

	Describe the discharge: <input type="checkbox"/> Stormwater <input type="checkbox"/> Non-stormwater <input type="checkbox"/> None
<b>6.</b>	Since the last inspection, do you see any evidence of erosion, sediment accumulation and/or other pollutants that can be attributed to your discharge? <input type="checkbox"/> Yes <input type="checkbox"/> No

Section III. Condition and Effectiveness of All On-site Control Measures (Erosion and Sediment (E&S), Stabilization and Pollution Preventions (P2) Practices)					
Description of Control Measures	Type of Control Measure: ▪ Erosion and Sediment (E&S) ▪ Stabilization ▪ Pollution Prevention (P2)	Additional Controls required?	Repairs or other maintenance needed?	Corrective action required? Date of discovery	Specify stabilization method (mulch, rock, planted vegetation, etc.)
<b>1.</b>	<input type="checkbox"/> E&S <input type="checkbox"/> Stabilization <input type="checkbox"/> P2	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No  Date	
<b>Notes:</b>					
<b>2.</b>	<input type="checkbox"/> E&S <input type="checkbox"/> Stabilization <input type="checkbox"/> P2	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No  Date	
<b>Notes:</b>					
<b>3.</b>	<input type="checkbox"/> E&S <input type="checkbox"/> Stabilization <input type="checkbox"/> P2	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No  Date	
<b>Notes:</b>					

4.	<input type="checkbox"/> E&S <input type="checkbox"/> Stabilization <input type="checkbox"/> P2	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No Date
Notes:				

Section VI. Certification and Signature
---



**Section VI.A. – Certification and Signature by Contractor or Subcontractor performing the inspections (if applicable)**

Check one of the following:

- No instances of non-compliance were discovered during the inspection and the project was in full compliance with the SWPPP and permit.
- Inspection follow-up is required, in accordance with the permit.

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

Signature of Contractor or Subcontractor: \_\_\_\_\_

Title: **SWPPP Inspector**

Printed name: \_\_\_\_\_

Date: \_\_\_\_\_

Business / Agency: \_\_\_\_\_

Phone number: \_\_\_\_\_

**Section VI.B. – Certification and Signature of Permittee (permittee / operator or a duly authorized representative is required to sign)**

Check one of the following:

- No instances of non-compliance were discovered during the inspection and the project was in full compliance with the SWPPP and permit.
- Inspection follow-up is required, in accordance with the permit.

“I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.”

Signature of Permittee or

“Duly Authorized Representative”:

Title: \_\_\_\_\_

Printed name: \_\_\_\_\_

Date: \_\_\_\_\_

Business / Agency: \_\_\_\_\_

Phone number: \_\_\_\_\_

## Appendix F – Corrective Action Log

Project Name: SDC Wall Prototype  
SWPPP Contact: (b) (6)



Stormwater Pollution Prevention Plan (SWPPP)

Appendix F- Corrective Action Maintenance Log

Date	Action	Location of Action	Date of Action	

## Appendix G – SWPPP Amendment Log

Project Name: SDC Wall Prototype  
SWPPP Contact: (b) (6)

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

## Appendix H – Subcontractor Certifications/Agreements

### SUBCONTRACTOR CERTIFICATION STORMWATER POLLUTION PREVENTION PLAN

Project Number: \_\_\_\_\_

Project Title: \_\_\_\_\_

Operator(s): \_\_\_\_\_

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

**I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.**

This certification is hereby signed in reference to the above named project:

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Telephone Number: \_\_\_\_\_

Type of construction service to be provided: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_

Date: \_\_\_\_\_



The CPESC® Application Review Committee certifies that

(b) (6)

Subscribes to the Code of Ethics and has met the requirements established by the CPESC Council as a

# Certified Professional in Erosion and Sediment Control™

*An EnviroCert International, Inc. Program*

Certification Number: 4408

Certification Date: February 7, 2008

(b) (6)

Chair, CPESC Council

(b) (6)

CPESC Program Manager



**CERTIFICATE OF TRAINING**

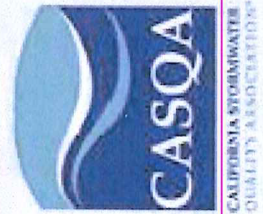
CALIFORNIA CONSTRUCTION GENERAL PERMIT

QUALIFIED SWPPP DEVELOPER (QSD)  
AND  
QUALIFIED SWPPP PRACTITIONER (QSP)

(b) (6)

Aug 08, 2017 - Aug 30, 2019

*Certificate # 20347*



California Stormwater Quality Association and  
California Construction General Permit Training Team



# Certificate of Completion

(b) (6)

**Has successfully completed the 6 - hour AGC-ADOT  
Erosion Control Coordinator Training Refresher Course**

**May 18, 2017 Expires: May 18, 2020**

(b) (6)

(b) (6)

(b) (6) AGC

(b) (6) Logan Simpson Design, Inc.

## Appendix I – Grading and Stabilization Activities Log

Project Name: SDC Wall Prototype  
SWPPP Contact: (b) (6)

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure and Location

## Appendix J – SWPPP Training Log

### Stormwater Pollution Prevention Training Log

Project Name: SDC Wall Prototype

Project Location: GSA Laydown area Otay Mesa, California

Instructor's Name(s):

Instructor's Title(s):

Course Location: \_\_\_\_\_ Date: \_\_\_\_\_

Course Length (hours): \_\_\_\_\_

Stormwater Training Topic: *(check as appropriate)*

- Erosion Control BMPs
- Emergency Procedures
- Sediment Control BMPs
- Good Housekeeping BMPs
- Non-Stormwater BMPs

Specific Training Objective: \_\_\_\_\_

---

Attendee Roster: *(attach additional pages as necessary)*

No.	Name of Attendee	Company
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		



## Appendix K – Delegation of Authority Form

### Delegation of Authority

I **(b)(6);(b)(7)(C)** hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the **SDC Wall Prototype** construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

\_\_\_\_\_ (name of person or position)  
\_\_\_\_\_ (company)  
\_\_\_\_\_ (address)  
\_\_\_\_\_ (city, state, zip)  
\_\_\_\_\_ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in \_\_\_\_\_ EPA 2017 GCP \_\_\_\_\_ (Reference State Permit), and that the designee above meets the definition of a "duly authorized representative" as set forth in \_\_\_\_\_ EPA 2017 GCP (Reference State Permit).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: **(b)(6);(b)(7)(C)** \_\_\_\_\_

Company: U.S Customs and Boarder Protection .

Title: Environmental Protection Specialist/ Operator

Signature: \_\_\_\_\_

Date: \_\_\_\_\_



**Construction Site Best Management  
Practices (BMP) Manual**

**CTSW-RT-17-314.18.1**

**May 2017**

**California Department of Transportation  
Division of Environmental Analysis, Stormwater Program  
1120 N Street  
Sacramento, California 95814  
<http://www.dot.ca.gov/hg/env/stormwater/index.htm>**

For individuals with sensory disabilities, this document is available in alternate formats upon request.

Please call or write to:

Stormwater Liaison, Caltrans Division of Environmental Analysis

MS 27, P.O. Box 942874, Sacramento, CA 94274-0001

(916) 653-8896 Voice or dial 711 to use a relay service.

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CALTRANS Technical Report Documentation Page

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## List of Abbreviations

ASBS	Areas of Special Biological Significance	NWS	National Weather Service
ATS	Active Treatment System	OHSD	Office of Hydraulics and Stormwater Design
BAT	Best Available Technology	O&M	Operation and Maintenance
BCT	Best Conventional Technology	PRDs	Permit Registration Documents
BMP	Best Management Practice	QSD	Qualified SWPPP Developer
Caltrans	State of California, Department of Transportation	QSP	Qualified SWPPP Practitioner
CASQA	California Stormwater Quality Association	RE	Resident Engineer
CEQA	California Environmental Quality Act	REAP	Rain Event Action Plan
SS	Cellular Confinement System	RECP	rolled erosion control products
CFR	Code of Federal Regulations	RW	Receiving Water
CGP	Construction General Permit	RWQCB	Regional Water Quality Control Board
CPESC	Certified Professional in Erosion and Sediment Control	SDS	Safety Data Sheet
CSBMP	Construction Site Best Management Practices	SAP	Sampling and Analysis Plan
CWA	Clean Water Act	SMARTS	Storm Water Multiple Application Reporting and Tracking System
DFW	Department of Fish and Wildlife	SS	Settleable Solids
DSA	Disturbed Soil Area	SSC	Suspended Sediment Concentration
DTSC	Department of Toxic Substance Control	SSPs	Standard Special Provisions
DEA	Division of Environmental Analysis	SWMP	Stormwater Management Program
DWQ	Division of Water Quality	SWPPP	Stormwater Pollution Prevention Plan
EPA	Environmental Protection Agency	SWRCB	State Water Resources Control Board
ESA	Environmentally Sensitive Area	TMDL	Total Maximum Daily Load
HQ	Headquarters	TSS	Total Suspended Solids
IH	Information Handout	USACOE	U.S. Army Corps of Engineers
LRP	Legally Responsible Person	USGS	United States Geological Service
LTCGP	Lake Tahoe Hydrologic Unit Construction General Permit	H:V	Horizontal versus Vertical
MEP	Maximum Extent Practicable	WDID	Waste Discharge Identification Number
MS4	Municipal Separate Storm Sewer System	WDR	Waste Discharge Requirement
NAL	Numeric Action Level	WQS	Water Quality Certification
NEL	Numeric Effluent Limitation	WQS	Water Quality Standards
NOAA	National Oceanic and Atmospheric Administration	WPC Manager	Water Pollution Control Manager
NOI	Notice of Intent	WPCD	Water Pollution Control Drawing
NPDES	National Pollutant Discharge Elimination System	WPCP	Water Pollution Control Program
NTU	Nephelometric Turbidity Units	WPCS	Water Pollution Control Schedule

## Section 1

# Introduction

### 1.1 Overview

This Construction Site Best Management Practices (CSBMP) Manual (Manual) provides guidance on the selection and implementation of Best Management Practices (BMPs) into construction projects within the Caltrans right-of-way.

The primary objective of this CSBMP Manual is to provide the overall process for selecting, installing, and maintaining temporary BMPs in Caltrans construction projects. The CSBMP Manual provides a general background of stormwater documents and references to other stormwater manuals, includes a flowchart showing applicable BMP triggers for each of the six Construction Site BMP categories, and detailed guidance for the selection, installation, and required maintenance for individual BMPs. The Manual ties into the Caltrans 2015 Standard Specifications applicable to BMP installation and maintenance frequency,

This Manual is organized as follows:

- **Section 1 – Introduction** provides a background on regulations and stormwater permits, and relevant stormwater guidance documents and websites.
- **Section 2 – Caltrans Construction Stormwater Program Requirements** provides a description of general documents prepared for or related to the construction phase of the project, instructions for the selection and implementation of Construction Site BMPs and details the minimum BMP inspections required for construction sites.
- **Section 3 – Temporary Soil Stabilization BMPs** provides an overview of the Soil Stabilization BMP category and a listing and working details for Caltrans Construction Site BMPs for Temporary Soil Stabilization.
- **Section 4 – Temporary Sediment Control BMPs** provides an overview of the Sediment Control BMP category and a listing and working details for Caltrans Construction Site BMPs for Temporary Sediment Control.
- **Section 5 - Wind Erosion Control BMPs** provides an overview of the Wind Erosion BMP category and a listing and working details for Caltrans Construction Site BMPs for Wind Erosion Control.
- **Section 6 - Tracking Control BMPs** provides an overview of the Tracking Control BMP category and a listing and working details for Caltrans Construction Site BMPs for Tracking Control.
- **Section 7 - Non-Stormwater Management BMPs** provides an overview of the Non- Stormwater Management BMP category and a listing and working details for Caltrans Construction Site BMPs for Non-Stormwater Management.
- **Section 8 - Waste Management and Material Pollution Control BMPs** provides an overview of the Waste Management and Materials Pollution Control BMP category and a listing and working details for Caltrans Construction Site BMPs for Waste Management and Materials Pollution Control.
- **Appendix A** – provides definitions of terms used throughout this Manual.
- **Appendix B** – provides guidance on the selection of temporary soil stabilization controls.
- **Appendix C** – provides guidance on the requirements for the implementation of Active Treatment System (ATS) to comply with the CGP or the LTCGP.

## 1.2 Regulations and Stormwater Permits

### 1.2.1 Federal Regulations

The Clean Water Act is a Federal regulation that deals in part with controlling discharges of pollutants from Municipal Separate Storm Sewer Systems (MS4s), construction sites, and industrial activities as part of the National Pollutant Discharge Elimination System (NPDES) permit process. In 1990, the Environmental Protection Agency (EPA) promulgated federal stormwater regulations requiring municipal, construction and industrial stormwater discharges to comply with an NPDES permit.

In California, the EPA delegated its authority to issue NPDES permits to the State Water Resources Control Board (SWRCB). The State Board has nine regional water quality control boards across the State. Figure 1-1 presents a depiction of the nine regional board boundaries in relation to the Caltrans Districts.

### 1.2.2 Caltrans NPDES Statewide Permit and NPDES Construction General Permits

On July 15, 1999, the SWRCB issued the first “NPDES Permit, Statewide Stormwater Permit and Waste Discharge Requirements (WDRs) for the State of California, Department of Transportation (Caltrans)” (NPDES No. CAS000003) hereby called “Caltrans Permit.” The Caltrans Permit requires the preparation and implementation of the Caltrans Statewide Stormwater Management Plan (SWMP). The SWMP describes how Caltrans plans to implement the Caltrans Permit requirements and describes Caltrans’ program addressing stormwater pollution control related to various activities, including planning, design, construction, maintenance, and operation of roadways and facilities.

The Caltrans Permit regulates stormwater discharges from Caltrans properties, facilities, and activities, and requires that Caltrans’ construction program comply with the requirements of the “NPDES General Permit, WDRs for Discharges of Stormwater Runoff Associated with Construction Activity” (NPDES No. CAS000002) (Construction General Permit) issued by the SWRCB.

Both the Caltrans Permit and the Construction General Permit (CGP) have been reissued since 2009. The current Caltrans Permit Order 2012-0011-DWQ became effected July 1, 2013 and requires construction projects with one acre or more of soil disturbance to comply with the CGP Order 2009-009-DWQ and amendments thereto. There are a small number of Caltrans projects that are situated in the Lake Tahoe Regional Board area; those projects are subject to the Lake Tahoe Construction General Permit (LTCGP) Order No.R6T-1016-0010. The CGP and the LTCGP require SWPPP projects to upload the authorized SWPPP and all other relevant documents and data to the State Board’s Stormwater Multiple Application and Report Tracking System (SMARTS).

### 1.2.3 Other NPDES Permits

There are other Permits that might be applicable to Caltrans construction projects depending on the specific activities. Any construction project might trigger the Statewide Industrial Permit coverage if there is a proposed batch plant or other industrial activities as outlined below. In addition, if there is any dewatering being proposed, there are specific Regional Permits that might be applicable.

#### 1.2.3.1 Industrial Permit

Industrial Activities are not covered under the Caltrans Permit. The Statewide Permit for Stormwater Discharges Associated with Industrial Activities (IGP) (Order 2014-0057-DWQ) regulates nine broad categories of industrial activities. There are certain activities that might occur ancillary to construction projects; for those operations, the industrial permit is triggered. Caltrans contracts include language requiring the Contractor to implement BMPs and seek coverage as required under the IGP.

### 1.2.3.2 Dewatering Permit

Dewatering discharge requirements vary among the nine regional boards. Caltrans has developed a Dewatering Manual that should be referred to determine appropriate requirements for the individual construction site. The Dewatering Manual can be accessed via the website link included in Table 1-4.

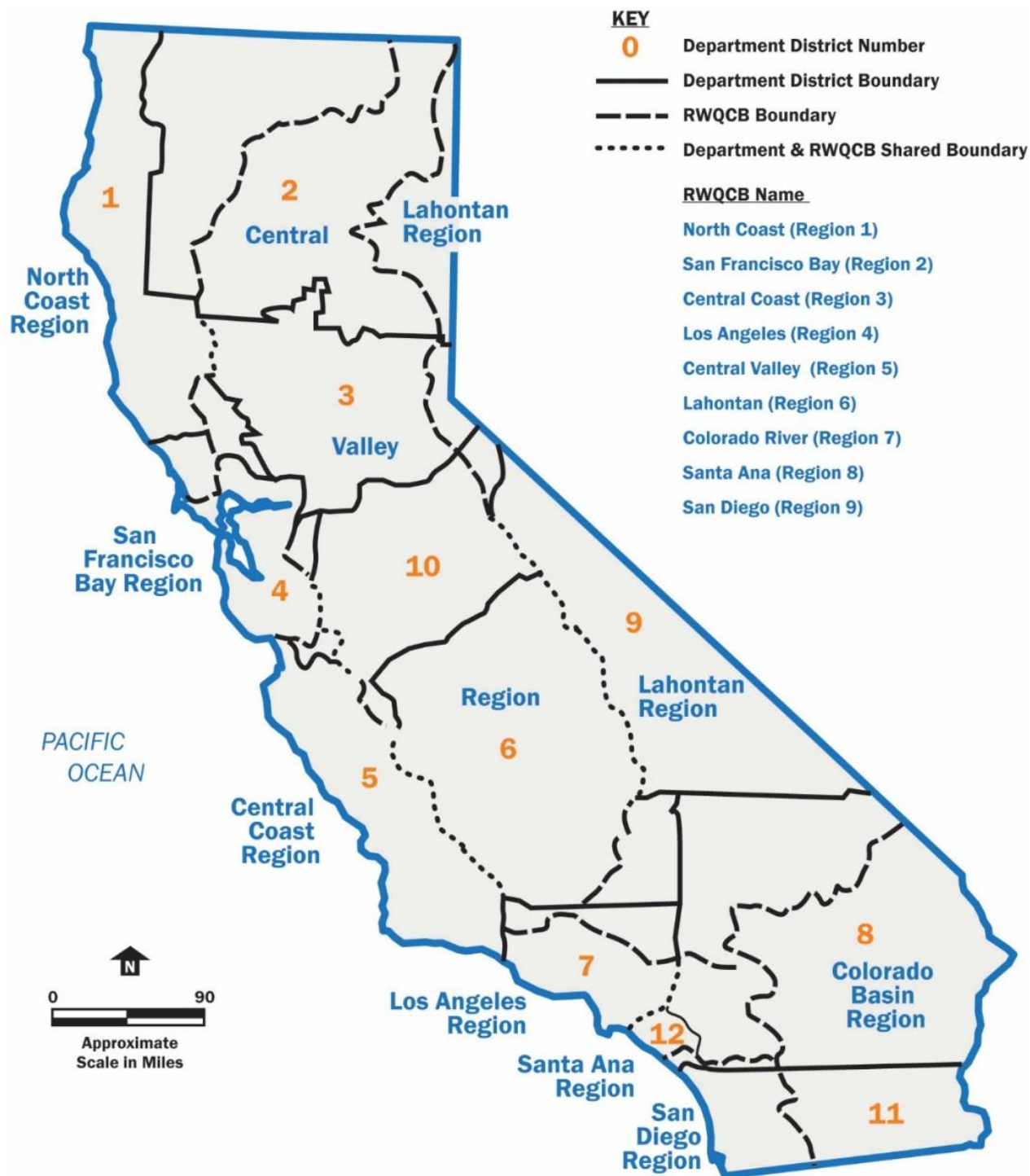


Figure 1-1. Map of California with Regional Water Quality Control Boards and Caltrans Districts

### 1.3 Caltrans Stormwater Manuals and Websites

Caltrans has devised a comprehensive stormwater program to comply with Caltrans Permit requirements. In addition to the 2016 SWMP, Caltrans has developed several stormwater guidance manuals that are available on their website for staff, consultants and anyone in the public to use to implement appropriate BMPs.

