50 mm (2 in) caliper, unless otherwise required by the contract documents.
- After all other work is complete, fences and barriers shall be removed last. This is because protected trees may be destroyed by carelessness during the final cleanup and landscaping.

Maintenance and Inspection

During construction, the limits of disturbance shall remain clearly marked at all times. Irrigation or maintenance of existing vegetation shall conform to the requirements in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below shall be followed:

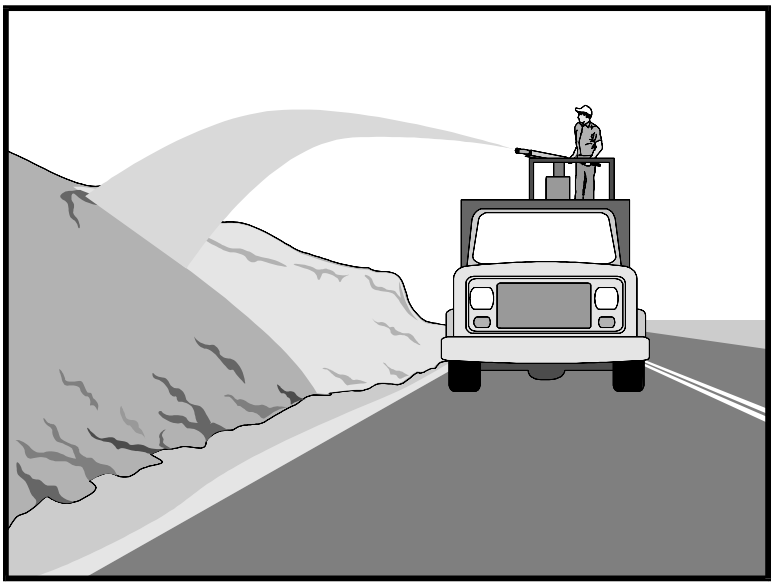
- Serious tree injuries shall be attended to by an arborist.
- Any damage to the crown, trunk, or root system of a retained tree shall be repaired immediately.
- Damaged roots shall be immediately cut clean.
- If bark damage occurs, all loosened bark shall be cut back into the undamaged area, with the cut tapered at the top and bottom, and drainage provided at the base of the wood. Cutting of the undamaged area shall be as limited as possible.
- Soil which has been compacted over a tree's root zone shall be aerated by punching holes 300 mm (12 in) deep with an iron bar, and moving the bar back and forth until the soil is loosened. Holes shall be placed 450 mm (18 in) apart throughout the area of compacted soil under the tree crown.
- Stressed or damaged broadleaf trees shall be fertilized to aid recovery.
- Trees shall be fertilized in the late fall or early spring.
- Fertilizer shall be applied to the soil over the feeder roots and in accordance with label instructions, but never closer than 1 m (3 ft) to the trunk. The

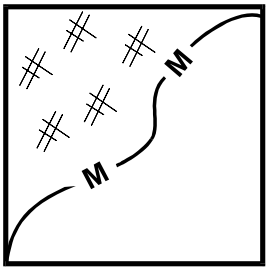
fertilized area shall be increased by one-fourth of the crown area for conifers that have extended root systems.

During construction, District Environmental shall be contacted to ensure that ESAs are protected.

Hydraulic Mulch

SS-3





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Hydraulic mulch consists of applying a mixture of shredded wood fiber or a hydraulic matrix, and a stabilizing emulsion or tackifier with hydro-mulching equipment. This will protect exposed soil from erosion by raindrop impact or wind. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

Hydraulic mulch is applied to disturbed areas requiring temporary protection until permanent vegetation is established or disturbed areas that must re-disturbed following an extended period of inactivity.

Avoid use in areas where the mulch would be incompatible with immediate earthwork activities and would have to be removed.

Limitations

Wood fiber hydraulic mulches are generally short-lived (only last a part of a growing season) and need 24 hours to dry before rainfall occurs to be effective.

Hydraulic matrices need 24 hours to dry before rainfall occurs to be effective.

Standards and Specifications

Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.

Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

Selection of hydraulic mulches by the Contractor must be approved by the Resident Engineer (RE).

Hydraulic Mulch

Materials for wood fiber based hydraulic mulches and hydraulic matrices shall conform to Standard Specifications Section 20-2.07. Paper based hydraulic mulches alone shall not be used for temporary soil stabilization applications.

Hydraulic Mulches

Wood fiber based hydraulic mulches are manufactured from lumber mill wood waste or from urban sources. This type of mulch is mixed in a hydraulic application machine (hydroseeder) and applied as a liquid slurry. Wood fiber mulch can be manufactured containing a stabilizing emulsion in each bag, or specified without.

Apply as a liquid slurry using a hydraulic application machine (i.e., hydroseeder) at rates of mulch and stabilizing emulsion recommended by the manufacturer to achieve complete coverage of the target area.

Hydraulic Matrices

Apply a wood fiber base layer and a paper fiber top layer, both mixed with acrylic polymers as binders. Apply as a liquid slurry using a hydraulic application machine (i.e., hydroseeder) at the following minimum rates, or as specified by the special provisions, to achieve complete coverage of the target area: 841 kg/ha (750 lbs/ac) wood fiber mulch, 1,140 kg/ha (1,000 lbs/ac) recycled paper mulch and 520 liters/ha (55 gal/ac) of acrylic copolymer.

Alternatively, a bonded fiber matrix (available mixed in a single bag) shall be applied at the rate specified in the special provisions. If the rate is not contained in the special provisions, the bonded fiber matrix shall be applied at a rate of 3,400 to 4,500 kg/ha (3,000 to 4,000 lbs/ac) based on manufacturers recommendation, to achieve complete coverage of the target area. Do not apply immediately before, during, or after a rainfall.

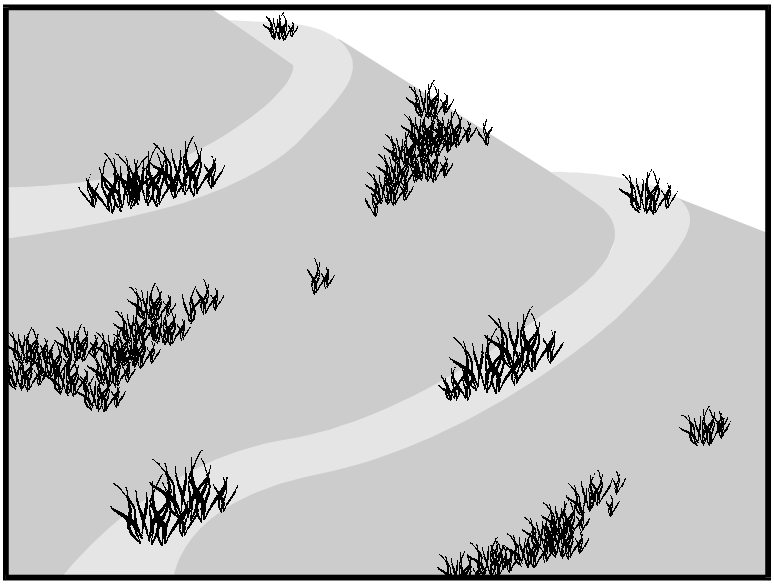
Maintenance and Inspections

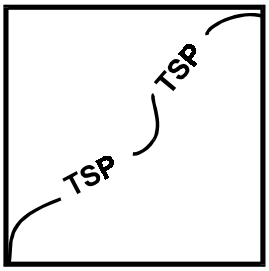
Maintain an unbroken, temporary mulched ground cover throughout the period of construction the soils are not being reworked. Inspect before expected rain storms and repair any damaged ground cover and re-mulch exposed areas of bare soil.

After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

Hydroseeding

SS-4





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Hydroseeding typically consists of applying a mixture of fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment, which temporarily protects exposed soils from erosion by water and wind. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

Hydroseeding is applied on disturbed areas requiring temporary protection until permanent vegetation is established, or disturbed areas that must be re-disturbed following an extended period of inactivity.

Limitations

Straw mulching may be necessary in addition to hydroseeding during the establishment of vegetation because temporary vegetation takes several weeks to establish.

Steep slopes are difficult to protect with temporary seeding.

Temporary seeding may not be appropriate in dry periods without supplemental irrigation.

Temporary vegetation may have to be removed before permanent vegetation is applied.

Temporary vegetation is not appropriate for short-term inactivity.

Standards and Specifications

In order to select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:

- Soil conditions
- Site topography
- Maintenance requirements
- Sensitive adjacent areas

- Season and climate
- Water availability
- Vegetation types
- Plans for permanent vegetation

Selection of hydroseeding mixtures shall be approved by the Landscape Architect and the Storm Water Coordinator.

The following steps shall be followed for implementation:

Seed mix shall comply with the Standard Specifications, Section 20-2.10, and the project's special provisions.

Avoid use of hydroseeding in areas where the best management practice (BMP) would be incompatible with future earthwork activities and would have to be removed.

Hydroseeding can be accomplished using a multiple-step or one-step process. The multiple-step process ensures maximum direct contact of the seeds to soil. When the one-step process is used to apply the mixture of fiber, seed, etc., the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.

Prior to application, roughen the slope, fill area, or area to be seeded with the furrows trending along the contours. See "Slope Roughening/Terracing/Rounding" BMP (*Caltrans Storm Water Quality Handbooks - Project Planning and Design Manual, May 2000*).

Apply a straw mulch to keep seeds in place and to moderate soil moisture and temperature until the seeds germinate and grow.

All seeds shall be in conformance with the California State Seed Law of the Department of Agriculture. Each seed bag shall be delivered to the site sealed and clearly marked as to species, purity, percent germination, dealer's guarantee, and dates of test. The container shall be labeled to clearly reflect the amount of Pure Live Seed (PLS) contained. All legume seed shall be pellet-inoculated. Inoculant sources shall be species specific and shall be applied at a rate of 2 kg of inoculant per 100 kg of seed (2-lb inoculant per 100-lb seed).

Commercial fertilizer shall conform to the requirements of the California Food and Agricultural Code. Fertilizer shall be pelleted or granular form.

Follow-up applications shall be made as needed to cover weak spots, and to maintain adequate soil protection.

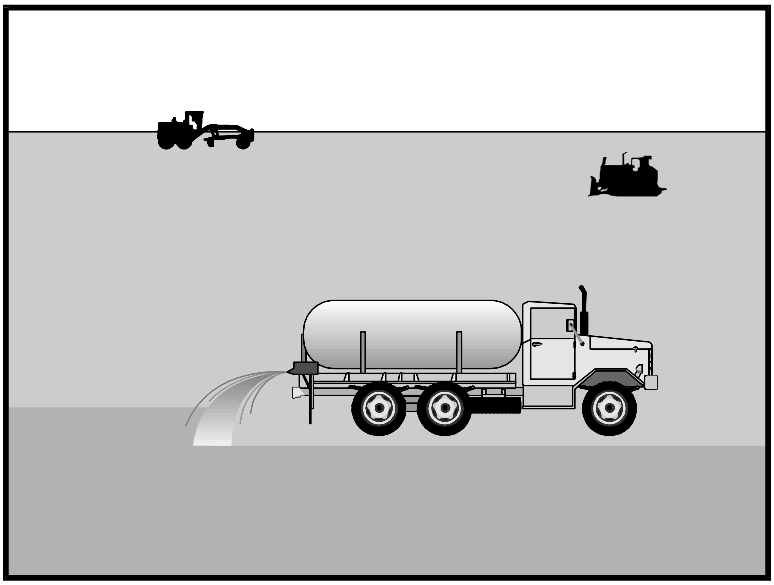
Avoid over-spray onto the travel way, sidewalks, lined drainage channels and existing vegetation.

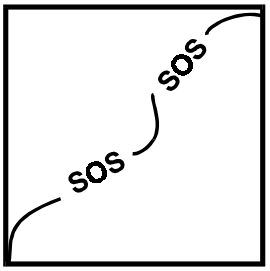
Maintenance and Inspection

- All seeded areas shall be inspected for failures and re-seeded, fertilized, and mulched within the planting season, using not less than half the original application rates. Any temporary revegetation efforts that do not provide adequate cover must be revegetated as required by the Resident Engineer (RE).
- After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

Soil Binders

SS-5





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Soil binders consist of applying and maintaining polymeric or lignin sulfonate soil stabilizers or emulsions. Soil binders are materials applied to the soil surface to temporarily prevent water-induced erosion of exposed soils on construction sites. Soil binders typically also provide dust, wind and soil stabilization (erosion control) benefits. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

Soil binders are applied to disturbed areas requiring short-term temporary protection. Because soil binders can often be incorporated into the work, they may be a good choice for areas where grading activities will soon resume.

Limitations

Soil binders are temporary in nature and may need reapplication.

Soil binders require a minimum curing time until fully effective, as prescribed by the manufacturer, which may be 24 hours or longer.

Soil binders will generally experience spot failures during heavy rainfall events. If runoff penetrates the soil at the top of a slope treated with a soil binder, it is likely that the runoff will undercut the stabilized soil layer and discharge at a point further down slope.

Soil binders do not hold up to pedestrian or vehicular traffic across treated areas.

Soil binders may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.

Some soil binders may not perform well with low relative humidity. Under rainy conditions, some agents may become slippery or leach out of the soil.

Soil Binders

May not cure if low temperatures occur within 24 hours of application.

Standards and Specifications

General Considerations

Regional soil types will dictate appropriate soil binders to be used.

A soil binder must be environmentally benign (non-toxic to plant and animal life), easy to apply, easy to maintain, economical, and shall not stain paved or painted surfaces.

Some soil binders are compatible with existing vegetation.

Performance of soil binders depends on temperature, humidity, and traffic across treated areas.

Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

Selecting a Soil Binder

Properties of common soil binders used for erosion control are provided on Table 1. Use Table 1 to select an appropriate soil binder.

Factors to consider when selecting a soil binder include the following:

Suitability to situation - Consider where the soil binder will be applied; if it needs a high resistance to leaching or abrasion, and whether it needs to be compatible with any existing vegetation. Determine the length of time soil stabilization will be needed, and if the soil binder will be placed in an area where it will degrade rapidly. In general, slope steepness is not a discriminating factor for the listed soil binders. The soil binders in Table 1 may also be used for dust control using the provided dust control application rates. The dust control application rates will not be adequate to provide protection from water-induced erosion.

Soil types and surface materials - Fines and moisture content are key properties of surface materials. Consider a soil binder's ability to penetrate, likelihood of leaching, and ability to form a surface crust on the surface materials.

Frequency of application - The frequency of application can be affected by subgrade conditions, surface type, traffic volumes, climate, and maintenance schedule. Frequent applications could lead to high costs. Application frequency may be minimized if the soil binder has good penetration, low evaporation, and good longevity. Consider also that frequent application will require frequent equipment clean-up.

After considering the above factors, the soil binders in Table 1 will be generally appropriate as follows:

Copolymer: Appropriate for long term soil stabilization in areas where cross-traffic might occur, or where stabilization needs to be achieved in conjunction with preserving existing vegetation. Longevity can be up to 2 years, it has a high resistance to abrasion, and is compatible with existing vegetation. However, it is also relatively costly which makes it less desirable for short-term or frequent applications.

Lignin sulfonate: Appropriate for short- or medium-term soil stabilization applications in low traffic areas. The moderate relative cost makes it less desirable to reapply frequently, though it typically lasts longer than psyllium or guar. With only moderate penetration and a low resistance to abrasion, it would be more suited to areas which will not be disturbed frequently by construction activities.

Psyllium/Guar: Appropriate for typical soil stabilizing situations or short-term applications. Because of the relatively low cost, they can be applied more frequently. Their high penetration provides good stabilization but their moderate resistance to abrasion limits their longevity. They are not very compatible with vegetation.

Applying Soil Binders

After selecting an appropriate soil binder, the untreated soil surface must be prepared before applying the soil binder. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution. In general, the following steps shall be followed:

Follow manufacturer's recommendations for application rates, pre-wetting of application area, and cleaning of equipment after use.

Prior to application, roughen embankment and fill areas. Track walking shall only be used where rolling is impractical.

Soil binders shall not be applied during or immediately before rainfall.

Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.

Do not apply soil binders to frozen soil, areas with standing water, under freezing or rainy conditions, or when the temperature is below 4°C (40°F).

More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.

Soil Binders

Generally, soil binders require a minimum curing time of 24 hours before they are fully effective. Refer to manufacturer's instructions for specific cure times.

For liquid agents:

- Crown or slope ground to avoid ponding.
- Uniformly pre-wet ground at 0.14 to 1.4 l/m^2 (0.03 to 0.3 gal/yd^2) or according to manufacturer's recommendations.
- Apply solution under pressure. Overlap solution 150 to 300 mm (6 to 12 in).
- Allow treated area to cure for the time recommended by the manufacturer; typically, at least 24 hours.
- Apply second treatment before first treatment becomes ineffective, using 50% application rate.
- In low humidities, reactivate chemicals by re-wetting with water at 0.5 to 0.9 l/m^2 (0.1 to 0.2 gal/yd^2).

Maintenance and Inspection

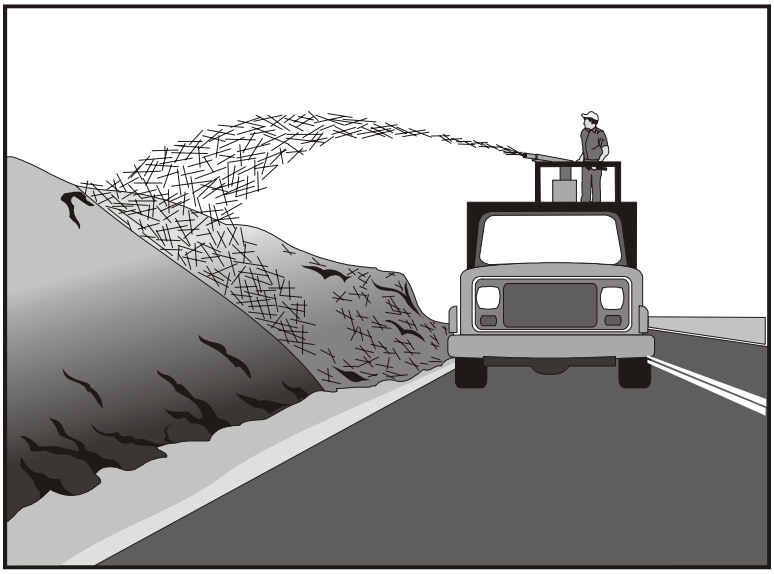
Reapplying the selected soil binder may be needed for proper maintenance. High traffic areas shall be inspected on a daily basis, and lower traffic areas should be inspected on a weekly basis.

After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

Table 1 *Properties of Soil Binders for Erosion Control*				
Chemicals	**Copolymer**	**Lignin Sulfonate**	**Psyllium**	**Guar**
Comments	- Forms semi-permeable transparent crust. - Resists ultraviolet radiation and moisture induced breakdown.	- Paper industry waste product - Acts as dispersing agent - Best in dry climates - Can be slippery	- Effective on dry, hard soils - Forms a crust	- Effective on dry, hard soils - Forms a crust
Relative Cost	High	Moderate	Low	Low
Environmental Hazard	Low	Low	Low	Low
Penetration	Moderate	Moderate	High	High
Evaporation	Moderate	Moderate	Moderate	Moderate
Resistance to Leaching	Low	High	High	High
Resistance to Abrasion	High	Low	Moderate	Moderate
Longevity	1 to 2 years	6 months to 1 year	3 to 6 months	3 to 6 months
Minimum Curing Time before Rain	24 hours	24 hours	24 hours	24 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Chemically Degradable	Biologically/Physically/ Chemically Degradable	Biologically Degradable	Biologically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Yes	Yes	Yes	Yes
Liquid/Powder	Liquid	Powder	Powder	Powder
Surface Crusting	Yes	Yes, but dissolves on rewetting	Yes, but dissolves on rewetting	Yes, but dissolves on rewetting
Clean-Up	Solvents	Solvents	Water	Water
Erosion Control Application Rate	Apply 800-1,000 l/ha (85-110 gal/ac).	Apply 5,600-6,500 l/ha (600-700 gal/ac).	Apply 170 kg/ha (150 lb./ac) with 560-2,200 kg/ha (500-2,000 lbs./ac) fiber mulch.	Apply 110-220 kg/ha (100-200 lbs./ac) with 560-2,200 kg/ha (500-2,000 lbs./ac) fiber mulch.
Dust Control Application Rate	Apply 280-520 L/ha (30-55 gal/ac).	Loosen surface 25-50mm (1-2 in). Need 4-8% fines. Apply 470-1,900 l/ha (50-200 gal/ac).	Apply 170 k/ha (150 lbs./ac).	Apply at 45-70 k/ha (40-60 lbs./ac).

Straw Mulch

SS-6



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a tackifier. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

Straw mulch is used for soil stabilization as a temporary surface cover on disturbed areas until soils can be prepared for re-vegetation and permanent vegetation is established.

Also typically used in combination with temporary and/or permanent seeding strategies to enhance plant establishment.

Limitations

Availability of erosion control contractors and straw may be limited prior to the rainy season due to high demand.

There is a potential for introduction of weed-seed and unwanted plant material.

When straw blowers are used to apply straw mulch, the treatment areas must be within 45 m (150 ft) of a road or surface capable of supporting trucks.

Straw mulch applied by hand is more time intensive and potentially costly.

May have to be removed prior to permanent seeding or soil stabilization.

"Punching" of straw does not work in sandy soils.

Standards and Specifications

Straw shall be derived from wheat, rice, or barley.

All materials shall conform to Sections 20-2.06, 20-2.07 and 20-2.11 of the Standard Specifications.

A tackifier is the preferred method for anchoring straw mulch to the soil on slopes.

Crimping, punch roller-type rollers, or track-walking may also be used to incorporate straw mulch into the soil on slopes. Track walking shall only be used where other methods are impractical.

Avoid placing straw onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.

Straw mulch with tackifier shall not be applied during or immediately before rainfall.

Application Procedures

Apply loose straw at a minimum rate of 3,570 kg/ha (4,000 lb./acre), or as indicated in the project's special provisions, either by machine or by hand distribution.

The straw mulch must be evenly distributed on the soil surface.

Anchor the mulch in place by using a tackifier or by "punching" it into the soil mechanically.

A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier shall be selected based on longevity and ability to hold the fibers in place.

A tackifier is typically applied at a rate of 140 kg/ha (125 lb/ac). In windy conditions, the rates are typically 200 kg/ha.

Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions and longevity. If the selected method is incorporation of straw mulch into the soil, then do as follows:

- Applying and incorporating straw shall follow the requirements in Section 20-3.03 of the Standard Specifications.
- On small areas, a spade or shovel can be used.
- On slopes with soils which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the

ground using a knife-blade roller or a straight bladed coulter, known commercially as a "crimper".

- On small areas and/or steep slopes, straw can also be held in place using plastic netting or jute. The netting shall be held in place using 11 gauge wire staples, geotextile pins or wooden stakes (as described in BMP SS-7, “Geotextiles, Plastic Covers and Erosion Control Blankets/Mats”.

Maintenance and Inspections

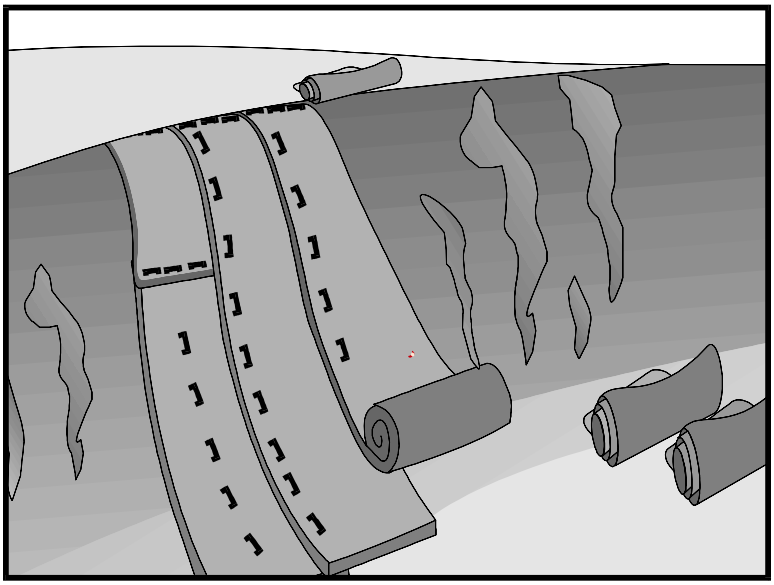
The key consideration in maintenance and inspection is that the straw needs to last long enough to achieve erosion control objectives.

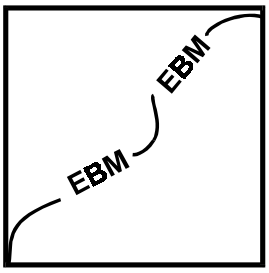
Reapplication of straw mulch and tackifier may be required by the Resident Engineer to maintain effective soil stabilization over disturbed areas and slopes.

After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.

Geotextiles, Plastic Covers and Erosion Control Blankets/Mats

SS-7





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

This Best Management Practice (BMP) involves the placement of geotextiles, plastic covers, or erosion control blankets/mats to stabilize disturbed soil areas and protect soils from erosion by wind or water. This is one of five temporary soil stabilization alternatives to consider.

Appropriate Applications

These measures are used when disturbed soils may be particularly difficult to stabilize, including the following situations:

Steep slopes, generally steeper than 1:3 (V:H).

Slopes where the erosion hazard is high.

Slopes and disturbed soils where mulch must be anchored

Disturbed areas where plants are slow to develop adequate protective cover.

Channels with flows exceeding 1.0 m/s (3.3 ft/s).

Channels intended to be vegetated.

Stockpiles

Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs).

Limitations

Blankets and mats are more expensive than other erosion control measures, due to labor and material costs. This usually limits their application to areas inaccessible to hydraulic equipment, or where other measures are not applicable, such as channels.

Blankets and mats are generally not suitable for excessively rocky sites, or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).

Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.

Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.

Plastic results in 100 percent runoff, which may cause serious erosion problems in the areas receiving the increased flow.

The use of plastic shall be limited to covering stockpiles, or very small graded areas for short periods of time (such as through one imminent storm event), until alternative measures, such as seeding and mulching, may be installed.

Standards and Specifications

Material Selection

There are many types of erosion control blankets and mats, and selection of the appropriate type should be based on the specific type of application and site conditions. Selection(s) made by the Contractor must be approved by the Resident Engineer (RE). The following criteria shall be considered in selection of the appropriate material:

Cost
- Material cost
- Preparation cost
- Installation cost
- Add-ons

Effectiveness
- Reduction of erosion
- Reduction of flow velocity
- Reduction of runoff

Acceptability
- Environmental compatibility
- Institutional/regulatory acceptability
- Visual impact

Vegetation Enhancement
- Native plant compatibility
- Moisture retention
- Temperature modification
- Open space/coverage

Installation
- Durability
- Longevity
- Ease of installation
- Safety

Operation and Maintenance
- Maintenance frequency

Geotextiles

Material shall be a woven polypropylene fabric with minimum thickness of 15 mm, minimum width of 3.7 m and shall have minimum tensile strength of 0.67 kN (warp) 0.36 kN (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric shall be approximately 0.07 sec^{-1} in conformance with the requirements in ASTM Designation: D4491. The fabric shall have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets shall be secured in place with wire staples or sandbags and by keying into tops of slopes to prevent infiltration of surface waters under Geotextile.

Geotextiles may be reused if, in the opinion of the RE, they are suitable for the use intended.

Plastic Covers

Temporary soil stabilization (Type plastic cover) material shall be polyethylene sheeting and shall have a minimum thickness of 6 mils. Plastic covers shall be anchored by sandbags placed no more than 3 m (10 ft) apart and by keying into the tops of slopes to prevent infiltration of surface waters under the plastic. All seams shall be taped or weighted down their entire length, and there shall be at least a 300 mm (12 in) to 600 mm (24 in) overlap of all seams.

Plastic covers may be reused if, in the opinion of the RE, they are suitable for the use intended.

Erosion Control Blankets/Mats

Erosion control blankets/mats shall be either straw, coconut, straw/coconut or Excelsior blanket, in accordance with the project Special Provisions, SSP 07-390.

Site Preparation

Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil.

Grade and shape the area of installation.

Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.

Prepare seedbed by loosening 50 mm (2 in) to 75 mm (3 in) of topsoil.

Seeding

Seed the area before blanket installation for erosion control and revegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all check slots and other areas disturbed during installation must be re-seeded. Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Anchoring

U-shaped wire staples, metal geotextile stake pins or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.

Staples shall be made of 3.05 mm steel wire and shall be U-shaped with 200-mm legs and 50-mm crown. Wire staples shall be minimum of 11 gauge.

Metal stake pins shall be 5 mm (0.188 in) diameter steel with a 40 mm (1.5 in) steel washer at the head of the pin.

Wire staples and metal stakes shall be driven flush to the soil surface.

All anchors shall be 150 mm (6 in) to 450 mm (18 in) long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes

Always consult the manufacturer's recommendations for installation. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 150 mm (6 in) deep by 150 mm (6 in) wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket downslope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 50 mm (2 in) to 75 mm (3 in) and staple every 1 m (3 ft).
- When blankets must be spliced, place blankets end over end (shingle style) with 150 mm (6 in) overlap. Staple through overlapped area, approximately 300 mm (12 in) apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (V:H) to 1:2 (V:H), require a minimum of 2 staples/m^2 (2 staples/yd^2). Moderate slopes, 1:2 (V:H) to 1:3 (V:H), require a minimum of 1½ staples/m^2 (1 ½ staples/yd^2), placing 1 staple/m (1 staple/yd) on centers. Gentle slopes require a minimum of 1 staple/m^2 (1 staple/yd^2).

Installation in Channels

Always consult the manufacturer's recommendations for installation. In general, these will be as follows:

- Dig initial anchor trench 300 mm (12 in) deep and 150 mm (6 in) wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 150 mm (6 in) deep and 150 mm (6 in) wide across the channel at 8 m to 10 m (25 ft to 30 ft) intervals along the channels.
- Cut longitudinal channel anchor slots 100 mm (4 in) deep and 100 mm (4 in) wide along each side of the installation to bury edges of matting, whenever possible extend matting 50 mm (2 in) to 75 mm (3 in) above the crest of the channel side slopes.

- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 300 mm (12 in) intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 75 mm (3 in).
- Secure these initial ends of mats with anchors at 300 mm (12 in) intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 75 mm (3 in) overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 300 mm (12 in) intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Alternate method for non-critical installations: Place two rows of anchors on 150 mm (6 in) centers at 8 m (25 ft) to 10 m (30 ft) intervals in lieu of excavated check slots.
- Shingle-lap spliced ends by a minimum of 300 mm (12 in) apart on 300 mm (12 in) intervals.
- Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soil.
- Anchor, fill and compact upstream end of mat in a 300 mm (12 in) by 150 mm (6 in) terminal trench.
- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement)

- Always consult the manufacturer's recommendations for installation.
- Do not drive tracked or heavy equipment over mat.

- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes or brooms for fine grading and touch up.
- Smooth out soil filling; just exposing top netting of mat.

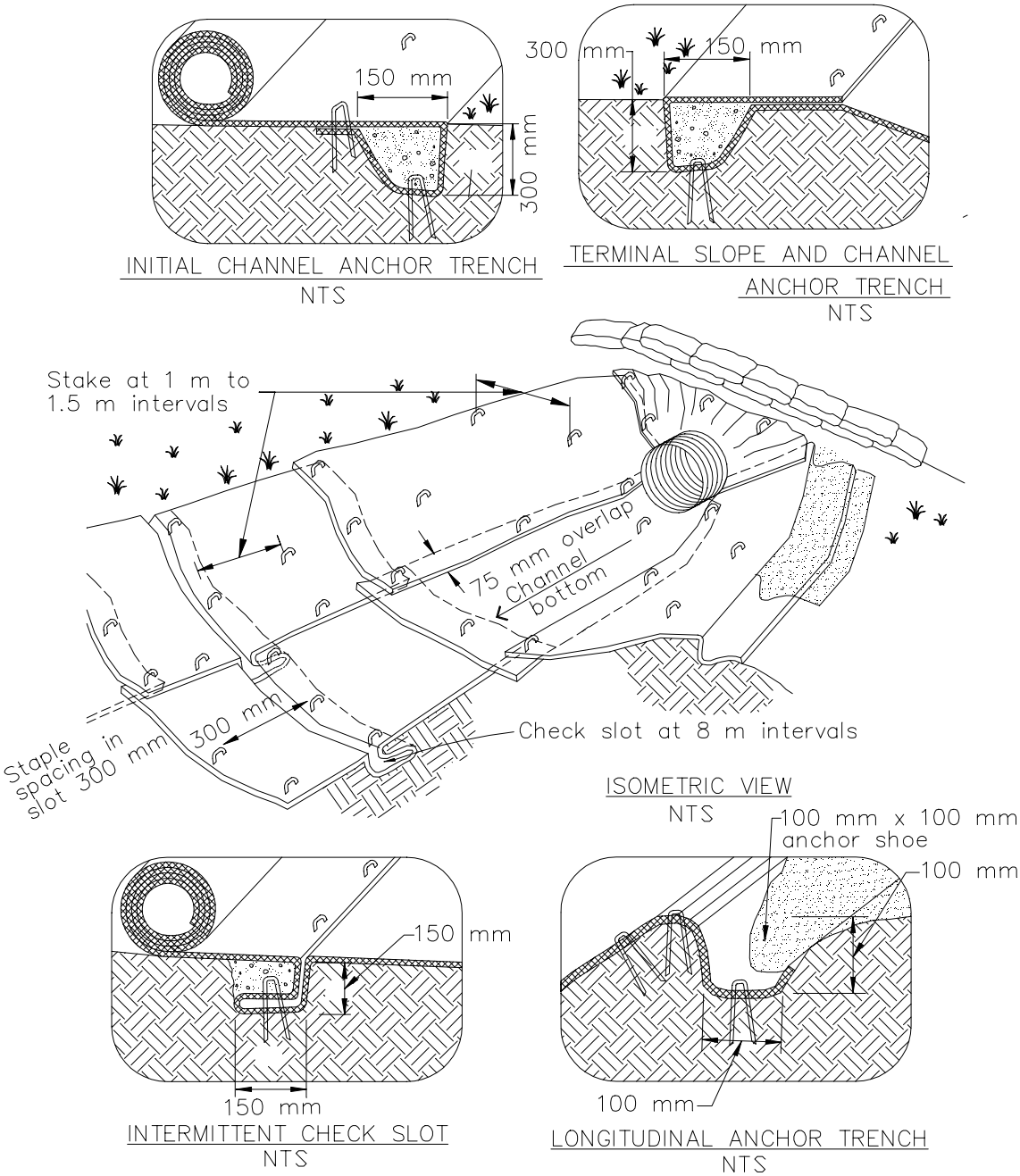
Temporary Soil Stabilization Removal

- When no longer required for the work, temporary soil stabilization shall become the property of the Contractor. Temporary soil stabilization removed from the site of the work shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Maintenance and Inspection

Areas treated with temporary soil stabilization shall be inspected as specified in the special provisions. Areas treated with temporary soil stabilization shall be maintained to provide adequate erosion control. Temporary soil stabilization shall be reapplied or replaced on exposed soils when greater than 10 percent of the previously treated area becomes exposed or exhibits visible erosion.

- All blankets and mats shall be inspected periodically after installation.
- Installation shall be inspected after significant rain storms to check for erosion and undermining. Any failures shall be repaired immediately.
- If washout or breakage occurs, re-install the material after repairing the damage to the slope or channel.

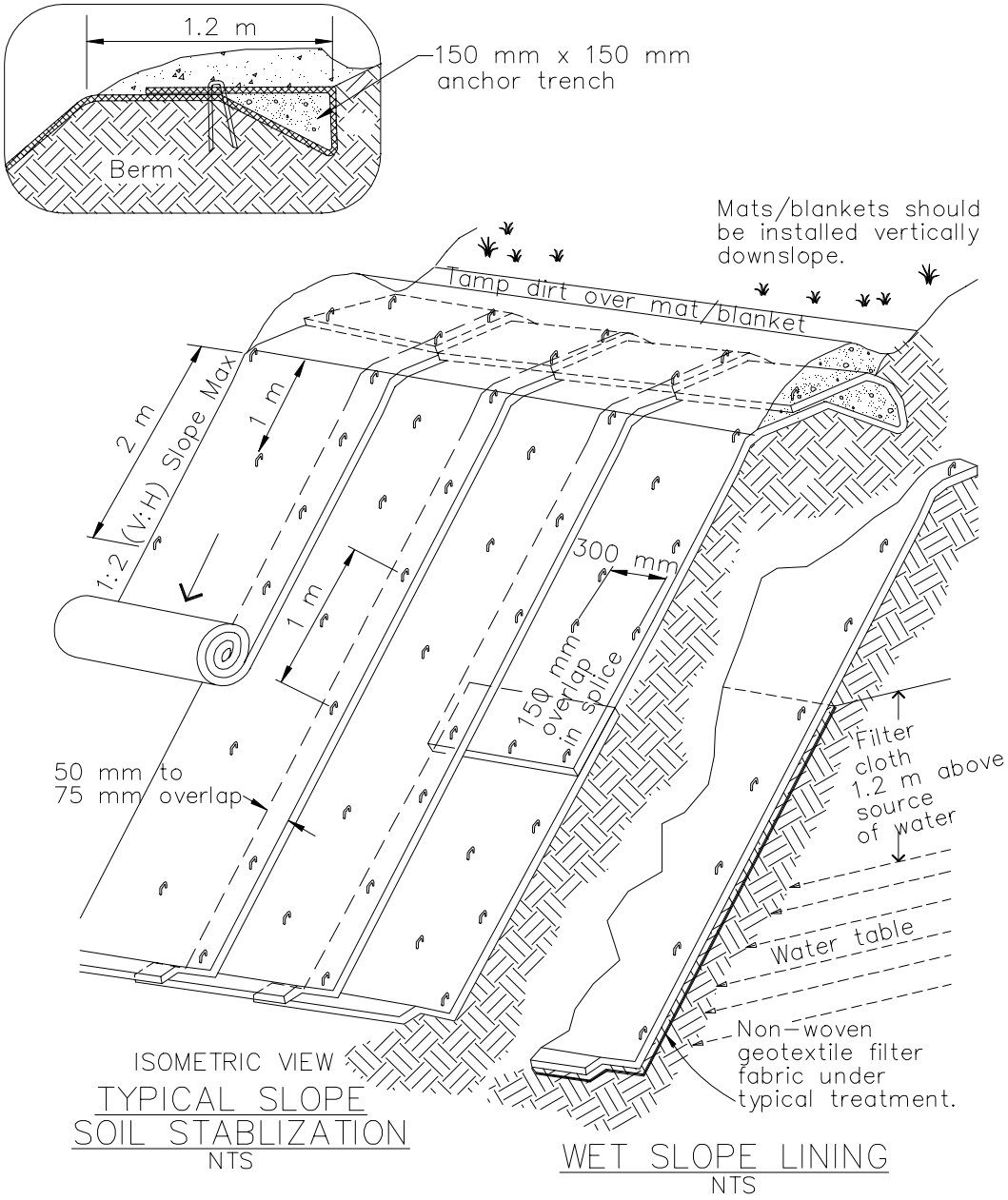


NOTES:

1. Check slots to be constructed per manufacturers specifications.
2. Staking or stapling layout per manufacturers specifications.
3. Install per manufacturer's recommendations

Geotextiles, Plastic Covers and Erosion Control Blankets/Mats

SS-7

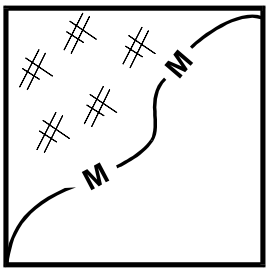


NOTES:

1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
3. Install per manufacturer's recommendations

Wood Mulching

SS-8



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Wood mulching consist of applying a mixture of shredded wood mulch, bark or compost. Wood mulch is mostly applicable to landscape projects.

The primary function of wood mulching is to reduce erosion by protecting bare soil from rainfall impact, increasing infiltration, and reducing runoff.

Appropriate Applications

Wood mulching is considered a temporary soil stabilization (erosion control) alternative in the following situations:

As a stand-alone temporary surface cover on disturbed areas until soils can be prepared for revegetation and permanent vegetative cover can be established.

As short term, non-vegetative ground cover on slopes to reduce rainfall impact, decrease the velocity of sheet flow, settle out sediment and reduce wind erosion.

Limitations

Wood mulch may introduce unwanted species.

Shredded Wood

Shredded wood does not withstand concentrated flows and is prone to sheet erosion.

Green Material/Compost

Green material has the potential for the presence of unwanted weeds and other plant materials. Delivery system is primarily by manual labor, although pneumatic application equipment is available.

Standards and Specifications

Mulch Selection

There are many types of mulches, and selection of the appropriate type shall be based on the type of application and site conditions. Prior to use of wood mulches, there shall be concurrence with the District Landscape Architect since some mulch use on construction projects may not be compatible with planned or future projects. Selection of wood mulches by the Contractor shall comply with Section 20-2.08 of the Standard Specifications and must be approved by the Resident Engineer (RE).

Application Procedures

Prior to application, after existing vegetation has been removed, roughen embankment and fill areas by rolling with a punching type roller or by track walking. The construction-application procedures for mulches vary significantly depending upon the type of mulching method specified. Two (2) methods are highlighted here:

Green Material: This type of mulch is produced by recycling of vegetation trimmings such as grass, shredded shrubs and trees. Methods of application are generally by hand, although pneumatic methods are available. Mulch shall be composted to kill weed seeds.

- It can be used as a temporary ground cover with or without seeding.
- The green material shall be evenly distributed on site to a depth of not more than 50 mm (2 in).

Shredded Wood: Suitable for ground cover in ornamental or revegetated plantings.

- Shredded wood/bark is conditionally suitable; see note under limitations.
- Shall be distributed by hand (although pneumatic methods may be available).
- The mulch shall be evenly distributed across the soil surface to a depth of 50 mm (2 in) to 75 mm (3 in).

Avoid mulch placement onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.

All material must be removed before re-starting work on the slopes.

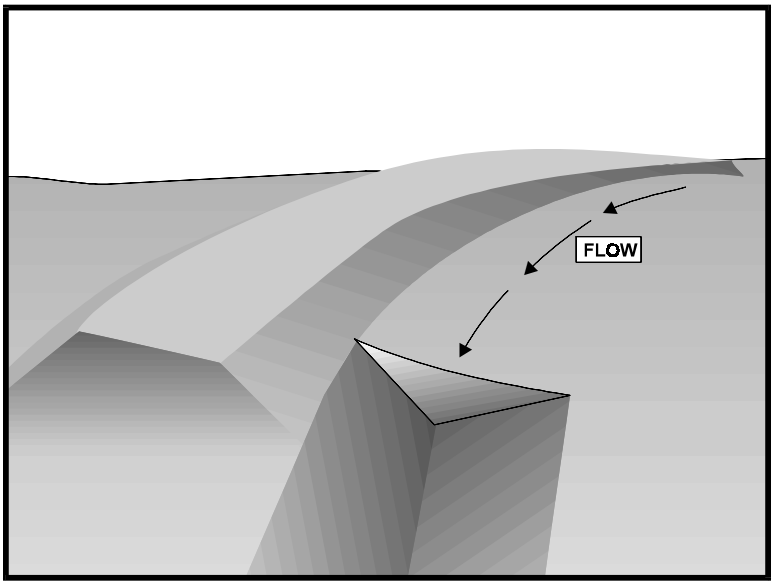
Maintenance and Inspection

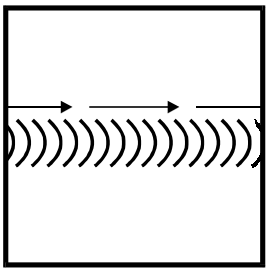
Regardless of the mulching technique selected, the key consideration in maintenance and inspection is that the mulch needs to last long enough to achieve erosion-control objectives. If the mulch is applied as a stand-alone erosion control method over disturbed areas (without seed), it shall last the length of time the site will remain barren or until final re-grading and revegetation.

Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance shall focus on longevity and integrity of the mulch.

Earth Dikes/Drainage Swales and Lined Ditches

SS-9





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are structures that intercept, divert and convey surface run-on, generally sheet flow, to prevent erosion.

Appropriate Applications

Earth dikes/drainage swales and lined ditches may be used to:

- Convey surface runoff down sloping land
- Intercept and divert runoff to avoid sheet flow over sloped surfaces
- Divert and direct runoff towards a stabilized watercourse, drainage pipe or channel.
- To intercept runoff from paved surfaces.

Earth dikes/drainage swales and lined ditches also may be used:

- Below steep grades where runoff begins to concentrate
- Along roadways and facility improvements subject to flood drainage.
- At the top of slopes to divert run-on from adjacent or undisturbed slopes.
- At bottom and mid-slope locations to intercept sheet flow and convey concentrated flows.

This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Earth Dikes/Drainage Swales and Lined Ditches

SS-9

Limitations

Earth dikes/drainage swales and lined ditches are not suitable as sediment trapping devices.

May be necessary to use other soil stabilization and sediment controls, such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales and ditches.

Standards and Specifications

Care must be applied to correctly size and locate earth dikes, drainage swales and lined ditches. Excessively steep, unlined dikes and swales are subject to erosion and gully formation.

Conveyances shall be stabilized.

Use a lined ditch for high flow velocities.

Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, over topping, flow backups, washout, and drainage flow patterns for each project site.

Compact any fills to prevent unequal settlement.

Do not divert runoff from the Highway right-of-way onto other property.

When possible, install and utilize permanent dikes, swales and ditches early in the construction process.

Provide stabilized outlets.

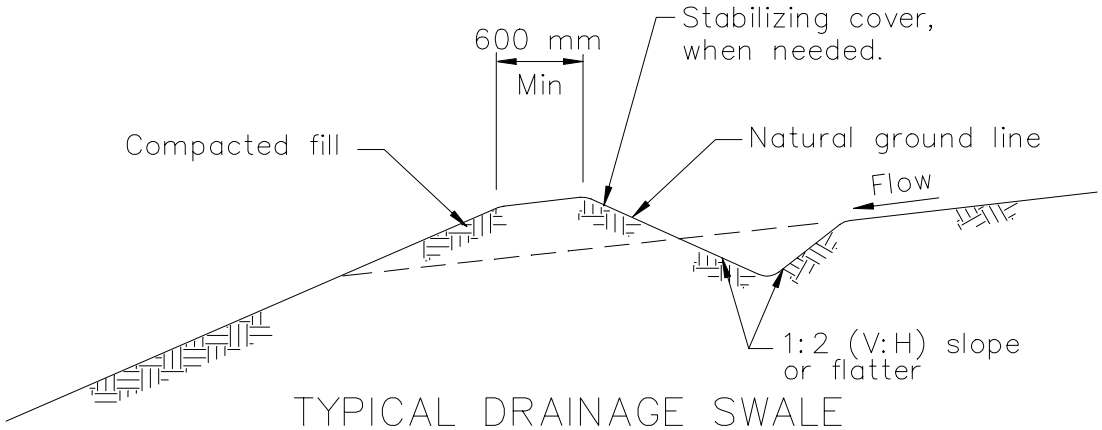
Maintenance and Inspections

Inspect temporary measures prior to the rainy season, after rainfall events, and regularly (approximately once per week) during the rainy season.

Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.

Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment, and repair linings and embankments as needed or as directed by the Engineer.

Temporary conveyances shall be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

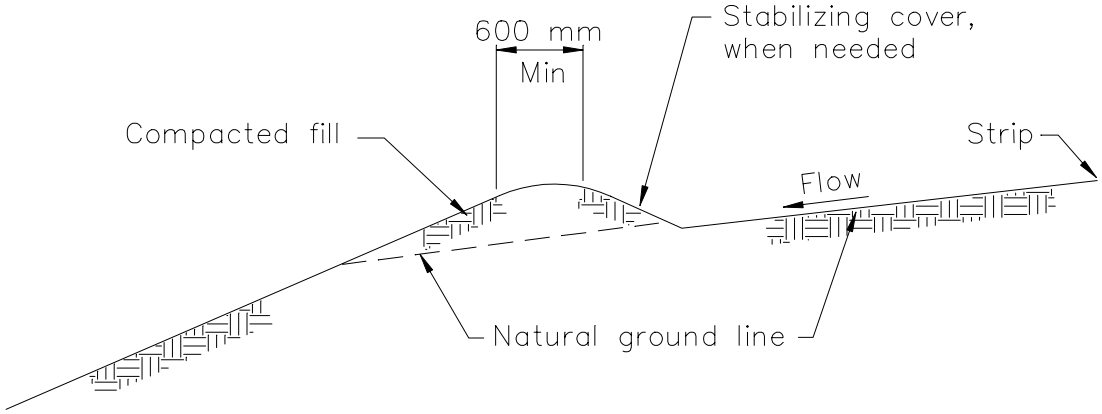


TYPICAL DRAINAGE SWALE

NOT TO SCALE

NOTES:

1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade, in conformance with Section 19–5 of the Caltrans Standard Specifications.

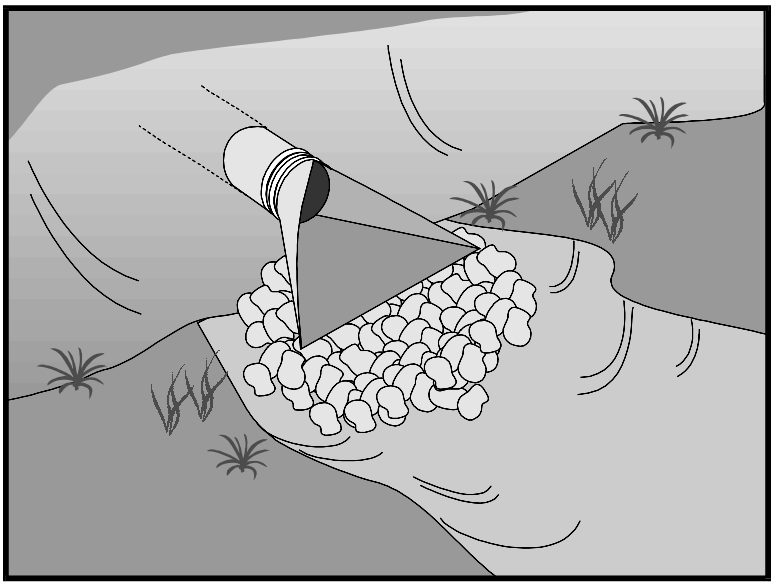


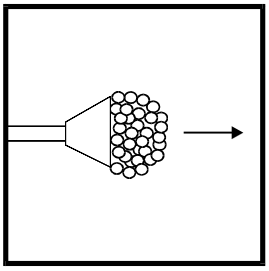
TYPICAL EARTH DIKE

NOT TO SCALE

Outlet Protection/Velocity Dissipation Devices

SS-10





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These devices are placed at pipe outlets to prevent scour and reduce the velocity and/or energy of exiting storm water flows.

Appropriate Applications

These devices may be used at the following locations:

- Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels.
- Outlets located at the bottom of mild to steep slopes.
- Discharge outlets that carry continuous flows of water.
- Outlets subject to short, intense flows of water, such as flash floods.
- Points where lined conveyances discharge to unlined conveyances.

This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Loose rock may have stones washed away during high flows.

Grouted riprap may break up in areas of freeze and thaw.

If there is not adequate drainage, and water builds up behind grouted riprap, it may cause the grouted riprap to break up due to the resulting hydrostatic pressure.

Outlet Protection/Velocity Dissipation Devices

SS-10

Standards and Specifications

There are many types of energy dissipater's, with rock being the one that is represented in the attached figure. Please note that this is only one example and the Resident Engineer (RE) may approve any other type of device proposed by the contractor.

Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction.

Carefully place riprap to avoid damaging the filter fabric.

For proper operation of apron:

- Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
- If size of apron riprap is large, protect underlying filter fabric with a gravel blanket

Outlets on slopes steeper than 10 percent shall have additional protection.

Maintenance and Inspection

Inspect temporary measures prior to the rainy season, after rainfall events, and regularly (approximately once per week) during the rainy season.

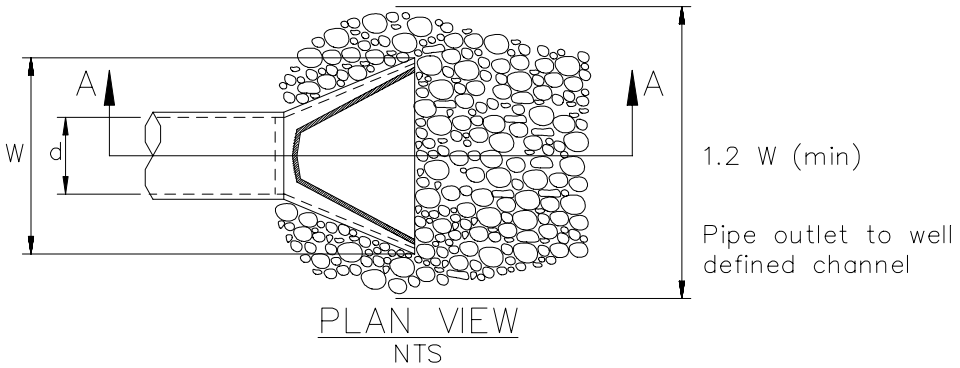
Inspect apron for displacement of the riprap and/or damage to the underlying fabric. Repair fabric and replace riprap which has washed away.

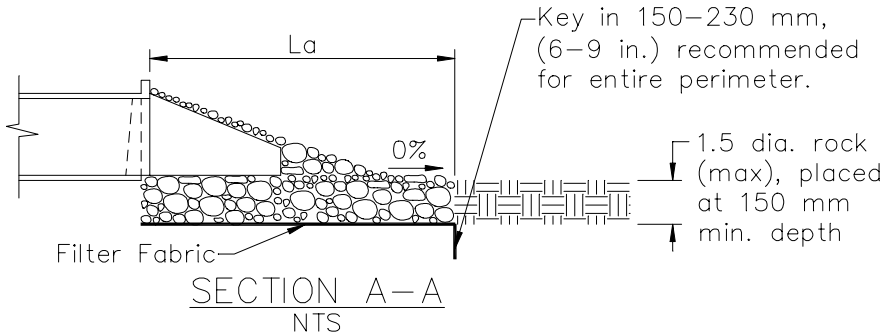
Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.

Temporary devices shall be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

Outlet Protection/Velocity Dissipation Devices

SS-10



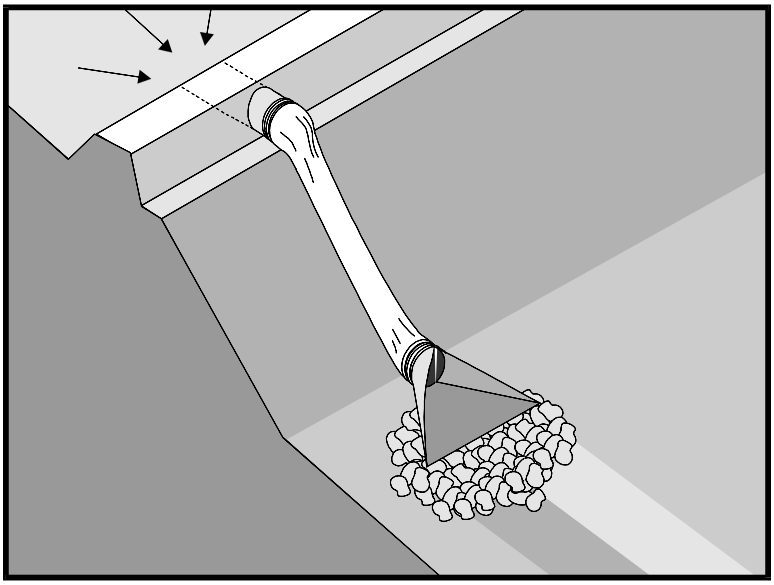


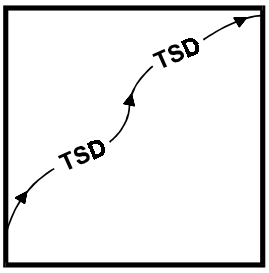
Pipe Diameter mm	Discharge m^3/s	Apron Length, La m	Rip Rap D_{50} Diameter Min mm
300	0.14	3	100
	0.28	4	150
450	0.28	3	150
	0.57	5	200
	0.85	7	300
	1.13	8	400
600	0.85	5	200
	1.13	8	200
	1.42	8	300
	1.70	9	400
For larger or higher flows, consult a Registered Civil Engineer			

Source: USDA – SCS

Slope Drains

SS-11





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A slope drain is a pipe used to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area. Slope drains are used with lined ditches to intercept and direct surface flow away from slope areas to protect cut or fill slopes.

Appropriate Applications

Slope drains may be used at construction sites where slopes may be eroded by surface runoff.

This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Severe erosion may result when slope drains fail by over topping, piping, or pipe separation.

Standards and Specifications

When using slope drains, limit drainage area to 4 ha (10 ac) per pipe. For larger areas, use a rock-lined channel or a series of pipes.

Maximum slope generally limited to 1:2 (V:H), as energy dissipation below steeper slopes is difficult.

Direct surface runoff to slope drains with interceptor dikes. See BMP SS-8, “Earth Dikes/Drainage Swales, and Lined Ditches”.

Slope drains can be placed on or buried underneath the slope surface.

Recommended materials are PVC, ABS, or comparable pipe.

Slope Drains

When installing slope drains:

- Install slope drains perpendicular to slope contours.
- Compact soil around and under entrance, outlet, and along length of pipe.
- Securely anchor and stabilize pipe and appurtenances into soil.
- Check to ensure that pipe connections are water tight.
- Protect area around inlet with filter cloth. Protect outlet with riprap or other energy dissipation device. For high energy discharges, reinforce riprap with concrete or use reinforced concrete device.
- Protect inlet and outlet of slope drains: use standard flared end section at entrance for pipe slope drains 300 mm (12in) and larger.

Maintenance and Inspection

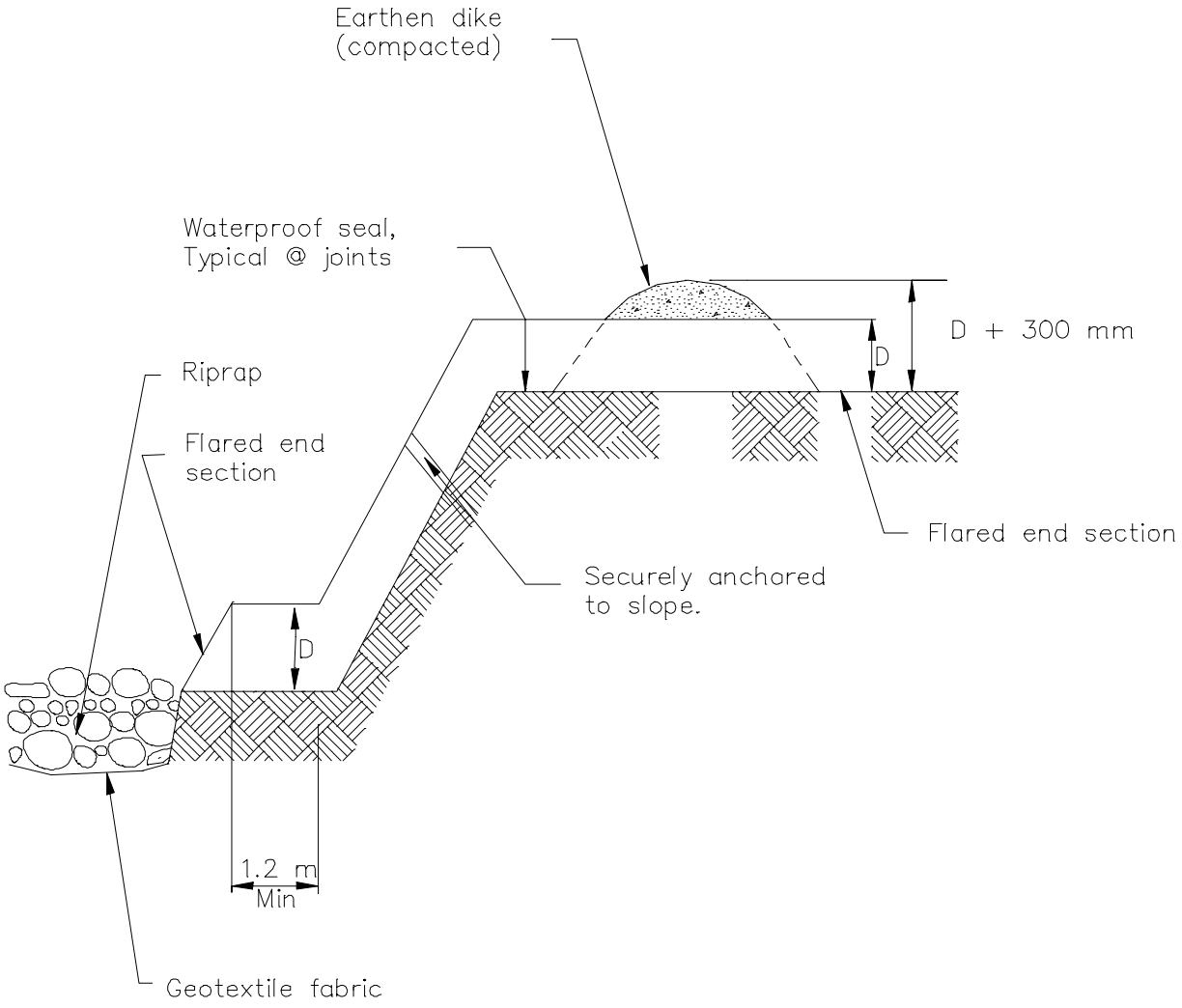
Inspect before and after each rain storm, and twice monthly until the tributary drainage area has been stabilized. Follow routine inspection procedures for inlets thereafter.

Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.

Inspect slope drainage for accumulations of debris and sediment.

Remove built-up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.

Make sure water is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).



TYPICAL SLOPE DRAIN
NOT TO SCALE

Section 4
Temporary Sediment Control Best Management Practices

4.1 Temporary Sediment Control Practices

Temporary sediment control practices include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped. Temporary sediment control practices can consist of installing temporary linear sediment barriers (such as silt fence, sandbag barrier, and straw bale barrier); providing fiber rolls, gravel bag berms, or check dams to break up slope length or flow; or constructing a temporary desilting basin, sediment trap, or sediment basin. Linear sediment barriers are typically placed below the toe of exposed and erodible slopes, downslope of exposed soil areas, around temporary soil stockpiles, and at other appropriate locations along the site perimeter.

Temporary sediment control practices shall be implemented in conformance with the criteria presented in Section 2, Selecting and Implementing Construction Site Best Management Practices (BMPs), of this Manual. Temporary sediment control practices include the BMPs listed in Table 4-1.

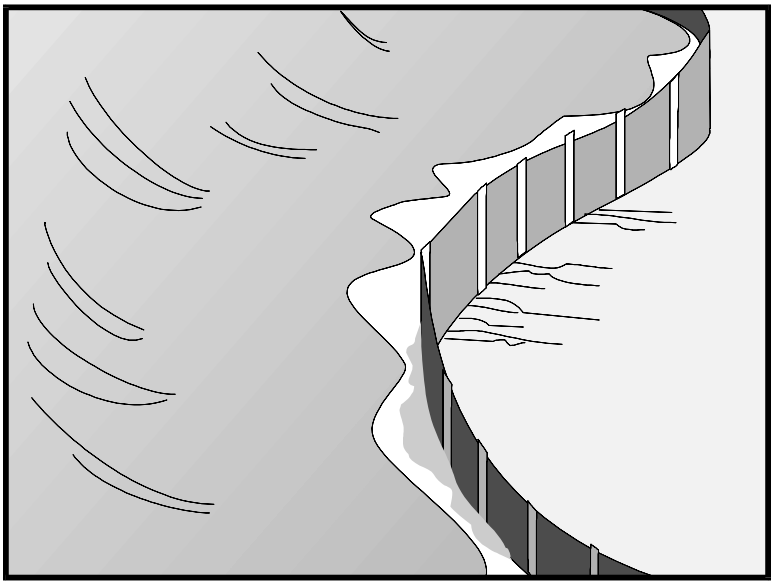
Table 4-1

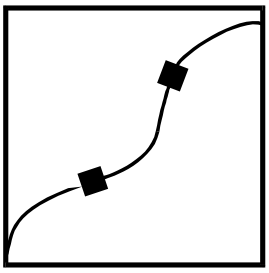
TEMPORARY SEDIMENT CONTROL BMPs	
ID	**BMP NAME**
SC-1	Silt Fence
SC-2	Desilting Basin
SC-3	Sediment Trap
SC-4	Check Dam
SC-5	Fiber Rolls
SC-6	Gravel Bag Berm
SC-7	Street Sweeping and Vacuuming
SC-8	Sandbag Barrier
SC-9	Straw Bale Barrier
SC-10	Storm Drain Inlet Protection

The remainder of this Section shows the working details for each of the temporary sediment control BMPs.

Silt Fence

SC-1





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A silt fence is a temporary linear sediment barrier of permeable fabric designed to intercept and slow the flow of sediment-laden sheet flow runoff. Silt fences allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications

Silt fences are placed:

Below the toe of exposed and erodible slopes.

Down-slope of exposed soil areas.

Around temporary stockpiles.

Along streams and channels.

Limitations

Not effective unless trenched and keyed in.

Not intended for use as mid-slope protection on slopes greater than 1:4 (V:H)

Must be maintained.

Must be removed and disposed of.

Standards and Specifications

General

Don't use below slopes subject to creep, slumping, or landslides.

Don't use in streams, channels, or anywhere flow is concentrated.

Don't use silt fences to divert flow.

Design and Layout

The maximum length of slope draining to any point along the silt fence shall be 61 m (200 ft) or less.

Slope of area draining to fence shall be less than 1:1 (V:H).

Limit to locations suitable for temporary ponding or deposition of sediment.

Fabric life span generally limited to between five and eight months. Longer periods may require fabric replacement.

Silt fences shall not be used in concentrated flow areas.

Lay out in accordance with Page 5 of this BMP.

For slopes steeper than 1:2 (V:H) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.

For slopes adjacent to water bodies or Environmentally Sensitive Areas (ESAs), additional temporary soil stabilization BMPs shall be used.

Materials

Silt fence fabric shall be woven polypropylene with a minimum width of 900 mm and a minimum tensile strength of 0.45-kN. The fabric shall conform to the requirements in ASTM designation D4632 and shall have an integral reinforcement layer. The reinforcement layer shall be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric shall be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491.

Wood stakes shall be commercial quality lumber of the size and shape shown on the plans. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

Staples used to fasten the fence fabric to the stakes shall be not less than 45 mm long and shall be fabricated from 1.57 mm or heavier wire. The wire used to fasten the tops of the stakes together when joining 2 sections of fence shall be 3.05 mm or heavier wire. Galvanizing of the fastening wire will not be required.

Installation

Generally, silt fences shall be used in conjunction with soil stabilization source controls up slope to provide effective control.

Trenches shall not be excavated wider and deeper than necessary for proper installation of the temporary linear sediment barriers.

Excavation of the trenches shall be performed immediately before installation of the temporary linear sediment barriers.

Construct silt fences with a set-back of at least 1m from the toe of a slope. Where a silt fence is determined to be not practicable due to specific site conditions, the silt fence may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case shall the reach exceed 150 meters.

Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.

Bottom of the silt fence shall be keyed-in.

Install in accordance with Page 5 of this BMP.

Maintenance and Inspection

Repair undercut silt fences.

Repair or replace split, torn, slumping, or weathered fabric.

Inspect silt fence when rain is forecast. Perform necessary maintenance, or maintenance required by the Resident Engineer (RE).

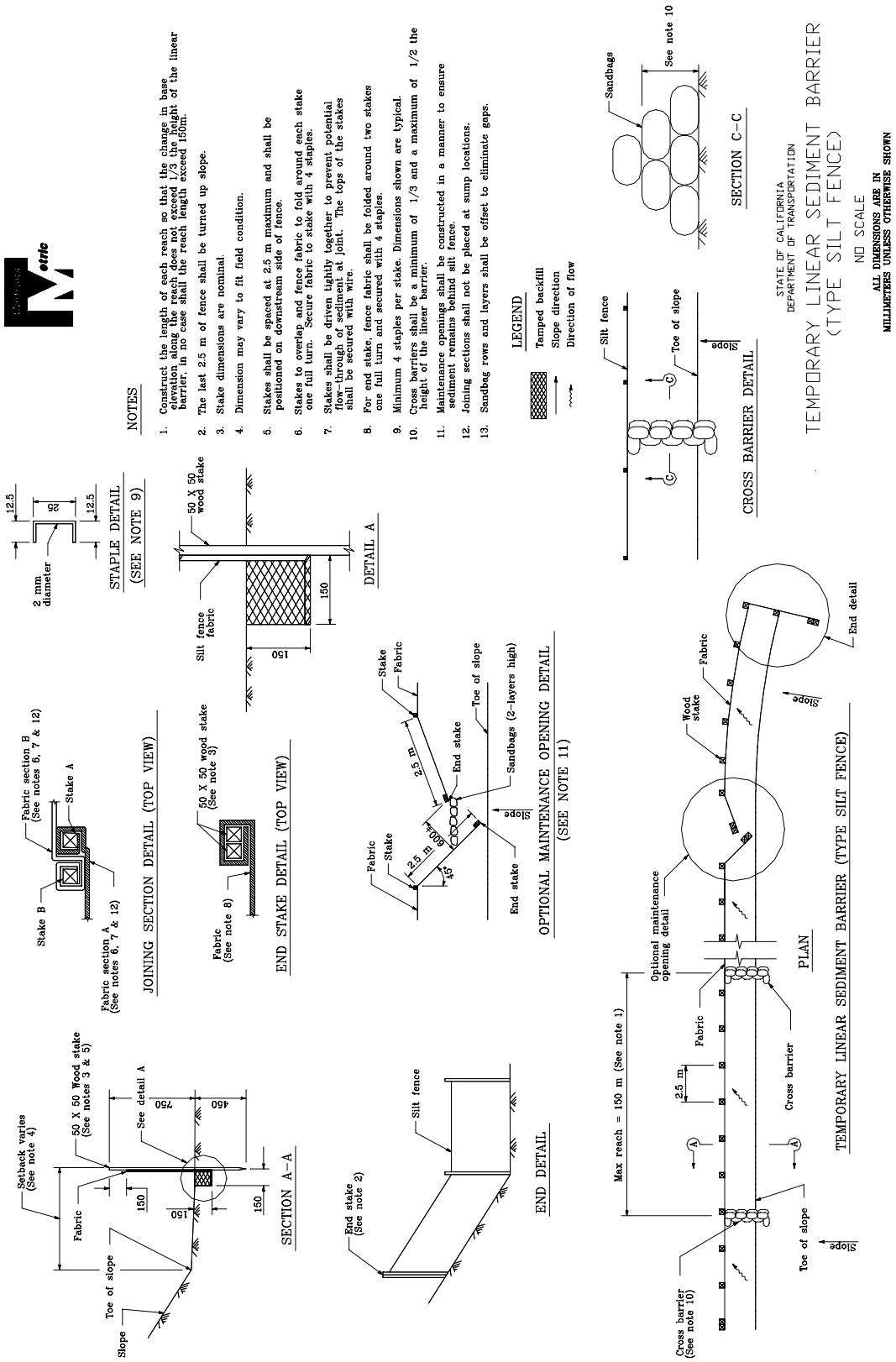
Inspect silt fence following rainfall events. Perform maintenance as necessary, or as required by the RE.