Table 1-3 presents a list of the primary reference material to be used for determining applicable permit requirements and specific compliance mechanisms developed by Caltrans. This Manual is intended to be used in conjunction with the SWPPP/WPCP Preparation Manual as both are directly related to water pollution control when performing construction operations within Caltrans projects and/or rights of way.

Table 1-3. Relevant Caltrans Stormwater Documents, Manuals and their Purpose <sup>1</sup>		
Date	Document	Purpose
July 2016	Caltrans Stormwater Management Plan (SWMP)	Describes how Caltrans plans to implement the Caltrans Permit requirements. The SWMP describes Caltrans' program and addresses stormwater pollution control related to various activities, including planning, design, construction, maintenance, and operation of roadways and facilities.
February 2016	Stormwater Quality Handbooks: Project Planning and Design Guide (PPDG)	Guides project planning staff in preparing and selecting appropriate Best Management Practices for inclusion into Contract Plans. Includes step-by-step guidance for documenting the selection and implementation of BMPs.
	Appendix E - Stormwater Data Report (SWDR)	Document prepared by the Project Engineer or Landscape Architect which forms basis for ensuring compliance with the Caltrans Permit requirements for the Design Division. Determination of SWPPP/WPCP applicability based on DSA and BMP line items included as part of the Contract Plans.
June 2016	Stormwater Pollution Prevention Plan (SWPPP) and Water Pollution Control Program (WPCP) Preparation Manual	Guides Contractors and Caltrans staff through the process of preparing a SWPPP and WPCP. This manual provides detailed step-by-step procedures, instructions, sample text and a template that Contractors must use to prepare the SWPPP/WPCP. Templates conform to CGP requirements based on risk level, LTCGP requirements including deviations from CGP language, and Caltrans requirements for preparing WPCPs.
August 2013	Construction Site Monitoring Program Guidance Manual	This manual presents guidance for Caltrans staff and Contractors to use in the planning and implementation of stormwater monitoring programs at construction sites. Describes and provides guidance on developing Sampling and Analysis Plans, standard operating procedures for pH and turbidity sampling and other requirements of the CGP and LTCGP.
July 2003	Guidance for Temporary Soil Stabilization	The main purpose of this document is to help direct the planning, selection, and implementation of Caltrans-approved temporary soil stabilization BMPs.
July 2014	Field Guide to Construction Site Dewatering	The purpose of this Dewatering Guide is to inform and guide intended users in selecting, implementing, and monitoring construction site dewatering operations.
September 2008	Erosion Prediction Procedure Manual	Describes the method established and approved by headquarters (HQ) Office of Hydraulics and Stormwater Design (OHSD) for the prediction of erosion rates before, during, and after construction of Caltrans projects to meet the erosion and sediment control requirements identified in the Caltrans Permit, the CGP and the LTCGP.

Table 1-4 presents website links for Caltrans Manuals, procedures and other documents along with other websites that can be used to either gain a deeper understanding of stormwater requirements or as

<sup>1</sup> There may be other relevant Manuals that pertain to specific enforcement or general criteria, see Table 1-4 for additional Manuals and links



guidance when preparing stormwater documents and selecting appropriate temporary construction site BMPs.

**Table 1-4. Stormwater Related Websites**

Table 1-4. Stormwater Related Websites		
	Description	Websites
EPA Agency	U.S. Environmental Protection Agency (EPA)	<a href="http://www.epa.gov">http://www.epa.gov</a>
Laws/ Regulations	Code of Federal Regulations (CFR)	<a href="http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR">http://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR</a>
NPDES Permits	Caltrans NPDES Statewide Stormwater Permit (Caltrans Permit)	<a href="http://www.swrcb.ca.gov/water_issues/programs/stormwater/caltrans.shtml">http://www.swrcb.ca.gov/water_issues/programs/stormwater/caltrans.shtml</a>
	Construction General Permit (CGP)	<a href="http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml">http://www.swrcb.ca.gov/water_issues/programs/stormwater/construction.shtml</a>
	Lake Tahoe Construction General Permit (LTCGP)	<a href="http://www.waterboards.ca.gov/lahtontan/water_issues/programs/storm_water/docs/r6t_2016_0010_cgp_combined.pdf">http://www.waterboards.ca.gov/lahtontan/water_issues/programs/storm_water/docs/r6t_2016_0010_cgp_combined.pdf</a>
	Industrial General Permit (IGP)	<a href="http://www.swrcb.ca.gov/water_issues/programs/stormwater/industrial.shtml">http://www.swrcb.ca.gov/water_issues/programs/stormwater/industrial.shtml</a>
Caltrans Stormwater Program	Caltrans Statewide Stormwater Program – HQ DEA (contains links such as SWMP, Annual Report)	<a href="http://www.dot.ca.gov/hq/env/stormwater/index.htm">http://www.dot.ca.gov/hq/env/stormwater/index.htm</a>
State Board SMARTS link	State Water Resources Control Board website, particularly Stormwater Multiple Application and Report Tracking System (SMARTS)	<a href="https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.xhtml">https://smarts.waterboards.ca.gov/smarts/faces/SwSmartsLogin.xhtml</a>
Caltrans Stormwater Manuals	Division of Construction - Stormwater Quality Link. Contains links to resources for developing SWPPP, WPCP, Construction Site Dewatering and other Manuals and resources.	<a href="http://www.dot.ca.gov/hq/construc/stormwater/">http://www.dot.ca.gov/hq/construc/stormwater/</a>
	Caltrans Construction Stormwater Quality Manuals and Handbooks	<a href="http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm">http://www.dot.ca.gov/hq/construc/stormwater/manuals.htm</a>
Caltrans SSP and Stormwater Costs Estimating Guidance	Caltrans Construction Contract Standards Specifications, Plans, Standard Special Provisions (SSPs) <sup>2</sup>	<a href="http://www.dot.ca.gov/hq/esc/oe/specs_html/index.html">http://www.dot.ca.gov/hq/esc/oe/specs_html/index.html</a>
	Caltrans Cost estimating guidance	<a href="http://www.dot.ca.gov/hq/oppd/costest/costest.htm">http://www.dot.ca.gov/hq/oppd/costest/costest.htm</a>

<sup>2</sup> Contract Documents could include specific project requirements such as specific monitoring requirements under CWA 401 or 404 Permit or others included in the Informational Handout.

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## Section 2

# Caltrans Construction Stormwater Management Program Requirements

## 2.1 Stormwater Pollution Prevention Plan and Water Pollution Control Program

Caltrans requires Contractors to prepare and implement a program to effectively control water pollution during the construction of all projects (see Standard Specification Section 13 Water Pollution Control). Projects resulting in one acre or more of disturbed soil area (DSA) are subject to the CGP or the LTCGP depending on the project location. Caltrans Standard Specifications require that for these projects, Contractors prepare and submit a SWPPP.

If two or more small projects [less than one acre of soil disturbance] in the same corridor are part of a larger common plan of development [one acre or more], then these small projects are also subject to the requirements of the CGP or the LTCGP to develop and implement a SWPPP. There also might be instances where a SWPPP is required even when there is less than one acre of DSA, if it is determined that the project poses a significant water quality risk; this determination will be made by the District/Regional NPDES Coordinator or the Construction Stormwater Coordinator or if mandated by the RWQCB or SWRCB or another regulatory agency. Potential examples when this might occur could be work over a 303d waterbody, water implosions, etc.

Caltrans requires that a WPCP addressing control measures be prepared and implemented by the construction Contractor for projects resulting in soil disturbance of less than one acre. The specific requirements and detailed instructions are included in Section 4 of the SWPPP/WPCP Preparation Manual. These general requirements are included in the Construction BMP Applicability Flowchart, Figure 2-1 of this Manual.

Projects that have a DSA between one and less than five acres may qualify for a rainfall erosivity waiver under the CGP if the rainfall erosivity factor (R factor) is less than a value of five. The R factor takes into account project location, length of construction period, and time of year so projects that begin and complete construction within a short period are likely to qualify for a rainfall erosivity waiver. To calculate the R value, refer to Section 1.4.2.1 of the SWPPP/WPCP Preparation Manual, a link to the manual is provided in Table 1-4.

Projects that qualify for a rainfall erosivity waiver do not need to prepare a SWPPP but are required to submit proper documentation via SMARTS (to be exempted from the CGP) as well as prepare and implement a site-specific Water Pollution Control Program (WPCP).

## 2.2 Construction BMP Applicability

The flowchart presented in Figure 2-1 guides the user as to whether the project triggers a SWPPP or a WPCP and where to find additional information, if needed. The flowchart also includes general questions to determine applicability of BMP categories that are described in Sections 3-8 of this Manual.



The steps described below correspond to the steps shown in Figure 2-1.

### Step 1 - Start

The Contractor, the Water Pollution Control (WPC) Manager, the Qualified SWPPP Developer (QSD) or the Qualified SWPPP Practitioner (QSP) should use Figure 2-1, the guidance provided in this section, and the SWPPP/WPCP Preparation Manual to determine the project's entire BMP selection and applicability for the duration of the construction phase.

### Step 2 - Is a Construction project being proposed?

A construction project is defined as any activity, including, but not limited to, clearing, grading, grubbing, or excavation. Routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility is not deemed a construction activity that requires a SWPPP or a WPCP.

If the project qualifies as a construction project, proceed to step 3.

If the project does not meet the definition of construction, then the project is subject to Maintenance BMPs, refer to the Caltrans July 2016 SWMP or the Caltrans Maintenance Staff Guide.

### Step 3 - Will the project create one acre or more of Disturbed Soil Area?

If the construction project will disturb more than one acre of soil, it is subject to either the CGP or the LTCGP depending on its location and must prepare and maintain an up to date SWPPP during the entire duration of the project.

If the project disturbs less than an acre of soil, the project must have a WPCP prepared and implemented, see Section 4 of the SWPPP/WPCP Preparation Manual for specific instructions.

### Step 4 - Can the construction project qualify for a Rainfall Erosivity Waiver?

If a project will be a short duration and is more than one acre but less than five acres of soil disturbance, it might qualify for an EPA rainfall erosivity waiver as discussed in Section 1.4.2 of the SWPPP/WPCP Preparation Manual.

If you answered yes, the project does not need coverage under the CGP but it still requires some paperwork to be filed via SMARTS. In addition, a WPCP must be prepared and implemented.

If you answered no, then project is subject to SWPPP requirements. See Section 3 of the SWPPP/WPCP Preparation Manual for further guidance on preparing a SWPPP.

### Step 5 - Are any soil areas expected to be exposed and need stabilization as part of the project or is there a need to stabilize concentrated flow conveyances?

Any project subject to CGP or LTCGP is required to implement appropriate controls year-round. If the project has exposed soil areas or unlined conveyances, the WPC Manager or QSP must be diligent in ensuring appropriate BMPs are implemented. See Section 3 of this Manual for specific BMP factsheets and proceed to Step 6. For further guidance on proper selection and costs, see Appendix B of this Manual.

If there are no soil areas needing stabilization and no unstable conveyances, then proceed to Step 6.

### Step 6 - Will the project require temporary controls to intercept/slowdown onsite or offsite flows?

If the project has areas where offsite flows are coming onto the project area, flows must be conveyed and the WPC Manager or QSP must ensure that no materials or contaminants including soil are being carried by the offsite flows. Onsite flows must be conveyed via lined or vegetated channels to reduce potential for turbid flows. See Section 4 of this Manual for specific BMP factsheets to control sediment-laden runoff.

**Step 7 - Will the project require a dust control plan or is there a potential for dust control BMPs to be applicable?**

Utilize Section 5 of this Manual for specific BMP factsheets if the contract documents require the preparation and implementation of a Dust Control Plan or if there is a potential for dust to be generated at any time during the duration of the construction project.

**Step 8 - Will the project require tracking controls in any area within project limits?**

Any areas where construction vehicles are entering or exiting the project must be stabilized to prevent tracking of sediment or other materials. See Section 6 of this Manual for specific BMP factsheets for tracking control. Additionally, SC-7, Street Sweeping should be evaluated and implemented either standalone or in combination to ensure compliance with all permits and contract documents.

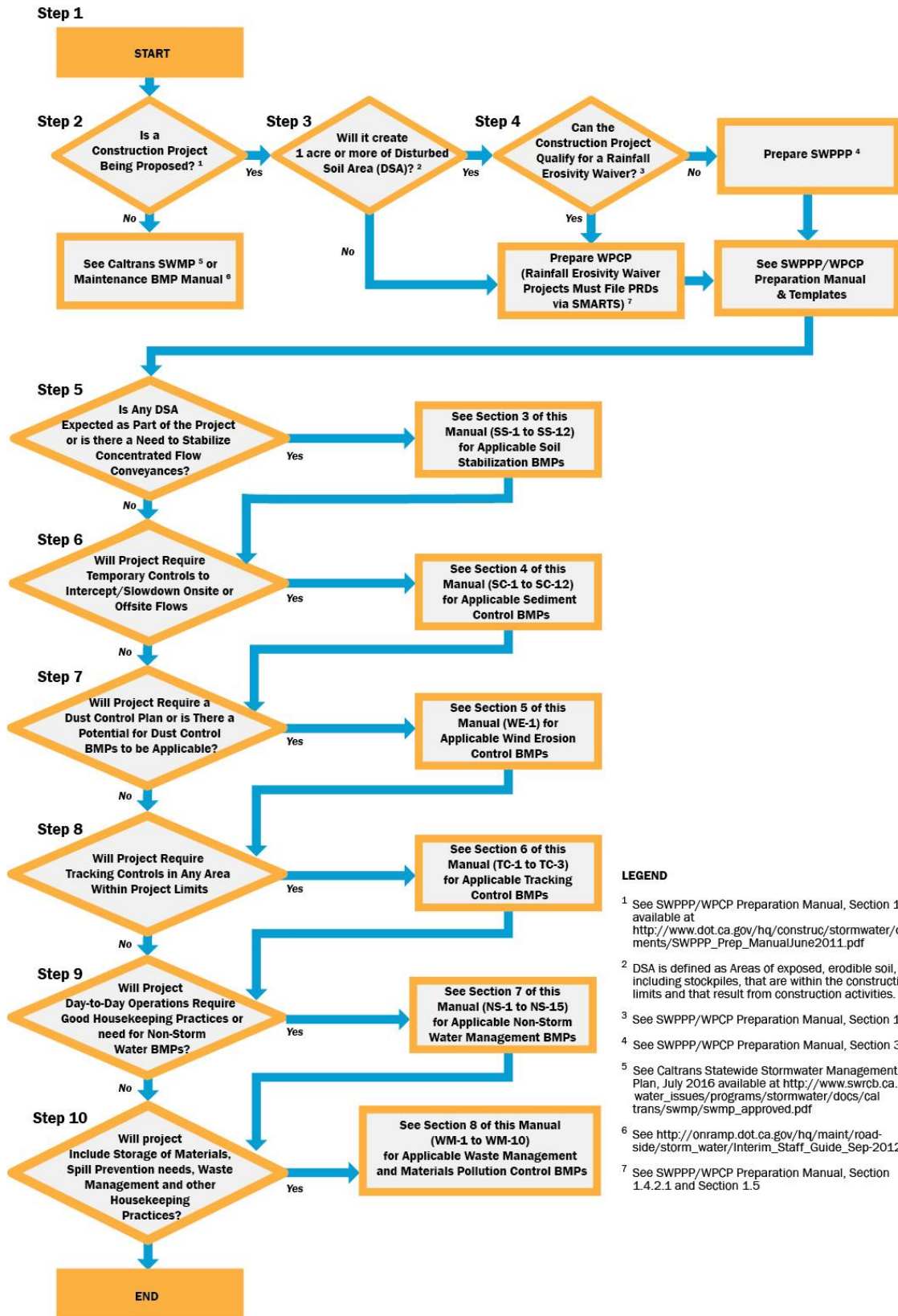
**Step 9 - Will the project day to day operations require good housekeeping practices or have a need for non-stormwater BMPs?**

Section 7 of this Manual includes a list of source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with stormwater.

**Step 10 - Will the project include storage of materials, spill prevention needs, waste management or other housekeeping practices?**

All materials or wastes either stored or generated during the construction phase must be properly stored and disposed of. Section 8 of this Manual includes lists of BMPs that must be utilized at the Contractor's yard, where the materials are stored, or where construction activities are being conducted to ensure proper usage, containment, and disposal of materials and waste products.

**END - Specific BMP factsheets should be reviewed and the Project's SWPPP or WPCP text and tables along with the Water Pollution Control Drawings (WPCDs) should be modified to ensure appropriate controls are implemented year-round**



- LEGEND**
- <sup>1</sup> See SWPPP/WPCP Preparation Manual, Section 1 available at [http://www.dot.ca.gov/hq/construc/stormwater/documents/SWPPP\\_Prep\\_ManualJune2011.pdf](http://www.dot.ca.gov/hq/construc/stormwater/documents/SWPPP_Prep_ManualJune2011.pdf)
  - <sup>2</sup> DSA is defined as Areas of exposed, erodible soil, including stockpiles, that are within the construction limits and that result from construction activities.
  - <sup>3</sup> See SWPPP/WPCP Preparation Manual, Section 1.4.2
  - <sup>4</sup> See SWPPP/WPCP Preparation Manual, Section 3
  - <sup>5</sup> See Caltrans Statewide Stormwater Management Plan, July 2016 available at [http://www.swrcb.ca.gov/water\\_issues/programs/stormwater/docs/caltrans/swmp/swmp\\_approved.pdf](http://www.swrcb.ca.gov/water_issues/programs/stormwater/docs/caltrans/swmp/swmp_approved.pdf)
  - <sup>6</sup> See [http://onramp.dot.ca.gov/hq/maint/roadside/storm\\_water/Interim\\_Staff\\_Guide\\_Sep-2012.pdf](http://onramp.dot.ca.gov/hq/maint/roadside/storm_water/Interim_Staff_Guide_Sep-2012.pdf)
  - <sup>7</sup> See SWPPP/WPCP Preparation Manual, Section 1.4.2.1 and Section 1.5

Figure 2-2. Construction Site BMP Applicability Flowchart

## 2.3 Minimum Construction BMPs

This section provides the minimum construction BMPs required for a project subject to the CGP or the LTCGP or one that requires the preparation and implementation of a WPCP. It is important to note that the requirements of this Section are minimum requirements, and that Caltrans contracts may impose more stringent requirements. Working details of Construction Site BMPs are presented in Sections 3 through 8 of this Manual.

Construction Site BMPs (also sometimes called temporary control practices or BMPs) are best conventional technology/best available technology (BCT/BAT)-based BMPs that are consistent with the BMPs and control practices required under the CGP and the LTCGP. Caltrans Construction Site BMPs are divided into six categories as shown in Table 2-1.

Stormwater 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. Appropriate water pollution control includes the implementation of an effective combination of both soil stabilization and sediment controls, implementation of wind erosion, tracking controls, non-stormwater and waste management, and material pollution BMPs. Some BMPs can be implemented as a stand-alone device while others can be combined to improve effectiveness and compliance.

Section 2 of the SWPPP/WPCP Preparation Manual describes in detail specific requirements under the applicable CGP. The CGP and LTCGP both require minimum controls and require BMPs based on the projects' calculated risk level to apply linear sediment controls along the toe of the slope, face of the slope, and at the grade breaks of exposed slopes to comply with sheet flow lengths.

Table 2-1. Construction Site BMPs			
ID	BMP Name	Minimum Requirement	
		CGP	LTCGP
<b>Temporary Soil Stabilization</b>			
SS-1	Scheduling	X	X
SS-2	Preservation of Existing Vegetation	X	X
SS-3	Hydraulic Mulch	X <sup>1</sup>	X <sup>1</sup>
SS-4	Hydroseeding		
SS-5	Soil Binders		
SS-6	Straw Mulch		
SS-7	Temporary Cover and Rolled Erosion Control Products (RECP)		
SS-8	Wood Mulching		
SS-9	Earth Dikes/Drainage Swales & Lined Ditches	-	-
SS-10	Outlet Protection/Velocity Dissipation Devices <sup>2</sup>	X	X
SS-11	Slope Drains	-	-
SS-12	Streambank Stabilization	-	-
<b>Temporary Sediment Control</b>			
SC-1	Silt Fence	X <sup>1</sup>	X <sup>1</sup>
SC-2	Sediment/Desilting Basin	-	-

Table 2-1. Construction Site BMPs			
ID	BMP Name	Minimum Requirement	
		CGP	LTCGP
SC-3	Sediment Trap/Curb Cutback	-	-
SC-4	Check Dam	-	-
SC-5	Fiber Rolls	X <sup>1</sup>	X <sup>1</sup>
SC-6	Gravel Bag/Earthen Berm		
SC-7	Street Sweeping	X	-
SC-8	Sandbag Barrier	X	X
SC-9	Straw Bale Barrier	X <sup>1</sup>	X <sup>1</sup>
SC-10	Temporary Drainage Inlet Protection	X	X
SC-11	Compost Sock	X <sup>1</sup>	X <sup>1</sup>
SC-12	Flexible Sediment Barrier		
<b>Wind Erosion Control</b>			
WE-1	Wind Erosion Control	X	X
<b>Tracking Control</b>			
TC-1	Temporary Construction Entrance/Exit	X	X
TC-2	Temporary Construction Roadway	-	-
TC-3	Temporary Entrance/Outlet Tire Wash	-	-
<b>Non-Stormwater Management</b>			
NS-1	Water Conservation Practices	-	-
NS-2	Dewatering Operations	-	X <sup>3</sup>
NS-3	Paving, Sealing, Sawcutting and Grinding Operations	X	X
NS-4	Temporary Stream Crossing	-	-
NS-5	Clear Water Diversion	-	-
NS-6	Illicit Connection and Illegal Discharge Detection and Reporting	X	X
NS-7	Potable Water/Irrigation	-	-
NS-8	Vehicle and Equipment Cleaning	X	X
NS-9	Vehicle and Equipment Fueling	X	X
NS-10	Vehicle and Equipment Maintenance	X	X
NS-11	Pile Driving Operations	-	-
NS-12	Concrete Curing	-	-
NS-13	Material and Equipment Use Over Water	-	-
NS-14	Concrete Finishing	-	-
NS-15	Structure Demolition/Removal Over or Adjacent to Water	-	-

Table 2-1. Construction Site BMPs			
ID	BMP Name	Minimum Requirement	
		CGP	LTCGP
<b>Waste Management and Materials Pollution Control</b>			
WM-1	Material Delivery and Storage	X	X
WM-2	Material Use	X	X
WM-3	Stockpile Management	X	X
WM-4	Spill Prevention and Control	X	X
WM-5	Solid Waste Management	X	X
WM-6	Hazardous Waste Management	X	X
WM-7	Contaminated Soil Management	X	X
WM-8	Concrete Waste Management	X	X
WM-9	Sanitary and Septic Waste Management	X	X
WM-10	Liquid Waste Management	X	X

<sup>1</sup> Can be selected as a standalone BMP or a combination of temporary soil stabilization BMPs is selected depending on site conditions, minimum requirement is met when the individual BMP or the combination is properly implemented.

<sup>2</sup> Only applicable when outlet protection/velocity dissipation is required.

<sup>3</sup> When dewatering is expected, must have a dewatering and/or diversion plan as required under LTCGP Section N.

## 2.4 BMP Inspection Frequency

The SWPPP or WPCP implemented on Caltrans construction projects includes specific visual monitoring requirements to comply with the CGP, LTCGP, and/or Caltrans Permit. All BMPs deployed on construction sites must be inspected on a frequency as described below. Improperly installed or damaged BMPs must be corrected immediately, or by a later date and time if requested by the Contractor and approved by the Resident Engineer (RE) in writing. Corrections must be made before the onset of forecasted rain events. Inspections of Construction Site BMPs are to be conducted at a minimum as follows:

- Prior to a forecast storm event
- After a qualified rain event that causes runoff from the construction site
- At 24-hour intervals during extended rain events
- Weekly throughout the duration of the construction project

Table 2-2 shows the monitoring requirements for projects subject to CGP or LTCGP. The SWPPP/WPCP Preparation Manual includes more details on what each inspection should include.

**Table 2-2. Monitoring Requirements for CGP and LTCGP**

Risk Level		Visual Inspections					Sampling		
		Quarterly Non-stormwater Discharge	Pre-Storm			Post Storm			
			Baseline	REAP	Daily Storm BMP	Post Storm	Non-visible Pollutant	Stormwater Discharge	Receiving Water
CGP	1	X	X		X	X	X		
	2	X	X	X	X	X	X	X	
	3	X	X	X	X	X	X	X	X
LTCGP	N/A	X	X	X	X	X	X	X	X

## Section 3

# Temporary Soil Stabilization BMP

### 3.1 Temporary Soil Stabilization

Temporary soil stabilization consists of preparing the soil surface and applying one of the BMPs shown in Table 3-1, or combination thereof, to disturbed soil areas. Temporary soil stabilization must be applied to disturbed soil areas of construction projects in conformance with contract documents and this Manual. Refer to Appendix B for additional guidance on the selection of temporary soil stabilization controls.

### 3.2 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:

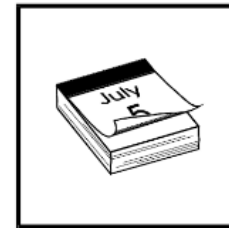
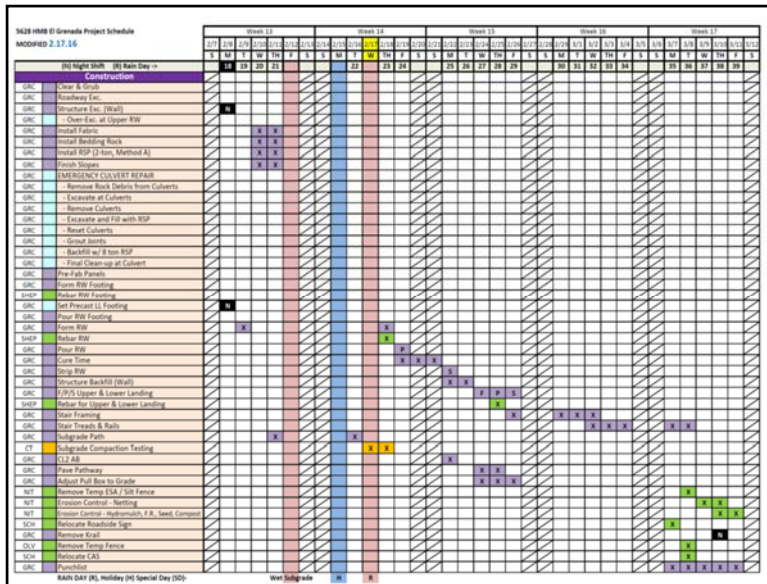
- Earth Dikes/Drainage Swales & Lined Ditches
- Outlet Protection/Velocity Dissipation Devices
- Slope Drains

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	Temporary Cover and Rolled Erosion Control Products (RECP)
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
SS-12	Streambank Stabilization

The remainder of this section shows the working details for each of the BMPs.



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Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input checked="" type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

## Definition and Purpose

This 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 and temporary sediment control 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 should be scheduled to minimize land disturbance during the wetter months for all projects. In addition, any construction windows required by regulatory permits, and any winter suspension work should be described in the schedule. Appropriate BMPs must be implemented year-round.

## Limitations

Environmental constraints such as nesting season prohibitions reduce the full capabilities of this BMP.

## Standards and Specifications

### General Requirements

- Developing a schedule and planning the project operations to minimize erosion and the potential to discharge pollutants to stormwater are the very first steps in an effective stormwater program. The construction schedule must be incorporated into the SWPPP or WPCP. Refer to Section 8 and 13 of the Standard Specifications.

- The schedule should clearly show when work activities that could pollute stormwater with sediment or other contaminants would occur (e.g., grading, move-in, move-out, stockpiling, pile driving), and when soil stabilization, sediment control, and other BMPs associated with each phase of construction would be implemented.
- The schedule should include details on the implementation and deployment of:
  - Temporary and permanent soil stabilization BMPs
  - Temporary sediment control BMPs
  - Tracking control BMPs
  - Wind erosion control BMPs
  - Non-stormwater BMPs and
  - Waste management and materials pollution control BMPs
- The schedule should also include dates for significant long-term operations or activities that may have planned non-stormwater discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, bridge cleaning, etc.
- The construction schedule should reflect requirements for in-water work and other construction activity with potential to disturb water and biological resources contained in regulatory agency permits and approvals (RWQCB 401 WQC, USACE 404 permit, DFG 1602 permit, etc.).

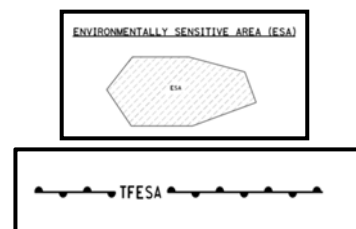
## **Recommendations**

- Schedule work to minimize soil disturbing activities during predicted rain events. Consider rescheduling activities for dry periods to minimize maintenance requirements.
- Develop 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.
- Schedule major grading operations during dryer months when practical.
- Stabilize inactive areas within 15 days from the cessation of soil-disturbing activities or one day prior to the onset of precipitation, whichever occurs first. Must consider manufacturers recommendation for the selected soil stabilization BMP to ensure they meet the minimum dry time required. See Appendix B of this Manual for additional guidance.
- Monitor the weather forecast for storm events, which are storms that produce or are forecasted to produce at least 0.1 inch of precipitation within a 24-hour period. When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization, sediment controls, and, if applicable, sediment treatment controls on all disturbed areas prior to the onset of rain.

- Ensure ample supply of BMP materials are on site in order to quickly mobilize and implement required BMPs, particularly ahead of rain events when materials may be in short supply or back order.
  - Be prepared year-round to deploy soil stabilization and sediment control practices. Erosion may be caused during dry seasons by unseasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year-round, and retain and maintain sediment trapping devices in operational condition.
  - Sequence trenching activities so that most open portions are closed before new trenching begins. Trenched material should be stored on the upstream side of the trenches.
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
  - Consider the early planting and establishment of permanent vegetation in the schedule to maximize plant establishment success and minimize irrigation and continuous maintenance needs.
  - 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.
  - Keep the schedule up to date and ensure it is consistent with the contractor's three-week look ahead, or other routine schedule submitted to the RE under the contract.
  - Amend the schedule when changes are warranted or when directed by the RE.
- SWPPP or WPCP
- A Water Pollution Control Schedule (WPCS) must include construction operations and BMP implementation for the entire duration of the project. The WPCS is to be included as an attachment and discussed in section 500.7 of the SWPPP or Section 30.5 of the WPCP.

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**Standard Symbol**

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- 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. This BMP is very applicable for multi-year or multiple location projects, where existing vegetation can be preserved until the area becomes active.
  - On a year-round basis, temporary fencing shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas.
  - Clearing and grubbing operations should be staged to preserve existing vegetation.
  - Areas where natural vegetation exists and is designated for preservation. Such areas often include steep slopes, watercourse, and building sites in wooded areas.
  - Areas where local, state, and federal government require preservation, such as vernal pools, wetlands, marshes, certain oak trees, etc.
  - Clearly marking and leaving a buffer area around these unique areas during construction will help to preserve these areas as well as take advantage of natural erosion prevention and sediment trapping.
  - During clearing and grubbing do not injure standing trees, plants, and improvements shown in the plans to be protected.
  - For any trenching or 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 8 in below the ground surface, and not below the tree center to minimize impact on the roots. 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.

- Limitations
- Protection of existing vegetation requires planning, and may limit the area available for construction activities.
  - For sites with diverse topography, it is often difficult and expensive to save existing trees while grading the site satisfactory for the construction project.

Standards and Specifications **General Requirements**

- Specifications for preservation of existing vegetation can be found in Standard Specifications Section 5-1.36A.
- Section 14 “Environmental Stewardship” of the Standard Specifications specifies the requirements related to environmental compliance and resource management, including requirements related to Environmentally Sensitive Areas (ESAs).
- Refer to Section 16-2.03 of the Standard Specifications for “High-Visibility Fences” used to delineate ESAs.
- Refer to 16-2.04 of the Standard Specifications for “Temporary Construction Mats” used to protect wetlands and other areas.

**Schedule**

- Preservation of existing vegetation must be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas identified on the plans to be preserved, including areas designated as ESAs.
- Preservation of existing vegetation should conform to scheduling requirements set forth in the special provisions.

**Design and Layout**

- Mark areas to be preserved with temporary fencing (Type ESA). The temporary fencing must be made of high visibility fabric secured with 6 foot (minimum) posts. Refer to Section 16-2.03B of the Standard Specifications for more information on temporary high-visibility fence materials.
- Fence posts can be either wood or steel, at the Contractor’s discretion, as appropriate for the intended purpose. The post spacing must be 8 feet center-to-center (maximum) and embedded at least 16 inches into the ground to completely support the fence in an upright position.
- See Standard Plan T65 for “Temporary Fence (Type ESA).”