Maintain silt fences to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches one-third (1/3) of the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

Silt fences that are damaged and become unsuitable for the intended purpose, as determined by the RE, shall be removed from the site of work, disposed of outside the highway right-of-way in conformance with the Standard Specifications, and replaced with new silt fence barriers.

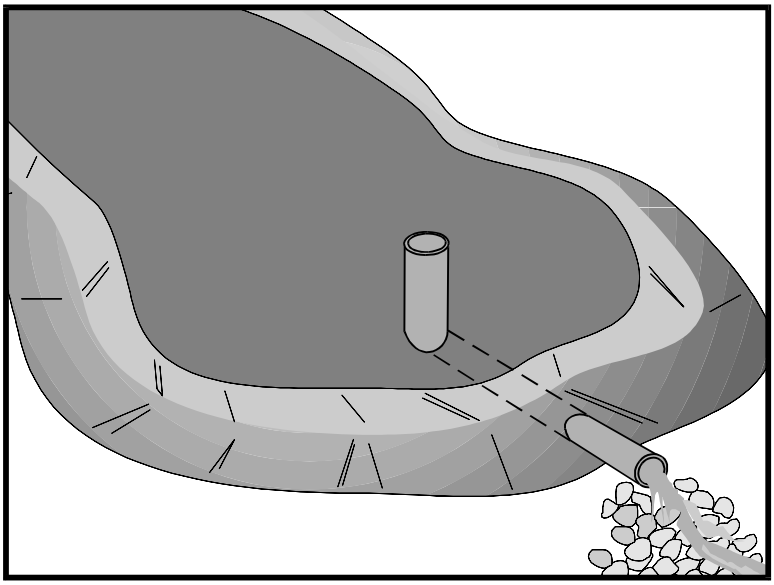
Holes, depressions or other ground disturbance caused by the removal of the temporary silt fences shall be backfilled and repaired in conformance with the Standard Specifications.

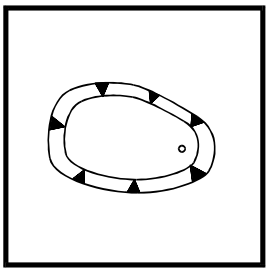
Remove silt fence when no longer needed or as required by the RE. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.


NOTES
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 150m.
2. The last 2.5 m of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 2.5 m maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.
LEGEND
Tamped backfill
Slope direction
Direction of flow
STAPLE DETAIL
(SEE NOTE 9)
2 mm diameter
12.5
25
12.5
DETAIL A
50 X 50 wood stake
Silt fence fabric
150
150
JOINING SECTION DETAIL (TOP VIEW)
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
END STAKE DETAIL (TOP VIEW)
50 X 50 wood stake (See note 3)
Fabric (See note 8)
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Stake
Fabric
2.5 m
End stake
Toe of slope
Sandbags (2-layers high)
Slope
600
45°
SECTION A-A
Setback varies (See note 4)
50 X 50 Wood stake (See notes 3 & 5)
See detail A
750
450
Fabric
150
150
150
Toe of slope
Slope
END DETAIL
Silt fence
End stake (See note 2)
CROSS BARRIER DETAIL
Silt fence
Toe of slope
Slope
SECTION C-C
Sandbags
See note 10
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SILT FENCE)
NO SCALE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SILT FENCE)
PLAN
Max reach = 150 m (See note 1)
Optional maintenance opening detail
Fabric
2.5 m
Cross barrier
Wood stake
Fabric
End detail
Slope
Toe of slope
Slope
Cross barrier (See note 10)

Desilting Basin

SC-2





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A desilting basin is a temporary basin formed by excavation and/or constructing an embankment so that sediment-laden runoff is temporarily detained under quiescent conditions, allowing sediment to settle out before the runoff is discharged.

Appropriate Applications

Desilting basins shall be considered for use:

- On construction projects with disturbed areas during the rainy season; and
- Where sediment-laden water may enter the drainage system or watercourses; and
- At outlets of disturbed soil areas with areas between 2 ha and 4 ha (5ac and 10 ac).

Limitations

- Alternative BMPs must be thoroughly investigated for erosion control before selecting temporary desilting basins.
- Requires large surface areas to permit settling of sediment.
- Not appropriate for drainage areas greater than 30 ha (75 ac).
- Not to be located in live streams
- If safety is a concern, basins may require protective fencing.
- Size may be limited by availability of right-of-way.

Standards and Specifications

- Limit the contributing area to the desilting basin to only the runoff from the disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the desilting basin.

- Desilting basins shall be designed to have a capacity equivalent to 100 cubic meters of storage (as measured from the top of the basin to the principal outlet,) per hectare of contributory area. This design is less than the required to capture the 0.01 mm particle size but larger than that required to capture particles 0.02 mm or larger.

- The length of the basin shall be more than twice the width of the basin; the length shall be determined by measuring the distance between the inlet and the outlet.

- The depth must be no less than one (1) meter nor greater than 1.5 m.

- Basins with an impounding levee greater than 1.5 m tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 1000 cubic meters (m^3), shall be designed by a professional Civil Engineer registered with the state of California. The design must be submitted to the Resident Engineer (RE) for approval at least 7 days prior to the basin construction. The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

- Design and locate desilting basins so that they can be maintained. Construct desilting basins prior to the rainy season and construction activities.

- Desilting basins, regardless of size and storage volume, shall include features to accommodate overflow or bypass flows that exceed the design storm event. The calculated basin volume and proposed location shall be submitted to the RE for approval at least 3 days prior to the basin construction.

- Basins shall be designed to drain within 72 hours following storm events.

- The outflow from the desilting basin shall be provided with outlet protection to prevent erosion and scouring of the embankment and channel.

- Basin shall be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, (3) where failure would not cause loss of life or property damage, and (4) where the basins can be

maintained on a year-round basins to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

- Areas under embankments, structural works, and desilting basin must be cleared, stripped of vegetation in accordance with Standard Specifications Section 16 - Clearing and Grubbing.
- Earthwork shall be in accordance with Standard Specifications Section 19 - Earthwork. Contractor is specifically directed to Section 19-5 , "Compaction", and 19-6, "Embankment Construction".
- Basin inlets shall be located to maximize travel distance to the basin outlet.
- Rock or vegetation shall be used to protect the basin inlet and slopes against erosion.
- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.
- Principal outlet shall consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure shall be designed to accommodate the inflow design storm.
- Structure shall be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel) which extends through the embankment to toe of fill. Provide anti-seep collars on the barrel.
- Cleanout level shall be clearly marked on the riser pipe.
- Avoid dewatering of groundwater to the desilting basin during the rainy season. Insignificant quantities of accumulated precipitation may be dewatered to the desilting basin unless precipitation is forecasted within 24 hours.
- Chain link fencing shall be provided around each desilting basin to prevent unauthorized entry to the basin or if safety is a concern. Fencing shall be in accordance with Standard Specifications Section 80 - Fencing.

- One of the dewatering configurations shown below for the principal outlet may be used. The Contractor shall verify that the outlet is properly designed to handle the design and peak flows.

Outlet #1, See Page 6

- Perforate the top one-third of the riser with 13 mm (0.5 in) diameter holes spaced 200 mm (8 in) vertically and 250 mm (10 in) - 300 mm (12 in) horizontally.
- Wrap with well-secured filter fabric.
- Place 19 mm (0.75 in) gravel over perforated holes to approximately 50 mm (2 in) minimum thickness to assist in prevention of clogging of dewatering holes. Gravel will naturally settle into a cone surrounding the riser pipe.

Outlet #2, See Page 7

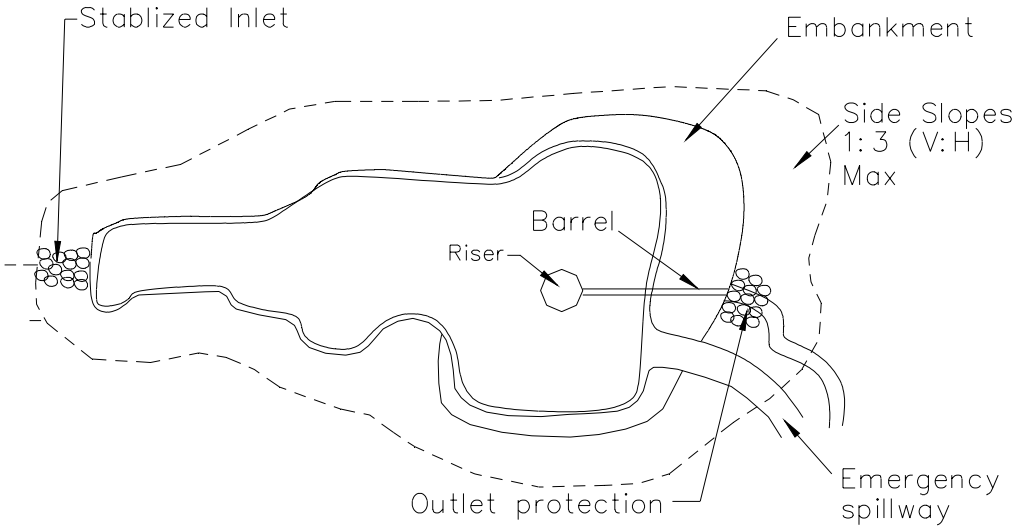
- Perforate the lower one-half of the riser pipe with 13 mm (0.5 in) diameter holes spaced approximately 75 mm (3 in) apart, in each outside valley (corrugated metal pipe).
- Place 19 mm (0.75 in) gravel over perforated holes to approximately 50 mm (2 in) minimum thickness to assist in prevention of clogging of dewatering holes. Gravel will naturally settle into a cone surrounding the riser pipe.

Outlet #3, See Page 8

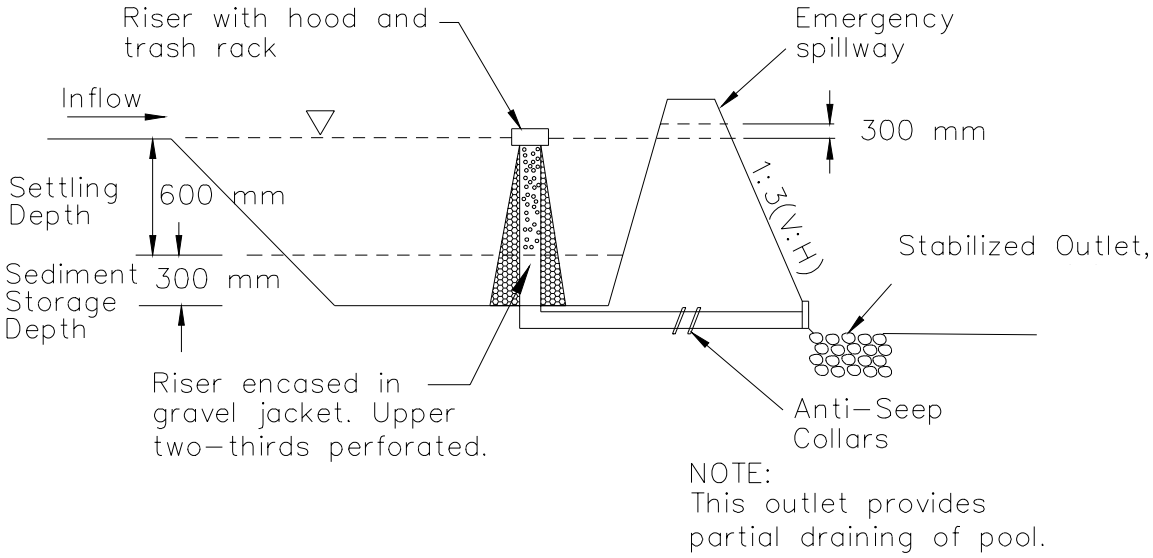
- Provide two 25 mm (1 in) diameter holes above the sediment storage volume on opposites sides of the non-perforated riser pipe. This will typically provide sufficient detention time for basins to drain approximately 4 ha (10 ac).
- Construct an emergency spillway to accommodate flows not carried by the principal spillway. Spillway shall consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
- Spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, shall be a minimum of 6 m (20 ft) in length.
- Use outlet protection at the pipe outlet. See BMP SS-10, “Outlet Protection/Velocity Dissipation Devices”.

Maintenance and Inspection

- Inspect temporary desilting basins before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect at least every 24 hours.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed, or as directed by the RE.
- Check inlet and outlet area for erosion and stabilize if required, or if directed by the RE.
- Remove sediments when storage zone is one-third full.
- Check fencing for damage and repair as needed or as directed by the RE.

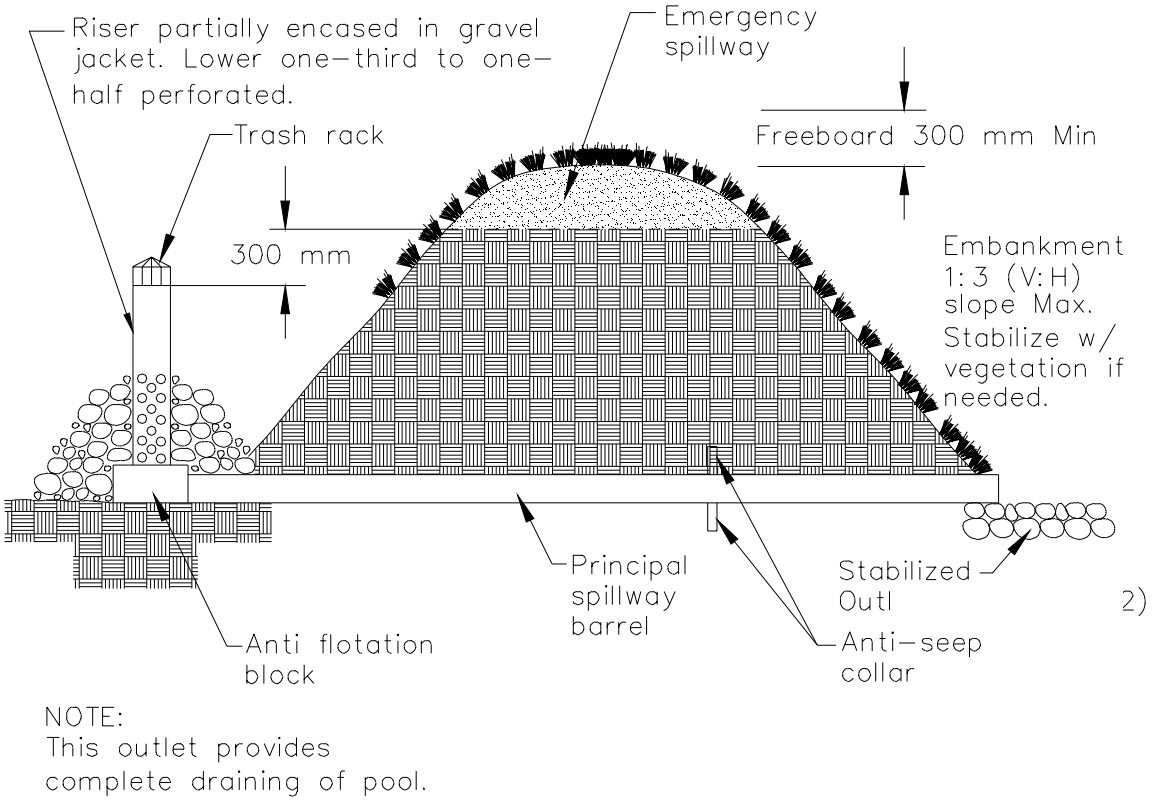


TOP VIEW



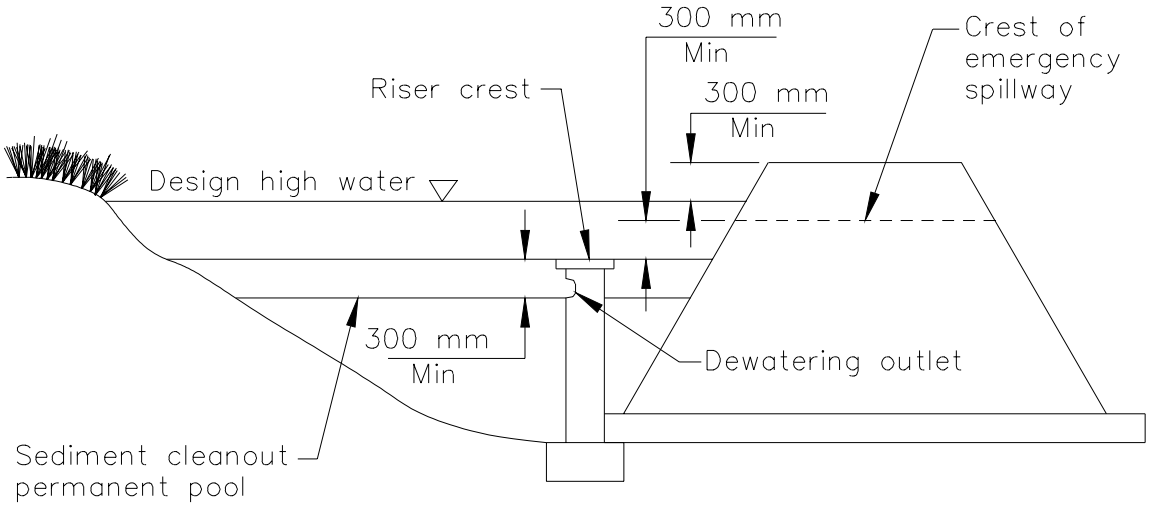
TYPICAL DESILTING BASIN – OUTLET #1

NOT TO SCALE



TYPICAL DESILTING BASIN – OUTLET #2

NOT TO SCALE

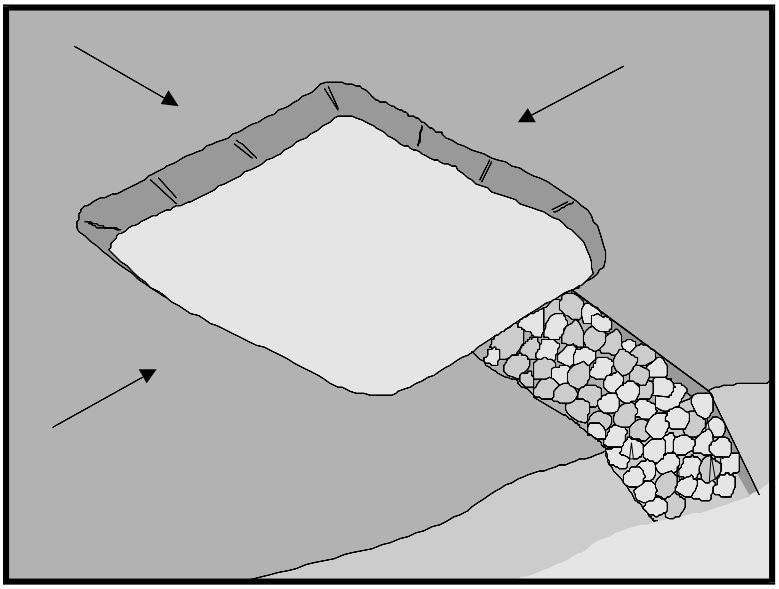


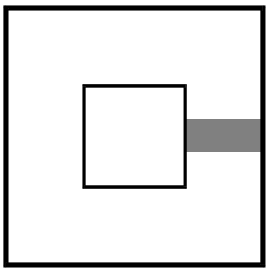
NOTE:
This outlet provides no drainage
for permanent pool.

TYPICAL DESILTING BASIN – OUTLET #3
NOT TO SCALE

Sediment Trap

SC-3





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A sediment trap is a temporary basin with a controlled release structure, formed by excavating or constructing an earthen embankment across a waterway or low drainage area.

Appropriate Applications

Sediment traps may be used on construction projects during the rainy season where the contributing drainage area is less than 2 ha (5acres). Traps would be placed where sediment laden storm water may enter a storm drain or watercourse, and around and/or up-slope from storm drain inlet protection measures.

This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).

As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

Requires large surface areas to permit settling of sediment.

Not appropriate for drainage areas greater than 2 ha (5 ac).

Only removes large and medium sized particles and requires upstream erosion control.

Attractive and dangerous to children, requiring protective fencing.

Not to be located in live streams.

Size may be limited by availability of right-of-way.

Standards and Specifications

Construct sediment traps prior to rainy season and construction activities.

Trap shall be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where failure would not cause loss of life or property damage, and (3) to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area.

Trap shall be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 130 m^3/ha (67 yd^3/ac) and 65 m^3/ha (33 yd^3/ac) of contributing drainage area, respectively, based on 12.7 mm (0.5 in) of runoff volume over a 24-hr period. Multiple traps and/or additional volume may be required to accommodate site specific rainfall and soil conditions.

Traps with an impounding levee greater than 1.5 m tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 1000 cubic meters (m^3), shall be designed by a professional Civil Engineer registered with the state of California. The design must be submitted to the Resident Engineer (RE) for approval at least 7 days prior to the basin construction. The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.

Earthwork shall be in accordance with Standard Specifications Section 19 - Earthwork. Contractor is specifically directed to Sections 19-5 and 19-6 entitled, "Compaction" and "Embankment Construction," respectively.

Areas under embankments, structural works, and sediment traps shall be cleared and stripped of vegetation in accordance with Standard Specifications Section 16 - Clearing and Grubbing.

Trap length to width ratio shall be greater than 3:1 (L:W) or baffles are required to prevent short circuiting of the inlet flow.

Trap inlets shall be located to maximize the travel distance to the trap outlet. Use rock or vegetation to protect the trap outlets against erosion.

Fencing, in accordance with Standard Specifications Section 80 - Fencing, shall be provided to prevent unauthorized entry.

To dewater the trap, the outlet shall be constructed in one of the following two ways:

(1) Use corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes encased in gravel to prevent floating debris from flowing out of the trap or obstructing the system (See Figure1).

(2) Construct a crushed stone outlet section of the embankment at the low point of the trap (See Figure 2). The stone section serves as a non-erosive spillway outlet for flood flows and the bottom section provides a means of dewatering the trap between rainfall events.

Maintenance and Inspection

Inspect sediment traps before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect sediment traps at least every 24 hours.

Check trap banks for seepage and structural soundness.

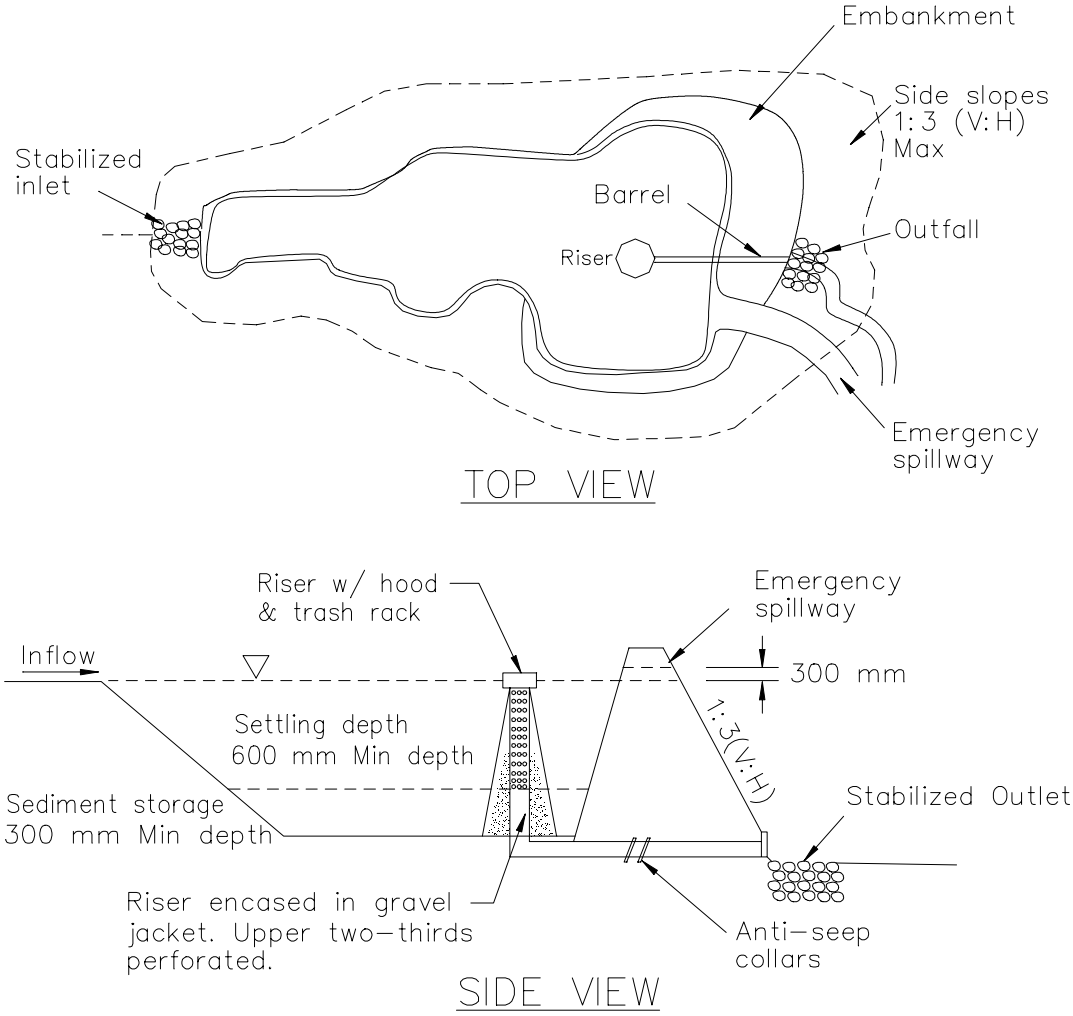
Check outlet structure and spillway for any damage or obstructions. Repair damage and remove obstructions as needed or as directed by the RE.

Check outlet area for erosion and stabilize if required, or as directed by the RE.

Remove accumulated sediment when the volume has reached one-third the original trap volume.

Properly disposed of sediment and debris removed from the trap.

Check fencing for damage and repair as needed or as directed by the RE.



NOTES:
1. Typical trap design shown will handle 12.7 mm of of runoff over a 24 hour period.
2. Settling volume: 130 m^3 per hectare of drainage area.
3. Sediment storage volume: 65 m^3 per hectare of drainage area.

TYPICAL SEDIMENT TRAP
NOT TO SCALE

FIGURE 1

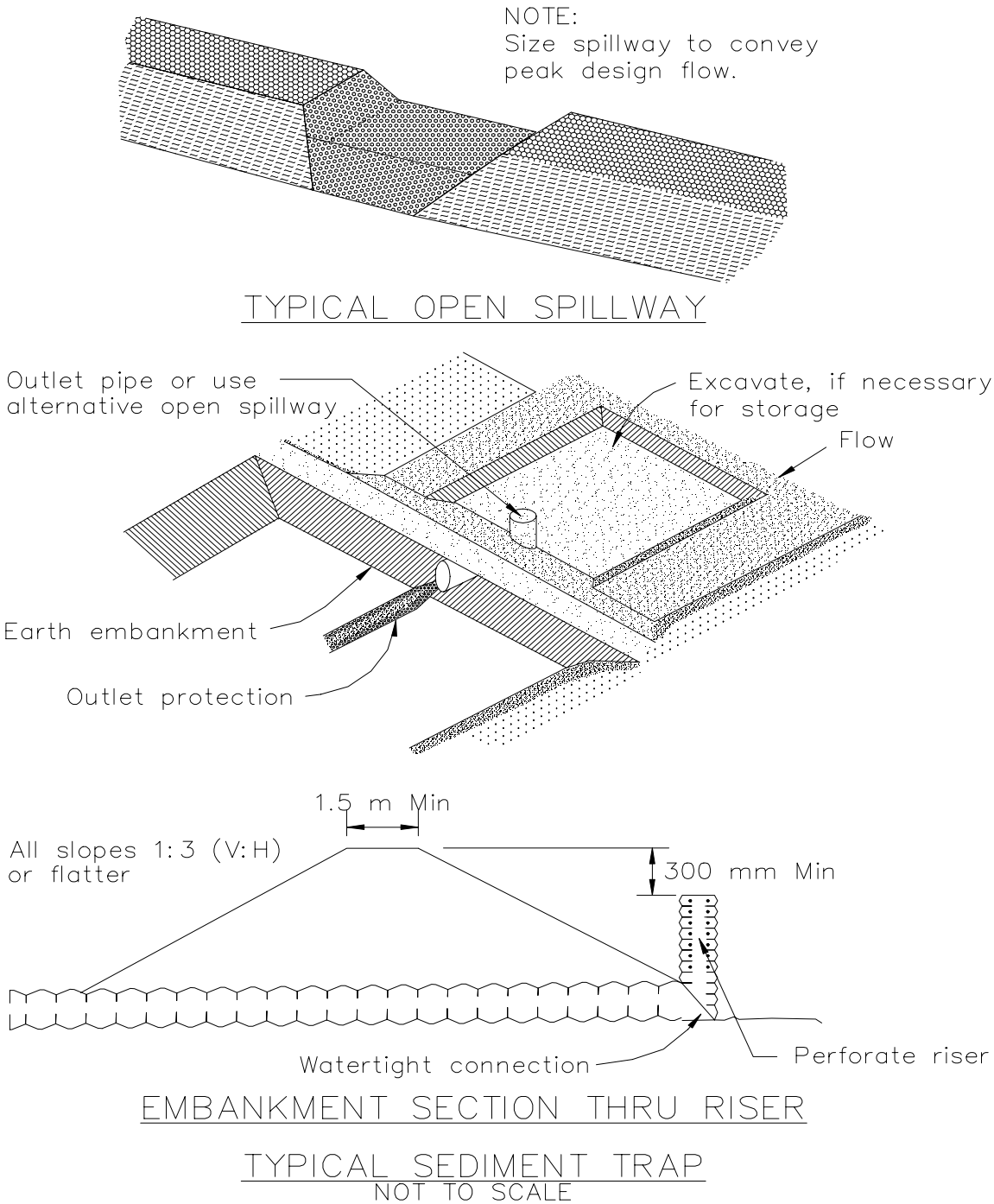
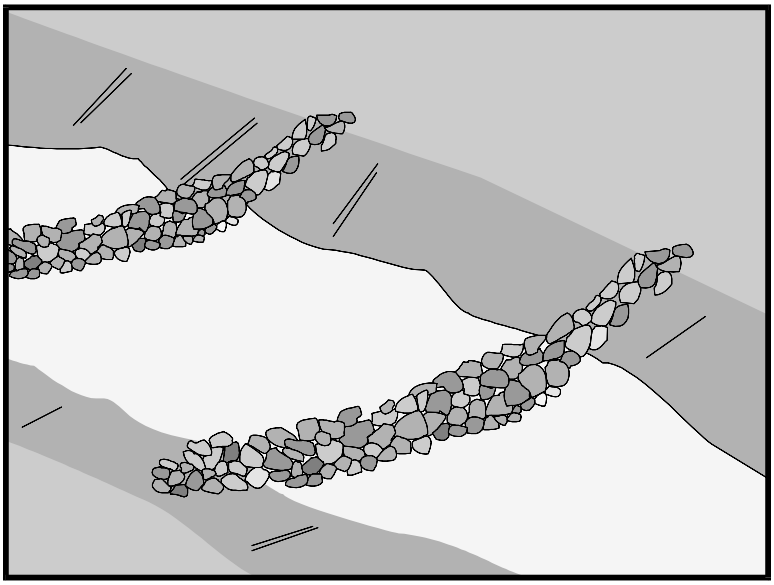
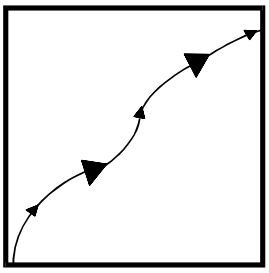

NOTE:
Size spillway to convey
peak design flow.
TYPICAL OPEN SPILLWAY
Outlet pipe or use
alternative open spillway
Excavate, if necessary
for storage
Flow
Earth embankment
Outlet protection
1.5 m Min
All slopes 1:3 (V:H)
or flatter
300 mm Min
Watertight connection
Perforate riser
EMBANKMENT SECTION THRU RISER
TYPICAL SEDIMENT TRAP
NOT TO SCALE

FIGURE 2

Check Dams

SC-4





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A check dam is a small device constructed of rock, sandbags, or fiber rolls, placed across a natural or man-made channel or drainage ditch. Check dams reduce scour and channel erosion by reducing flow velocity and encouraging sediment dropout.

Appropriate Applications

Check dams may be installed in the following:

- In small open channels which drain 4 ha (10 ac) or less.
- In steep channels where storm water runoff velocities exceed 1.5 meters per second (m/s).
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where a short length of service does not warrant establishment of erosion-resistant linings.

This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Not to be used in live streams.

Not appropriate in channels which drain areas greater than 4 ha (10 ac).

Not to be placed in channels which are already grass lined unless erosion is expected, as installation may damage vegetation.

Require extensive maintenance following high velocity flows.

Check Dams

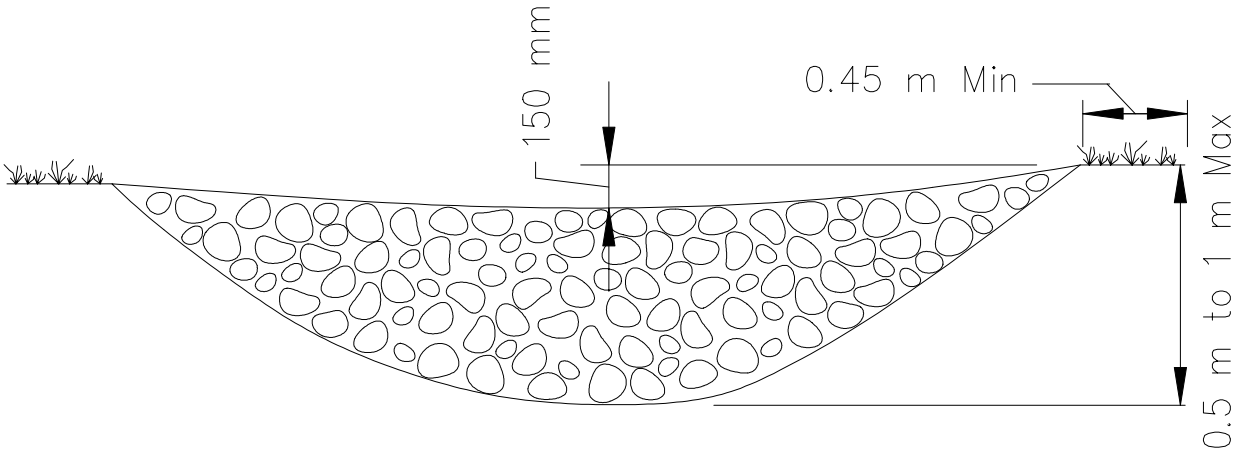
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Not to be constructed from straw bales or a silt fence.

Standards and Specifications

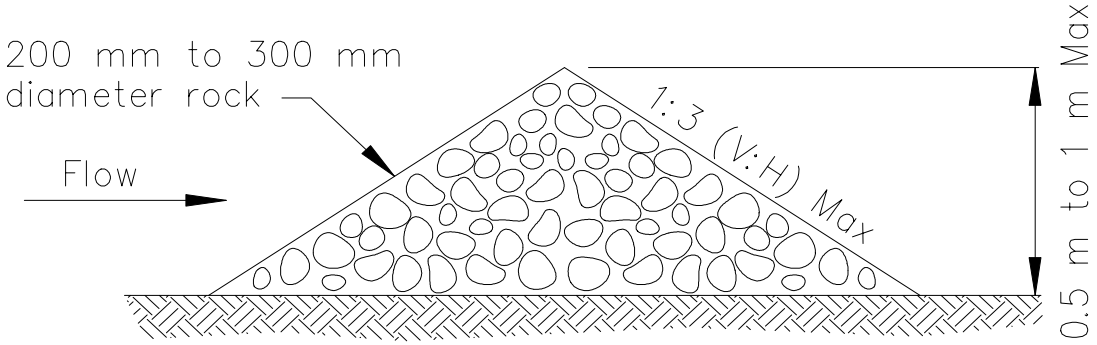
- Check dams shall be placed at a distance and height to allow small pools to form behind them.
- Install the first check dam approximately five meters (5 m) from the outfall device and at regular intervals based on slope gradient and soil type.
- For multiple check dam installation, backwater from downstream check dam shall reach the toe of the upstream dam.
- High flows (typically a 2-year storm or larger) shall safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams shall be removed when grass has matured sufficiently to protect the ditch or swale.
- Rock shall be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.