**Installation**

- Construction materials, equipment storage, and parking areas should be located where they will not cause damage to vegetation designated for preservation. This could include: keeping equipment away from trees to prevent trunk and root damage, considering the impact of grade changes to existing vegetation

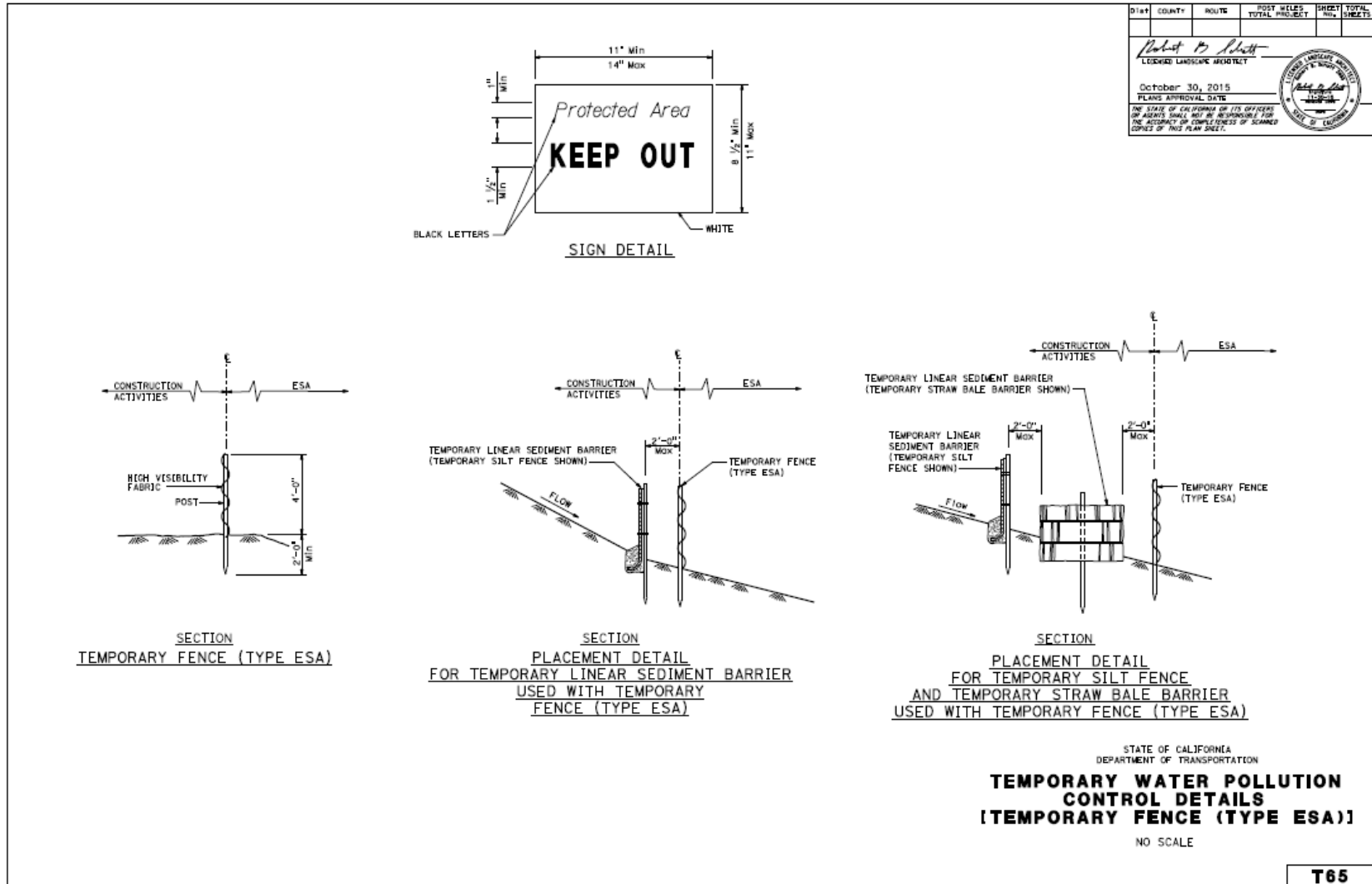
and the root zone, and minimizing disturbed areas by avoiding stands of trees and shrubs and following existing contours to reduce cutting and filling for temporary roads.

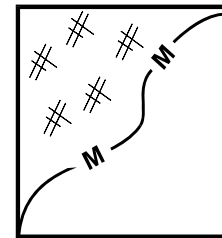
- Maintain existing irrigation systems.
  - Employees and subcontractors must be instructed to honor protective devices. No heavy equipment, vehicular traffic, or storage piles of any construction materials is permitted within the drip line of any tree to be retained. Removed trees should not be felled, pushed, or pulled into any retained trees. Fires should not be permitted within 100 ft of the drip line of any retained trees. Any fires must be of limited size, and must be kept under continual surveillance. No toxic or construction materials (including paint, acid, nails, gypsum board, chemicals, fuels, and lubricants) should be stored within 50 feet of the drip line of any retained trees, nor disposed of in any way which would injure vegetation.
  - After all other work is complete, fences and barriers must be removed last. This is because protected trees may be destroyed by carelessness during the final cleanup and landscaping.
- Maintenance and Inspection
- During the entire construction phase, the limits of disturbance must remain clearly marked to avoid damage to the existing vegetation during site cleanup and stabilization. Irrigation or maintenance of existing vegetation must conform to the requirements in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below must be followed:
    - Serious tree injuries must be attended to by an arborist.
    - During construction, the District Environmental Branch must be contacted to ensure that ESAs are protected and any environmental regulations are followed.
    - Existing Vegetated Areas to be Preserved must be clearly demarcated in the WPCDs.
- SWPPP or WPCP
- Preservation of Existing Vegetation must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.



# Preservation of Existing Vegetation

SS-2





Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose** Hydraulic mulch consists of applying a mixture of natural fibers and a stabilizing compound with hydroseeding equipment to temporarily 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 be re-disturbed following an extended period of inactivity.
- Limitations**
- Wood fiber hydraulic mulches are generally short-lived (only last a part of a growing season) and require (24 hours or more) time to dry before rainfall occurs to be effective.
  - Paper mulches are not permitted.
  - Avoid use in areas where the mulch would be incompatible with immediate future earthwork activities and would have to be removed.
  - Cellulose fiber mulches alone may not perform well on steep slopes or in coarse soils.
- Standards and Specifications**
- General Requirements**
- See Standard Specifications Section 13-5.03D to 13-5.03G for placing various types of hydraulic mulch.
  - Standard Specifications Section 21-2.02D and 21-2.02E contain material specifications for fiber and tackifier, respectively.

- A certificate of compliance, as required under Standard Specifications Section 21-2.01C(4), is required for tackifier and bonded fiber matrix (BFM).
- Hydraulic matrices require time to dry before rainfall occurs to be effective. Refer to the manufacturer's specifications for drying times.
- 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 a licensed professional.
- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking should only be used where other methods are impractical.

### ***Temporary Hydraulic Mulch***

- Temporary hydraulic mulch contains mixtures of fiber and tackifier that is applied to soil with hydraulic spray equipment.
- Fiber for temporary hydraulic mulch must be at least 50 percent wood fiber. The remaining percentage must be cellulose fiber, alternate fiber, or a combination of these fibers.
- Temporary hydraulic mulch application rates must follow the manufacturer's recommendations. If not provided, apply at a rate of 2,000 lb/ac.
- Tackifier should be applied per the manufacturer's instructions for the slope, soil, and wind conditions

### ***Temporary BFM Hydraulic Mulch***

- BFM contains 100% wood fiber and tackifier, sometimes combined with seed and fertilizer that is applied to soil hydraulically.
- BFM applications rates must follow the manufacturer's recommendations. If not provided, apply at a rate of 3,500 lb/ac.
- Tackifier used for BFM must be:
  - Bonded to the fiber or prepackaged with the fiber by the manufacturer
  - Contain a minimum of 10 percent of the combined weight of the dry fiber, activating agents, and additives
  - Organic, high viscosity colloidal polysaccharide with activating agents or a blended hydrocolloid-based binder

### ***Temporary Cementitious Binder Hydraulic Mulch***

- Temporary cementitious binder hydraulic mulch is a mixture of fiber and a cementitious binder that is applied to soil with hydraulic spray equipment.
- Application rates of temporary cementitious binder hydraulic mulch must be according to the manufacturer's specifications. If not provided, apply at a rate of 2,000 lb/ac and cementitious binder at 4,000 lb/ac.

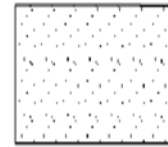
## Maintenance and Inspections

## SWPPP or WPCP

- Additional standards for cementitious binder are provided in Section 13-5.03G.
- Additional guidance on the selection of soil stabilization BMPs can be found in Appendix B of this Manual.
- A certificate of compliance under Standard Specifications Section 21-2.01C(4) for the applicable BMP must be submitted to the RE prior to application to ensure proper mix is being used.
- It is recommended that a small test area/mock-up occurs prior to large area application to verify sufficient cover for the approved mix.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when 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.
- Areas where Hydraulic Mulch will be implemented must be shown in the WPCDs and match site conditions.
- Hydraulic Mulch, Temporary BFM Hydraulic Mulch or Temporary Cementitious Hydraulic Mulch must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.

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BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** Hydroseeding typically consists of applying a mixture of wood, fiber, seed, fertilizer, and stabilizing emulsion with hydromulch equipment, which temporarily protects exposed soils from erosion by water and wind.

**Appropriate Applications**

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

- Can be used in conjunction with other rolled erosion control products.

**Limitations**

- Hydroseeding may be used alone only when there is sufficient time in the season to ensure adequate vegetation establishment and erosion control. Otherwise, hydroseeding must be used in conjunction with a soil binder or mulch, such as SS-5 “Soil Binders” and SS-6 “Straw Mulch.”

- 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.
- Hydroseeding should not be used in areas subject to heavy traffic.
- Could trigger non-visible sampling if the appropriate application timeframe (before a rain event) and manufacturer recommendations are not followed.

**Standards and Specifications** **General Requirements**

- Refer to Standard Specifications Section 13-5.03I “Temporary Hydroseed.”

- To select appropriate hydroseeding mixtures, an evaluation of site conditions shall be performed with respect to:
  - Soil conditions
  - Site topography
  - Season and climate
  - Vegetation types
  - Maintenance requirements
  - Sensitive adjacent areas
  - Water availability
  - Plans for permanent vegetation
- Selection of hydroseeding mixtures must be approved by the licensed professional.
- Seed mix must comply with Standard Specifications Section 21-2.02F “Seed,” and the project’s special provisions.
- Seed may be dry applied to small areas not accessible by hydroseeding equipment if authorized.
- Seeds must not contain seeds of prohibited noxious weeds and more than 1.0% total weed seed by weight. Seeds must be delivered to the project site with each species in separate, unopened containers with the seed tag attached. Measure individual seed species and mix in the presence of the RE.
- Fiber must be at least 50 percent wood fiber. The remaining percentage must be cellulose fiber, alternate fiber, or a combination of these fibers.
- Commercial fertilizer must conform to the requirements of the California Food and Agricultural Code. Fertilizer can be pelleted or granular form.

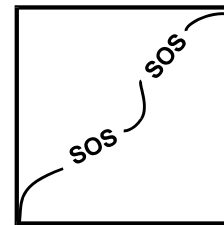
### ***Application Procedures***

- Prior to application, roughen the slope, fill area, or area to be seeded with the furrows trending along the contours. Rolling with a crimping or punching type roller or track walking is required on all slopes prior to hydroseeding. Track walking should only be used where other methods are impractical.
- Add water to hydroseed materials as recommended by the manufacturer and mix sufficiently to ensure an even application. A dispersing agent may be added to the mixture if authorized.
- Equipment must have a built-in continuous agitation and discharge system capable of producing a homogeneous mixture and a uniform application rate. The tank must have a minimum capacity of 1,000 gallons. A smaller tank can be used if authorized by the RE.
- Apply temporary hydroseed at the following rates:
  - Apply seed at rates specified in the project’s erosion control plans.
  - Apply fiber at 2,000 lb/ac.

- Apply tackifier according to manufacturer’s recommendations for the slope, soil, and wind conditions.
  - Apply materials in locations, rates, and number of applications shown and as follows:
  - Start application within 60 minutes after adding seed to the tank.
  - Apply in successive passes as necessary to achieve the specified application rate.
  - Apply all hydroseed materials shown for a single area within 72 hours.
  - If hydroseed materials are applied to areas covered by Rolled Erosion Control Products (RECP), apply hydroseed materials to the RECP as follows:
    - Verify the RECP is in uniform contact with the slope surface.
    - Spray materials into the RECP perpendicular to the slope and integrate well.
    - Do not displace or damage the RECP.
    - After the final application, do not allow pedestrians or equipment on the treated areas.
    - Follow-up applications shall be made as needed to cover weak spots, and to maintain adequate soil protection.
    - Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.
  - Additional guidance on the selection of soil stabilization BMPs can be found in Appendix B of this Manual.
- Maintenance and Inspection
- All seeded areas must 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 reapplied at a scheduled recommended by the licensed professional.
  - A certificate of compliance under Standard Specifications Section 21-2.01C(4) for the applicable BMP must be submitted to the RE prior to application to ensure proper mix is being used.
  - It is recommended that a small test area/mock-up occurs prior to large area application to verify sufficient cover for the approved mix.



- After any rain event, the Contractor is responsible for maintaining all slopes to prevent erosion.
  - Areas where Hydroseeding will be implemented must be shown in the WPCDs. Application timeframes (dates) must be included in the WPCS.
  - Must ensure correct application rates and passes (different directions) take place to ensure adequate coverage.
- SWPPP  
or WPCP
- Hydroseeding must be discussed in Section 500.3.2 of SWPPP or Section 30.2 of the WPCP.



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input checked="" type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose** Soil binders consist of applying and maintaining a soil stabilizer to exposed soil surfaces. Soil binders are materials applied to the soil surface to temporarily prevent water-induced erosion of exposed soils on construction sites. Soil binders also provide temporary dust, wind, and soil stabilization (erosion control) benefits. This is one of five temporary soil stabilization alternatives to consider.
- Appropriate Applications** Soil binders are typically 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. Application on stockpiles to prevent water and wind erosion.
- 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. Soil binders may need reapplication after a storm event.
  - 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.
  - May not cure if low temperatures occur within 24 hours of application.

## Standards and Specifications

### **General Considerations**

- Site-specific 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, refer to Standard Specifications Section 13,18 and 21.
- 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.
- Storm water quality runoff sampling is required for many soil binders. Per table 5-1, footnote 7, of the 2013 Construction Site Monitoring Program Guidance Manual the following copolymers/polymers do not discharge pollutants and water quality sampling and analysis is not required Super Tak, M-binder, Fish Stik, Pro40dc, Fisch-Bond, Soil Master WR and EarthGuard.

### **Soil Binders Applications**

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 by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where rolling is impractical.
- Consider the drying time for the selected soil binder and apply with sufficient time before anticipated rainfall. 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.
- Soil binders shall not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the air temperature is below 4°C (40°F) during the curing period.
- More than one treatment is often necessary, although the second treatment may be diluted or have a lower application rate.
- 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 0.03 to 0.3 gal/yd<sup>2</sup> or according to manufacturer’s recommendations.
  - Apply solution under pressure. Overlap solution 6 to 12 in.
  - Allow treated area to cure for the time recommended by the manufacturer; typically, at least 24 hours.
  - In low humidities, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd<sup>2</sup>.

### Selecting a Soil Binder

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

**Table 1**  
**Properties of Soil Binders for Erosion Control**

Chemicals	Plant Material Based (Short Lived)	Plant Material Based (Long Lived)	Polymeric Emulsion Blends	Cementitious-Based Binders
Relative Cost	Low	Low	Low	Low
Resistance to Leaching	High	High	Low to Moderate	Moderate
Resistance to Abrasion	Moderate	Low	Moderate to High	Moderate to High
Longevity	Short to Medium	Medium	Medium to Long	Medium
Minimum Curing Time before Rain	9 to 18 hours	19 to 24 hours	0 to 24 hours	4 to 8 hours
Compatibility with Existing Vegetation	Good	Poor	Poor	Poor
Mode of Degradation	Biodegradable	Biodegradable	Photodegradable/ Chemically Degradable	Photodegradable/ Chemically Degradable
Labor Intensive	No	No	No	No
Specialized Application Equipment	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher	Water Truck or Hydraulic Mulcher
Liquid/Powder	Powder	Liquid	Liquid/Powder	Powder
Surface Crusting	Yes, but dissolves on rewetting	Yes	Yes, but dissolves on rewetting	Yes
Clean-Up	Water	Water	Water	Water
Erosion Control Application Rate	Varies <sup>(1)</sup>	Varies <sup>(1)</sup>	Varies <sup>(1)</sup>	4,500 to 13,500 kg/ha

(1) Dependant on product, soil type, and slope inclination

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

- Suitability to situation - Consider where the soil binder will be applied; determine 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.
- 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, 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:

### **Plant-Material Based (Short Lived)**

-*Guar*: Guar gum based tackifier must be derived from the ground endosperm of the guar plant, *Cyanmopsis tetragonolobus*. It must be treated with dispersing agents for easy mixing.. It shall be diluted at the rate of 1 to 5 lb per 100 gallons of water, depending on application machine capacity. Recommended minimum application rates are as follows:

**Application Rates for Guar Soil Stabilizer**

Slope (V:H):	Flat	1:4	1:3	1:2	1:1
Kg/Ha:	45	50	56	67	78
lb/ac	40	45	50	60	70

-*Psyllium*: Psyllium is composed of the finely ground muciloid coating of plantago seeds that is applied as a dry powder or in a wet slurry to the surface of the soil. It dries to form a firm but rewettable membrane that binds soil particles together but permits germination and growth of seed. Psyllium requires 12 to 18 hours drying time. Psyllium shall be applied at a rate of 80 to 200 lb/ac, with enough water in solution to allow for a uniform slurry flow.

-*Starch*: Starch is non-ionic, water soluble granular cornstarch. The material is mixed with water and applied at the rate of 150 lb/ac. Approximate drying time is 9 to 12 hours.

## ***Plant-Material Based (Long Lived)***

-*Pitch and Rosin Emulsion*: Generally, a non-ionic pitch and rosin emulsion has a minimum solids content of 48%. The rosin shall be a minimum of 26% of the total solids content. The soil stabilizer shall be non-corrosive, water-dilutable emulsion that upon application cures to a water insoluble binding and cementing agent. For soil erosion control applications, the emulsion is diluted and shall be applied as follows:

For clayey soil: 5 parts water to 1 part emulsion

For sandy soil: 10 parts water to 1 part emulsion

Application can be by water truck or hydraulic seeder with the emulsion/product mixture applied at the rate specified by the manufacturer. Approximate drying time is 19 to 24 hours.

## ***Polymeric Emulsion Blends***

-*Acrylic Copolymers and Polymers*: Polymeric soil stabilizers shall consist of a liquid or solid polymer or copolymer with an acrylic base that contains a minimum of 55% solids. The polymeric compound shall be handled and mixed in a manner that will not cause foaming or shall contain an anti-foaming agent. The polymeric emulsion shall not exceed its shelf life or expiration date; manufacturers shall provide the expiration date. Polymeric soil stabilizer shall be readily miscible in water, non-injurious to seed or animal life, non-flammable, shall provide surface soil stabilization for various soil types without totally inhibiting water infiltration, and shall not re-emulsify when cured. The applied compound shall air cure within a maximum of 36 to 48 hours. Liquid copolymer shall be diluted at a rate of 10 parts water to 1 part polymer and applied to soil at a rate of 1,175 gal/ac.

-*Liquid Polymers of Methacrylates and Acrylates*: This material consists of a tackifier/sealer that is a liquid polymer of methacrylates and acrylates. It is an aqueous 100% acrylic emulsion blend of 40% solids by volume that is free from styrene, acetate, vinyl, ethoxylated surfactants or silicates. For soil stabilization applications, it is diluted with water in accordance with manufacturer's recommendations, and applied with a hydraulic seeder at the rate of 20 gal/ac. Drying time is 12 to 18 hours after application.

-*Copolymers of Sodium Acrylates and Acrylamides*: These materials are non-toxic, dry powders that are copolymers of sodium acrylate and acrylamide. They are mixed with water and applied to the soil surface for erosion control at rates that are determined by slope gradient:

Slope Gradient (V:H)	kg/ha (lb/ac)
Flat to 1:5	3-5
1:5 to 1:3	5-10
1:2 to 1:1	10-20

*-Poly-Acrylamide and Copolymer of Acrylamide:* Linear copolymer polyacrylamide is packaged as a dry-flowable solid. When used as a stand-alone stabilizer, it is diluted at a rate of 1 lb/100 gal of water and applied at the rate of 5 lb/ac.

*-Hydro-Colloid Polymers:* Hydro-Colloid Polymers are various combinations of dry-flowable poly-acrylamides, copolymers and hydro-colloid polymers that are mixed with water and applied to the soil surface at rates of 53 to 62 lb/ac. Drying times are 0 to 4 hours.

### **Cementitious-Based Binders**

*-Gypsum:* This is a formulated gypsum-based product that readily mixes with water and mulch to form a thin protective crust on the soil surface. It is composed of high purity gypsum that is ground, calcined and processed into calcium sulfate hemihydrate with a minimum purity of 86%. It is mixed in a hydraulic seeder and applied at rates 4,000 to 12,000 lb/ac. Drying time is 4 to 8 hours.

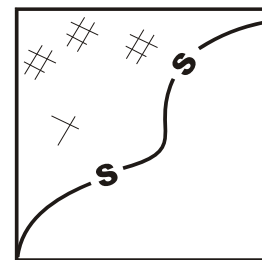
- Additional guidance on the selection of soil stabilization BMPs can be found in Appendix B of this Manual.

- Maintenance and Inspection
  - Reapplying the selected soil binder may be needed for proper maintenance. High traffic areas shall be inspected daily, and lower traffic areas shall be inspected weekly.
  - A certificate of compliance under Standard Specifications Section 21-2.01C(4) must be submitted to the RE prior to application.
  - It is recommended that a small test area/mock-up occurs prior to large area application to verify sufficient cover for the approved mix.
  - After any rainfall event, the Contractor is responsible for maintaining all slopes to prevent erosion.
  - Maintain an unbroken, temporary stabilized area while DSAs are inactive. Repair any damaged stabilized area and re-apply soil binder to exposed areas.
  - Cleaning of equipment must be done in a designated area that can collect the water to prevent triggering of non-visible and non-stormwater requirements.
  
- SWPPP or WPCP
  - Soil Binders must be discussed in Section 500.3.2 of the SWPPP or Section 30.2 of the WPCP.



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BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- 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 or Rolled Erosion Control Product (RECP). This is one of the temporary soil stabilization alternatives to consider.
- Appropriate Applications**
- Straw mulch is typically used for soil stabilization as a temporary surface cover on disturbed areas until soils can be prepared for revegetation 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 rain events due to high demand.
  - There is a potential for introduction of weed-seed and unwanted plant material.
  - 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, must use a tackifier.

## Standards and Specifications

### **General Requirements**

- Straw and tackifier must conform to Standard Specifications Sections 21-2.02H, 21.2-03G and 21-2.02E.
- Submit a certificate of compliance for straw before application. If weed-free straw is used, the certificate of compliance must include the certificate of quarantine compliance.
- Straw must be derived from wheat, rice, or barley.
- A tackifier is the preferred method for anchoring straw mulch to the soil on slopes.
- Selected tackifier must be environmentally benign (non-toxic to plants and animal life) and does not pose a threat to water quality.
- 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 should not be applied during or immediately before a rain event.

### **Application Procedures**

- Apply loose straw at the rate indicated either by machine or by hand distribution.
- The straw mulch must be evenly distributed on the soil surface.
- Straw may be anchored in place by incorporating it into soil or using a tackifier. Additionally, in small areas and/or steep slopes, straw mulch can also be held in place using Rolled Erosion Control Product. Refer to BMP SS-7, “Temporary Cover and Rolled Erosion Control Products.”
- If a tackifier will be used to anchor the straw mulch in lieu of incorporation, roughen embankment or fill areas by rolling with a crimping or punching-type roller. Track walking should only be used where rolling is impractical.
- A tackifier acts to glue the straw fibers together and to the soil surface. Factors influencing tackifier selection include longevity and ability to hold the fibers in place.
- Apply tackifier according to the manufacturer’s instructed rate for the slope, soil, and wind conditions.
- If incorporation of straw mulch into soil is the selected method for anchoring, then do as follows:
  - A spade or shovel can be used to incorporate straw into soil in small areas.
  - On slopes with soils that 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 coultter, known commercially as a “crimper” under Section 21-2.03J of the Standard Specifications.

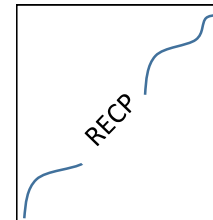
- Maintenance and Inspections
  - Straw needs to last long enough to achieve erosion control objectives.
  - Maintain an unbroken, temporary mulched ground cover while DSAs are inactive. Repair any damaged ground cover and re-mulch exposed areas.
  - Reapplication of straw mulch and tackifier may be required by the RE 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.
- SWPPP or WPCP
  - Straw Mulch must be discussed in Section 500.3.2 of the SWPPP or Section 30.2 of the WPCP.

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# Temporary Cover and Rolled Erosion Control Products

SS-7



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** This BMP involves the placement of geosynthetics, turf reinforcement mats, plastic covers, or rolled erosion control products (RECPs), including erosion control blankets, to stabilize disturbed soil areas and protect soils from erosion by wind or water. This is one of the 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 3:1 (H:V).
    - Slopes where the erosion potential is high.
    - Slopes and disturbed soils where mulch must be anchored.
    - Disturbed areas where plants are slow to develop.
    - Channels with flows exceeding 3 ft/s.
    - Channels to be vegetated.
    - Slopes adjacent to receiving waters or ESAs.
  - Standards for plastic sheeting used for stockpile covers are provided in Section 14-11.05A of the Standard Specifications.

- Limitations**
- Blankets and mats are typically 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.
  - May delay seed germination due to reduction in soil temperature.
  - Plastic netting should not be used when regulatory permits prohibit their use or if there is a potential for plastic netting to endanger wildlife.
  - 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 should be removed and disposed of prior to application of permanent soil stabilization measures as required by the contract plans. Long-term erosion control blankets must be Class 8 Rock Slope Protection fabric.
  - Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill and requires extensive inspection and maintenance.
  - Plastic results in 100 percent runoff, which may cause serious erosion problems in the downstream areas receiving the increased flow.
  - The use of plastic should 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, can be installed.
  - Geosynthetics, mats, plastic covers, and RECPs have maximum flow rate limitations; consult the manufacturer for proper selection.
  - Additional guidance for selection of soil stabilization BMPs is provided in Appendix B of this Manual.

**Standards and Specifications**    **Material Selection**

- There are many types of temporary cover material and RECPs, and selection of the appropriate type is based on the specific type of application and site conditions. Selection(s) made by the Contractor must be approved by the Resident Engineer; certification of compliance must be in accordance with Standard Specifications Sections 6-2 and 21-2.01C and 21-2.02O.

**Temporary Cover – Geosynthetics**

- Material shall be a woven polypropylene fabric with minimum thickness of 0.06 inch, minimum width of 12 feet and meet all requirements of Standard Specification Section 96-1 Temporary Cover. Material shall have a minimum tensile strength of 150 lb (warp) and 80 lbs (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric must be approximately 0.07 sec –1 in conformance with the requirements in

ASTM Designation: D4491. The fabric must have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets should be secured in place with wire staples or sandbags and by keying into tops of slopes and edges to prevent infiltration of surface water. Staples should be made of minimum 16 gauge steel wire and be U-shaped with 8-inch legs and 2-inch crown.

- Geotextiles may be reused if, in the opinion of the RE, they are suitable for the use intended.
- Submit a certificate of compliance for each type of geosynthetic material used.

### **Temporary Cover – Plastic Sheeting**

- Plastic sheeting shall comply with Standard Specification Section 13-5 and 96-1 which requires a minimum thickness of 0.39 inches, and be keyed in at the top of slope and firmly held in place with gravel-filled bags placed no more than 6 feet apart or other weights authorized by the RE. Seams are typically taped or weighted down their entire length, and there should be at least a 12 to 24 inches overlap of all seams. Edges must be embedded a minimum of 6 inches in soil.
- All sheeting must be inspected periodically after installation and after rain events to check for erosion, undermining, and anchorage failure. Any failures must be repaired immediately. If washout or breakages occurs, the material should be re-installed after repairing the damage to the slope or area.

### **Rolled Erosion Control Products**

- RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials. For an RECP to be considered 100 percent biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable.
  - **Jute mesh** is made from a natural fiber that is spun into a yarn, then loosely woven into a biodegradable mesh. It is designed to be used in conjunction with vegetation and has longevity of approximately one year. The material is supplied in rolled strips that are secured to the soil with steel U-shaped staples. Jute mesh shall comply with all requirements of Jute mesh table included in Standard Specification Section 21-2.
  - **Erosion control blanket** is a machine-produced mat made of processed natural fibers that are bound together to form a continuous matrix surrounded by two natural nets. The processed natural fibers comprising the matrix of the blanket may be a mixture of straw (70 percent) and coconut (30 percent), woven coir (100 percent), or excelsior (curled wood fiber) (80 percent). Erosion control blankets must be furnished in rolled strips a minimum of 72 inches wide, and secured in place with steel U-shaped staples. Erosion control blankets must also comply with Section 21-2.02O(4) of the Standard Specifications.



- **Netting** consists of pure coconut fibers, or coir, woven into a matrix. Coir netting must be furnished in rolled strips a minimum of 72 to 158 inches in width and 0.3 inches thick. There are three classes of coir netting: Type A, Type B, and Type C. See Section 21-2.02O(3) of the Standard Specifications for the minimum requirements for each type of netting.
- Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well. Check contract special provisions to determine whether non-biodegradable products are not to be used based on regulatory requirements.
  - **Turf reinforcement mat** is a nondegradable, open-weave textile made of synthetic fibers, filaments, nets, wire mesh, or other elements processed into a permanent three-dimensional matrix. Turf reinforcement mats must be a minimum of 72 inches in width and 0.25 inches thick. There are three classes of turf reinforcement mat: Type A, Type B, and Type C. See section 21-2.02O(5) of the Standard Specifications for the minimum requirements for each type of netting.
  - **Plastic netting** is a lightweight biaxially-oriented netting designed for securing loose mulches like straw to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which should be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Plastic mesh** is an open-weave geotextile that is composed of an extruded synthetic fiber woven into a mesh with an opening size of less than 0.25 inch. It is used with revegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Synthetic fiber with netting** is a mat that is composed of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three-dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be revegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which should be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.
  - **Bonded synthetic fibers** consist of a three-dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than 90 percent open area, which facilitates root growth. Its tough root-reinforcing system anchors vegetation and protects against hydraulic lift and shear forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an

invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that should be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Combination synthetic and biodegradable RECPs** consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high-strength continuous-filament geomatrix or net stitched to the bottom. The material is designed to enhance revegetation. The material is furnished in rolled strips, which should be secured with U-shaped staples or stakes in accordance with manufacturers' recommendations.

### ***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 larger than 1 inch in size. Fill voids or depressions.
- Proper site preparation ensures that the products and covers will have complete, direct contact with the soil.

### ***Seeding***

- If applicable, seed the area before RECP installation for erosion control and revegetation.
- Check all slots and other areas disturbed during installation must be re-seeded.
- For turf reinforcement mats, seeding is often specified to occur after installation.

### ***Anchoring***

- U-shaped wire staples, metal stake pins, triangular wooden stakes, or fasteners recommended by manufacturers can be used to anchor mats and blankets to the ground surface in conformance with Standard Specification section 13-10.
- Staples should be made of minimum 16 gauge steel wire and be U-shaped with 8-inch legs and 2-inch crown.
- Metal stake pins should be 0.188 inch diameter steel with a 1.5 inch steel washer at the head of the pin, and 8 inch in length.
- Wire staples and metal stakes should be driven flush to the soil surface.
- All anchors should be 6 inch to 18 inch long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

### ***Installation on Slopes***

- Refer to Standard Plans T53 and T54 for details regarding installation on slopes for temporary uses, and H52 for permanent uses.

## ***Installation in Channels***

- Refer to Standard Plan T55 for details regarding installation in channels.
- Installation shall be in accordance with the manufacturer's recommendations. In general, these will be as follows:
  - Dig initial anchor trench 12 in deep and 6 in wide across the channel at the lower end of the project area.
  - Excavate intermittent check slots, 6 in deep and 6 in wide across the channel at 25 ft to 30 ft intervals along the channels.
  - Cut longitudinal channel anchor slots 4 in deep and 4 in wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 in to 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 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 3 in.
  - Secure these initial ends of mats with anchors at 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 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 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 6 in centers at 25 ft to 30 ft intervals in lieu of excavated check slots.
  - Shingle-lap spliced ends by a minimum of 12 in apart on 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 12 in by 6 in terminal trench.

# Temporary Cover and Rolled Erosion Control Products

SS-7

- 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 becomes the property of the Contractor.
- Temporary soil stabilization removed from the site of the work must be disposed of outside the highway right-of-way in conformance with the provisions in Standard Specifications Section 14-10. If approved by the RE, the contractor may leave the temporary soil stabilizer in place.

### **Maintenance and Inspection**

Areas treated with temporary soil stabilization must be inspected as specified in the Standard Specifications and special provisions. Areas treated with temporary soil stabilization must be maintained to provide adequate erosion control. Temporary soil stabilization should be reapplied or replaced on exposed soils when area becomes exposed or exhibits visible erosion.

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

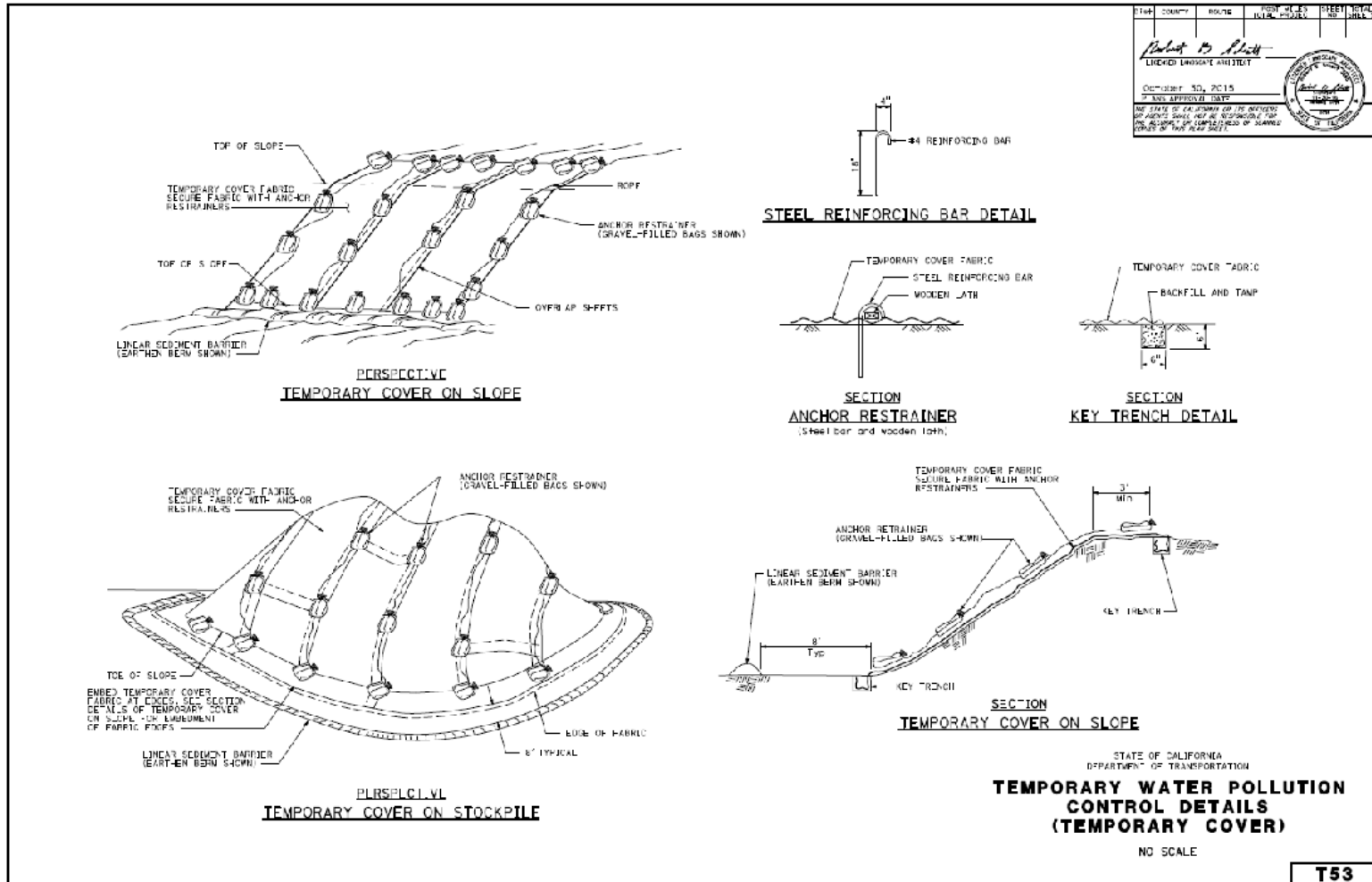
### **SWPPP or WPCP**

- RECP must be discussed in Section 500.3.2 of the SWPPP or Section 30.2 of the WPCP.