Maintenance and Inspection

- Inspect check dams after each significant rainfall event. Repair damage as needed or as required by the RE.
- Remove sediments when depth reaches one-third of the check dam height.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed or when required by the RE.
- Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.



ELEVATION

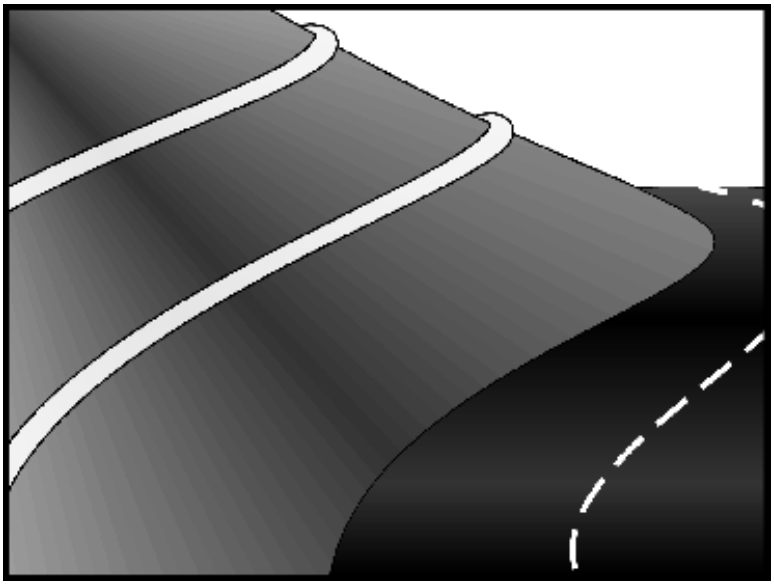


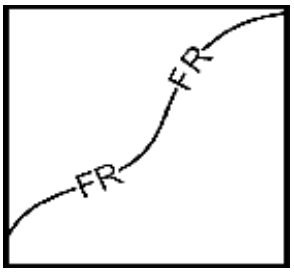
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE

Fiber Rolls

SC-5





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A fiber roll consists of straw, flax, or other similar materials that are rolled and bound into a tight tubular roll and placed on the face of slopes at regular intervals to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some removal of sediment from the runoff.

Appropriate Applications

May be used along the top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Fiber rolls may be used as check dams if approved by the Resident Engineer (RE).

This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.

Limitations

Is a relatively new sediment control/soil stabilization technology. Effectiveness and capabilities in the field are not completely known.

Although fiber rolls provide some sediment removal, this BMP is not to be used in place of a linear sediment barrier (i.e., a silt fence, sandbag barrier, or straw bale barrier).

Standards and Specifications

Fiber Roll Materials

Fiber rolls shall be either:

(1) prefabricated rolls; or,

(2) rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

Roll length of erosion control blanket into a tube of minimum 200 mm (8 in) diameter.

Bind roll at each end and every 1.2 m (4 ft) along length of roll with jute-type twine.

Installation

Locate fiber rolls on level contours spaced 2.4 to 6.0 m (8 to 20 ft) along the face of slope, or as required by the RE.

Stake fiber rolls into a 50 to 100 mm (2 to 4 in) trench.

Drive stakes at the end of each fiber roll and spaced 1.2 m (4 ft) maximum on center.

Use wood stakes with a nominal classification of 19 by 19 mm (3/4 by 3/4 in), and minimum length of 600mm (24 in).

If more than one fiber roll is placed in a row, the rolls shall be butted; not overlapped.

Removal

Fiber rolls are typically left in place.

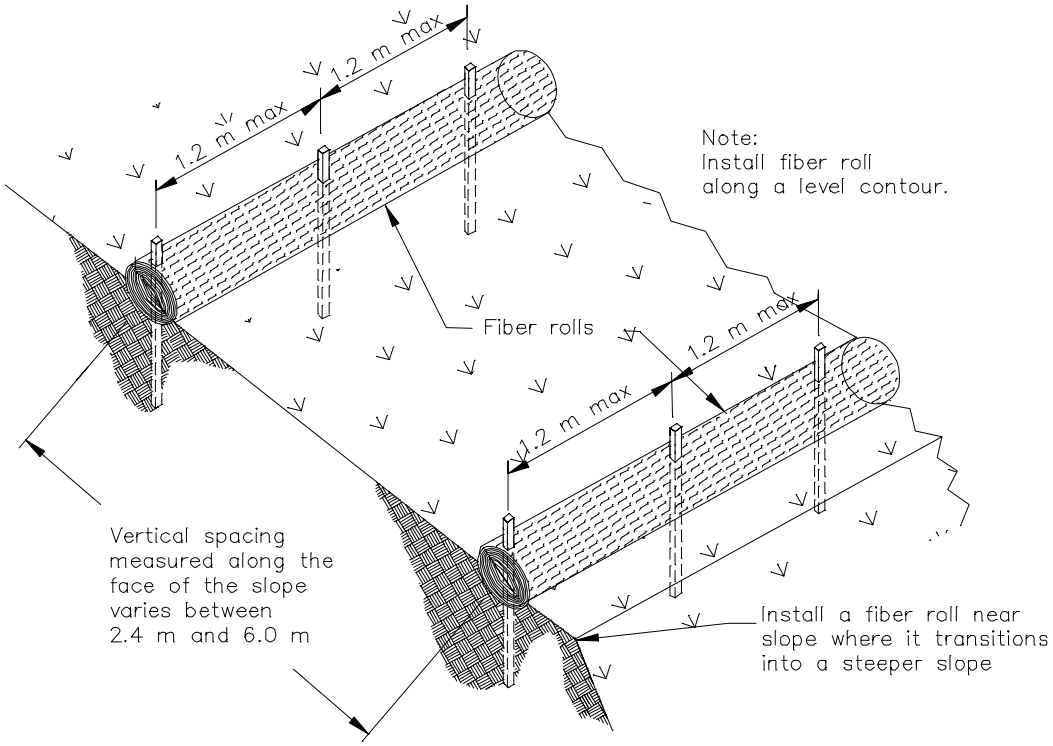
If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Maintenance and Inspection

Repair or replace split, torn, unraveling, or slumping fiber rolls.

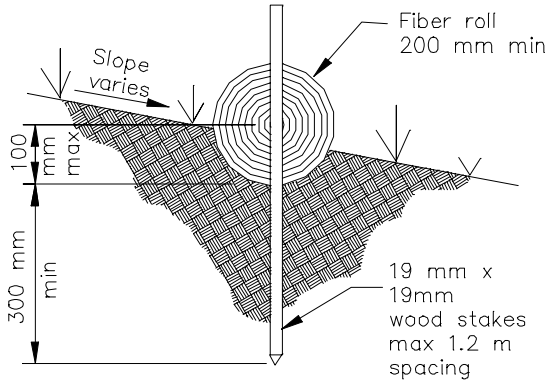
Inspect fiber rolls when rain is forecast. Perform maintenance as needed or as required by the RE.

Inspect fiber rolls following rainfall events and a least daily during prolonged rainfall. Perform maintenance as needed or as required by the RE.



TYPICAL FIBER ROLL INSTALLATION

N.T.S.

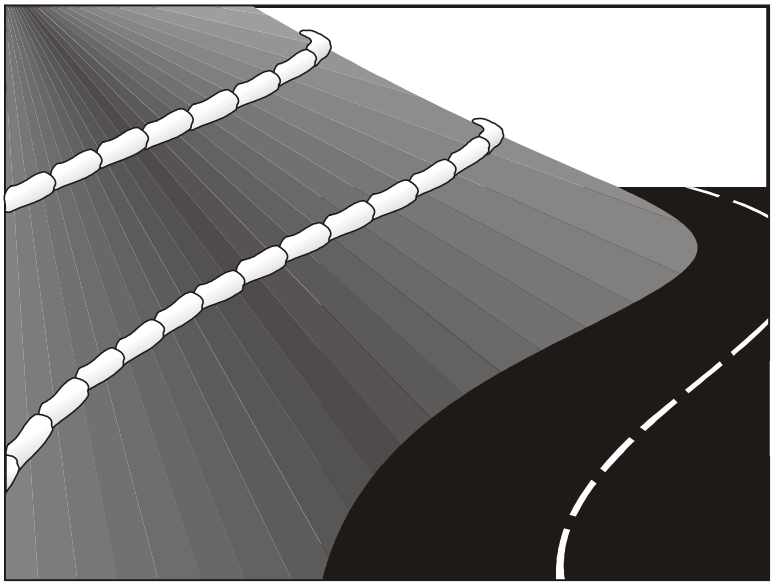


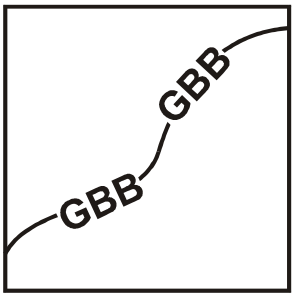
ENTRENCHMENT DETAIL

N.T.S.

Gravel Bag Berm

SC-6





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A gravel bag berm consist of a single row of gravel bags that are installed end-to-end to form a barrier across a slope to intercept runoff, reduce runoff velocity, release runoff as sheet flow, and provide some sediment removal.

Appropriate Applications

Along the face and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Although this BMP will remove some sediment, it is not to be used in place of a linear sediment barrier (i.e., a silt fence, sandbag barrier, or straw bale barrier).

Degraded gravel bags may rupture when removed, spilling contents.

Installation can be labor intensive.

Limited durability for long term projects.

Standards and Specifications

Materials

Bag Material: Bags shall be woven polypropylene, polyethylene or polyamide fabric or burlap, minimum unit weight 135 g/m^2 (four ounces per square yard), mullen burst strength exceeding 2,070 kPa (300 psi) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70 percent in conformance with the requirements in ASTM designation D4355.

Gravel Bag Berm

Bag Size: Each gravel-filled bag shall have a length of 450 mm (18 in), width of 300 mm (12 in), thickness of 75 mm (3 in), and mass of approximately 15 kg (33 lb). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the Resident Engineer (RE) for approval prior to deployment.

Fill Material: Fill material shall be one-half to one-inch Class 2 aggregate base, clean and free from clay and deleterious material, conforming to the provisions in Section 26-1.02 "Class 2 Aggregate Base," of the Standard Specifications. Fill material is subject to approval by the RE.

Installation

Install along a level contour.

Tightly abut bags

Maintenance and Inspection

Inspect gravel bag berms before and after each rainfall event, and weekly throughout the rainy season.

Reshape or replace gravel bags as needed, or as directed by the RE.

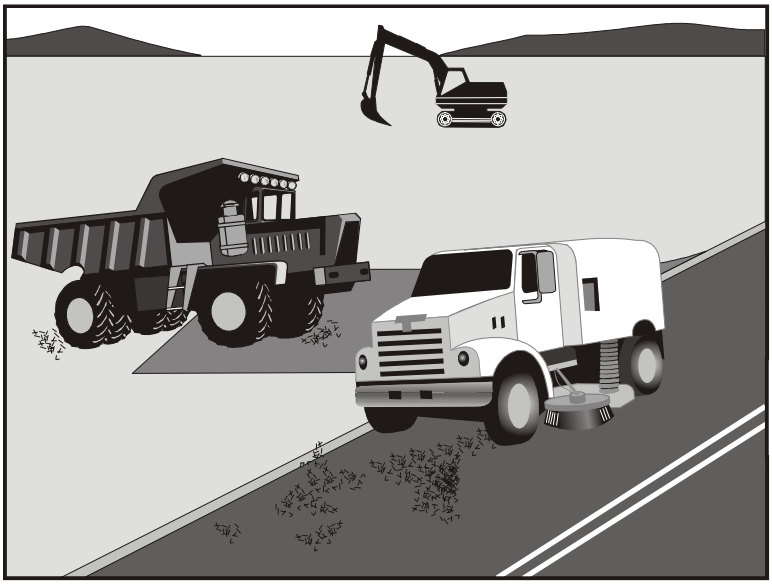
Repair washouts or other damages as needed, or as directed by the RE.

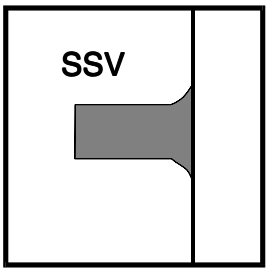
Inspect gravel bag berms for sediment accumulations and remove sediments when accumulation reaches one-third of the berm height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

Remove gravel bag berms when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilized the area. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

Street Sweeping and Vacuuming

SC-7





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Practices to remove tracked sediment to prevent the sediment from entering a storm drain or watercourse.

Appropriate Applications

These practices are implemented anywhere sediment is tracked from the project site onto public or private paved roads, typically at points of egress.

Limitations

Sweeping and vacuuming may not be effective when soil is wet or muddy.

Standards and Specifications

Do not use kick brooms or sweeper attachments.

Inspect potential sediment tracking locations daily.

Visible sediment tracking shall be swept and vacuumed on a daily basis.

If not mixed with debris or trash, consider incorporating the removed sediment back into the project.

Maintenance and Inspection

Inspect ingress/egress access points daily and sweep tracked sediment as needed, or as required by the Resident Engineer (RE).

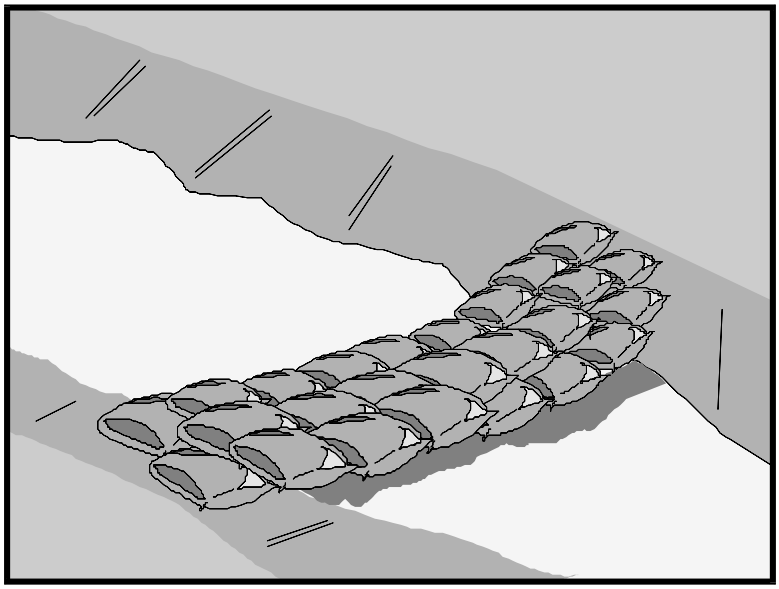
Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.

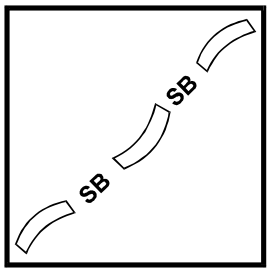
Adjust brooms frequently; maximize efficiency of sweeping operations.

After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Sandbag Barrier

SC-8





BMP Objectives

- ○ Soil Stabilization
- ● Sediment Control
- ○ Tracking Control
- ○ Wind Erosion Control
- ○ Non-Storm Water Management
- ○ Materials and Waste Management

Definition and Purpose

A sandbag barrier is a temporary linear sediment barrier consisting of stacked sandbags, designed to intercept and slow the flow of sediment-laden sheet flow runoff. Sandbag barriers allow sediment to settle from runoff before water leaves the construction site. Sandbags can also be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets (see BMP SC-10, Storm Drain Inlet Protection) to divert and/or detain flows.

Appropriate Applications

- Along the perimeter of a site.
- Along streams and channels.
- Below the toe of exposed and erodible slopes.
- Down slope of exposed soil areas.
- Around stockpiles.
- Across channels to serve as a barrier for utility trenches or provide a temporary channel crossing for construction equipment, to reduce stream impacts.
- Parallel to a roadway to keep sediment off paved areas.
- At the top of slopes to divert roadway runoff away from disturbed slopes.
- To divert or direct flow or create a temporary sediment basin.
- During construction activities in stream beds when the contributing drainage area is less than 2 ha (5 ac).

- When extended construction period limits the use of either silt fences or straw bale barriers.
- Along the perimeter of vehicle and equipment fueling and maintenance areas or chemical storage areas.
- To capture and detain non-storm water flows until proper cleaning operations occur.
- When site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction.
- To temporarily close or continue broken, damaged or incomplete curbs.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

- Limit the drainage area upstream of the barrier to 2 ha (5 ac).
- Degraded sandbags may rupture when removed, spilling sand.
- Installation can be labor intensive.
- Limited durability for long term projects.
- When used to detain concentrated flows, maintenance requirements increase.

Standards and Specifications

Materials

- ***Sandbag Material:*** Sandbag shall be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight 135 g/m^2 (four ounces per square yard), mullen burst strength exceeding 2,070 kPa (300 psi) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70 percent in conformance with the requirements in ASTM designation D4355. Use of burlap is not acceptable.
- ***Sandbag Size:*** Each sand-filled bag shall have a length of 450 mm (18 in), width of 300 mm (12 in), thickness of 75 mm (3 in), and mass of approximately 15 kg (33 lb.). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the Resident Engineer (RE) for approval prior to deployment.
- ***Fill Material:*** All sandbag fill material shall be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material, conforming to the provisions in Section 68-1.025 "Permeable Material," of

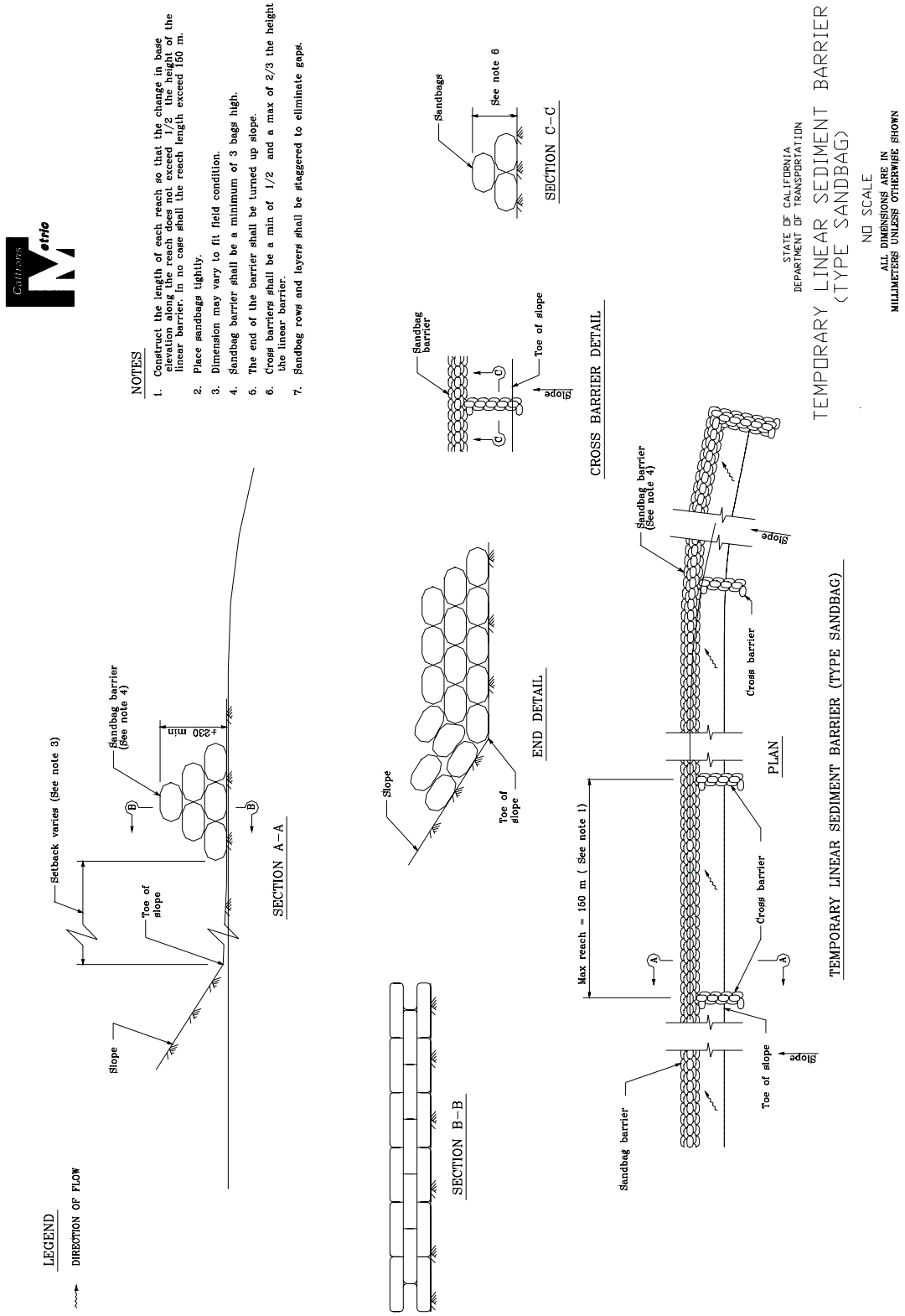
the Standard Specifications. The requirements for the Durability Index and Sand Equivalent do not apply. Fill material is subject to approval by the RE.

Installation

- When used as a linear control for sediment removal:
  - Install along a level contour.
  - Turn ends of sandbag row up slope to prevent flow around the ends.
  - Generally, sandbag barriers shall be used in conjunction with temporary soil stabilization controls up slope to provide effective control.
  - Install as shown in Page 4 of this BMP.
- When used for concentrated flows:
  - Stack sandbags to required height using a pyramid approach as shown in Page 4 of this BMP.
  - Upper rows of sandbags shall overlap joints in lower rows.
- Construct sandbag barriers with a set-back of at least 1m from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the sandbag barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

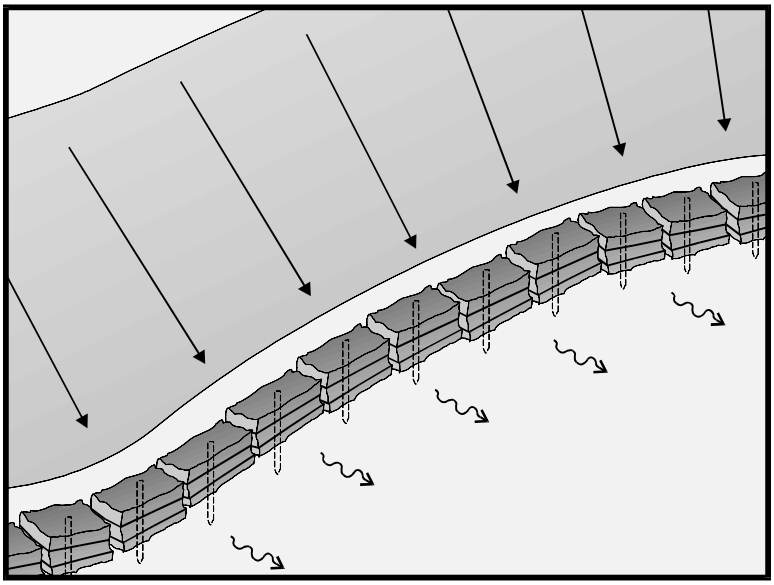
Maintenance and Inspection

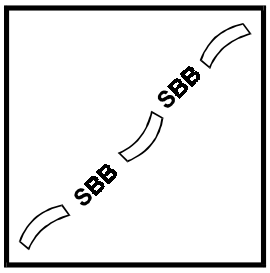
- Inspect sandbag barriers before and after each rainfall event, and weekly throughout the rainy season.
- Reshape or replace sandbags as needed, or as directed by the RE.
- Repair washouts or other damages as needed, or as directed by the RE.
- Inspect sandbag barriers for sediment accumulations and remove sediments when accumulation reaches one-third the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.
- Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilized the area.


Caltrans Metric
NOTES
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 150 m.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.
LEGEND
DIRECTION OF FLOW
Setback varies (See note 3)
Sandbag barrier (See note 4)
+230 min
Toe of slope
Slope
SECTION A-A
SECTION B-B
Slope
Toe of slope
END DETAIL
Sandbag barrier
Toe of slope
Slope
CROSS BARRIER DETAIL
Sandbags
See note 6
SECTION C-C
Sandbag barrier (See note 4)
Slope
Cross barrier
Max reach = 150 m (See note 1)
Cross barrier
Sandbag barrier
Toe of slope
Slope
PLAN
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SANDBAG)
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SANDBAG)
NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN

Straw Bale Barrier

SC-9





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A straw bale barrier is a temporary linear sediment barrier consisting of straw bales, designed to intercept and slow sediment-laden sheet flow runoff. Straw bale barriers allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications

Along the perimeter of a site.

Along streams and channels.

Below the toe of exposed and erodible slopes.

Down slope of exposed soil areas.

Around stockpiles.

Across minor swales or ditches with small catchments.

Around above grade type temporary concrete washouts (See BMP WM-8, “Concrete Waste Management”).

Parallel to a roadway to keep sediment off paved areas.

This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

- Don't use in areas subjected to highly concentrated flows, such as channels or live streams.
- Installation can be labor intensive.
- Straw bale barriers are maintenance intensive.
- Degraded straw bales may fall apart when removed or left in place for extended periods.
- Can't be used on paved surfaces.
- Not to be used for drain inlet protection.
- Shall not be used on lined ditches.

Standards and Specifications

Materials

- ***Straw Bale Material:*** Straw bale materials shall conform to the provisions in Section 20-2.06, "Straw," of the Standard Specifications.
- ***Straw Bale Size:*** Each straw bale shall be a minimum of 360 mm (14 in) wide, 450 mm (18 in) in height, 900 mm (36 in) in length and shall have a minimum mass of 23 kg (51 lb.) The straw bale shall be composed entirely of vegetative matter, except for the binding material.
- ***Bale Bindings:*** Bales shall be bound by either steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding shall not be used. Baling wire shall be a minimum diameter of 1.57 mm. Nylon or polypropylene string shall be approximately 2 mm in diameter with a breaking strength of 360 N.
- ***Stakes:*** Wood stakes shall be commercial quality lumber of the size and shape shown on the plans. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.

Installation

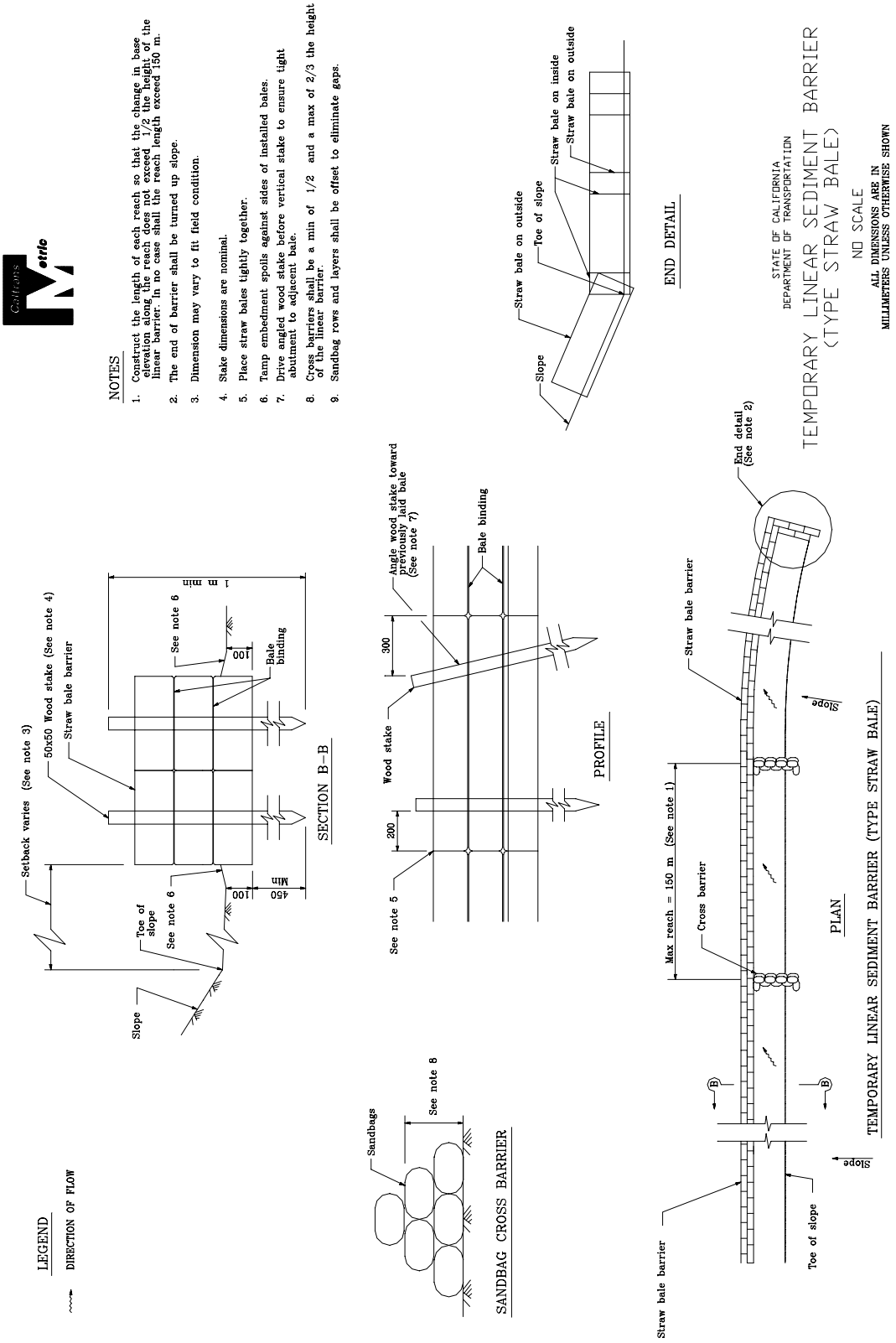
- Limit the drainage area upstream of the barrier to 0.3 ha/100 m (0.25ac/100ft) or barrier.
- Limit the slope length draining to the straw bale barrier to 30 m (100 ft.)
- Slopes of 2:100 (V:H)(2%) or flatter are preferred. If the slope exceeds 1:10 (V:H) (10%), the length of slope upstream of the barrier must be less than 15 m (50 ft).

Straw Bale Barrier

- Install straw bale barriers along a level contour, with the last straw bale turned up slope.
- Straw bales must be installed in a trench and tightly abut adjacent bales.
- Construct straw bale barriers with a set-back of at least 1m from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the straw bale barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.
- See page 4 of this BMP for installation detail.

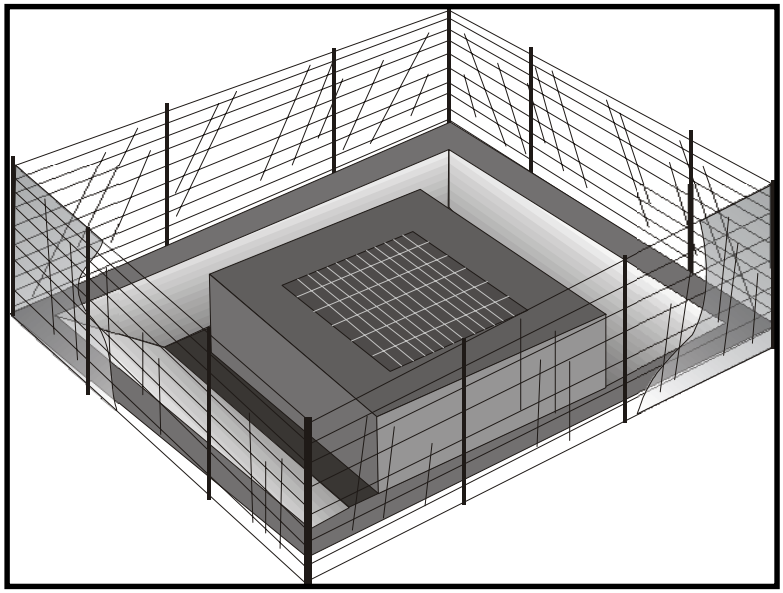
Maintenance and Inspection

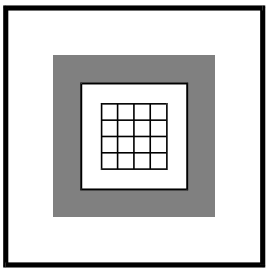
- Inspect straw bale barriers before and after each rainfall event, and weekly throughout the rainy season.
- Inspect straw bale barriers for sediment accumulations and remove sediments when depth reaches one-third the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.
- Replace or repair damage bales as needed or as directed by the RE.
- Repair washouts or other damages as needed or as directed by the RE.
- Remove straw bales when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilized the area. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.


Caltrans
Metric
NOTES
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 150 m.
2. The end of barrier shall be turned up slope.
3. Dimension may vary to fit field condition.
4. Stake dimensions are nominal.
5. Place straw bales tightly together.
6. Tamp embedment spoils against sides of installed bales.
7. Drive angled wood stake before vertical stake to ensure tight abutment to adjacent bale.
8. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
9. Sandbag rows and layers shall be offset to eliminate gaps.
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE STRAW BALE)
NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN
Setback varies (See note 3)
50x50 Wood stake (See note 4)
Straw bale barrier
See note 6
1 m min
100
Bale binding
Toe of slope
See note 6
100
450
Min
Slope
SECTION B–B
Angle wood stake toward previously laid bale (See note 7)
Bale binding
300
Wood stake
200
See note 5
PROFILE
End detail (See note 2)
Straw bale barrier
Slope
Max reach = 150 m (See note 1)
Cross barrier
B
B
Slope
Straw bale barrier
Toe of slope
PLAN
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE STRAW BALE)
LEGEND
DIRECTION OF FLOW
Sandbags
See note 8
SANDBAG CROSS BARRIER

Storm Drain Inlet Protection

SC-10





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Devices used at storm drain inlets that are subject to runoff from construction activities to detain and/or to filter sediment-laden runoff to allow sediment to settle and/or to filter sediment prior to discharge of storm water into storm water drainage systems or watercourses.

Appropriate Applications

Where ponding will not encroach into highway traffic.

Where sediment laden surface runoff may enter an inlet.

Where disturbed drainage areas have not yet been permanently stabilized.

Where the drainage area is 0.4 ha (1 ac) or less.

Appropriate during wet and snow-melt seasons.

Limitations

Use only when ponding will not encroach into highway traffic or onto erodible surfaces and slopes. If safety is a concern, use other methods of temporary protection to prevent sediment-laden storm water and non-storm water discharges to enter the storm drain system.

Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other on-site sediment trapping techniques in conjunction with inlet protection.

Frequent maintenance is required.

For drainage areas larger than 0.4 ha (1ac), runoff shall be routed to a sediment trapping device designed for larger flows. See BMPs SC-2, "Desilting Basin", and SC-3 "Sediment Traps".

Storm Drain Inlet Protection

Filter fabric fence inlet protection appropriate in open areas is subject to sheet flow and for flows not exceeding 0.014 m^3/s (0.5 cfs).

Sandbag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.014 m^3/s (0.5 cfs), and it is necessary to allow for overtopping to prevent flooding.

Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.

Standards and Specifications

Identify existing and/or planned storm drain inlets that have the potential to receive sediment-laden surface runoff. Determine if storm drain inlet protection is needed, and which method to use.

Methods and Installation

DI Protection Type 1 - Filter Fabric Fence - The filter fabric fence (Type 1) protection is illustrated in Page 4. Similar to constructing a silt fence. See BMP SC-1, "Silt Fence". Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.

DI Protection Type 2 - Excavated Drop Inlet Sediment Trap - The excavated drop inlet sediment trap (Type 2) is illustrated in Page 5. Similar to constructing a temporary silt fence, See BMP SC-1, "Silt Fence". Size excavated trap to provide a minimum storage capacity calculated at the rate of 130 m^3/ha (67 yd^3/ac) of drainage area.