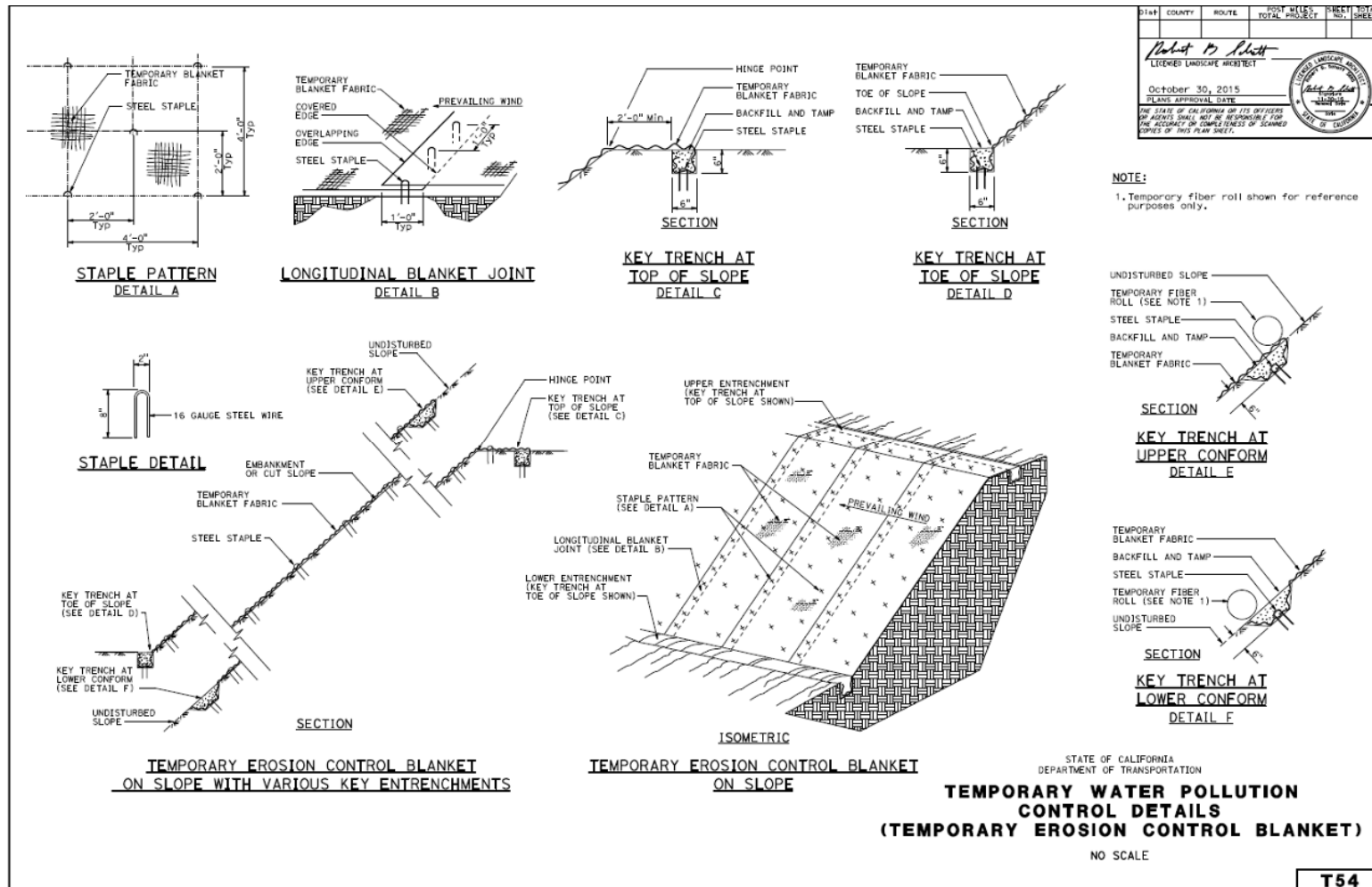
# Temporary Cover and Rolled Erosion Control Products

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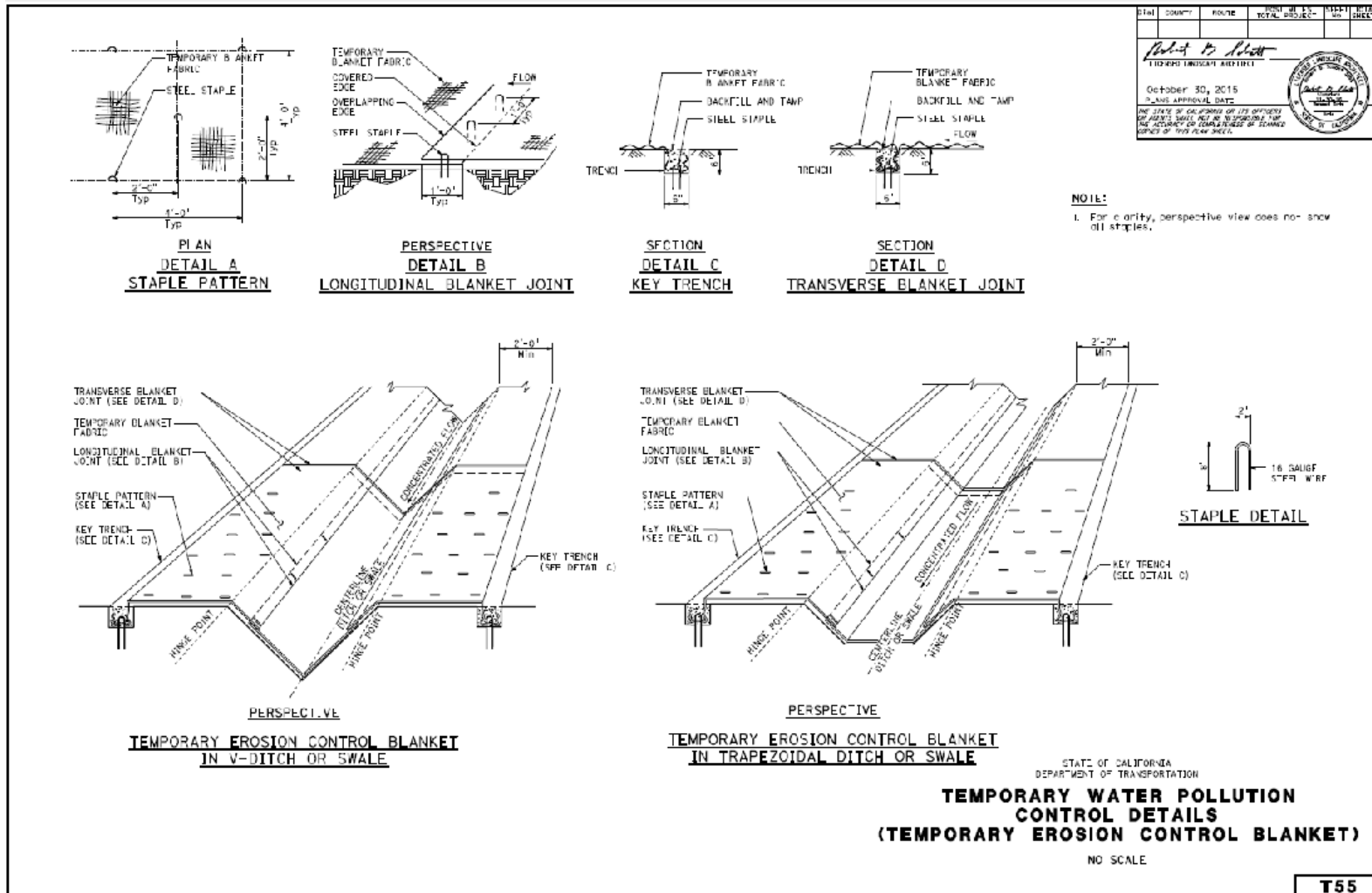
# Temporary Cover and Rolled Erosion Control Products

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# Temporary Cover and Rolled Erosion Control Products

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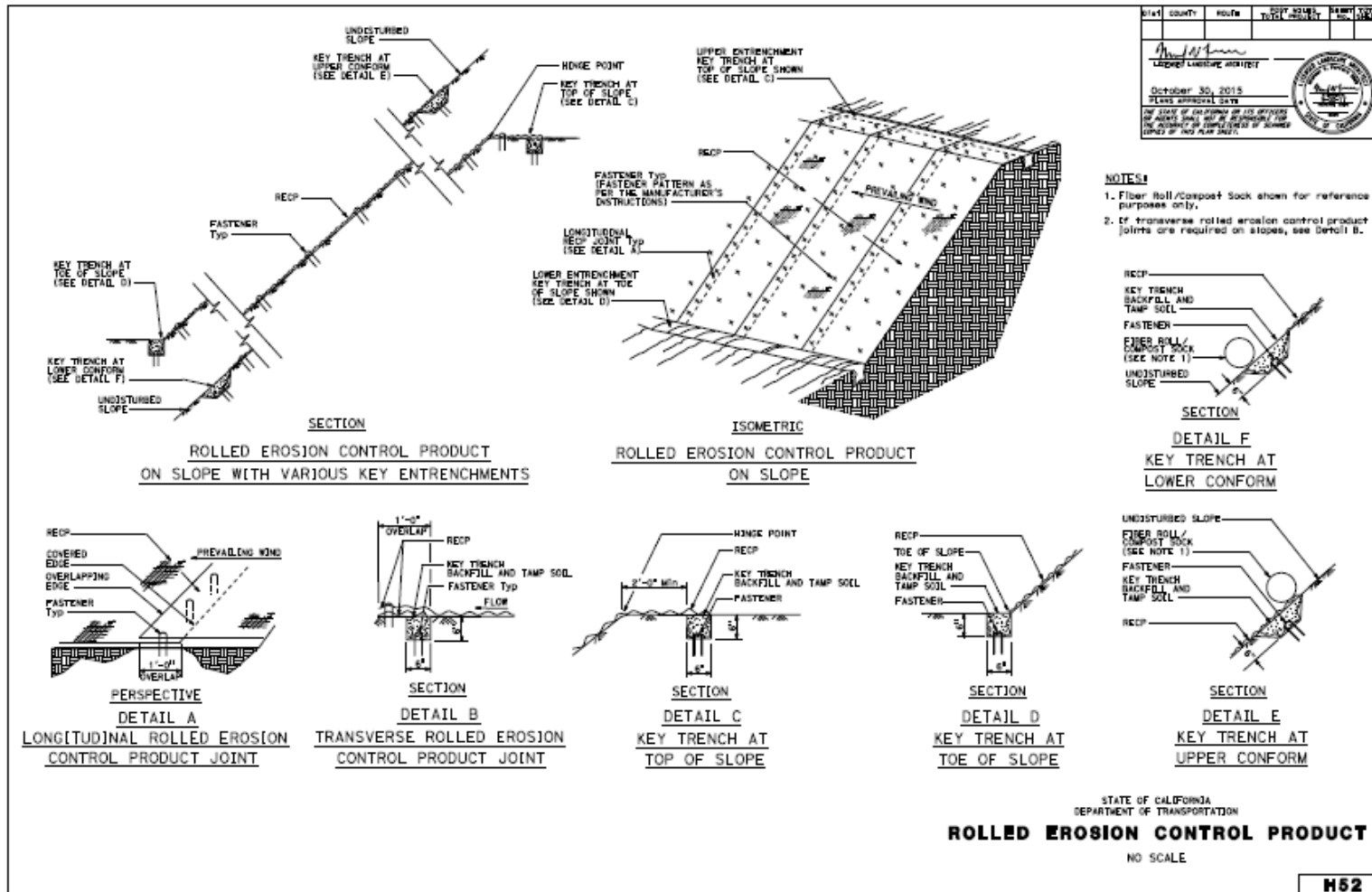
2015 STANDARD PLAN T55

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# Temporary Cover and Rolled Erosion Control Products

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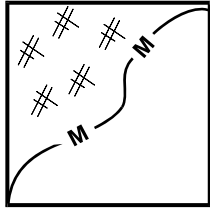
# Temporary Cover and Rolled Erosion Control Products

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Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** Wood mulching consist of applying a mixture of shredded bark, wood chips, or tree trimmings on top of soil. 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 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.
    - In combination with other BMPs, mulch may be used to stabilize roadway embankment slopes and control wind erosion.

- Limitations**
- Wood mulch may introduce unwanted species of vegetation.
  - Shredded wood does not withstand concentrated flows and is prone to sheet erosion.
  - 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.
  - Mulch may need to be removed prior to further earthwork.

## Standards and Specifications

- Mulch should not be used alone to stabilize embankments or sides of swales where concentrated flows could mobilize the material.

### **Mulch Selection**

There are many types of mulches, including tree bark mulch, wood chip mulch, shredded bark mulch, and tree trimming mulch. Selection of the appropriate type should be based on the type of application and site conditions. Prior to use of wood mulches, obtain concurrence with the District Landscape Architect because some mulch used on construction projects may not be compatible with planned or future projects.

Selection of wood mulches must comply with Standard Specifications Section 20-5.03E, and must be approved by the RE.

### **Tree Bark Mulch**

- Tree bark mulch must be derived from cedar, Douglas fir, or redwood tree species.
- Tree bark mulch must be ground such that at least 95 percent of the material by volume is less than 2 inches in any direction and no more than 30 percent by volume is less than 1 inch in any direction.

### **Wood Chip Mulch**

- Wood chip mulch must be derived from clean wood, and it may not contain leaves or small twigs.
- Wood chip mulch must contain at least 95 percent wood strands by volume with an average thickness of 1/8 to 1-1/2 inches in any direction and 2 to 8 inches in length.

### **Shredded Bark Mulch**

- Shredded bark mulch must be derived from trees. The mulch must be a blend or loose, long, thin wood or bark pieces.
- Shredded bark mulch must contain at least 95 percent wood strands by volume with an average thickness of 1/8 to 1-1/2 inches in any direction and 2 to 8 inches in length

### **Tree Trimming Mulch**

- Tree trimming mulch is derived from chipped trees and may contain leaves, small twigs, and green material.
- Tree trimming mulch must contain at least 95 percent material by volume less than 3 inches and no more than 30 percent by volume less than 1 inch

### **Application Procedures**

- Do not use soil sterilant or filter fabric.
- Mulch should be placed uniformly from the outside edge of area designated for mulch. Permanent, landscape mulch should be placed after vegetation has been installed.

## Maintenance and Inspection

### SWPPP or WPCP

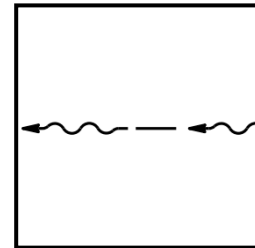
- Mulch may be installed by manual application or with pneumatic devices.
- Do not place mulch within 4 ft of the flow line of drainage ditches or other channels, or the edge of paved roads.
- All material must be removed before re-starting work on the slopes.
- Wood mulch needs to last long enough to achieve erosion-control objectives. If the mulch is applied as a stand-alone erosion control method over disturbed areas (without seed), it should last the length of time the site will remain barren or until final re-grading and revegetation. Additional information is provided in Appendix B of this Manual.
- Where vegetation is not the ultimate cover, such as ornamental and landscape applications of bark or wood chips, inspection and maintenance should focus on longevity and integrity of the mulch.
- May require reapplication when bare soil becomes visible.
- Wood Mulch must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.

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# Earth Dikes/Drainage Swales and Lined Ditches

SS-9



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

## 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.
  - 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.

# 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.
  - Temporary swales and ditches should not or any other runoff diversion device should not adversely impact upstream or downstream properties.
- Standards and Specifications**
- Standard Specification Section 19-6 “Embankment Construction,” which covers allowable materials and construction procedures for dikes.
  - Standard Specification Section 72-5 “Concrete Slope Protection, Gutter, Ditch and Channel Lining” covers ditch and channel lining materials and construction procedures.
  - 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.
  - Must complete a careful evaluation of the risks due to erosion of the selected measure based on flow velocity, soil types, potential for over topping, flow backups, washouts, and drainage patterns for each BMP location.
  - Conveyances shall be stabilized. Consider using a lined ditch for high flow velocities to prevent scour. Compact any fills or backfills 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.
  - Earthen berms should be 8 inches tall and 36 inches wide at a minimum. Earthen berms must be compacted either by hand or mechanical methods.
  - Provide stabilized outlets. Refer to SS-10, “Outlet Protection/Velocity/Dissipation Devices.”
- Maintenance and Inspections**
- Inspect temporary measures prior to, daily during extended rain events post-storm and weekly year-round.
  - 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 to ensure they function as intended.
  - Temporary conveyances should be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.



# Earth Dikes/Drainage Swales and Lined Ditches

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SS-9

- SWPPP or WPCP ■ Earth Dikes/Drainage Swales and Lined Ditches must be discussed in Section 500.3.2 of SWPPP or Section 30.2 of the WPCP.





# Earth Dikes/Drainage Swales and Lined Ditches

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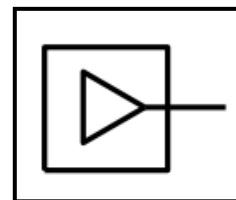
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# Outlet Protection/Velocity Dissipation Devices

SS-10



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** These devices are placed at pipe outlets to prevent scour and reduce the velocity and/or energy of stormwater 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.

- Limitations**
- Loose rock may have stones washed away during high flows.
  - Grouted rock slope protection may break up in areas of freeze and thaw.
  - If there is not adequate drainage, and water builds up behind grouted rock slope protection, it may cause the grouted rock slope protection to break up due to the resulting hydrostatic pressure.
  - Outlet protection may negatively impact the channel habitat.

# Outlet Protection/Velocity Dissipation Devices

SS-10

## Standards and Specifications

- There are many types of energy dissipaters; a flared end section and rock slope protection is shown in the figure on the previous page. Please note that this is only one example and the RE may approve other types of devices proposed by the contractor.
- Flared end sections must comply with Standard Specification 70-5.02.
- Rock slope protection must comply with Standard Specification Section 72.
- Install rock slope protection, grouted rock slope protection, or concrete apron at selected outlet. Rock slope protection aprons are best suited for temporary use during construction.
- Carefully place rock slope protection 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, consider placing it in upper section of apron.
  - If size of apron rock slope protection is large, consider protecting underlying filter fabric with a gravel blanket.
- Outlets on slopes steeper than 10% should have additional protection.

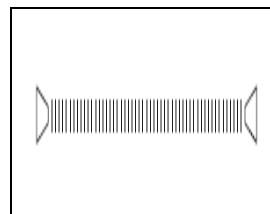
## Maintenance and Inspection

- At a minimum, perform inspections weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Minimize areas of standing water by removing sediment blockages and filling scour depressions. If persistent, it might be necessary to have licensed professional re-evaluate size and type of device implemented.
- Inspect apron for displacement of the rock slope protection and/or damage to the underlying fabric. Repair fabric and replace rock slope protection that has washed away.
- Inspect for scour beneath the rock slope protection and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices should be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

## SWPPP or WPCP

- Outlet Protection/Velocity Dissipation Devices must be discussed in Section 500.3.2 of SWPPP or Section 30.2 of the WPCP.





Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- 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 on construction sites where slopes may be eroded by surface runoff.
  - Drainage for top of slope dikes or swales.
  - Drainage for top of cut and fill slopes where water can accumulate.
  - Emergency spillway for a sediment basin.
- Limitations**
- Severe erosion may result when slope drains fail by overtopping, piping, or pipe separation.
  - Sediment accumulation, scour depressions, and/or persistent non-stormwater discharges in energy dissipaters associated with slope drain outlets can result in suitable areas for vector production.
- Standards and Specifications**
- Maximum slope generally limited to 2:1 (H:V), 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 plastic or corrugated metal, or comparable pipe.
  - 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 rock slope protection or other energy dissipation device. For high energy discharges, reinforce rock slope protection with concrete or use reinforced concrete device.
- Protect inlet and outlet of slope drains; use standard flared end section at entrance and exit for pipe slope drains 12 in and larger.

## Maintenance and Inspection

- Inspect before, daily during and after each rain event, and weekly during the duration of the construction project. 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.
- Inspect slope drainage for accumulations of debris and sediment.
- Remove built-up sediment from entrances, outlets, and within drains as required.
- Make sure stormwater is not ponding onto inappropriate areas (e.g., active traffic lanes, material storage areas, etc.).

## SWPPP or WPCP

- Slope Drains must be discussed in Section 500.3.2 of SWPPP or Section 30.2 of the WPCP.



Standard Symbol

BMP Objectives	
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Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose** Drainage systems including the stream channel, streambank, and associated riparian areas, are dynamic and sensitive ecosystems that respond to changes in land use activity. Streambank and channel disturbance resulting from construction activities can increase the stream’s sediment load, which can cause channel erosion or sedimentation and have adverse affects on the biotic system. BMPs can reduce the discharge of sediment and other pollutants and minimize the impact of construction activities on watercourses. Streams included on the 303(d) list by the State Water Resources Control Board (SWRCB) may require careful evaluation to prevent any increases in sedimentation, siltation and/or turbidity to the stream.
- Appropriate Applications** These procedures typically apply to all construction projects that disturb or occur within stream channels and their associated riparian areas. Streambank stabilization typically consists of a combination of several BMPs to prevent destabilization and enhance stability of eroding streambanks.
- Limitations** Specific permit requirements or mitigation measures such as Regional Water Quality Control Board (RWQCB) 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Wildlife Service may be included in contract documents. Specific requirements could include in-water work windows, vegetation species, seed mixes, stabilization measures, water quality monitoring protocols and specific reporting requirements. If numerical-based water quality standards are mentioned in any of these and other related permits, testing and sampling may be required. Streams included on the 303(d) list by the SWRCB because of sediment, silt, or turbidity impairment are required to conduct sampling to verify that there is no net increase in sediment load due to construction activities.
- Standards and Specifications** **PLANNING**
- Proper planning, design, and construction techniques can minimize impacts normally associated with in-stream construction activities. Poor planning can adversely affect soil, fish, and wildlife resources, land uses, or land users.



Planning should take into account: scheduling, avoidance of in-stream construction; minimizing disturbance area and construction time period; using pre-disturbed areas; selecting crossing location; selecting equipment and proper stabilization techniques once the activity is completed.

## ***Scheduling (SS-1)***

- Construction activities should be scheduled according to the relative sensitivity of the environmental concerns and in accordance with SS-1, “Scheduling.” Scheduling considerations will be different when working near perennial streams vs. ephemeral streams, and are as follows:
  - Construction work near perennial streams should optimally be performed during the dry season (see below).
  - When working in or near ephemeral, intermittent, or perennial streams, construction should be performed during the dry season and in accordance with regulatory agency permits and approvals. By their very nature, ephemeral and intermittent streams are usually dry in the summer, and therefore, in-stream construction activities will not cause significant water quality problems. For perennial streams, clear water diversion (see NS-5 for “Clear Water Diversion”), dewatering (see NS-2 for “Dewatering Operations”), and water quality monitoring may be required.
  - When closing the site at the end of the job, wash any fines that were formed in-situ back into the channel the bed material, to decrease pollution from the first rainstorm (“first flush”) of the season. When working near stream channels, erosion and sediment controls (see silt fences, straw bale barriers, etc.) should be implemented on the banks to keep sediment out of the stream channel.
  - Regulatory permits might require or allow for the stockpiling of native bed material to be backfilled during stabilization.

## ***Minimize Disturbance***

- Minimize disturbance through: selection of the narrowest crossing location; limiting the number of equipment trips across a stream during construction; and, minimizing the number and size of work areas (equipment staging areas and spoil storage areas). Provide stabilized access to the stream when in-stream work is required. Field reconnaissance should be conducted during the planning stage to identify work areas.
- Comply with regulatory permit requirements, if none are applicable, then place work areas (stage area, active construction) at least 50 ft from the stream channel. Perform each of the following activities at least 100 feet from a drainage course if it is performed within the floodplain, or at least 50 feet outside the floodplain: stockpiling materials, storing pile-driving equipment and liquid waste containers, washing vehicles and equipment, fueling and maintaining vehicles and equipment.
- Locate access and staging areas in paved or pre-disturbed areas when possible. If not possible, select access and staging areas that minimizes disturbance to aquatic species, riparian vegetation, and habitat.

- Avoid steep and unstable banks, highly erodible or saturated soils, or highly fractured rock, wherever possible.
- Select equipment that reduces the amount of pressure exerted on the ground surface, and therefore, reduces erosion potential and/or use overhead or aerial access for transporting equipment across drainage channels. Use equipment that exerts ground pressures of less than 5 or 6 pounds per square inch (PSI), where possible. Low ground pressure equipment includes: wide or high flotation tires (34 to 72 inch wide); dual tires; bogie axle systems; tracked machines; lightweight equipment; and central tire inflation systems.

## **STREAMBANK STABILIZATION**

### ***Preservation of Existing Vegetation (SS-2)***

- Preserve existing vegetation in accordance with SS-2, “Preservation of Existing Vegetation.” In a streambank environment preservation of existing vegetation provides the following benefits:

#### *Water Quality Protection*

Vegetated buffers on slopes trap sediment and promote groundwater recharge. The buffer width needed to maintain water quality ranges from 15 to 100 feet. On gradual slopes, most of the filtering occurs within the first 30 feet of the buffer. Steeper slopes require a greater width of vegetative buffer to provide water quality benefits.

#### *Streambank Stabilization*

The root system of riparian vegetation stabilizes streambanks by increasing tensile strength in the soil. The presence of vegetation modifies the moisture condition of slopes (infiltration, evapotranspiration, interception) and increases bank stability.

#### *Riparian Habitat*

Buffers of diverse riparian vegetation provide food, shelter, and shade for riparian and aquatic organisms. Minimizing impacts to fisheries habitat is a major concern when working near streams and rivers. Riparian vegetation provides shade, shelter, organic matter (leaf detritus and large woody debris), and other nutrients that are necessary for fish and other aquatic organisms. Buffer widths for habitat concerns are typically wider than those recommended for water quality concerns (100 to 1,500 feet).

When working near watercourses, it is important to understand the work site’s placement in the watershed. Riparian vegetation in the headwater streams has a greater impact on overall water quality than vegetation in downstream reaches. Preserving existing vegetation in upstream areas is necessary to maintain water quality, minimize bank failure, and maximize riparian habitat downstream of the work site.

- Local county and municipal ordinances regarding width, extent and type of vegetative buffer required may exceed the specifications provided here; these ordinances should be investigated prior to construction.



- As a general rule, the width of a buffer strip between a road and the stream is recommended to be 50 feet plus four times the percent slope of the land, measured between the road and the top of stream bank.

### ***Hydraulic Mulch (SS-3), Hydroseeding (SS-4), and Soil Binders (SS-5)***

- Apply hydraulic mulch, hydroseed, or soil binders on disturbed streambanks above the mean high water level to provide temporary soil stabilization.
- Do not place hydraulic mulch, tackifiers, fertilizers, or soil binders below the mean high water level, as these materials could wash into the channel and impact water quality or possibly cause eutrophication.

### ***Straw Mulch (SS-6)***

- Apply straw mulch to disturbed streambanks in accordance with SS-6, “Straw Mulch.”
- Do not place straw mulch or tackifiers below the mean high water level, as this material could wash into the channel and impact water quality.

### ***Temporary Cover and Rolled Erosion Control Products (SS-7)***

- Install geosynthetics, rolled erosion control product, and plastic as described in SS-7, “Temporary Cover and Rolled Erosion Control Products” to stabilize disturbed channels and streambanks.
- Not all applications of SS-7 should be installed in a channel, for example, certain geotextile netting may snag fish gills and are not appropriate in fish-bearing streams. Geotextile fabrics that are not biodegradable are not appropriate for in-stream use. Additionally, geotextile fabric or blankets placed in channels must be adequate to sustain anticipated hydraulic forces.

### ***Earth Dikes/Drainage Swales, and Lined Ditches (SS-9)***

- Convey, intercept, or divert runoff from disturbed streambanks using SS-9, “Earth Dikes/Drainage Swales, and Lined Ditches.”
- Do not place earth dikes in watercourses, as these structures are only suited for intercepting sheet flow, and should not be used to intercept concentrated flow.

### ***Outlet Protection/Velocity Dissipation Devices (SS-10)***

- Place outlet protection or velocity dissipation devices at outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels in accordance with SS-10.

### ***Slope Drains (SS-11)***

- Use slope drains to intercept and direct surface runoff or groundwater into a stabilized watercourse, trapping device or stabilized area in accordance with SS-11, “Slope Drains.” The use of slope drains minimizes potential streambank erosion from overland flows.

## **STREAMBANK SEDIMENT CONTROL**

### **Silt Fences (SC-1)**

- Install silt fences in accordance with SC-1, “Silt Fence” to control sediment. Silt fences should only be installed where sediment-laden water can pond, thus allowing the sediment to settle out.

### **Fiber Rolls (SC-5)**

- Install fiber rolls in accordance with SC-5, “Fiber Rolls” along slope contour above the high water level to intercept runoff, reduce flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. In a stream environment, fiber rolls should be used in conjunction with other sediment control methods such as SC-1, “Silt Fence” or SC-9, “Straw Bale Barrier.” Install silt fence, straw bale barrier, or other erosion control methods along the toe of slope above the high water level. Typical fiber roll installation is illustrated at the end of this Section.

### **Gravel Bag Berm (SC-6)**

- A gravel bag berm or barrier can be utilized to intercept and slow the flow of sediment-laden sheet flow runoff in accordance with SC-6, “Gravel Bag Berm.” In a stream environment gravel bag barriers can allow sediment to settle from runoff before water leaves the construction site and can be used to isolate the work area from the stream. Gravel bag barriers are not recommended as a perimeter sediment control practice around streams.

### **Straw Bale Barrier (SC-9)**

- Install straw bale barriers in accordance with SC-9, “Straw Bale Barrier” to control sediment. Straw bale barriers should only be installed where sediment-laden water can pond, thus allowing the sediment to settle out. Install a silt fence in accordance with SC-1, “Silt Fence” on the down-slope side of the straw bale barrier closest to stream channel to provide added sediment control.

### **Compost Sock (SC-08)**

- Compost socks are a mesh sock containing compost that act as three dimensional, biodegradable structures that intercept and filter sheet flow. Compost socks can filter runoff, retain sediment, and reduce sheet flow velocities. Compost may be pre-seeded to assist in the establishment of vegetation. Compost socks may be used as either a temporary or permanent sediment control measure.

### **Inspection and Maintenance**

- Inspect BMPs daily during construction.
- Maintain and repair BMPs.
- Remove accumulated sediment as necessary.

### **SWPPP or WPCP**

- Streambank Stabilization must be discussed in Section 500.3.2 of the SWPPP or Section 30.2 of the WPCP.

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## Section 4

# Temporary Sediment Control BMP

### 4.1 Temporary Sediment Controls

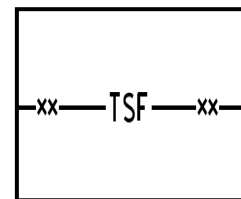
Temporary sediment control practices include those practices that intercept and slow or detain the flow of stormwater to allow sediment to settle and be trapped. These practices can consist of installing temporary linear sediment barriers (such as silt fences, sandbag barriers, and straw bale barriers);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

Temporary sediment control practices must be implemented in conformance with the criteria presented in Section 2 of this Manual and the SWPPP/WPCP Preparation 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	Sediment/Desilting Basin
SC-3	Sediment Trap/Curb Cutback
SC-4	Check Dam
SC-5	Fiber Rolls
SC-6	Gravel Bag Berm/Earthen Berm
SC-7	Street Sweeping
SC-8	Sandbag Barrier
SC-9	Straw Bale Barrier
SC-10	Temporary Drainage Inlet Protection
SC-11	Compost Sock
SC-12	Flexible Sediment Barrier

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

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Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**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**
- Below the toe of exposed and erodible slopes.
  - Down-slope of exposed soil areas.
  - Around temporary stockpiles.
  - Along streams and channels.
  - Along the perimeter of a project.

- Limitations**
- Not effective unless trenched and keyed in.
  - Not intended for use as mid-slope protection on slopes greater than 4:1 (H:V).
  - Must be maintained.
  - Must be removed and disposed of.
  - Don't use below slopes subject to creep, slumping, or landslides.
  - Don't use in streams, channels, drain inlets, or anywhere flow is concentrated.
  - Don't use silt fences to divert flow.
  - Don't use in locations where ponded water may cause a flooding hazard.

**Standards and Specifications** *Design and Layout*

- The drainage area above any fence should not exceed a quarter of an acre, (100-feet of silt fence per 10,000 square feet of DSA).
- Slope of area draining to silt fence should be less than 1:1 (H:V).
- Silt fences must be placed parallel to the slope contour.

- Silt fences rely on temporary ponding to encourage sediment deposition and achieve water quality benefits. Limit application to areas where ponding and deposition may occur on the uphill side of the silt fence.
- Temporary silt fence fabrics generally have life spans ranging between five and eight months. Projects with longer durations may require replacing silt fence fabric.
- Silt fences constructed across concentrated flows are susceptible to washout. Silt fences shall not be installed across concentrated flows.
- For slopes adjacent to water bodies or Environmentally Sensitive Areas (ESAs), additional temporary soil stabilization BMPs should be used.
- For any 50 foot section of silt fence, the elevation of the base of the fence may not vary by more than 1/3 of the fence height.
- Install along a level contour, so water does not pond more than 1.5 ft at any point along the silt fence.
- Join separate sections to form reaches not more than 500 feet without openings. Ensure there are no gaps between posts.