DI Protection Type 3 - Sandbag Barrier - The sandbag barrier (Type 3) is illustrated in Page 6. Flow from a severe storm shall not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct sandbags in accordance with BMP SC-8, "Sandbag Barrier".

Maintenance and Inspection

General

Inspect all inlet protection devices before and after every rainfall event, and weekly during the rest of the rainy season. During extended rainfall events, inspect inlet protection devices at least once every 24 hours.

Inspect the storm drain inlet after severe storms in the rainy season to check for bypassed material.

Remove all inlet protection devices within thirty days after the site is stabilized, or when the inlet protection is no longer needed.

- Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
- Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

Requirements by Method

Type 1 - Filter Fabric Fence

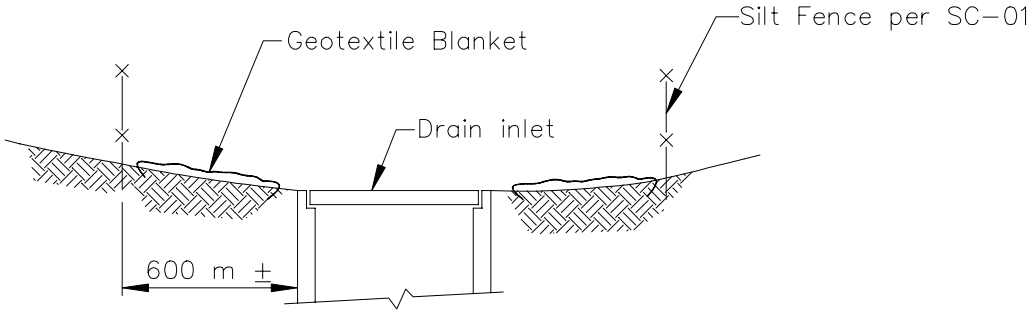
- Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
- Replace or clean the fabric when the fabric becomes clogged with sediment. Make sure the fabric does not have any holes or tears. Repair or replace fabric as needed or as directed by the Resident Engineer (RE).
- At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

Type 2 - Excavated Drop Inlet Sediment Trap

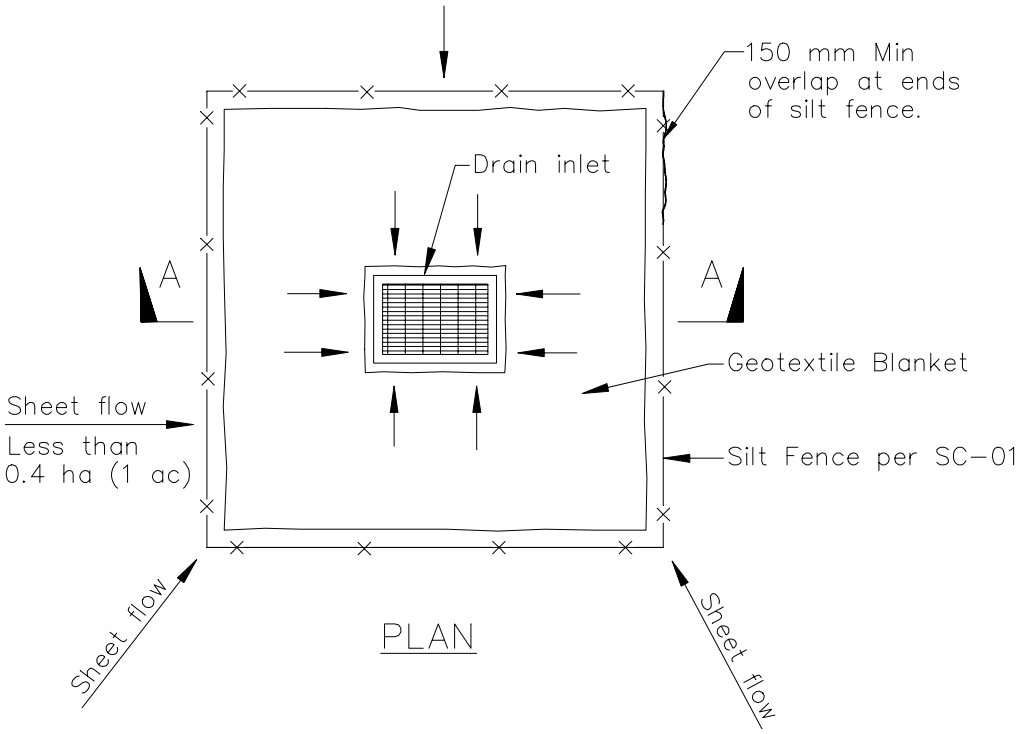
- Remove sediment from basin when the volume of the basin has been reduced by one-half.

Type 3 - Sandbag Barrier

- Inspect bags for holes, gashes, and snags.
- Check sandbags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.



SECTION A–A

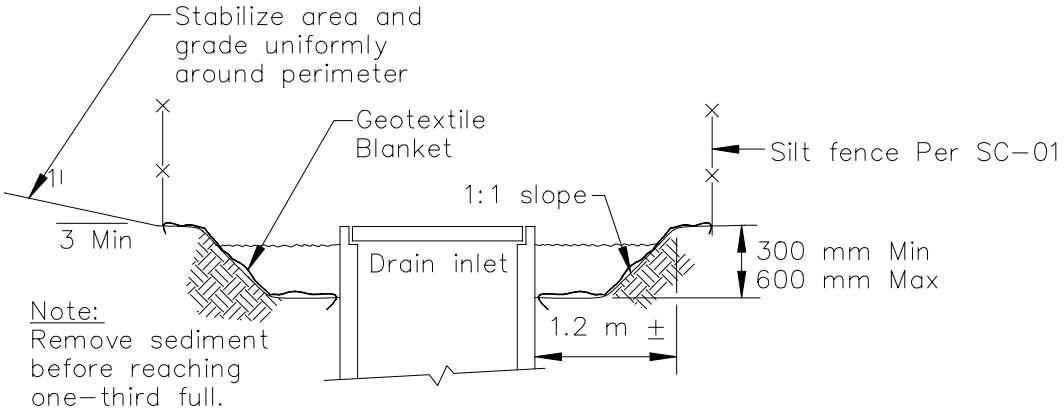


PLAN

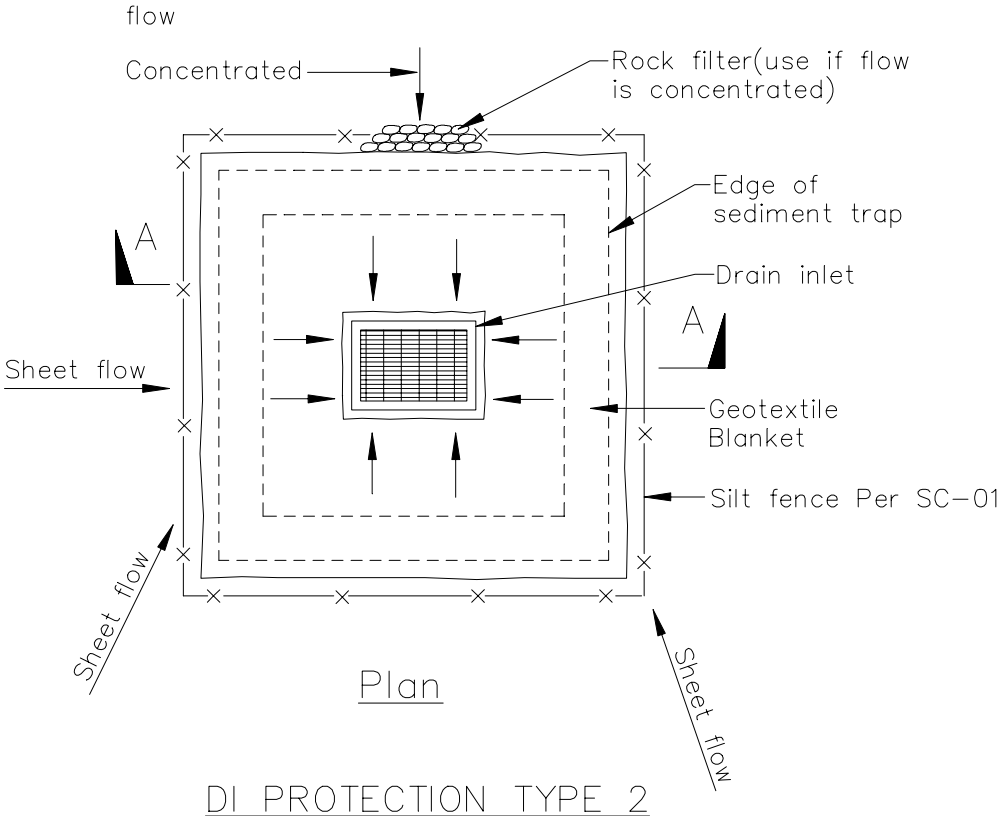
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.



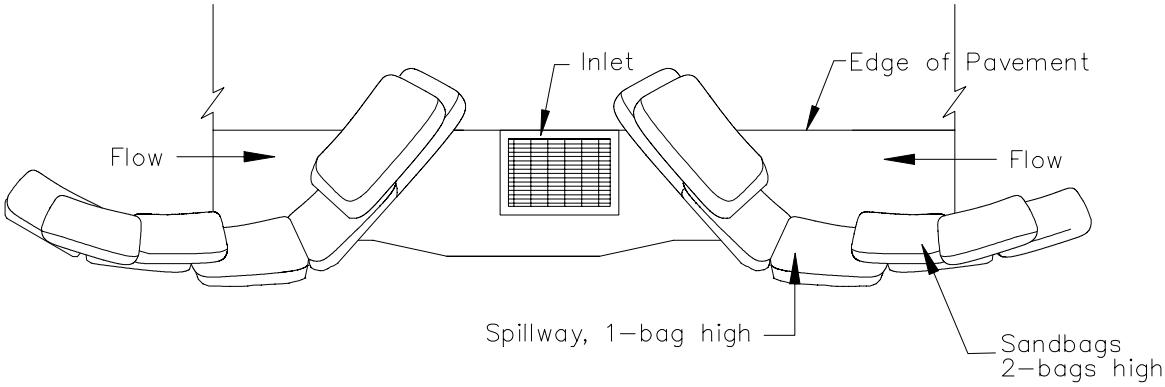
Section A–A



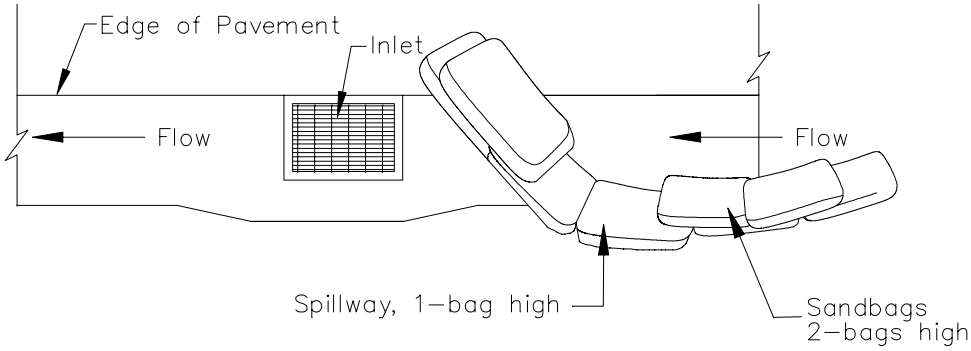
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.



TYPICAL PROTECTION FOR INLET ON SUMP



TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

1. Intended for short–term use.
2. Use to inhibit non–storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed
5. Not applicable in areas with high silts and clays without filter fabric.

Section 5
Wind Erosion Control
Best Management Practices

5.1 Wind Erosion Control

Wind erosion control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance. Wind erosion control best management practices (BMPs) are shown in Table 5-1.

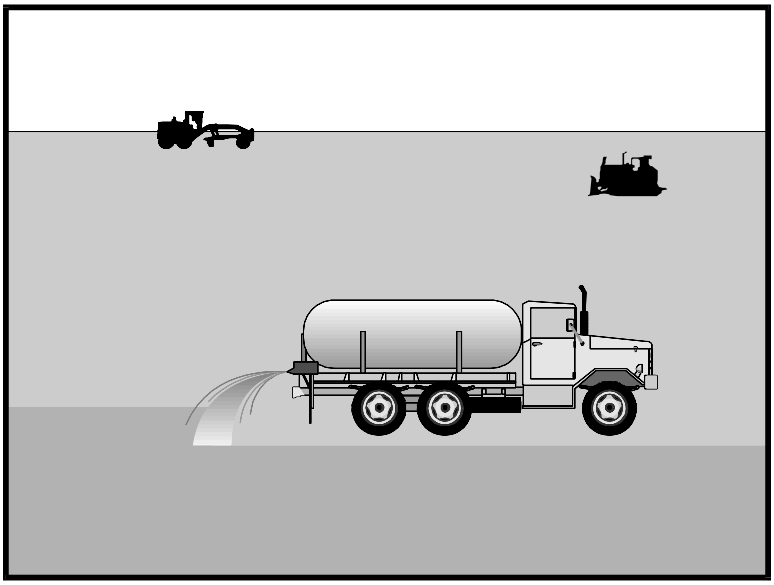
Table 5-1

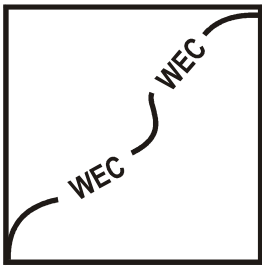
WIND EROSION CONTROL BMPs	
ID	**BMP NAME**
WE-1	Wind Erosion Control

Other BMPs that are sometimes applied to disturbed soil areas in order to control wind erosion are BMPs SS-3 through SS-7, shown in Section 3 of this Manual. The remainder of this Section shows the working details for the Wind Erosion Control BMPs.

Wind Erosion Control

WE-1





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Wind erosion control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance. Dust control shall be applied in accordance with Caltrans standard practices. Covering of small stockpiles or areas is an alternative to applying water or other dust palliatives.

Appropriate Applications

This practice is implemented on all exposed soils subject to wind erosion.

Limitations

Effectiveness depends on soil, temperature, humidity and wind velocity.

Standards and Specifications

Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.

All distribution equipment shall be equipped with a positive means of shutoff.

Unless water is applied by means of pipelines, at least one mobile unit shall be available at all times to apply water or dust palliative to the project.

If reclaimed waste water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water shall not be conveyed in tanks or drain pipes that will be used to convey potable water and there shall be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances shall be marked “NON-POTABLE WATER - DO NOT DRINK.”

Materials applied as temporary soil stabilizers and soil binders will also provide wind erosion control benefits.

Maintenance and Inspection

- Check areas protected to ensure coverage.
- Implement requirements of Section 10 of the Caltrans Standard Specifications as appropriate.

Section 6
Tracking Control
Best Management Practices

6.1 Tracking Control

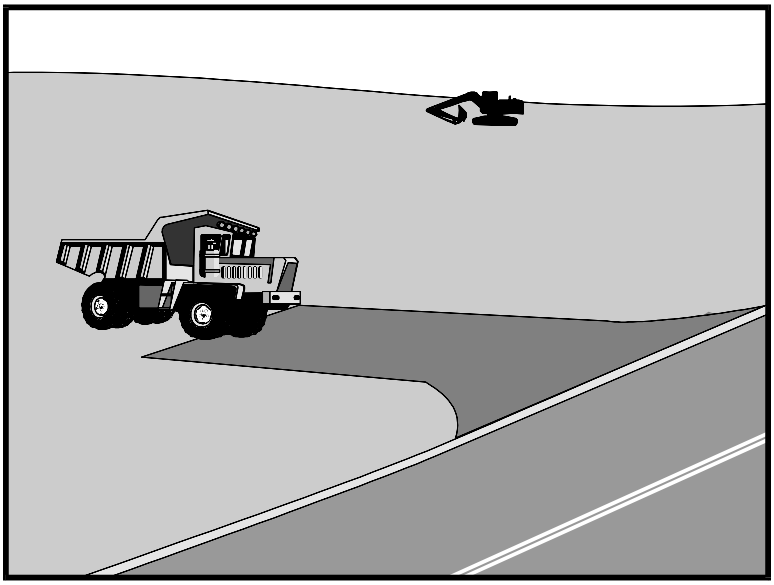
Tracking control consists of preventing or reducing off-site vehicle tracking from entering a storm drain or watercourse. Tracking control best management practices (BMPs) are shown in Table 6-1.

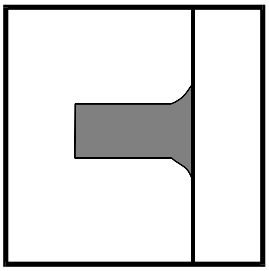
Table 6-1

TRACKING CONTROL BMPs	
ID	**BMP NAME**
TC-1	Stabilized Construction Entrance/Exit
TC-2	Stabilized Construction Roadway
TC-3	Entrance/Outlet Tire Wash

The remainder of this Section shows the working details for the tracking control BMPs.

Stabilized Construction Entrance/Exit TC-1





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A stabilized construction access is a defined point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Appropriate Applications

Use at construction sites:

- where dirt or mud is tracked onto public roads
- adjacent to water bodies
- where poor soils are encountered
- where dust is a problem during dry weather conditions.

This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Site conditions will dictate design and need.

Standards and Specifications

Limit the points of entrance/exit to the construction site.

Limit speed of vehicles to control dust.

Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.

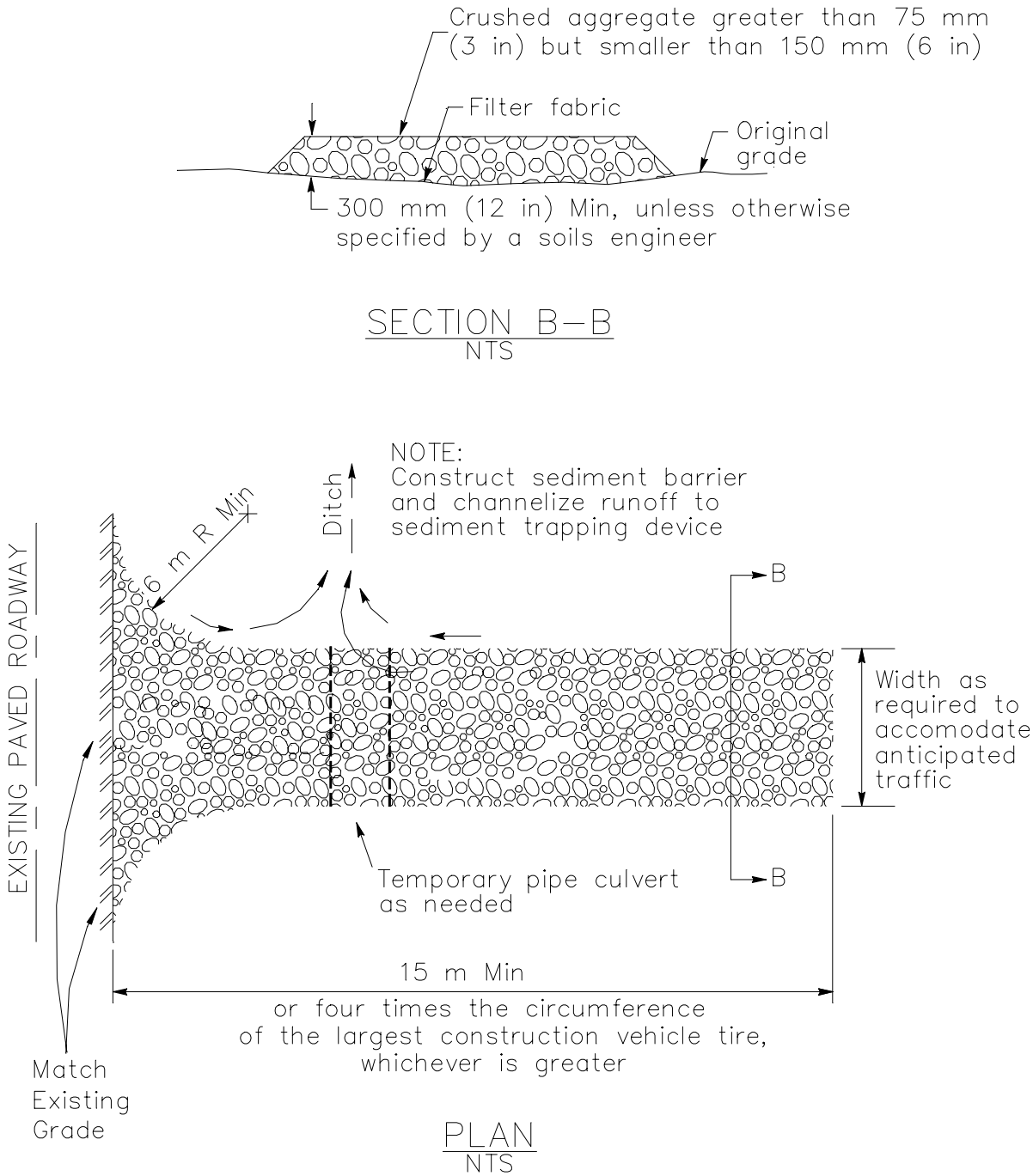
Route runoff from stabilized entrances/exits through a sediment-trapping device before discharge.

Stabilized Construction Entrance/Exit TC-1

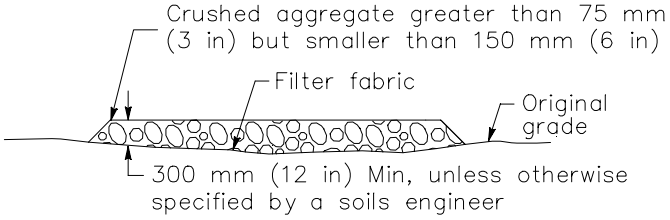
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. The use of asphalt concrete (AC) grindings for stabilized construction access/roadway is not allowed.
- Use of constructed or constructed/manufactured steel plates with ribs for entrance/exit access is allowed with written approval of the RE.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 300 mm (12 in) depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 75 mm (3 inches) but smaller than 150 mm (6 inches) shall be used.
- Designate combination or single purpose entrances and exits to the construction site. Require all employees, subcontractors and others to use them.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.

Maintenance and Inspection

- Inspect routinely for damage and assess effectiveness of the BMP. Repair if access is clogged with sediment or as directed by the RE.
- Keep all temporary roadway ditches clear.



Stabilized Construction Entrance/Exit (Type 1)



SECTION B–B
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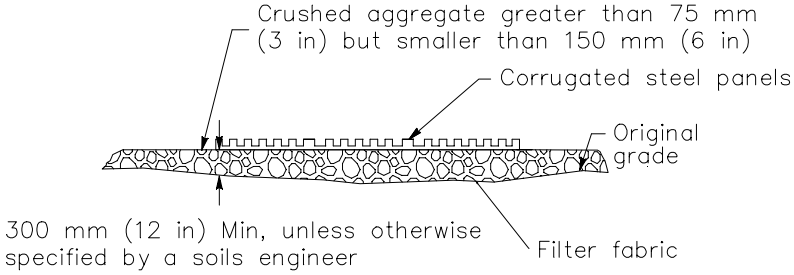

SECTION A–A
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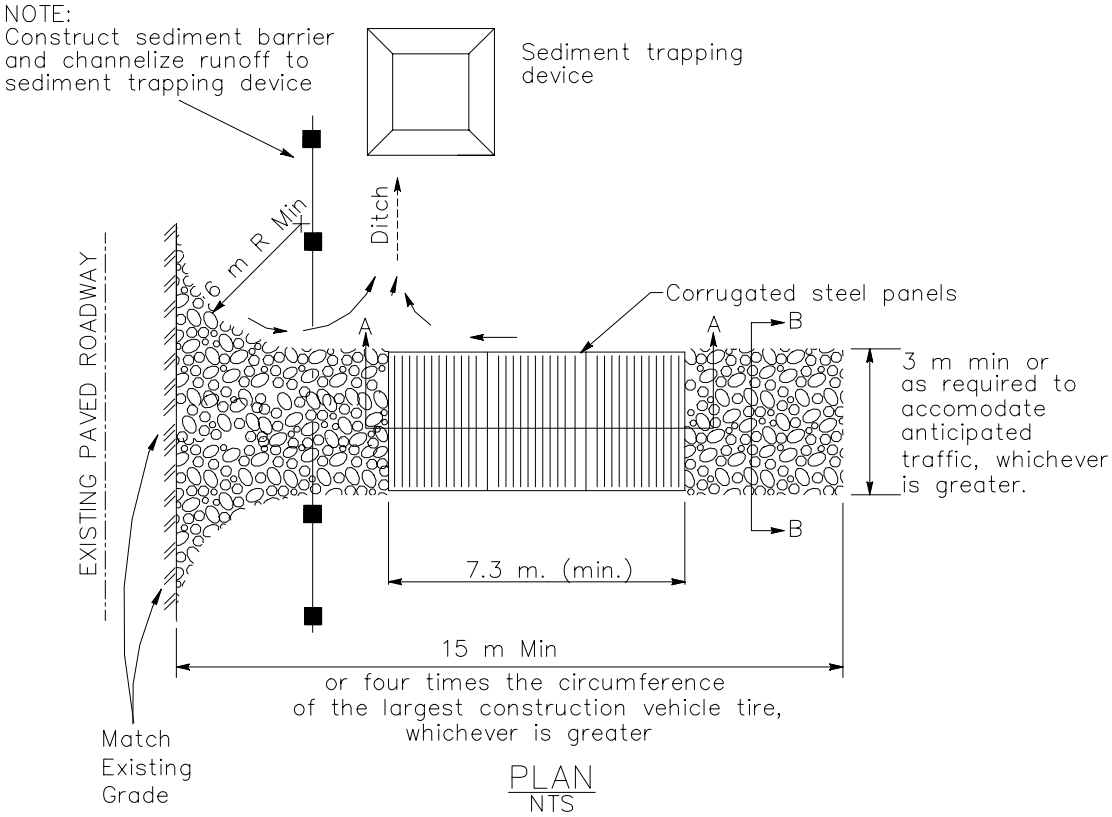

PLAN
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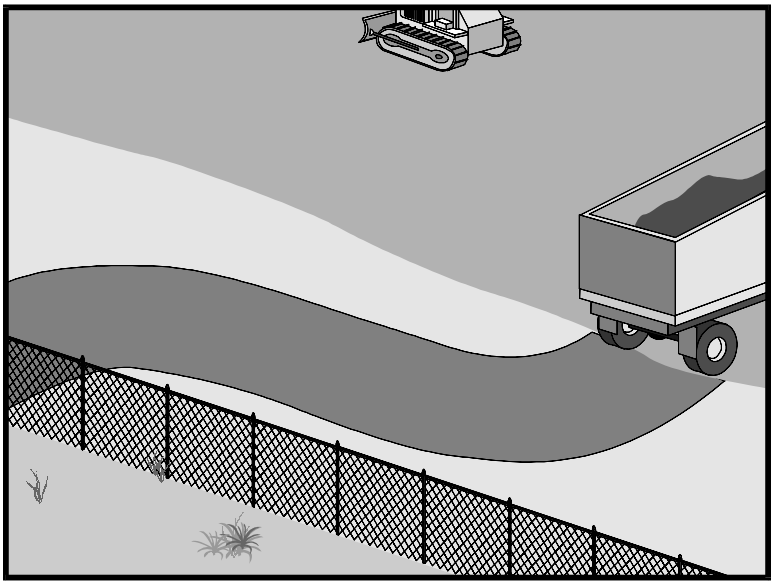
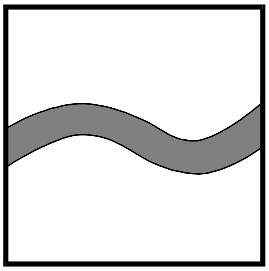
Stabilized Construction Entrance/Exit (Type 2)

Stabilized Construction Roadway

TC-2





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A stabilized construction roadway is a temporary access road connecting existing public roads to a remote construction area. It is designed for the control of dust and erosion created by vehicular tracking.

Appropriate Applications

Construction roadways and short-term detour roads:

- Where mud tracking is a problem during wet weather
- Where dust is a problem during dry weather
- Adjacent to water bodies
- Where poor soils are encountered

This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Materials will likely need to be removed prior to final project grading and stabilization.

Site conditions will dictate design and need.

May not be applicable to very short duration projects.

Limit speed of vehicles to control dust.

Standards and Specifications

Properly grade roadway to prevent runoff from leaving the construction site.

Design stabilized access to support heaviest vehicles and equipment that will use it.

Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.

Coordinate materials with those used for stabilized construction entrance/exit points.

If aggregate is selected, place crushed aggregate over geotextile fabric to at least 300 mm (12 in) depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 75 mm (3 inches) but smaller than 150 mm (6 inches) shall be used.

Maintenance and Inspection

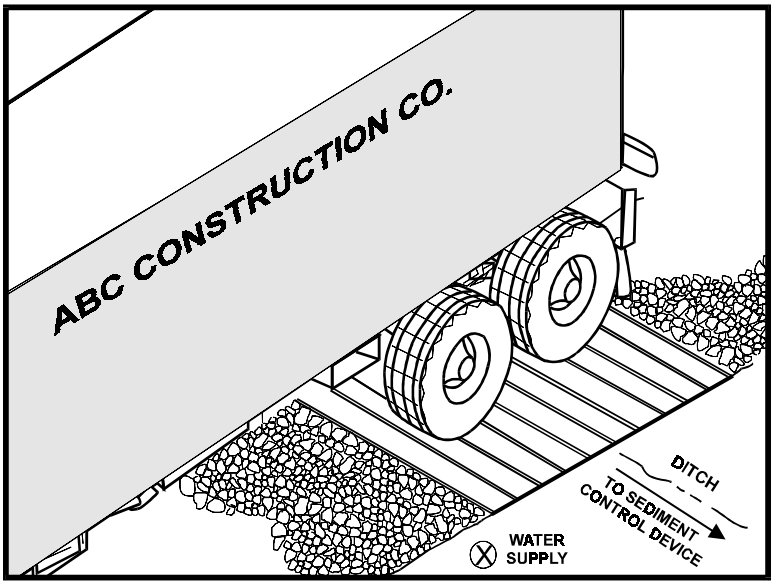
Inspect routinely for damage and repair as needed, or as directed by the Resident Engineer (RE).

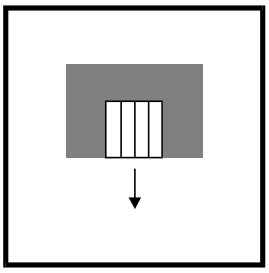
Keep all temporary roadway ditches clear.

When no longer required, remove stabilized construction roadway and re-grade and repair slopes.

Entrance/Outlet Tire Wash

TC-3





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A tire wash is an area located at stabilized construction access points to remove sediment from tires and under carriage, and to prevent sediment from being transported onto public roadways.

Appropriate Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

Requires a supply of wash water.

Requires a turnout or double wide exit in order to keep entering vehicles from having to drive through the wash area.

Standards and Specifications

Incorporate with a stabilized construction entrance/Exit. See BMP TC-1, “Stabilized Construction Entrance/Exit”.

Construct on level ground when possible, on a pad of coarse aggregate, greater than 75 mm (3 inches) but smaller than 150 mm (6 inches).

Wash rack shall be designed and constructed/manufactured for anticipated traffic loads.

Provide a drainage ditch that will convey the runoff from the wash area to a sediment sump device. The drainage ditch shall be of sufficient grade, width, and depth to carry the wash runoff.

Entrance/Outlet Tire Wash

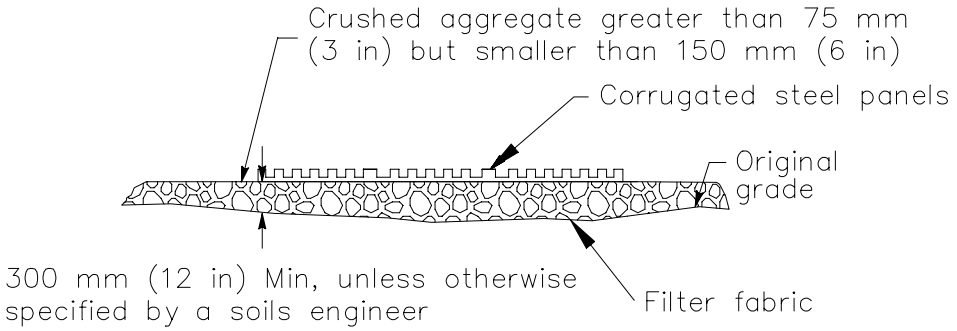
Require that all employees, subcontractors, and others that leave the site with mud-caked tires and/or undercarriages use the wash facility.

Constructed/Manufactured steel-ribbed plates may be used in lieu of rock.

Maintenance and Inspection

Remove accumulated sediment in wash rack and/or sediment sump to maintain system performance.

Inspect routinely for damage and repair as needed.



SECTION A–A
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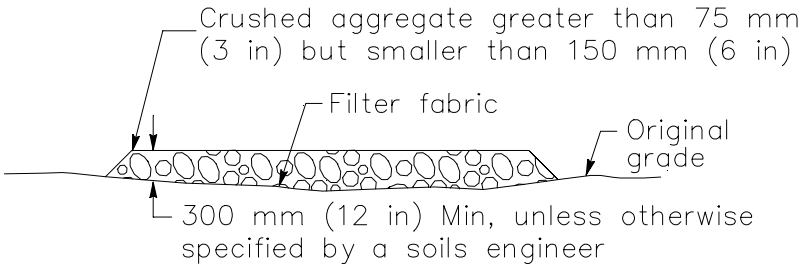

SECTION B–B
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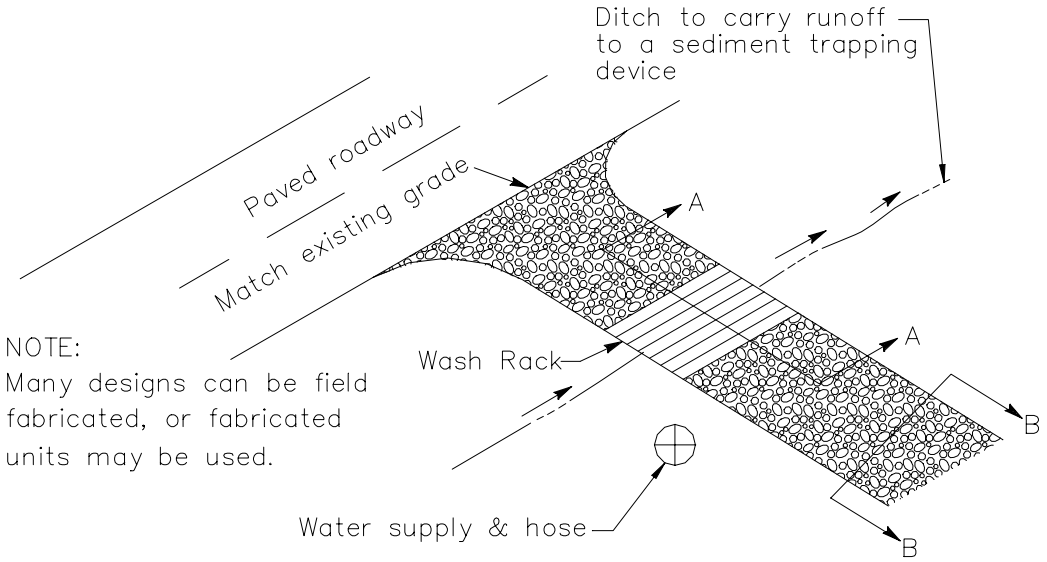


TYPICAL TIRE WASH
NOT TO SCALE

Section 7
Non-Storm Water Management Best Management Practices

7.1 Definition

Non-storm water management best management practices (BMPs) are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with storm water. These practices involve day-to-day operations of the construction site and are usually under the control of the Contractor. These BMPs are also referred to as "good housekeeping practices", which involve keeping a clean, orderly construction site.

Table 7-1 lists the non-storm water management BMPs. It is important to note that all these BMPs have been approved by Caltrans for statewide use and they shall be implemented depending on the conditions/applicability of deployment described as part of the BMP.

Table 7-1

NON-STORM WATER MANAGEMENT BMPs	
ID	**BMP NAME**
NS-1	Water Conservation Practices
NS-2	Dewatering Operations
NS-3	Paving and Grinding Operations
NS-4	Temporary Stream Crossing
NS-5	Clear Water Diversion
NS-6	Illicit Connection/Illegal Discharge Detection and Reporting
NS-7	Potable Water/Irrigation
Vehicle and Equipment Operations	
NS-8	Vehicle and Equipment Cleaning
NS-9	Vehicle and Equipment Fueling
NS-10	Vehicle and Equipment Maintenance

7.1.1 Vehicle and Equipment Operations

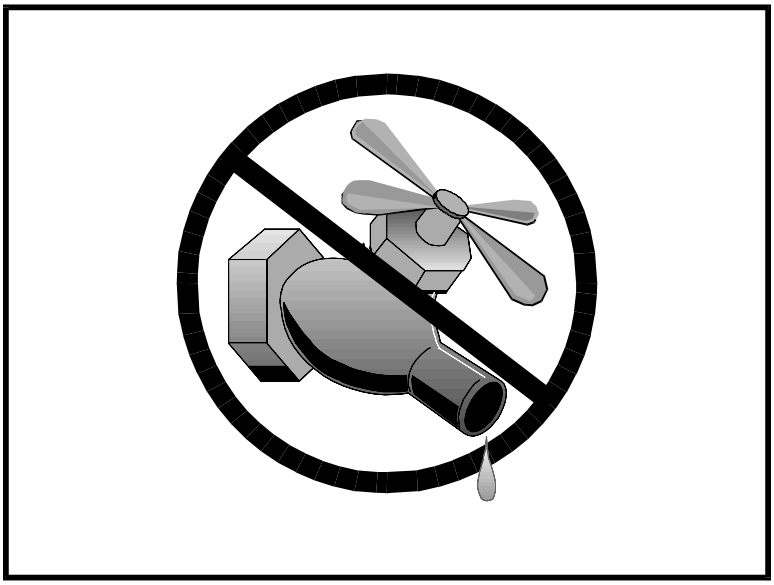
These are procedures and practices designed to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning, fueling and maintenance operations to storm water drainage systems or to watercourses. Vehicle and equipment operations includes the following BMPs:

- Vehicle and Equipment Cleaning
- Vehicle and Equipment Fueling
- Vehicle and Equipment Maintenance

The remainder of this Section shows the working details for each of the non-storm water management BMPs.

Water Conservation Practices

NS-1



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Water conservation practices are activities that use water during the construction of a project in a manner that avoids causing erosion and/or the transport of pollutants off site.

Appropriate Applications

Water conservation practices are implemented wherever water is used.

Applies to all construction projects.

Limitations

None identified.

Standards and Specifications

Keep water equipment in good working condition.

Repair water leaks promptly.

Washing of vehicles and equipment on the construction site is discouraged.

Avoid using water to clean construction areas. Paved areas shall be swept and vacuumed.

Direct construction water runoff to areas where it can soak into the ground.

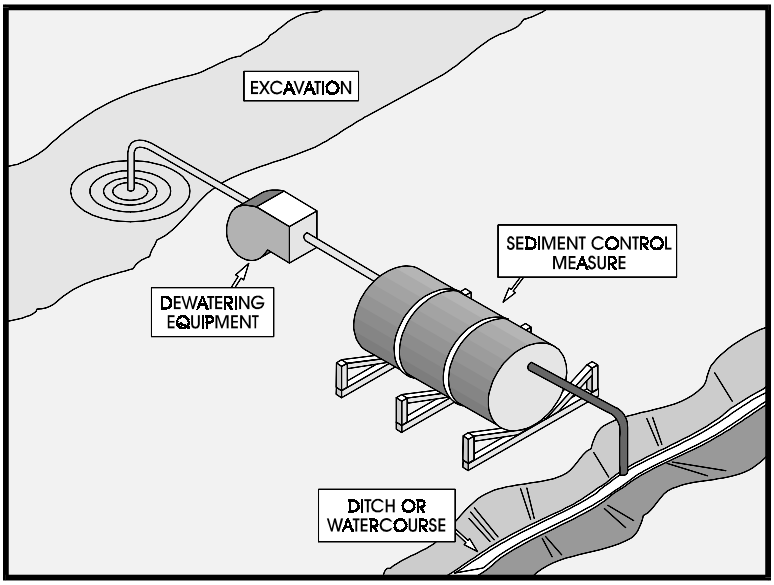
Apply water for dust control in accordance with Section 10 of the Standard Specifications.

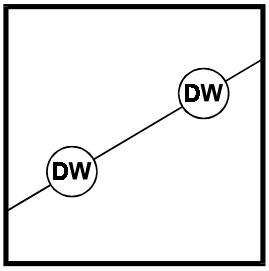
Maintenance and Inspection

Inspect water equipment at least weekly.

Dewatering Operations

NS-2





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Dewatering operations are practices that manage the discharge of pollutants from groundwater and accumulated precipitation dewatering operations.

Appropriate Applications

These practices are implemented where groundwater or accumulated precipitation will be discharged from a construction site. Controlling sediment from dewatering operations is required on all projects that pump sediment-laden water from work areas and plan to discharge the pumped water into a conveyance system or water body. Dewatering discharges include but are not limited to:

Removal of uncontaminated groundwater.

Removal of accumulated rainwater from work areas.

Removing water from cofferdams or diversions.

Limitations

Site conditions will dictate design and use of dewatering operations.

The controls discussed in this best management practice (BMP) address sediment only. If the presence of polluted water is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water to be removed by dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Resident Engineer (RE) and comply with Standard Specifications Section 5-1.116, “Differing Site Conditions.”

The controls detailed in this BMP only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.

Dewatering operations will require, and must comply with, applicable local permits.

Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.

Standards and Specifications

The flow chart shown in page 3 of this BMP shall be utilized to guide dewatering operations.

Contractor shall notify the RE of planned discharges.

The RE will coordinate monitoring and permit compliance.

Discharges must comply with regional and watershed-specific discharge requirements.

Ensure that dewatering discharges do not cause erosion at the discharge point.

Sediment Control Treatment: Dewatering effluent (groundwater and accumulated precipitation) that is laden with suspended solids shall be treated by a device designed to remove soil particles down to 0.02 mm in size. Desilting basins (see BMP SC-2) and sediment traps (see BMP SC-3) are examples of temporary treatment devices; these devices shall be designed according to the respective BMPs.

A filtration devise may be substituted for a desilting basin or sediment trap if the Contractor can demonstrate, to the RE's satisfaction, that the filtration device provides equivalent or greater removal of suspended solids than the basin.

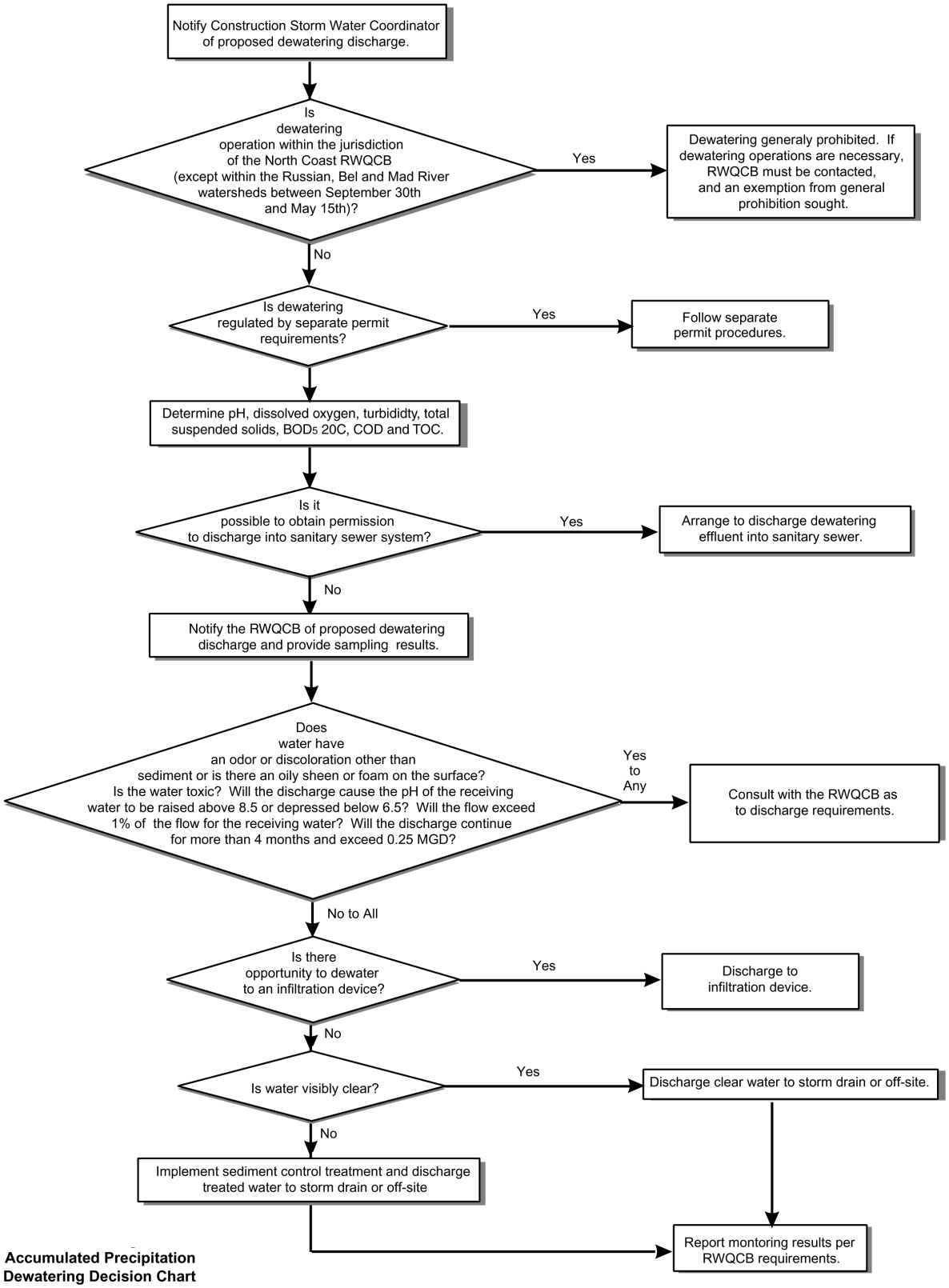
Filter bags may be used for small-scale dewatering operations.

Maintenance and Inspection

Prior to completion of permit application, notify the District Environmental Unit to perform testing requirements and complete necessary paper work for the permit.

Inspect filtering device frequently and repair or replace once the sediment build-up prevents the structure from functioning as designed.

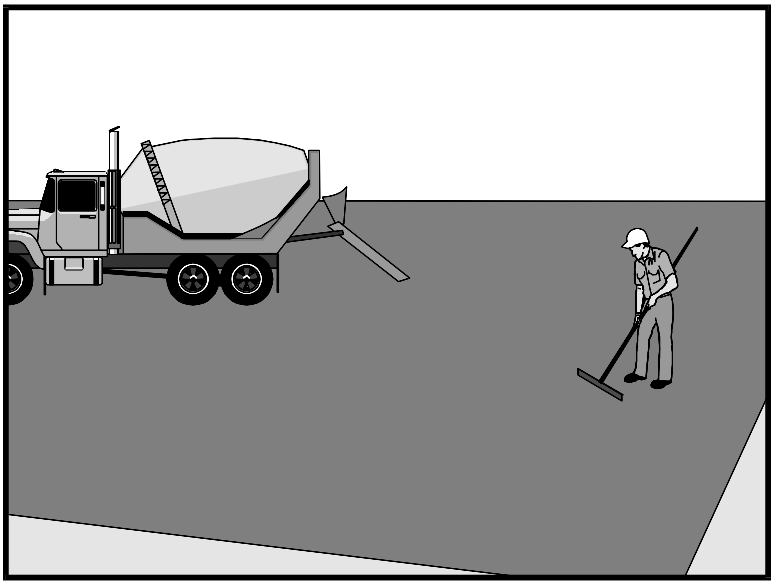
Accumulated suspended solids removed from a dewatering device shall be spread on the project site and stabilized at locations designated by the RE, or shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.



Accumulated Precipitation Dewatering Decision Chart

Paving and Grinding Operations

NS-3



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures that minimize pollution of storm water runoff during paving operations, including new paving and preparation of existing paved surfaces for overlays.

Appropriate Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute storm water runoff or discharge to the storm drain system or watercourses.

Limitations

Finer solids are not effectively removed by filtration systems.

Paving opportunities may be limited during wet weather.

Standards and Specifications

Substances used to coat asphalt transport trucks and asphalt trucks and asphalt spreading equipment shall not contain soap and shall be non-foaming and non-toxic.

Place drip pans or absorbent materials under paving equipment while not in use, to catch and/or contain drips and leaks. See also BMP WM-10, "Liquid Waste Management".

When paving involves asphaltic concrete (AC), the following steps shall be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:

- Minimize the washing of sand or gravel from new asphalt into storm drains, streets, and creeks by sweeping where practical.
- Old or spilled asphalt must be disposed as approved by the Resident Engineer (RE).

- AC grindings, pieces, or chunks used in embankments or shoulder backing must not be allowed to enter any storm drains or watercourses. Apply temporary perimeter controls until structure is stabilized or permanent controls are in place. Examples of temporary perimeter controls can be found in the following BMPs: SS-10, "Earth Dikes/Drainage Swales & Ditches"; SC-1, "Silt Fence"; or SC-5, "Fiber Rolls".
- Collect and remove all broken asphalt and recycle when practical; otherwise, dispose in accordance with Standard Specification 7-1.13.
- Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least 0.3m (1 ft) of material.
- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.

Drainage inlet structures and manholes shall be covered with filter fabric during application of seal coat, tack coat, slurry seal, and/or fog seal.

Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall is predicted to occur during the application or curing period.

Clean asphalt coated equipment off-site whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in BMP WM-5, "Solid Waste Management". Any cleaning on site shall follow BMP NS-8, "Vehicle and Equipment Cleaning".

Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile, or dispose of properly.

Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in BMP WM-08, "Concrete Waste Management", or pump the water to the sanitary sewer if allowed by the local wastewater authority.

Do not allow saw-cut Portland Concrete Cement (PCC) slurry to enter storm drains or watercourses. Residue from grinding operations shall be picked up by means of a vacuum attachment to the grinding machine, shall not be allowed to flow across the pavement, and shall not be left on the surface of the pavement. See also BMP WM-8, "Concrete Waste Management"; and BMP WM-10, "Liquid Waste Management".

Pavement Grinding and Removal

Collect digout material by mechanical or manual methods. This material may be recycled if approved by the RE for use as shoulder backing or base material at locations approved by the RE.

If digout material cannot be recycled, transport the material back to a Maintenance facility or approved storage site.

Digout activities shall not be conducted in the rain.

When approved by the RE, stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses.

Disposal of PCC and AC waste shall be in conformance with Section 15-3.02 of the Standard Specifications. See also BMP WM-8, "Concrete Waste Management".

Thermoplastic Striping

All thermoplastic striper and pre-heater equipment shutoff valves shall be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the storm water drainage system, or watercourses.

The pre-heater shall be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave six inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.

Contractor shall not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.

Clean truck beds daily of loose debris and melted thermoplastic. When possible recycle thermoplastic material. Thermoplastic waste shall be disposed of in accordance with Standard Specification 7-1.13.

Raised/Recessed Pavement Marker Application and Removal

Do not transfer or load bituminous material near drain inlets, the storm water drainage system or watercourses.

Melting tanks shall be loaded with care and not filled to beyond six inches from the top to leave room for splashing when vehicle is deadheaded.

When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.

Paving and Grinding Operations

On large scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Waste shall be disposed of in accordance with Standard Specification 7-1.13.

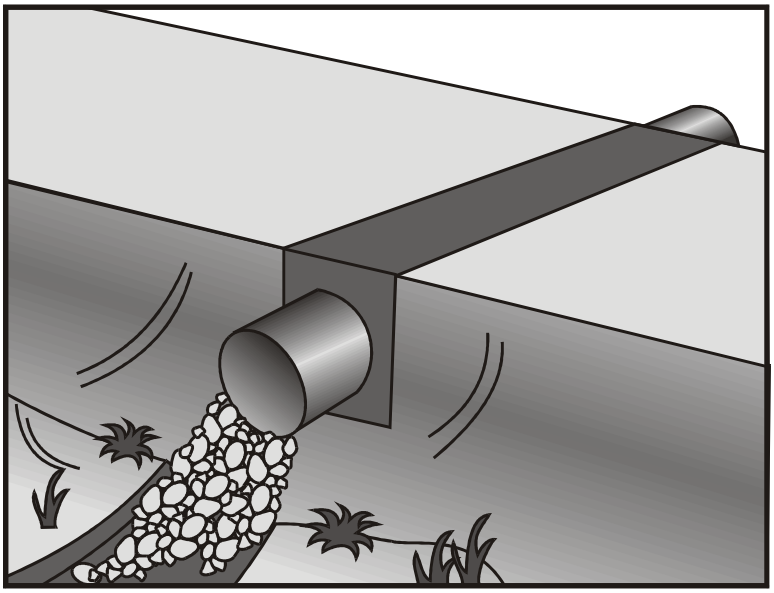
Maintenance and Inspection

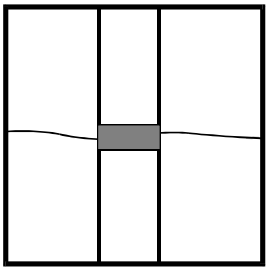
Inspect and maintain machinery regularly to minimize leaks and drips.

Ensure that employees and subcontractors are implementing appropriate measures during paving operations.

Temporary Stream Crossing

NS-4





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

A temporary stream crossing is a structure placed across a waterway which allows vehicles to cross the waterway during construction without entering the water, eliminating erosion and downstream sedimentation caused by the vehicles.

Appropriate Applications

Temporary stream crossings are installed at sites:

Where appropriate permits have been secured (1601 Agreement).

Where construction equipment or vehicles need to frequently cross a waterway.

When alternate access routes impose significant constraints.

When crossing perennial streams or waterways causes significant erosion.

Where construction activities will not last longer than one year.

Limitations

Will usually disturb the waterway during installation and removal.

May require Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Game. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. If monitoring is not addressed in the contract documents, contact the Resident Engineer (RE).

Installation may require dewatering or temporary diversion of the stream. See BMP NS-2, “Dewatering Operations ”.

May become a constriction in the waterway, which can obstruct flood flow and cause flow backups or washouts. If improperly designed, flow backups can increase the pollutant load through washouts and scouring.

Standards and Specifications

General Considerations

Location of the temporary stream crossing shall address:

Site selection where erosion potential is low.

Areas where the side slopes from highway runoff will not spill into the side slopes of the crossing.

The following types of temporary stream crossings shall be considered:

Culverts - Used on perennial and intermittent streams.

Fords - Appropriate during the dry season in arid areas. Used on dry washes and ephemeral streams. Avoid use on perennial streams.

Bridges - Appropriate for streams with high flow velocities, steep gradients and/or where temporary restrictions in the channel are not allowed.

Design and installation requires knowledge of stream flows and soil strength. Designs shall be prepared under direction of, and approved by, a registered civil and/or structural engineer. Both hydraulic and construction loading requirements shall be considered with the following:

Comply with the requirements for culvert and bridge crossings, as contained in the Caltrans Highway Design Manual, particularly if the temporary stream crossing will remain through the rainy season.

Provide stability in the crossing and adjacent areas to withstand the design flow. The design flow and safety factor shall be selected based on careful evaluation of the risks due to over topping, flow backups, or washout.

Install sediment traps immediately downstream of crossings to capture sediments. See BMP SC-3, “Sediment Trap”.

Avoid oil or other potentially hazardous waste materials for surface treatment.

Construction Considerations:

Stabilize construction roadways, adjacent work area and stream bottom against erosion.

Construct during dry periods to minimize stream disturbance and reduce costs.

Construct at or near the natural elevation of the stream bed to prevent potential flooding upstream of the crossing.

Vehicles and equipment shall not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of a water body where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed, except as authorized by the RE, as necessary to complete the work.

Temporary water body crossings and encroachments shall be constructed to minimize scour. Cobbles used for temporary water body crossings or encroachments shall be clean, rounded river cobble.

The exterior of vehicles and equipment that will encroach on the water body within the project shall be maintained free of grease, oil, fuel, and residues.

Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment.

Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.

Any temporary artificial obstruction placed within flowing water shall only be built from material, such as clean gravel or sandbags, that will cause little or no siltation.

Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

Conceptual temporary stream crossings are shown in Figures 1-3.

Specific Considerations:

Temporary Stream Crossing

Culverts are relatively easy to construct and able to support heavy equipment loads.

Fords are the least expensive of the crossings, with maximum load limits.

Temporary fords are not appropriate if construction will continue through rainy season, if thunderstorms are likely, or if the stream is perennial.

Bridges are generally more expensive to design and construct, but provides the least disturbance of the stream bed and constriction of the waterway flows.

Maintenance and Inspection

Maintenance provisions shall include:

Periodic removal of silt behind fords, in culverts, and under bridges.

Replacement of lost aggregate from inlets and outlets of culverts.

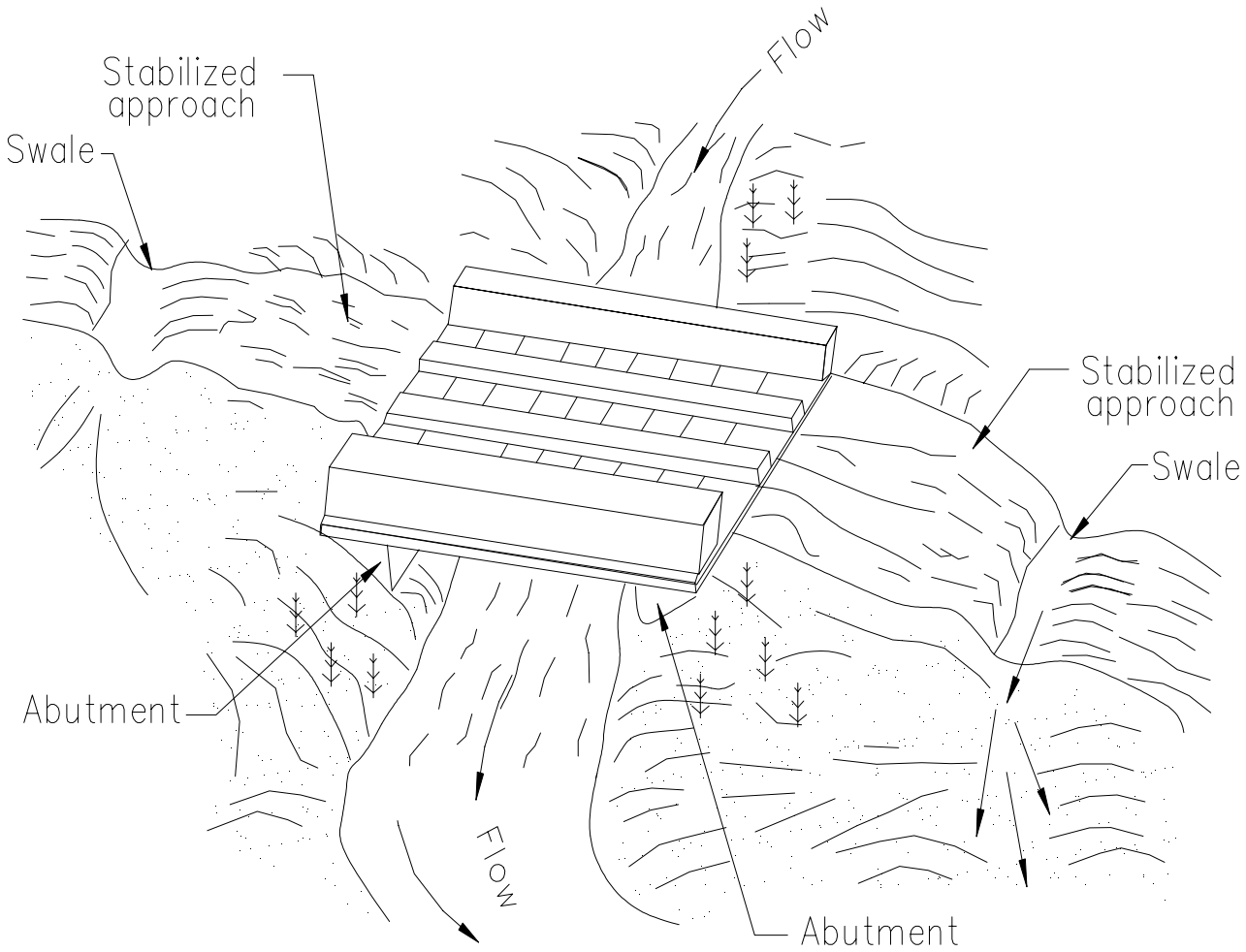
Removal of temporary crossing promptly when it is no longer needed.

Inspection shall, at a minimum, occur weekly and after each significant rainfall, and include:

Checking for blockage in the channel, sediment buildup in culverts or behind fords, or trapped debris.

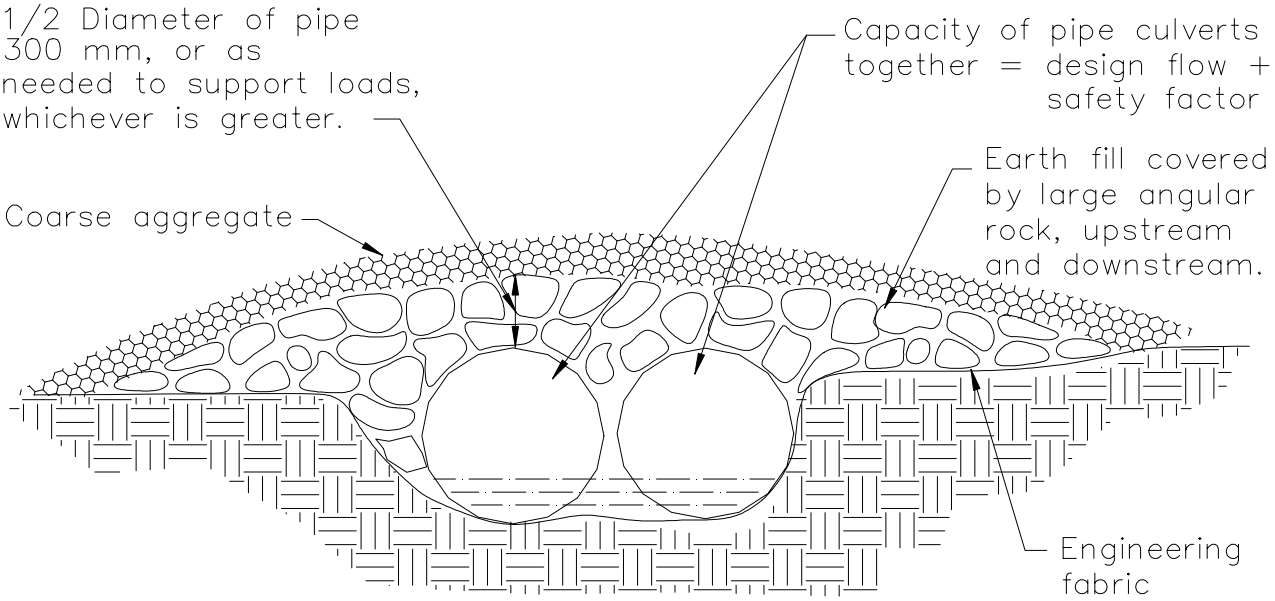
Checking for erosion of abutments, channel scour, riprap displacement, or piping in the soil.

Checking for structural weakening of the temporary crossing, such as cracks, and undermining of foundations and abutments.

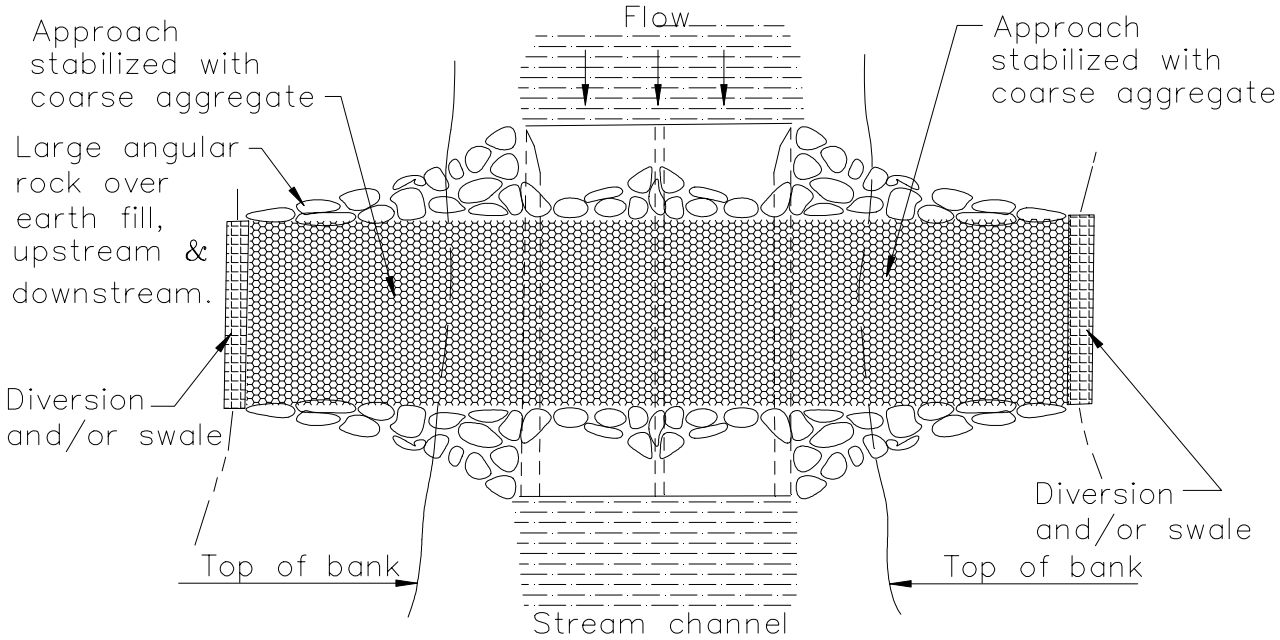


NOTE:
Surface flow of road diverted by swale and/or dike.

TYPICAL BRIDGE CROSSING
NOT TO SCALE



ELEVATION



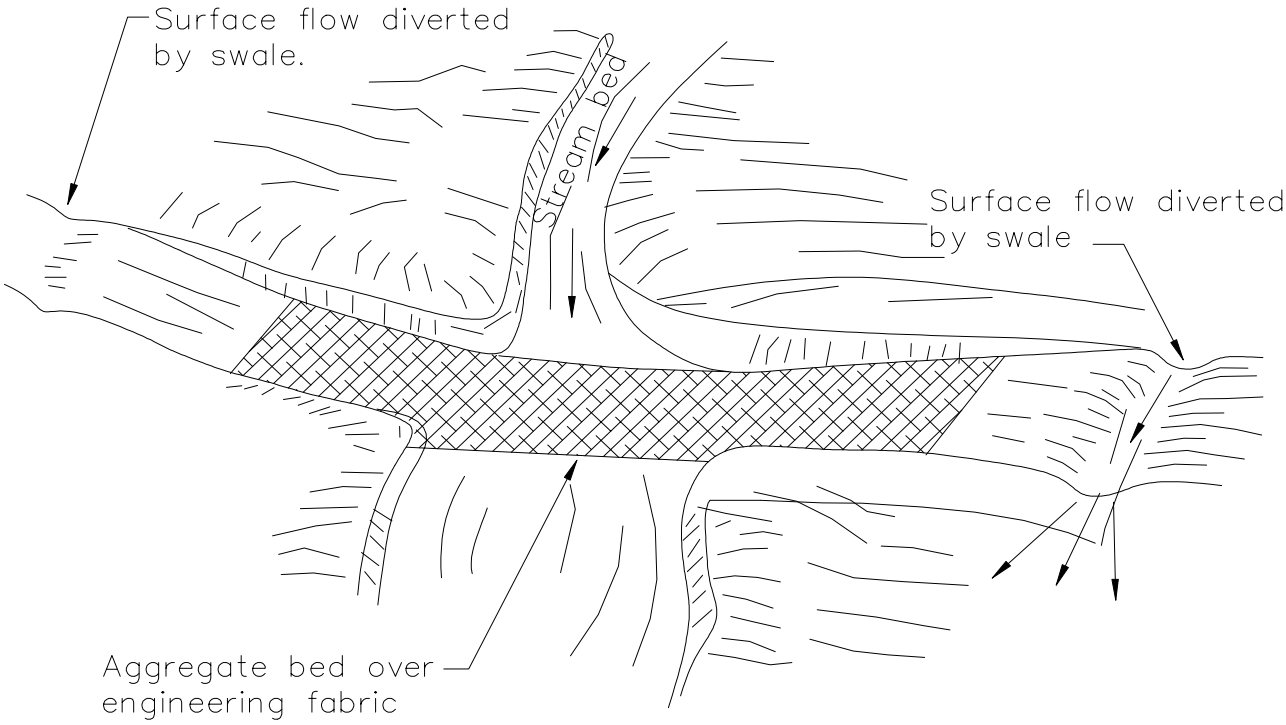
PLAN VIEW

TYPICAL CULVERT CROSSING

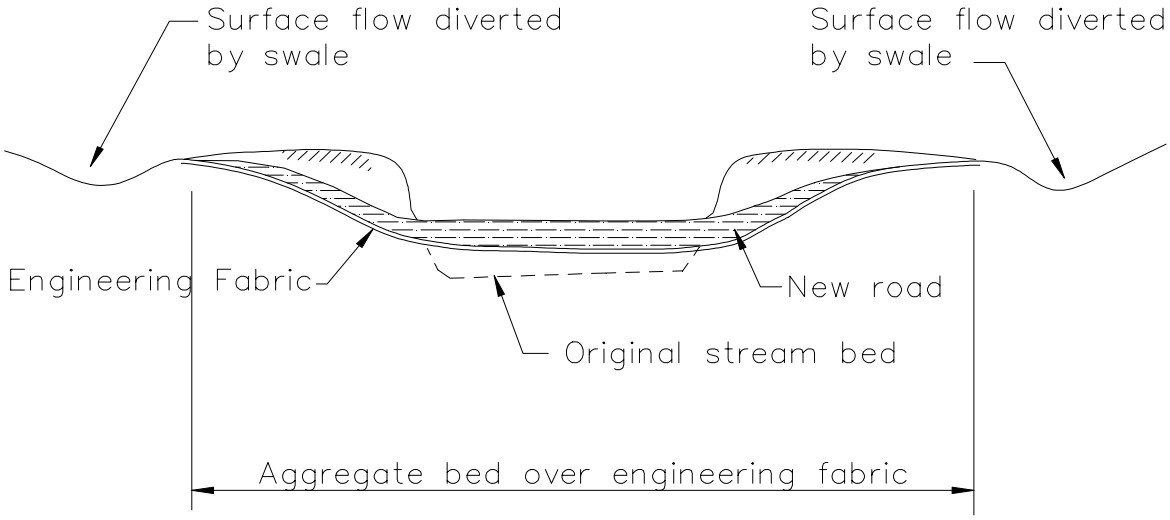
NOT TO SCALE

Temporary Stream Crossing

NS-4



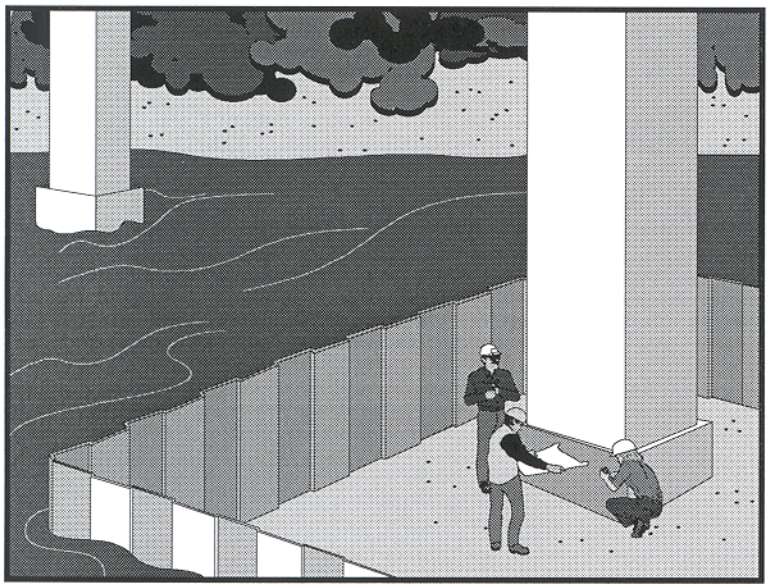
Aggregate approch
1:5 (V:H) Maximum slope on road

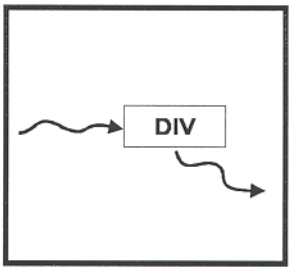


TYPICAL FORD CROSSING
NOT TO SCALE

Clear Water Diversion

NS-5





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Clear water diversion consists of a system of structures and measures that intercept clear surface water runoff upstream of a project site, transport it around the site, and discharge it downstream with minimal water quality degradation for either the project construction operations or the construction of the diversion. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, drainage and interceptor swales.

Appropriate Applications

Implemented where appropriate permits (1601 Agreement) have been secured and work must be performed in a running stream or water body.

Limitations

Diversion/encroachment activities will usually disturb the waterway during installation and removal of diversion structures.

Specific permit requirements or mitigation measures, such as the U.S. Army Corps of Engineers, California Department of Fish and Game, Federal Emergency Management Agency (FEMA), Regional Water Quality Control Board (RWQCB), etc. may be included in contract documents because of clear water diversion/encroachment activities.

Diversion/encroachment activities may constrict the waterway, which can obstruct flood flows and cause flooding or washouts.

Standards and Specifications

General

Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams shall be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams shall be held to a minimum.

Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc.

Heavy equipment driven in wet portions of a water body to accomplish work shall be completely clean of petroleum residue, and water levels are below the gear boxes of the equipment in use, or lubricants and fuels are sealed such that inundation by water shall not result in leaks.

Mechanical equipment operated in the water shall not be submerged to a point above any axle of said mechanical equipment.

Excavation equipment buckets may reach out into the water for the purpose of removing or placing fill materials. Only the bucket of an excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe shall not enter water covered portions of a water body, except as necessary to cross the stream to access the work site.

Stationary equipment such as motors and pumps, located within or adjacent to a water body, shall be positioned over drip pans.

When any artificial obstruction is being constructed, maintained, or placed in operation, sufficient water shall, at all times, be allowed to pass downstream to maintain aquatic life downstream.

The exterior of vehicles and equipment that will encroach on a water body within the project shall be maintained free of grease, oil, fuel, and residues.

Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations. Precautions shall be taken to avoid damage to vegetation by people or equipment.

Riparian vegetation, when removed pursuant to the provisions of the work, shall be cut off no lower than ground level to promote rapid re-growth. Access roads and work areas built over riparian vegetation shall be covered by a sufficient layer of clean river run cobble to prevent damage to the underlying soil and root structure. The cobble shall be removed upon completion of project activities.

Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

Where possible, avoid or minimize diversion/encroachment impacts by scheduling construction during periods of low flow or when the stream is dry. See also the project special provisions for scheduling requirements.

Scheduling shall also consider seasonal releases of water from dams, fish migration and spawning seasons, and water demands due to crop irrigation.

Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil. If sandbags are used, they shall be filled with clean materials free of silt, clay, and organic substances.

Temporary Diversions/Encroachments

Construct diversion channels in accordance with BMP SS-9, "Earth Dikes/Drainage Swales, and Ditches".

In high flow velocity areas, stabilize slopes of embankments and diversion ditches using an appropriate liner, in accordance with BMP SS-7, "Geotextiles, Mats/Plastic Covers and Erosion Control Blankets", or, use rock slope protection, as described in Standard Specifications Section 72-2, "Rock Slope Protection."

Where appropriate, use natural streambed materials such as large cobbles and boulders for temporary embankment/slope protection, or other temporary soil stabilization methods.

Provide for velocity dissipation at transitions in the diversion, such as the point where the stream is diverted to the channel and the point where the diverted stream is returned to its natural channel. See also BMP SS-10, "Outlet Protection/Velocity Dissipation Devices".

Temporary Dry Construction Areas

When dewatering behind temporary structures to create a temporary dry construction area, such as coffer dams, pass pumped water through a sediment settling device, such as a portable tank or settling basin, before returning water to the water body. See also BMP NS-2, "Dewatering Operations".

If the presence of polluted water or sediment is identified in the contract, the contractor shall implement dewatering pollution controls as required by the contract documents. If the quality of water or sediment to be removed while dewatering is not identified as polluted in the contract documents, but is later determined by observation or testing to be polluted, the contractor shall notify the Resident Engineer (RE) and comply with Standard Specifications Section 5-1.116 "Differing Site Conditions."

Any substance used to assemble or maintain diversion structures, such as form oil, shall be non-toxic and non-hazardous.

Clear Water Diversion

Any material used to minimize seepage underneath diversion structures, such as grout, shall be non-toxic, non-hazardous, and as close to a neutral pH as possible.

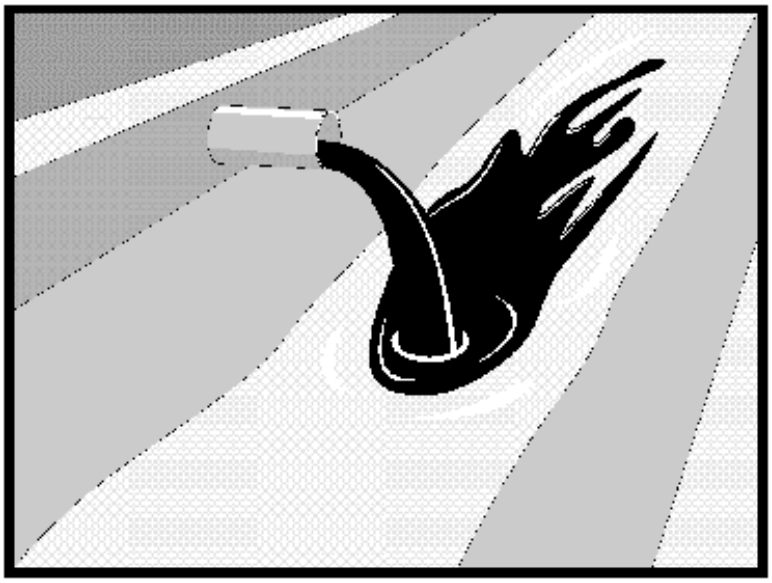
Maintenance and Inspection

Inspect diversion/encroachment structures before and after significant storms, and at least once per week while in service.

Inspect embankments and diversion channels before and after significant storms, and at least once per week while in service for damage to the linings, accumulating debris, sediment buildup, and weakening of the slope protection. Remove debris and repair linings and slope protection as required.

Illicit Connection/Illegal Discharge Detection and Reporting

NS-6



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site and report incidents to the Resident Engineer (RE).

Appropriate Applications

Illicit connection/illegal discharge detection and reporting is applicable anytime an illicit discharge is discovered or illegally dumped material is found on the construction site.

This best management practice (BMP) applies to all construction projects.

Limitations

Unlabeled or non-identifiable material shall be assumed to be hazardous.

Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor.

Procedures and practices presented in this BMP are general. Contractor shall use extreme caution, immediately notify the RE when illicit connections or illegal dumping or discharges are discovered, and take no further action unless directed by the RE.

If pre-existing hazardous materials or wastes are known to exist on site, the contractor's responsibility will be detailed in separate special provisions.

Standards and Specifications

Planning

Inspect site before beginning the job for evidence of illicit connections or illegal dumping or discharges.

Inspect site regularly during project execution for evidence of illicit connections or illegal dumping or discharges.

Observe site perimeter for evidence or potential of illicitly discharged or illegally dumped material which may enter the job site.

Identification of illicit connections and illegal dumping or discharges.

Solids - Look for debris, or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.

Liquids - signs of illegal liquid dumping or discharge can include:

- Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils
- Pungent odors coming from the drainage systems.
- Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.
- Abnormal water flow during the dry weather season.

Urban Areas - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:

- Abnormal water flow during the dry weather season.
- Unusual flows in subdrain systems used for dewatering.
- Pungent odors coming from the drainage systems.
- Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.
- Excessive sediment deposits, particularly adjacent to or near active off-site construction projects.

Rural Areas - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:

- Abnormal water flow during the dry weather season.
- Non-standard junction structures.
- Broken concrete or other disturbances at or near junction structures.

Reporting

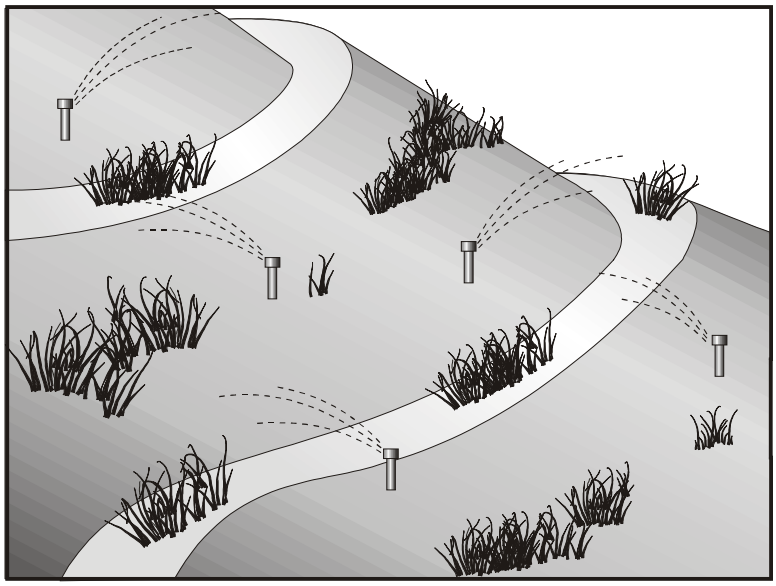
Notify the RE of any illicit connections and illegal dumping or discharge incidents at the time of discovery. The RE will notify the District Storm Water Coordinator for reporting.

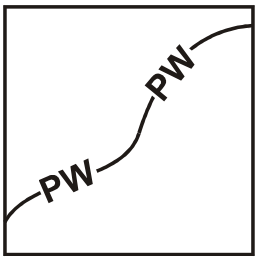
Cleanup and Removal

The contractor is not responsible for investigation and clean up of illicit or illegal dumping or discharges not generated by the contractor. Caltrans may direct contractor to clean up non-hazardous dumped or discharged material on the construction site.

Potable Water/Irrigation

NS-7





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Potable Water/Irrigation consists of practices and procedures to reduce the possibility for the discharge of potential pollutants generated during discharges from irrigation water lines, landscape irrigation, lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

Appropriate Applications

Implement this BMP whenever the above activities or discharges occur at or enter a construction site.

Limitations

None identified.

Standards and Specifications

Where possible, direct water from off-site sources around or through a construction site in a way that minimizes contact with the construction site.

When possible, discharges from water line flushing shall be reused for landscaping purposes.

Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.

Protect downstream storm water drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

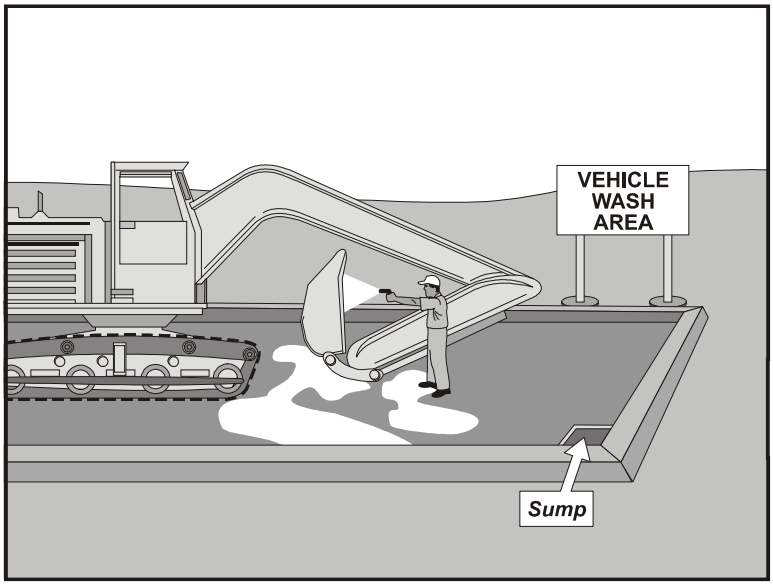
Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, time of year, and type of plant material in determining the proper amounts of water for a specific area.

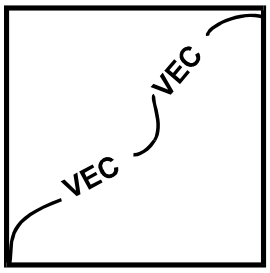
Maintenance and Inspection

Repair broken water lines as soon as possible or as directed by the Resident Engineer (RE).

Vehicle and Equipment Cleaning

NS-8





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices used to minimize or eliminate the discharge of pollutants from vehicle and equipment cleaning operations to storm drain system or to watercourses.

Appropriate Applications

These procedures are applied on all construction sites where vehicle and equipment cleaning is performed.

Limitations

None.

Standards and Specifications

On-site vehicle and equipment washing is discouraged.

Cleaning of vehicles and equipment with soap, solvents or steam shall not occur on the project site unless the Resident Engineer (RE) has been notified in advance and the resulting wastes are fully contained and disposed of outside the highway right-of-way in conformance with the provisions in Section 7-1.13 of the Standard Specifications. Resulting wastes shall not be discharged or buried within the highway right-of-way.

Vehicle and equipment wash water shall be contained for percolation or evaporative drying away from storm drain inlets or watercourses and shall not be discharged within the highway right-of-way.

All vehicles/equipment that regularly enter and leave the construction site must be cleaned off-site.

When vehicle/equipment washing/cleaning must occur on-site, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall have the

following characteristics, and shall be arranged with the construction storm water coordinator:

- Located away from storm drain inlets, drainage facilities, or watercourses
- Paved with concrete or asphalt and bermed to contain wash waters and to prevent run-on and runoff
- Configured with a sump to allow collection and disposal of wash water
- Wash waters shall not be discharged to storm drains or watercourses
- Used only when necessary

When cleaning vehicles/equipment with water:

- Use as little water as possible. High pressure sprayers may use less water than a hose, and shall be considered.
- Use positive shutoff valve to minimize water usage.

Maintenance and Inspection

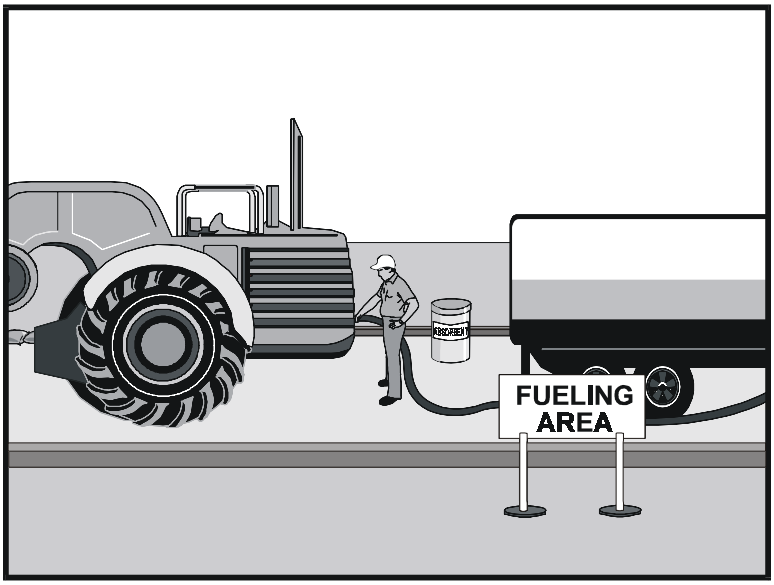
The control measure shall be inspected at a minimum of once a week.

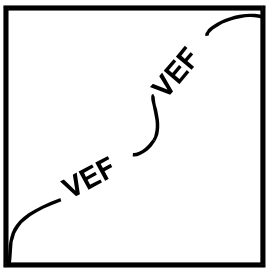
Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

Inspect sump regularly and remove liquids and sediment as needed or as directed by the RE.

Vehicle and Equipment Fueling

NS-9





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of fuel spills and leaks into the storm drain system or to watercourses.

Appropriate Applications

These procedures are applied on all construction sites where vehicle and equipment fueling takes place.

Limitations

On-site vehicle and equipment fueling shall only be used where it's impractical to send vehicles and equipment off-site for fueling.

Standards and Specifications

When fueling must occur on-site, the contractor shall select and designate an area to be used, subject to approval of the Resident Engineer (RE).

Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.

Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.

Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.

Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.

Vehicle and Equipment Fueling

Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.

Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD).

Fuel tanks shall not be "topped-off."

Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.

Absorbent materials shall be used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.

Federal, state, and local requirements shall be observed for any stationary above ground storage tanks.

Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.

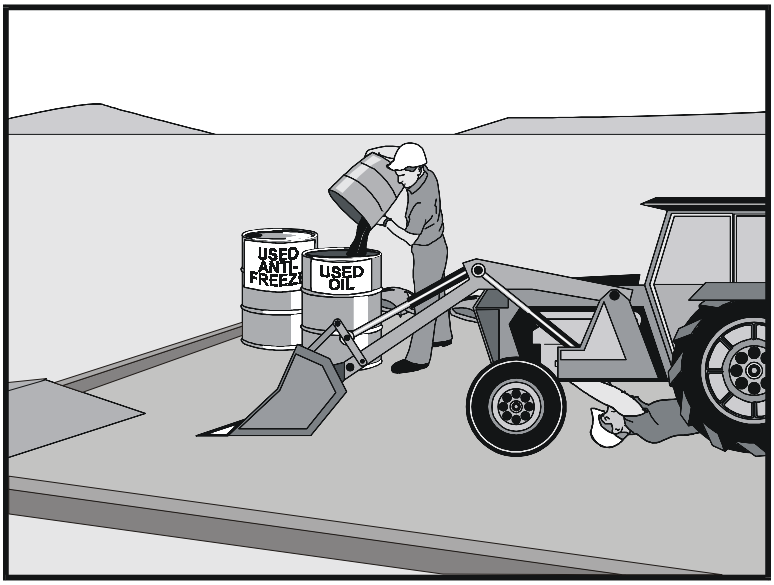
Maintenance and Inspection

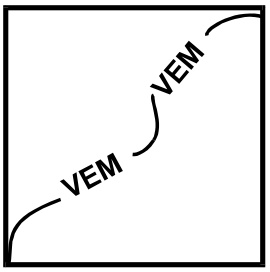
Fueling areas and storage tanks shall be inspected on a regular basis.

Keep an ample supply of spill cleanup material on the site.

Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

Vehicle and Equipment Maintenance NS-10





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of pollutants to the storm drain system or to watercourses from vehicle and equipment maintenance procedures.

Appropriate Applications

These procedures are applied on all construction projects where an on-site yard area is necessary for storage and maintenance of heavy equipment and vehicles.

Limitations

None identified.

Standards and Specifications

Drip pans or absorbent pads shall be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.

All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.

Dedicated maintenance areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m from downstream drainage facilities and watercourses.

Drip Pans or plastic sheeting shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.

Absorbent spill clean-up materials shall be available in maintenance areas and shall be disposed of properly after use.Substances used to coat asphalt transport trucks and asphalt spreading equipment shall be non-toxic. Drainage inlet structures and manholes shall be covered with filter fabric

when seal coat, tack coat , slurry seal, or fog seal is applied to adjacent surfaces. Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rainfall or thunderstorms are predicted to occur during the application or curing period.

Use off-site maintenance facilities whenever practical.

For long-term projects, consider using portable tents or covers over maintenance areas.

Properly dispose of used oils, fluids, lubricants and spill cleanup materials.

Do not dump fuels and lubricants onto the ground.

Do not place used oil in a dumpster or pour into a storm drain or watercourse.

Properly dispose of or recycle used batteries.

Do not bury used tires.

Repair leaks of fluids and oil immediately.

Provide spill containment dikes or secondary containment around stored oil and chemical drums.

Maintenance and Inspection

Maintain waste fluid containers in leak proof condition.

Vehicle and equipment maintenance areas shall be inspected regularly.

Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately or the problem vehicle(s) or equipment shall be removed from the project site.

Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

Section 8
Waste Management and Materials Pollution Control Best Management Practices

8.1 Definitions

Waste management and materials pollution control best management practices (BMPs), like non-storm water management BMPs, are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with storm water. These BMPs also involve day-to-day operations of the construction site and are under the control of the Contractor, and are additional "good housekeeping practices", which involve keeping a clean, orderly construction site.

8.1.1 Waste Management BMPs

Waste management consists of implementing procedural and structural BMPs for handling, storing, and disposing of wastes generated by a construction project to prevent the release of waste materials into storm water discharges. Waste management includes the following BMPs:

- Spill Prevention and Control
- Solid Waste Management
- Hazardous Waste Management
- Contaminated Soil Management
- Concrete Waste Management
- Sanitary/Septic Waste Management
- Liquid Waste Management

8.1.2 Materials Pollution Control BMPs

Materials pollution control (also called materials handling) consists of implementing procedural and structural BMPs for handling, storing, and using construction materials to prevent the release of those materials into storm water discharges. The objective is to reduce the opportunity for rainfall to come in contact with these materials. These controls shall be implemented for all applicable activities, material usage and site conditions. Materials handling practices include the following BMPs:

- Material Delivery, and Storage
- Material Use
- Stockpile Management

Table 8-1 lists the waste management and materials pollution control BMPs. It is important to note that all these BMPs have been approved by Caltrans for statewide use and they shall be implemented depending on the conditions/applicability of deployment described as part of the BMP.

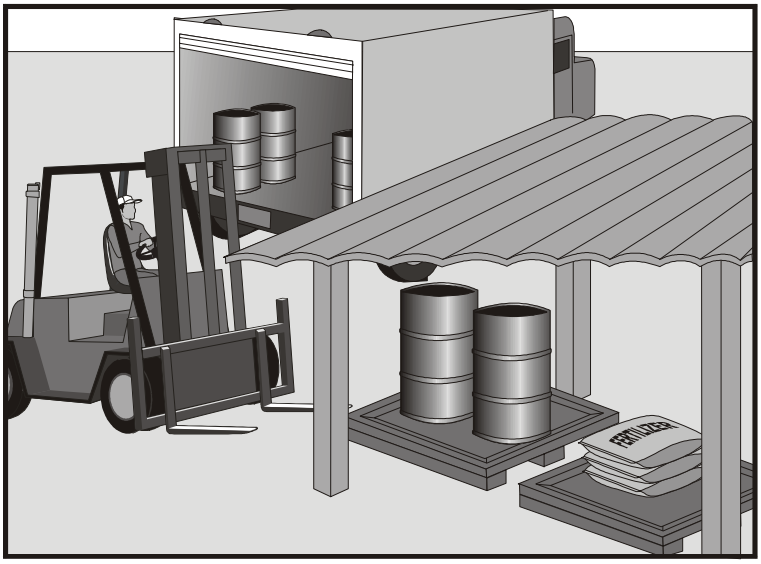
Table 8-1

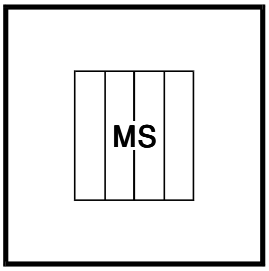
WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL BMPs	
ID	**BMP NAME**
WM-1	Material Delivery and Storage
WM-2	Material Use
WM-3	Stockpile Management
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Waste Management
WM-7	Contaminated Soil Management
WM-8	Concrete Waste Management
WM-9	Sanitary/Septic Waste Management
WM-10	Liquid Waste Management

The remainder of this Section shows the working details for each of the waste management and materials pollution control BMPs.

Material Delivery and Storage

WM-1





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices for the proper handling and storage of materials in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

Appropriate Applications

These procedures are implemented at all construction sites with delivery and storage of the following:

Soil

Pesticides and herbicides

Fertilizers

Detergents

Plaster

Petroleum products such as fuel, oil, and grease

Asphalt and concrete components

Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds

Concrete compounds

Other materials that may be detrimental if released to the environment

Limitations

Space limitation may preclude indoor storage.

Storage sheds must meet building & fire code requirements.

Standards and Specifications

General

Train employees and subcontractors on the proper material delivery and storage practices.

Temporary storage area shall be located away from vehicular traffic.

Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials stored.

Material Storage Areas and Practices

Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be handled in conformance with the following provisions:

Storage, preparation, and mixing shall be accomplished in temporary containment facilities. Each temporary containment facility shall provide a spill containment volume equal to 1.5 times the volume of all containers therein and shall be impervious to the materials contained therein for a minimum contact time of 72 hours.

Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.

Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.

To provide protection from wind and rain, throughout the rainy season, temporary containment facilities shall be covered during non-working days and prior to rain events.

Temporary containment facilities shall be maintained free of accumulated rainwater and spills.

Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.

Liquid materials, petroleum products, and substances listed in 40 CFR Parts 110, 117 or 302 shall be stored in approved containers and drums shall not be overfilled. Containers shall be placed in temporary containment facilities for storage.

Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain, throughout the rainy season, bagged and boxed materials shall be covered during non-working days and prior to rain events.

Material Delivery and Storage

Stockpiles shall be protected in accordance with BMP WM-3, "Stockpile Management".

Minimize the material inventory stored on-site (e.g., only a few days supply).

Store materials indoors within existing structures or sheds when available.

Have proper storage instructions posted at all times in an open and conspicuous location.

Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and when possible, under cover in secondary containment.

Keep hazardous chemicals well labeled and in their original containers.

Keep ample supply of appropriate spill clean up material near storage areas.

Also see BMP WM-6, "Hazardous Waste Management", for storing of hazardous materials.

Material Delivery Practices

Keep an accurate, up-to-date inventory of material delivered and stored on-site.

Employees trained in emergency spill clean-up procedures shall be present when dangerous materials or liquid chemicals are unloaded.

Spill Clean-up

Contain and clean up any spill immediately.

If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.

See BMP WM-4, "Spill Prevention and Control", for spills of chemicals and/or hazardous materials.

Maintenance and Inspection

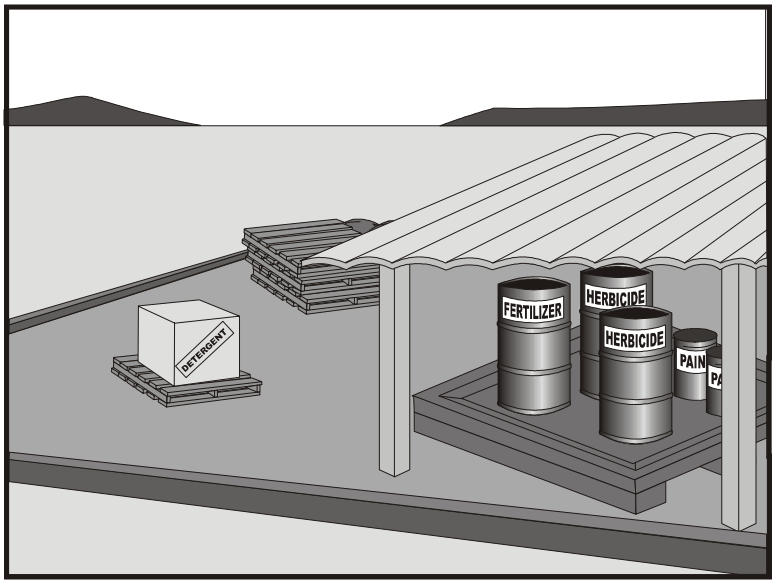
Storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.

Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

Inspect storage areas before and after rainfall events, and at least weekly during other times.

Material Use

WM-2



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BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices for use of construction material in a manner that minimizes or eliminates the discharge of these materials to the storm drain system or to watercourses.

Appropriate Applications

This BMP applies to all construction projects. These procedures apply when the following materials are used or prepared on site:

Pesticides and herbicides

Fertilizers

Detergents

Plaster

Petroleum products such as fuel, oil, and grease

Asphalt and other concrete components

Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds

Concrete compounds

Other materials that may be detrimental if released to the environment

Limitations

Safer alternative building and construction products may not be available or suitable in every instance.

Standards and Specifications

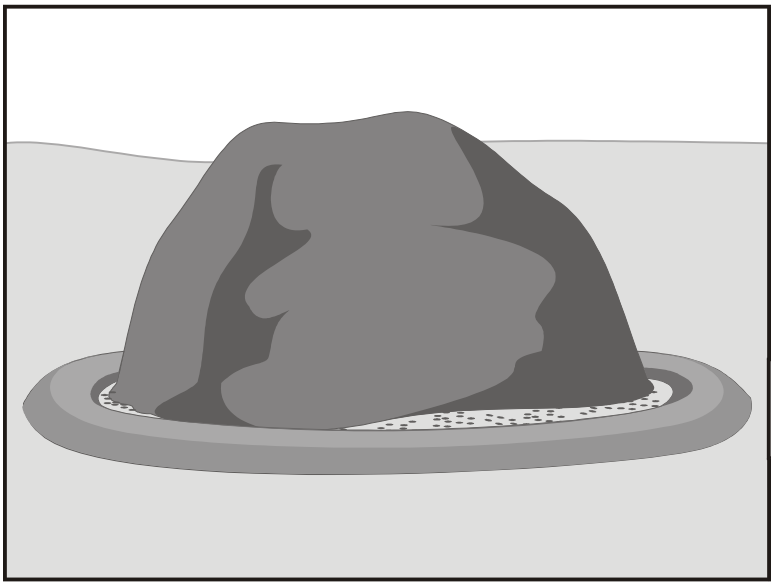
- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, may be disposed of with other construction debris.
- Do not remove the original product label, it contains important safety and disposal information. Use the entire product before disposing of the container.
- Mix paint indoors, or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain or watercourse. Dispose of any paint thinners, residue and sludge(s), that cannot be recycled, as hazardous waste.
- For water-based paint, clean brushes to the extent practical, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practical and filter and reuse thinners and solvents.
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials.
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials on-site when practical.
- Do not over-apply fertilizers and pesticides. Prepare only the amount needed. Strictly follow the recommended usage instructions. Apply surface dressings in smaller applications, as opposed to large applications, to allow time for it to work in and to avoid excess materials being carried off-site by runoff.
- Application of herbicides and pesticides shall be performed by a licensed applicator.
- Contractors are required to complete the “Report of Chemical Spray Forms” when spraying herbicides and pesticides.
- Keep an ample supply of spill clean up material near use areas. Train employees in spill clean up procedures.
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

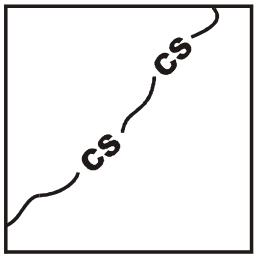
Maintenance and Inspections

- Spot check employees and subcontractors monthly throughout the job to ensure appropriate practices are being employed.

Stockpile Management

WM-3





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices to reduce or eliminate pollution of storm water from stockpiles of soil, and paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate subbase or pre-mixed aggregate and asphalt minder (so called "cold mix" asphalt).

Appropriate Applications

Implemented in all projects that stockpile soil and paving materials.

Limitations

None identified

Standards and Specifications

Protection of stockpiles is a year-round requirement.

Locate stockpiles away from concentrated flows of storm water, drainage courses, and inlets.

Protect all stockpiles from storm water run-on using a temporary perimeter sediment barrier such as berms, dikes, silt fences or sandbag barriers.

Implement wind erosion control practices as appropriate on all stockpiled material. For specific information see BMP WE-1, "Wind Erosion Control."

Stockpiles of contaminated soil shall be managed in accordance with BMP WM-7 "Contaminated Soil Management".

Bagged materials should be placed on pallets and under cover.

Protection of Non-Active Stockpiles

Non-active stockpiles of the identified materials shall be protected further as follows:

Soil stockpiles:

- During the rainy season, soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate subbase:

- During the rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "cold mix":

- During the rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles

Active stockpiles of the identified materials shall be protected further as follows:

All stockpiles shall be protected with a temporary linear sediment barrier prior to the onset of precipitation.

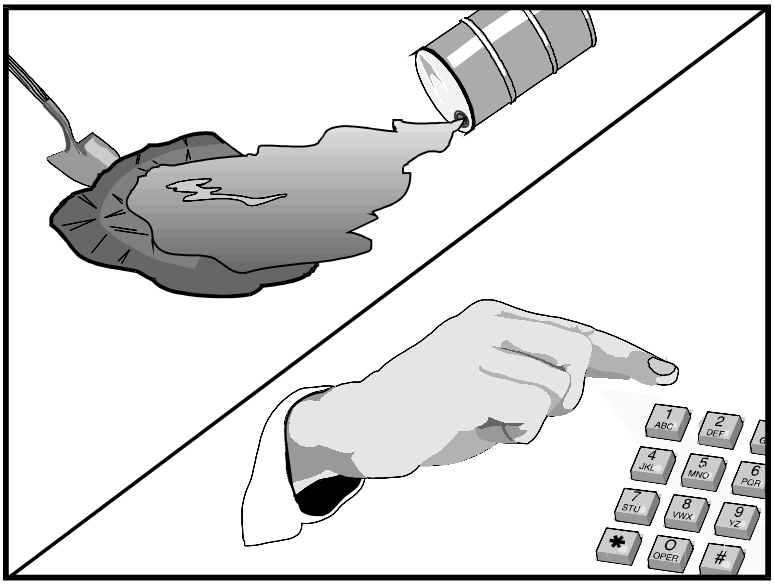
Stockpiles of "cold mix" shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Maintenance and Inspections

Repair and/or replace perimeter controls and covers as needed, or as directed by the RE, to keep them functioning properly.

Spill Prevention and Control

WM-4



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses.

Appropriate Application

This best management practice (BMP) applies to all construction projects. Spill control procedures are implemented anytime chemicals and/or hazardous substances are stored. Substances may include, but are not limited to:

Soil stabilizers/binders

Dust Palliatives

Herbicides

Growth inhibitors

Fertilizers

Deicing/anti-icing chemicals

Fuels

Lubricants

Other petroleum distillates

To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately.

Limitations

- This BMP only applies to spills caused by the contractor.
- Procedures and practices presented in this BMP are general. Contractor shall identify appropriate practices for the specific materials used or stored on-site.

Standards and Specifications

- To the extent that it doesn't compromise clean up activities, spills shall be covered and protected from storm water run-on during rainfall.
- Spills shall not be buried or washed with water.
- Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose shall be stored and disposed of in conformance with the provisions in these special provisions.
- Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses and shall be collected and disposed of in accordance with BMP WM-10, "Liquid Waste Management".
- Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or watercourses.
- Proper storage, clean-up and spill reporting instruction for hazardous materials stored or used on the project site shall be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas shall be kept clean, well organized and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed to maintain proper function.

Education

- Educate employees and subcontractors on what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Spill Prevention and Control

The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper spill prevention and control measures.

Clean up and Storage Procedures

Minor Spills

- Minor spills typically involve small quantities of oil, gasoline, paint, etc. which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Remove the absorbent materials promptly and dispose of properly.
- The practice commonly followed for a minor spill is:
  1. Contain the spread of the spill.
  2. Recover spilled materials.
  3. Clean the contaminated area and/or properly dispose of contaminated materials.

Semi-Significant Spills

- Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.
- Clean up spills immediately:
  1. Notify the project foreman immediately. The foreman shall notify the Resident Engineer (RE).
  2. Contain spread of the spill.
  3. If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
  4. If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
  5. If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Spill Prevention and Control

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:

  1. Notify the RE immediately and follow up with a written report.
  2. Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
  3. Notify the Governor's Office of Emergency Services Warning Center, (805) 852-7550.
  4. For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor shall notify the National Response Center at (800) 424-8802.
  5. Notification shall first be made by telephone and followed up with a written report.
  6. The services of a spills contractor or a Haz-Mat team shall be obtained immediately. Construction personnel shall not attempt to clean up until the appropriate and qualified staff have arrived at the job site.
  7. Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, etc.

Maintenance and Inspection

Verify weekly that spill control clean up materials are located near material storage, unloading, and use areas.

Update spill prevention and control plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals on site.

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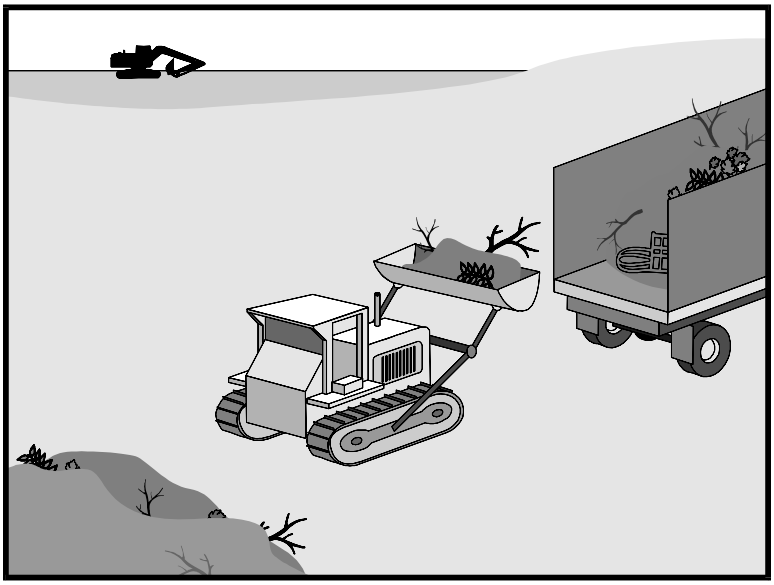
Solid Waste Management

WM-5



SWM

BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling, and removal of construction site wastes.

Appropriate Applications

Solid waste management practices are implemented on all construction projects that generate solid wastes.

Solid wastes include but are not limited to:

Construction wastes including brick, mortar, timber, steel and metal scraps, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials.

Highway planting wastes, including vegetative material, plant containers, and packaging materials.

Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers, and smoking materials, including litter generated by the public.

Limitations

Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Standards and Specifications

Education

The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper solid waste procedures and practices.

Solid Waste Management

- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Wherever possible, minimize production of solid waste materials.

Collection, Storage, and Disposal

- Littering on the project site shall be prohibited.
- To prevent clogging of the storm drainage system litter and debris removal from drainage grates, trash racks, and ditch lines shall be a priority.
- Trash receptacles shall be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site shall be collected and placed in water tight dumpsters at least weekly regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to drain inlets, storm water drainage systems or watercourses.
- Dumpsters of sufficient size and number shall be provided to contain the solid waste generated by the project.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of outside the highway right of way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.
- Litter stored in collection areas and containers shall be handled and disposed of by trash hauling contractors.
- Materials that are disposed of or temporarily stockpiled outside the highway right-of-way but are visible from the Highway, shall be in a neat and orderly fashion to the satisfaction of the Resident Engineer (RE).
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or

through the use of measures to elevate waste form site surfaces.

Solid waste storage areas shall be located at least 15m from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.

Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be protected from wind and rain by securely covering the waste with tarps or plastic sheeting or protected in conformance with the applicable Disturbed Soil Area protection.

Dumpster washout on the project site is not allowed.

Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site.

Plan for additional containers during the demolition phase of construction.

Plan for more frequent pickup during the demolition phase of construction.

Designate on-site waste storage areas and obtain approval of the RE.

Segregate potentially hazardous waste from non-hazardous construction site waste.

Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

Dispose of non-hazardous waste in accordance with Standard Specification 7-1.13, Disposal of Material Outside the Highway right-of-way.

For disposal of hazardous waste, see BMP WM-6, “Hazardous Waste Management”. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

Salvage or recycle useful vegetation debris, packaging and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

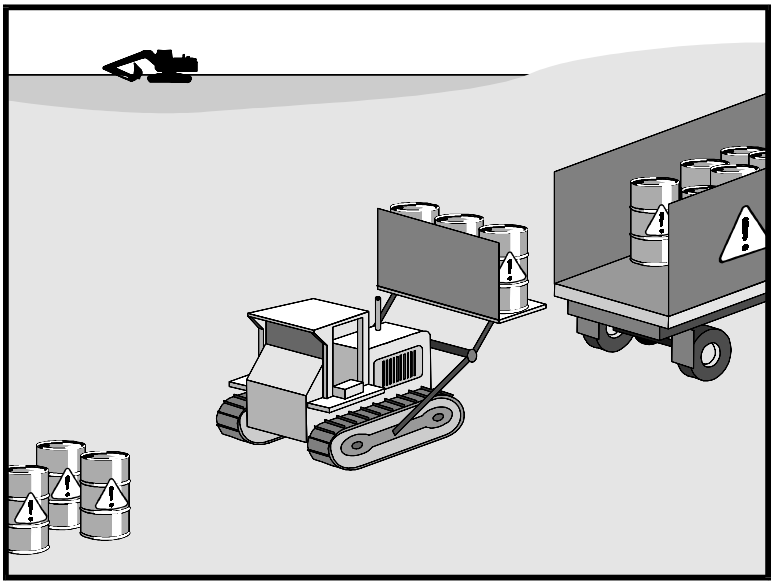
Maintenance and Inspection

The WPCM shall monitor on-site solid waste storage and disposal procedures.

Police site for litter and debris.

Hazardous Waste Management

WM-6



BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharge of pollutants from construction site hazardous waste to the storm drain system or to watercourses.

Appropriate Applications

This best management practice (BMP) applies to all construction projects.

Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum Products,
- Concrete Curing Compounds,
- Palliatives,
- Septic Wastes,
- Stains,
- Wood Preservatives,
- Asphalt Products,
- Pesticides,
- Acids,
- Paints,
- Solvents,
- Roofing Tar, or
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302.

Limitations

Nothing in this BMP relieves the Contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.

This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to BMP WM-7, Contaminated Soil Management, and the project Special Provisions.

Standards and Specifications

Education

Educate employees and subcontractors on hazardous waste storage and disposal procedures.

Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.

Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.

Instruct employees and subcontractors in identification of hazardous and solid waste.

Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).

The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper hazardous waste management procedures and practices.

Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

Storage Procedures

Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172,173, 178, and 179.

All hazardous waste shall be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.

Waste containers shall be stored in temporary containment facilities that shall comply with the following requirements:

- Temporary containment facility shall provide a spill containment volume equal to 1.5 times the volume of all containers.
- Temporary containment facility shall be impervious to the materials contained for a minimum contact time of 72 hours.
- Temporary containment facilities shall be maintained free of accumulated rainwater and spills.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.

- Throughout the rainy season, temporary containment facilities shall be covered during non-working days, prior to rain events.

Drums shall not be overfilled and wastes shall not be mixed.

Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, watercourses or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.

Ensure that adequate hazardous waste storage volume is available.

Ensure that hazardous waste collection containers are conveniently located.

Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

Minimize production or generation of hazardous materials and hazardous waste on the job site.

Use containment berms in fueling and maintenance areas and where the potential for spills is high.

Segregate potentially hazardous waste from non-hazardous construction site debris.

Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.

Place hazardous waste containers in secondary containment.

Do not allow potentially hazardous waste materials to accumulate on the ground.

Unless watertight, containers of dry waste shall be stored on pallets.

Do not mix wastes.

Disposal Procedures

Waste shall be disposed of outside the highway right-of-way within 90 days of being generated, or as directed by the Resident Engineer (RE).

To minimize on-site storage, full containers of waste shall be disposed of outside the highway right-of-way at least weekly. In no case shall hazardous waste storage exceed requirements in Title 22 CCR, section 66262.34.

Waste shall be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Waste Manifest forms. In no case shall hazardous waste storage exceed requirements in Title 22 CCR, section 66262.34.

A Caltrans certified laboratory shall sample waste to determine the appropriate disposal facility.

Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for solid waste construction debris.

Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.

Recycle any useful material such as used oil or water-based paint when practical.

Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Maintenance and Inspection

The WPCM shall monitor on-site hazardous waste storage and disposal procedures.

Waste storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.

Storage areas shall be inspected in conformance with the provisions in the contract documents.

Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

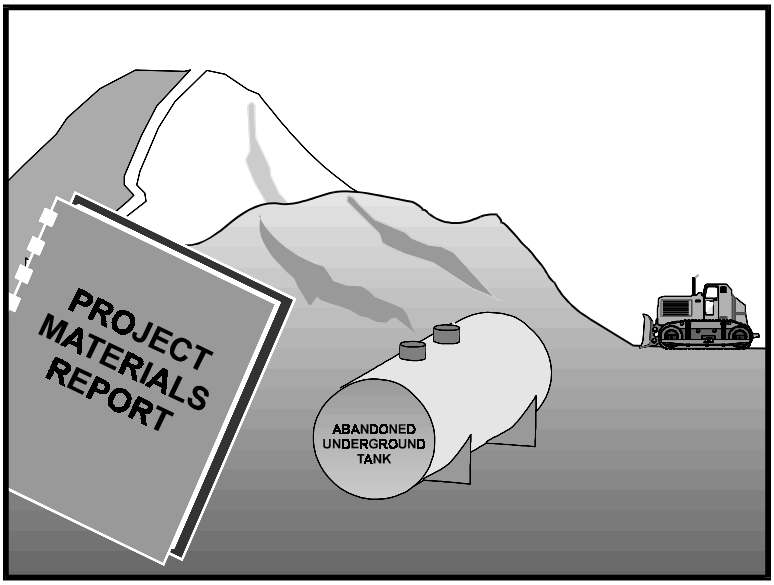
Hazardous spills shall be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

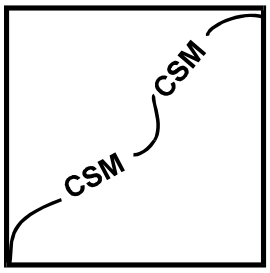
The National Response Center, at (800) 424-8802, shall be notified of spills of Federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.

Copy of Bill of Laden and disposal receipts shall be provided to the RE.

Contaminated Soil Management

WM-7





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharges of pollutants to the drainage system or to watercourses from contaminated soil.

Appropriate Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, and leaks from underground storage tanks.

It may also apply to highway widening projects in older areas where median and shoulder soils may have been contaminated by aerially deposited lead (ADL).

Limitations

The procedures and practices presented in this best management practice (BMP) are general. The contractor shall identify appropriate practices and procedures for the specific contaminants known to exist or discovered on site.

Standards and Specifications

Identifying Contaminated Areas

Contaminated soils are often identified during project planning and development with known locations identified in the plans and specifications. The contractor shall review applicable reports and investigate appropriate call-outs in the plans and specifications.

The contractor may further identify contaminated soils by investigating:

- Past site uses and activities.
- Detected or undetected spills and leaks.

- Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris. Test suspected soils at a certified laboratory.

Education

Prior to performing any excavation work at the locations containing material classified as hazardous, employees and subcontractors shall complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified.

Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling and disposal procedures.

Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.

Excavation, transportation, and placement operations shall result in no visible dust.

Use caution to prevent spillage of lead containing material during transport.

Monitor the air quality during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

Test suspected soils at a Caltrans approved certified laboratory.

If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.

Avoid temporary stockpiling of contaminated soils or hazardous material.

If temporary stockpiling is necessary:

(1) Cover the stockpile with plastic sheeting or tarps.

(2) Install a berm around the stockpile to prevent runoff from leaving the area.

(3) Do not stockpile in or near storm drains or watercourses.

Contaminated material and hazardous material on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone.

Monitor the air quality continuously during excavation operations at all locations containing hazardous material.

Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.

Collect water from decontamination procedures and treat and/or dispose of it at an appropriate disposal site.

Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.

Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.

Excavation, transport, and disposal of contaminated material and hazardous material shall be in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):

- United States Department of Transportation (USDOT);
- United States Environmental Protection Agency (USEPA);
- California Environmental Protection Agency (CAL-EPA);
- California Division of Occupation Safety and Health Administration (CAL-OSHA); and
- Local regulatory agencies.

Procedures for Underground Storage Tank Removals

Prior to commencing tank removal operations, obtain the required underground storage tank removal permits and approval from the federal, state, and local agencies which have jurisdiction over such work.

Arrange to have tested, as directed by the Resident Engineer (RE), any liquid or sludge found in the underground tank prior to its removal to determine if it contains hazardous substances.

Contaminated Soil Management

Following the tank removal, take soil samples beneath the excavated tank and perform analysis as required by the local agency representative(s).

The underground storage tank, any liquid and/or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal shall be transported to disposal facilities permitted to accept such waste.

Water Control

Take all necessary precautions and preventive measures to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank excavations. Such preventative measures may consist of, but are not limited to: berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.

If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, shall be discharged to clean, closed top, watertight holding tanks, treated, and disposed of in accordance with federal, state, and local laws.

Maintenance and Inspection

The Contractor's Water Pollution Control Manager and/or construction supervisor shall monitor on-site contaminated soil storage and disposal procedures.

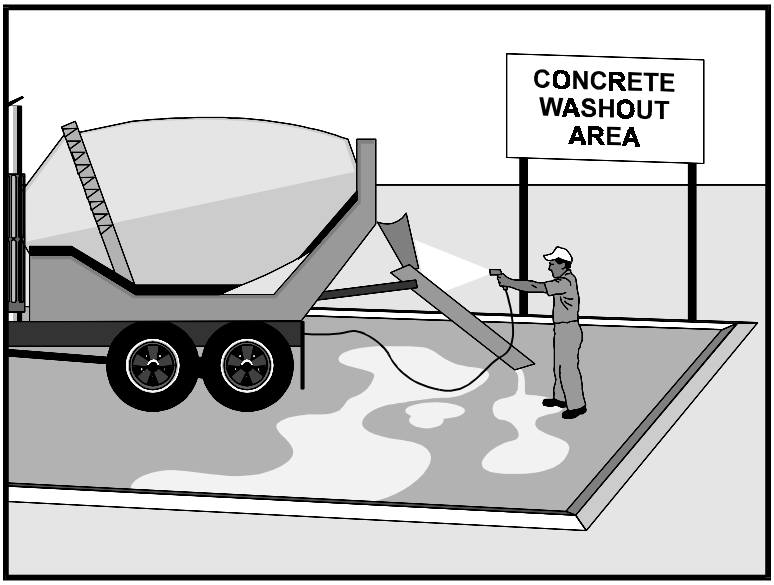
Monitor air quality continuously during excavation operations at all locations containing hazardous material.

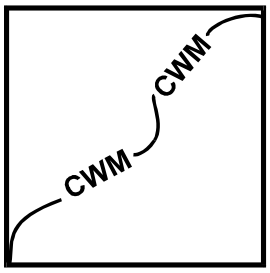
Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal, state, and local agencies.

Inspect hazardous waste receptacles and areas regularly.

Concrete Waste Management

WM-8





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

These are procedures and practices that are implemented to minimize or eliminate the discharge of concrete waste materials to the storm drain system or to watercourses.

Appropriate Applications

Concrete waste management practices are implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result form demolition activities.

Where slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition.

Where concrete trucks and other concrete-coated equipment are washed on site, when approved by the Resident Engineer (RE). See also NS-8, Vehicle and Equipment Cleaning.

Where mortar-mixing stations exist.

Limitations

None identified.

Standards and Specifications

Education

Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.

The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

PCC and AC waste shall not be allowed to enter storm drains or watercourses.

PCC and AC waste shall be collected and disposed of outside the highway right-of-way in conformance with section 7-1.13 of Standard Specifications or placed in a temporary concrete washout facility.

Disposal of hardened PCC and AC waste shall be in conformance with Section 15-3.02 of the Standard Specifications.

A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.

Do not allow slurry residue from wet coring or saw-cutting AC or PCC to enter storm drains or receiving waters by:

- Placing temporary berms or sandbags around coring or saw-cutting locations to capture and contain slurry runoff.
- Placing straw bales, sandbags, or gravel dams around inlets to prevent slurry from entering storm drains.

Vacuum slurry residue and dispose in a temporary pit (as described in *On-Site Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures*, below) and allow slurry to dry. Dispose of dry slurry residue in accordance with BMP WM-5, “Solid Waste Management”, or, for on-site disposal, in accordance with Standard Specification 15-3.02, Removal Methods.

Collect residue from grooving and grinding operations in accordance with Standard Specifications Section 42-1.02 and 42-2.02, "Construction."

On-site Temporary Concrete Washout Facility, Transit Truck Washout Procedures

Temporary concrete washout facilities shall be located a minimum of 15 m (50 ft) from storm drain inlets, open drainage facilities, and watercourses, unless determined unfeasible by the RE. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.

A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. The sign shall be

installed as shown on the plans and in conformance with the provisions in Section 56-2, "Roadside Signs", of the Standard Specifications.

Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

Perform washout of concrete trucks in designated areas only.

Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of per BMP WM-5, "Solid Waste Management", and in conformance with the provisions in Section 15-3.02, "Removal Methods", of the Standard Specifications. Dispose of hardened concrete on a regular basis.

Temporary Concrete Washout Facility (Type Above Grade)

- Temporary concrete washout facility (type above grade) shall be constructed as shown on the plans, with a recommended minimum length and minimum width of 3m, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the RE.

- Straw bales, wood stakes, and sandbag materials shall conform to the provisions in BMP SC-9, "Straw Bale Barrier".

- Plastic lining material shall be a minimum of 60 mil polyethylene sheeting and shall be freeof holes, tears or other defects that compromise the impermeability of the material.

- Portable delineators shall conform to the provisions in Section 12-3.04, "Portable Delineators", of the Standard Specifications. The delineator bases shall be cemented to the pavement in the same manner as provided for cementing pavement markers to pavement in Section 85-1.06, "Placement", of the Standard Specifications. Portable delineators shall be applied only to a clean, dry surface.

Temporary Concrete Washout Facility (Type Below Grade)

- Temporary concrete washout facility (type below grade) shall be constructed as shown on the plans, with a recommended minimum

length and minimum width of 3m (10 ft). The quantity and volume shall be sufficient to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the RE. Lath and flagging shall be commercial type.

Removal of Temporary Concrete Washout Facilities

When temporary concrete washout facilities are no longer required for the work, as determined by the RE, the hardened concrete shall be removed and disposed of in conformance with the provisions in Section 15-3.02 of the Standard Specifications. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the highway right-of-way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Section 15-1.02, "Preservation of Property," of the Standard Specifications.

Maintenance and Inspection

The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site concrete waste storage and disposal procedures at least weekly.

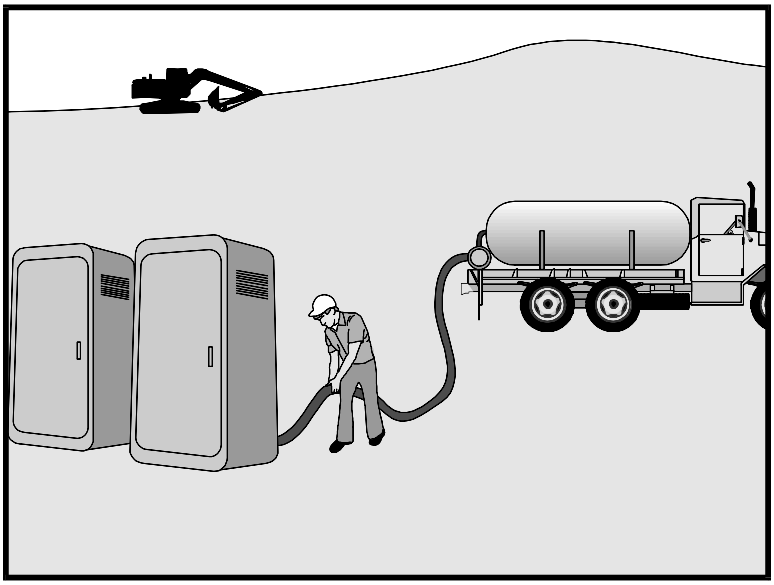
The WPCM shall monitor concrete working tasks, such as saw cutting, coring, grinding and grooving at least weekly to ensure proper methods are employed.

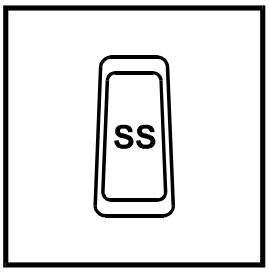
Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100mm for above grade facilities and 300mm for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Section 15-3.02, "Removal Methods," of the Standard Specifications.

Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

Sanitary/Septic Waste Management

WM-9





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses.

Appropriate Applications

Sanitary/septic waste management practices are implemented on all construction sites that use temporary or portable sanitary/septic waste systems.

Limitations

Not applicable.

Standards and Specifications

Education

Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures.

Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary/septic wastes.

Instruct employees, subcontractors, and suppliers in identification of sanitary/septic waste.

Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Establish a continuing education program to indoctrinate new employees.

Storage and Disposal Procedures

Temporary sanitary facilities shall be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk of high winds, as determined by the Resident Engineer (RE), temporary

sanitary facilities shall be secured to prevent overturning.

Wastewater shall not be discharged or buried within the highway right-of-way.

Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, shall comply with the local health agency, city, county, and sewer district requirements.

If using an on site disposal system, such as a septic system, comply with local health agency requirements.

Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.

Ensure that sanitary/septic facilities are maintained in good working order by a licensed service.

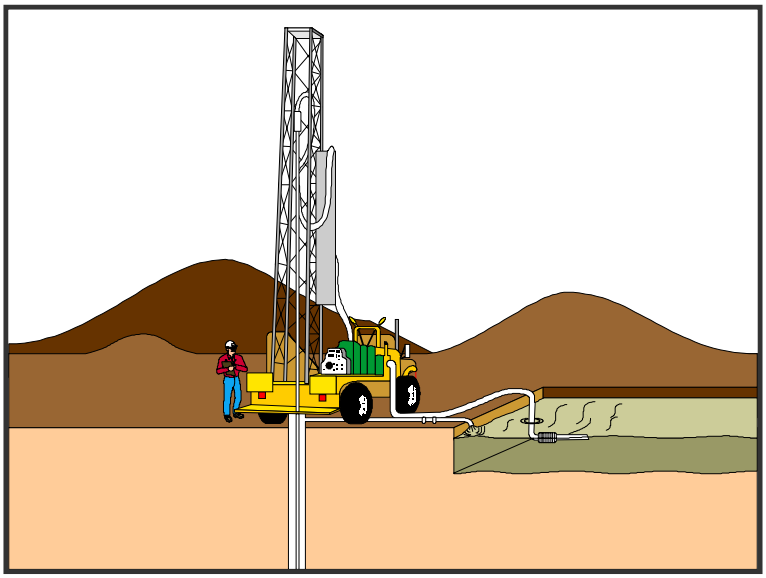
Use only reputable, licensed sanitary/septic waste haulers.

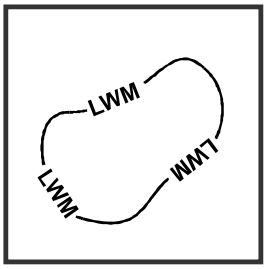
Maintenance and Inspection

The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site sanitary/septic waste storage and disposal procedures at least weekly.

Liquid Waste Management

WM-10





BMP Objectives

- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

Definition and Purpose

Procedures and practices to prevent discharge of pollutants to the storm drain system or to watercourses as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Appropriate Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous byproducts, residuals, or wastes, such as:

Drilling slurries and drilling fluids

Grease-free and oil-free wastewater and rinse water

Dredgings

Other non-storm water liquid discharges not permitted by separate permits.

Limitations

Disposal of some liquid wastes may be subject to specific laws and regulations, or to requirements of other permits secured for the construction project (e.g., National Pollutant Discharge Elimination System [NPDES] permits, Army Corps permits, Coastal Commission permits, etc.).

Does not apply to dewatering operations (see BMP NS-2 Dewatering Operations”), solid waste management (see BMP WM-5, “Solid Waste Management”), hazardous wastes (see BMP WM-6, “Hazardous Waste Management”), or concrete slurry residue (see BMP WM-8, “Concrete Waste Management”).

Does not apply to non-stormwater discharges permitted by any NPDES permit held by the pertinent Caltrans District, unless the discharge is determined by Caltrans to be a source of pollutants. Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation;

diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and, discharges or flows from emergency fire fighting activities.

Standards and Specifications

General Practices

The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper liquid waste management procedures and practices.

Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.

Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage device, waterway, or receiving water.

Educate employees and subcontractors on liquid waste generating activities, and liquid waste storage and disposal procedures.

Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Verify which non-stormwater discharges are permitted by the Caltrans Statewide NPDES permit; different regions might have different requirements not outlined in this permit. Some listed discharges may be prohibited if Caltrans determines the discharge to be a source of pollutants.

Apply the "Vehicle and Equipment Cleaning" best management practice (BMP) for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

Drilling residue and drilling fluids shall not be allowed to enter storm drains and watercourses and shall be disposed of outside the highway right-of-way in conformance with the provisions in Section 7-1.13 of the Standard Specifications.

If an appropriate location is available, as determined by the Resident Engineer (RE), drilling residue and drilling fluids that are exempt under CCR T23 '2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the provisions concerning the Temporary Concrete Washout Facilities detailed in BMP WM-08, "Concrete Waste Management"

Liquid Waste Management

- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, shall be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Contain liquid wastes in a controlled area, such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.
- Take precautions to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in BMP WM-4, "Spill Prevention and Control".
- Do not locate containment areas or devices where accidental release of the contained liquid can threaten health or safety, or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes running off a surface which has the potential to affect the storm drainage system, such as wash water and rinse water from cleaning walls or pavement.
- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.
- If the liquid waste is sediment laden, use a sediment trap (see BMP SC-3, "Sediment Trap") for capturing and treating the liquid waste stream, or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- Typical method is to dewater the contained liquid waste, using procedures such as described in BMP NS-2, "Dewatering Operations", and BMP SC-2, "Desilting Basin"; and dispose of resulting solids per BMP WM-5, "Solid Waste Management", or per Standard Specifications Section 7-1.13, "Disposal of Material Outside the Highway Right-of-Way", for off-site disposal.
- Method of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 or 404 permits, local agency discharge permits, etc., and may be defined elsewhere in the Special Provisions.

Liquid Waste Management

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.
- For disposal of hazardous waste, see BMP WM-6, "Hazardous Waste Management".
- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Maintenance and Inspection

- Spot check employees and subcontractors at least monthly throughout the job to ensure appropriate practices are being employed.
- Remove deposited solids in containment areas and capturing devices as needed, and at the completion of the task. Dispose of any solids as described in BMP WM-5, "Solid Waste Management".
- Inspect containment areas and capturing devices frequently for damage, and repair as needed.

Appendix A
Abbreviations, Acronyms, and Definition of Terms

Abbreviations

ac	acre
º C	Degrees Celsius
cfs	cubic feet per second
cy	cubic yards
º F	Degrees Fahrenheit
ft	feet
g	gram
gal	gallon
gpm	gallons per minute
ha	hectares
hr	hour
in	inches
kg	kilogram
kN	Kilo-Newton
kPa	Kilo-Pascal
l	liter
lbs	pound
lf	linear feet
m	meter
m^2	square meters
m^3	cubic meters
mm	millimeter
N	Newton
psi	pounds per square inch
s	second
yd	yard
y^2	square yards
y^3	cubic yards

Acronyms

AC	Asphalt Concrete
ABS	Acrylonitrile Butadiene Styrene
ADL	Aerially Deposited Lead
AQMD	Air Quality Management District
ASTM	American Society of Testing Materials
BAT	Best Available Technology
BCT	Best Conventional Technology
BMP	Best Management Practice
CAL-EPA	California Environmental Protection Agency
CAL-OSHA	California Occupation Safety and Health Association
CMP	Corrugated metal pipe
CFR	Code of Federal Regulations
DSA	Disturbed Soil Area
EPA	Environmental Protection Agency (US EPA)
ESA	Environmentally Sensitive Area
FEMA	Federal Emergency Management Agency
L:W	Length versus Width
MSDS	Material Safety Data Sheet
OSHA	Occupation Safety and Health Association
PCC	Portland Cement Concrete
PVC	Polyvinyl Chloride

RE	Resident Engineer
RWQCB	California Regional Water Quality Control Board
SSP	Standard Special Provisions
SWMP	Storm Water Management Plan
SWRCB	California State Water Resources Control Board
V:H	Vertical versus Horizontal
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
US EPA	United States Environmental Protection Agency
USLE	Universal Soil Loss Equation

Definition of Terms

Active Construction Area: Construction areas where soil-disturbing activities have already occurred and continue to occur or will occur during the ensuing 21 days. This may include areas where soils have been disturbed as well as areas where soil disturbance has not yet occurred.

Best Management Practice (BMP): Any program, technology, process, siting criteria, operating method, measure, or device that controls, prevents, removes, or reduces pollution.

Construction Activity: Includes clearing, grading, or excavation and contractor activities that result in soil disturbance.

Construction Site: The area involved in a construction project as a whole.

Contamination: An impairment of the quality of the waters of the state by waste to a degree that creates a hazard to the public health through poisoning or through the spread of disease including any equivalent effect resulting from the disposal of waste, whether or not waters of the state are affected.

Contractor: Party responsible for carrying out the contract per plans and specifications. The Standard Specifications and Special Provisions contain storm water protection requirements the contractor must address.

Desert Areas: Areas within the Colorado River Basin RWQCB and the North and South Lahontan RWQCB jurisdictions (excluding the Mono and Antelope areas, East and West Walker River, East and West Carson River, and the Truckee and Little Truckee River).

Discharge: Any release, spill, leak, pump, flow, escape, dumping, or disposal of any liquid, semi-solid or solid substance.

Disturbed Soil Areas (DSAs): Areas of exposed, erodible soil, including stockpiles, that are within the construction limits and that result from construction activities

Environmental Protection Agency (EPA): Agency that issued the regulations to control pollutants in storm water runoff discharges (The Clean Water Act and NPDES permit requirements).

Erosion: The wearing away of land surface primarily by wind or water. Erosion occurs naturally as a result of weather or runoff but can be intensified by clearing, grading, or excavation of the land surface.

Exempt Construction Activities: Activities exempt from the General Permit, including routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility; and emergency construction activities required to protect public health and safety. Local permits may not exempt these activities.

Existing vegetation: Any vegetated area that has not already been cleared and grubbed.

Fair Weather Prediction: When there is no precipitation in the forecast between the current calendar day and the next working day. The National Weather Service NOAA Weather Radio forecast shall be used. The contractor may propose an alternative forecast for use if approved by the Engineer.

Feasible: Economically achievable or cost-effective measures which reflect a reasonable degree of pollutant reduction achievable through the application of available nonpoint pollution control practices, technologies, processes, site criteria, operating methods, or other alternatives.

General Permit: The General Permit for Storm Water Discharges Associated with Construction Activity (Order No. 99-08-DWQ, NPDES Permit CAS000002) issued by the State Water Resources Control Board.

Good Housekeeping: A common practice related to the storage, use, or cleanup of materials, performed in a manner that minimizes the discharge of pollutants.

Local permit: An NPDES storm water permit issued to a District by the RWQCB having jurisdiction over the job site. Requirements of the local permit are generally similar to, but supersede the requirements of the General Permit. The District Storm Water Coordinator should be consulted to identify and to incorporate variances between the local permit and General Permit.

National Pollutant Discharge Elimination System (NPDES) Permit: A permit issued pursuant to the Clean Water Act that requires the discharge of pollutants to Waters of the United States from storm water be controlled.

Non-active Construction Area: Any area not considered to be an active construction area. Active construction areas become non-active construction areas whenever construction activities are expected to be discontinued for a period of 21 days or longer.

Non-Storm Water Discharge: Any discharge to a storm drain system or receiving water that is not composed entirely of storm water.

Permit: The Caltrans Statewide NPDES Permit (see Statewide Permit), General Construction Permit, or local permit, whichever is applicable to the construction project.

Pollution: The man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water. An alteration of the quality of the water of the state by waste to a degree which unreasonably affects either the waters for beneficial uses or facilities that serve these beneficial uses.

Receiving Waters: All surface water bodies within the permit area.

Regional Water Quality Control Board (RWQCB): California agencies that implement and enforce Clean Water Act Section 402(p) NPDES permit requirements, and are issuers and administrators of these permits as delegated by EPA. There are nine regional boards working with the State Water Resources Control Board.

Resident Engineer (RE): The Caltrans representative charged with administration of construction contracts. The RE decides questions regarding acceptability of material furnished and work performed. The RE has "contractual authority" to direct the contractor and impose sanctions if the contractor fails to take prompt and appropriate action to correct deficiencies. The following contractual sanctions can be imposed by the RE: (a) withholding payments (or portions of payments), (b) suspending work, (c) bringing in a separate contractor to complete work items (the contractor is billed for such costs), (d) assessing liquidated damages including passing along fines for permit violations, (e) initiating cancellation of the construction contract.

Sediment: Organic or inorganic material that is carried by or suspended in water and that settles out to form deposits in the storm drain system or receiving waters.

Statewide Permit: The National Pollutant Discharge Elimination System (NPDES) Permit, Statewide Storm Water Permit and Waster Discharge Requirements (WRDs) for the State of California Department of Transportation (Caltrans). Order No. 99-06-DWQ, NPDES No. CAS000003.

State Water Resources Control Board (SWRCB): California agency that implements and enforces Clean Water Act Section 402(p) NPDES permit requirements, is issuer and administrator of these permits as delegated by EPA. Works with the nine Regional Water Quality Control Boards.

Storm Drain System: Streets, gutters, inlets, conduits, natural or artificial drains, channels and watercourses, or other facilities that are owned, operated, maintained and used for the purpose of collecting, storing, transporting, or disposing of storm water.

Storm Water: Rainfall runoff, snow melt runoff, and surface runoff and drainage. It excludes infiltration and runoff from agricultural land.

Storm Water Inspector: Caltrans staff member who provides support to the Resident Engineer. Coordinates activities and correspondence related to WPCP and SWPPP review and implementation.

Storm Water Pollution Prevention Plan (SWPPP): A plan required by the Permit that includes site map(s), an identification of construction/contractor activities that could cause pollutants in the storm water, and a description of measures or practices to control these pollutants. It must be prepared and approved before construction begins. A SWPPP prepared in accordance with the

Special Provisions and the Handbooks will satisfy Standard Specifications Section 7-1.01G - Water Pollution, requirement for preparation of a program to control water pollution.

Temporary Construction Site BMPs: Construction Site BMPs that are required only temporarily to address a short-term storm water contamination threat. For example, silt fences are located near the base of newly graded slopes that have a substantial area of exposed soil. Then, during rainfall, the silt fences filter and collect sediment from runoff flowing off the slope.

Waste Discharge Identification Number (WDID): The unique project number issued by the SWRCB upon receipt of the notice of intent (NOI).

Water Pollution Control Program (WPCP): A program that must be prepared and implemented by the construction contractor under Standard Specifications Section 7-1.01G - Water Pollution.

Rainy Season: The dates of the rainy season shall be as specified: use dates in the local permit if a local permit is applicable to the project site and rainy season dates are specified therein; or, if the local permit does not specify rainy season dates and/or in areas of the state not subject to a local permit, the rainy season dates shall be determined using Figure 2-1.