### **Reinforced Silt Fence**

- Temporary reinforced silt fence is typically used in areas affected by high winds. They are also often used on slopes steeper than 2:1 (H:V) that contain a high number of rocks or large dirt clods that tend to dislodge, or where area draining fence contains moderate sediment loads.
- Temporary reinforced silt fence (type 2) may also be used to provide sediment control and delineate ESAs.

### **Materials**

- Silt fence fabric should be a woven or unwoven geosynthetic textile that complies with Section 96-1.02E of the Standard Specifications. The Contractor must submit a certificate of compliance for silt fence fabric in accordance with Standard Specifications Section 6-2.03C.
- Wood posts should be untreated fir, redwood, cedar, or pine lumber. Each silt fence post should be at least 4 feet long, except reinforced silt fence posts should be at least 6 feet for Type 1 and 5 feet for Type 2 installations. Posts should be free from decay, splits or cracks longer than the thickness of the post or other defects that would weaken the posts and cause the posts to be structurally unsuitable. Steel posts may be used as well. Posts should comply with the requirements in Standard Specifications sections 16-2.03B and 13-10.02C.
- Anchors may be used. Anchors consist of a number 4 steel reinforcing bar. End protection shall be provided for any exposed bar reinforcement.
- Staples used to fasten the fence fabric to the posts and to join adjacent silt fence sections shall be U-shaped and have 1/2-inch legs and a 1-inch crown.

Staples should be 1/16-inch in diameter. At least four staples should be installed on each silt fence post for adequate fastening, with a maximum of 8-inches between each staple.

## **Installation**

- Install in accordance with Pages 5 and 6 of this BMP (Standard Plans T51 “Temporary Silt Fence” and T60 “Temporary Reinforced Silt Fence”).
- Generally, silt fences should be used in conjunction with soil stabilization source controls up slope to provide effective erosion and sediment control.
- Excavate a trench that is 6-inches deep and 6-inches wide with a length consistent with the project design plans. Place the bottom of the silt fence fabric in the trench. Backfill the trench with soil over the base of the silt fence fabric. Compact the backfill soil by hand or mechanical methods.
- Construct the length of each reach so that the change in base elevation along any 50-foot reach does not exceed 1/3 the height of the barrier; in no case should any reach of temporary silt fence exceed 500 feet in length.
- Construct silt fences with a set-back of at least 3 feet from the toe of a slope. Where a silt fence is determined to be not practical with a 3 foot set-back from the toe due to specific site conditions, the silt fence may be constructed at the toe of the slope, but should be constructed as far from the toe of the slope as practical.

## 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 Engineer.
- Inspect silt fence following rain events. Perform maintenance as necessary, or as required by the Engineer.
- Maintain silt fences to provide an adequate sediment holding capacity. Sediment should be removed when the sediment accumulation reaches one-third (1/3) of the barrier height.
- Silt fences that are damaged and become unsuitable for the intended purpose should 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 should be backfilled and repaired in conformance with the Standard Specifications.
- Remove silt fence when no longer needed. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.
- Silt Fence placement is to be shown in the WPCDs along with other BMPs.



# Temporary Silt Fence

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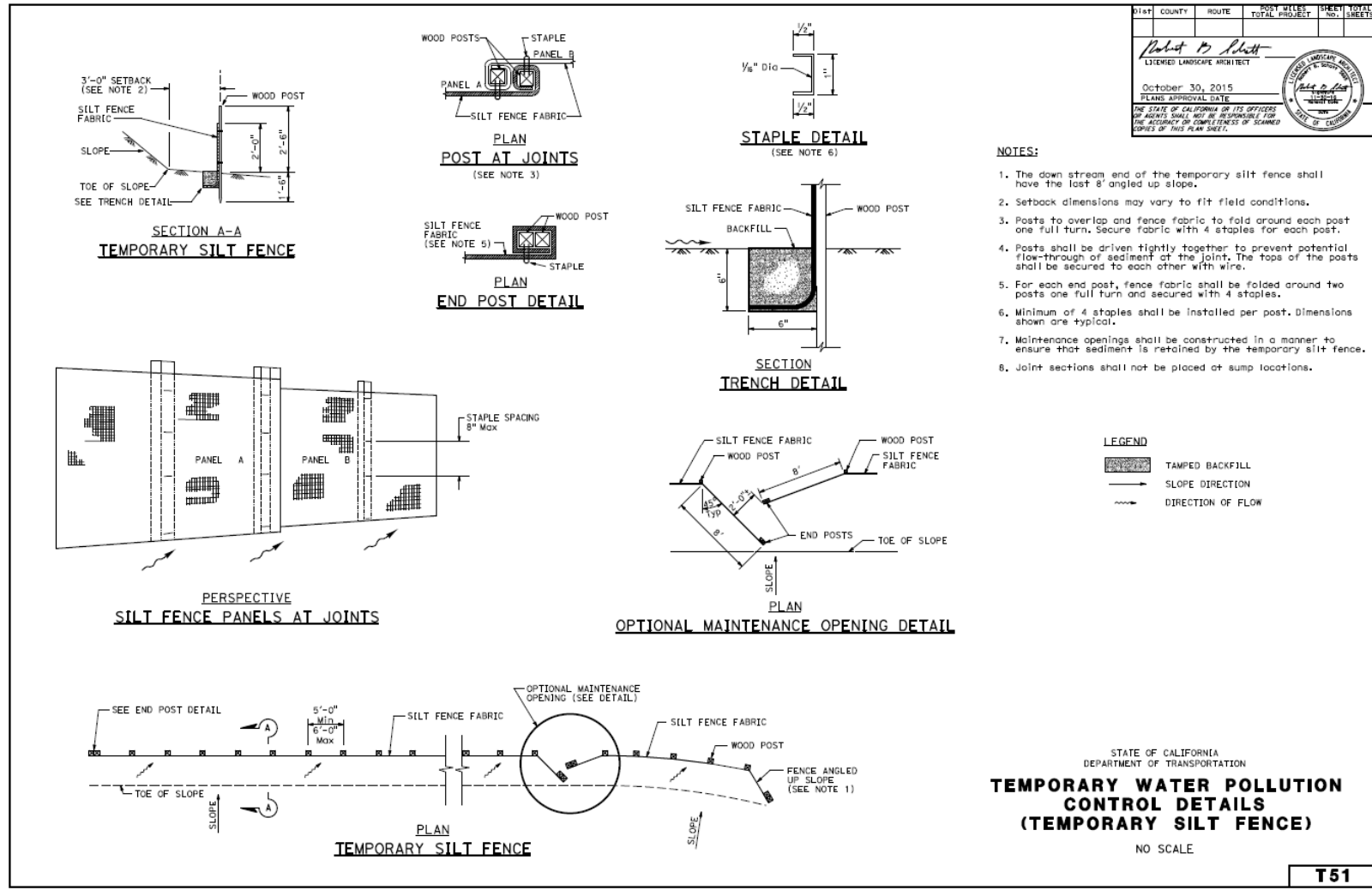
SC-1

- SWPPP or WPCP Temporary Silt Fence or Reinforced Silt Fence must be discussed in Section 500.3.3 of the SWPPP or Section 30.2.2 of the WPCP.



# Temporary Silt Fence

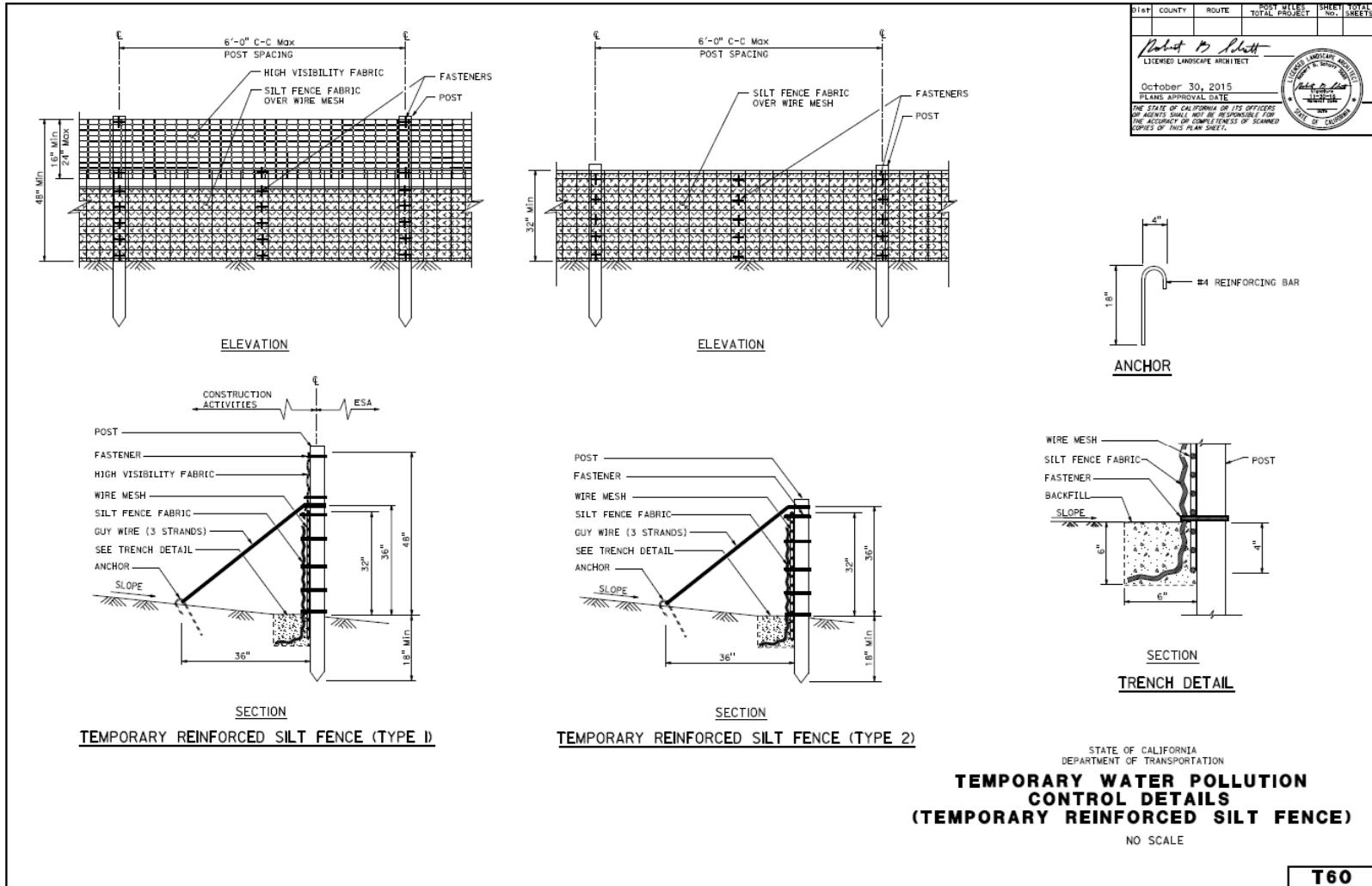
SC-1

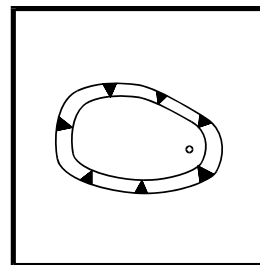


- NOTES:**
1. The down stream end of the temporary silt fence shall have the last 8' angled up slope.
  2. Setback dimensions may vary to fit field conditions.
  3. Posts to overlap and fence fabric to fold around each post one full turn. Secure fabric with 4 staples for each post.
  4. Posts shall be driven tightly together to prevent potential flow-through of sediment at the joint. The tops of the posts shall be secured to each other with wire.
  5. For each end post, fence fabric shall be folded around two posts one full turn and secured with 4 staples.
  6. Minimum of 4 staples shall be installed per post. Dimensions shown are typical.
  7. Maintenance openings shall be constructed in a manner to ensure that sediment is retained by the temporary silt fence.
  8. Joint sections shall not be placed at sump locations.

# Temporary Silt Fence

SC-1





Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** A sediment/desilting basin is a temporary basin formed by excavating 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 (refer to Figures 1 through 4).

**Appropriate Applications** Sediment basins shall be designed in accordance with the State of California NPDES General Permit for Storm Water Discharges Associated with Construction Activities (CGP). If there is insufficient area to construct a sediment basin in accordance with the CGP requirements, then the alternate desilting design standards specified herein may be used as approved by the RE.

Sediment/Desilting Basins should be considered for use:

- On construction projects with disturbed areas during the wetter months, typically October through May.
- Where sediment-laden water may enter the drainage system or watercourses.
- At drainage outlets of disturbed soil areas with areas between 5 and 10 ac.

**Limitations**

- Alternative BMPs must be thoroughly investigated for erosion control before selecting temporary sediment/desilting basins.
- Requires large surface areas to permit settling of sediment.
- Size may be limited by availability of right-of-way.
- Not appropriate for drainage areas greater than 75 ac.
- Not to be located in live streams.
- For safety reasons, basins should have protective fencing.
- Not to be used as a standalone BMP, requires proper BMP implementation upstream and downstream of its location.

## Standards and Specifications

### **General Requirements**

- Sediment basins should be designed in accordance with the methods referenced in the State of California NPDES General Permit for Storm Water Discharges Associated with Construction Activities (CGP).
- Areas under embankments, structural works, and sediment basin must be cleared, stripped of vegetation in accordance with Standard Specifications Section 16 – “Temporary Facilities.”
- Earthwork should be in accordance with Standard Specifications Section 19 – “Earthwork.” Contractor is specifically directed to Standard Specifications Sections 19-5, “Compaction,” and 19-6, “Embankment Construction.”
- Chain link fencing should be provided around each sediment basin to prevent unauthorized entry to the basin or if safety is a concern. Fencing should be in accordance with Standard Specifications Section 80 – “Fences.”
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- The outflow from the basins must have outlet protection to prevent erosion and scouring of the embankment and channel. See BMP SS-10, “Outlet Protection/Velocity Dissipation Devices.”
- Avoid dewatering of groundwater to the sediment basin during the wetter months. Insignificant quantities of accumulated precipitation may be dewatered to the sediment basin unless precipitation is forecasted within 24 hours. Refer to NS-2 “Dewatering Operations.”

### **Other Considerations**

- Basin should 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, (4) where the basins can be maintained on a year-round basis 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.
- Construct sediment basins prior to the rainy season and construction activities.
- Sediment basins, regardless of size and storage volume, should include features to accommodate overflow or bypass flows that exceed the design storm event. The calculated basin volume and proposed location should be submitted to the RE for approval at least 3 days prior to the basin construction.
- Construct an emergency spillway to accommodate flows not carried by the principal spillway. Spillway should consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible rock slope protection.
- The spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, should be a minimum of 20 ft in length.

- Limit the contributing area to the sediment basin to only the runoff from disturbed soil areas. Use temporary concentrated flow conveyance controls to divert runoff from undisturbed areas away from the sediment basin.
- A forebay, constructed upstream of the basin may be provided to allow debris and larger particles to settle out of suspension before entering the basin.
- Basin inlets should be located to maximize travel distance to the basin outlet and resulting sediment deposition benefits.
- Rock or vegetation should be used to protect the basin inlet and slopes against erosion.
- The outlet structure should be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.
- Discharge from the basin should be accomplished through a water quality outlet. An example is shown in Figure 3. The principal outlet should 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 should be designed to accommodate the inflow design storm.
- A rock pile or rock-filled gabions can serve as alternatives to the debris screen, although the designer should be aware of the potential for extra maintenance involved should the pore spaces in the rock pile clog.
- Proper hydraulic design of the outlet is critical to achieving the desired performance of the basin. The water quality outlet should be designed to drain the basin within 24 to 96 hours (also referred to as “drawdown time”). (The 24-hour limit is specified to provide adequate settling time; the 96-hour limit is specified to avoid vector control concerns). Local agencies may have more stringent drawdown time requirements.
- The two most common outlet problems that occur are: (1) the capacity of the outlet is too great resulting in only partial filling of the basin and drawdown time less than designed for; and (2) the outlet clogs because it is not adequately protected against trash and debris. To avoid these problems, the following outlet types are recommended for use: (1) a single orifice outlet with or without the protection of a riser pipe, and (2) perforated riser. Design guidance for single orifice and perforated riser outlets are as follows:

### **Flow Control Using a Single Orifice At The Bottom Of The Basin**

(Figure 1). The outlet control orifice should be sized using the following equation:

$$a = \frac{2A(H - H_o)^{0.5}}{3600CT(2g)^{0.5}} = \frac{(7 \times 10^{-5})A(H - H_o)^{0.5}}{CT} \quad (\text{Eq. 2})$$

Where:

$a$  = area of orifice (ft<sup>2</sup>) (1 ft<sup>2</sup> = 0.0929m<sup>2</sup>)

$A$  = surface area of the basin at mid elevation (ft<sup>2</sup>)

$C$  = orifice coefficient

$T$  = drawdown time of full basin (hrs)

$G$  = gravity (32.2 ft/s<sup>2</sup>)

$H$  = elevation when the basin is full (ft)

$H_o$  = final elevation when basin is empty (ft)

With a drawdown time of 40 hours, the equation becomes:

$$a = \frac{(1.75 \times 10^{-6})A(H - H_o)^{0.5}}{C} \quad (\text{Eq. 3})$$

### **Flow Control Using Multiple Orifices (see Figure2):**

$$a_t = \frac{2A(h_{\max})}{CT(2g[h_{\max} - h_{\text{centroid of orifices}}])^{0.5}} \quad (\text{Eq. 4})$$

With terms as described above except:

$a_t$  = total area of orifices

$h_{\max}$  = maximum height from lowest orifice to the maximum water surface (ft)

$h_{\text{centroid of orifices}}$  = height from the lowest orifice to the centroid of the orifice configuration (ft)

Allocate the orifices evenly on two rows; separate the holes by 3x hole diameter vertically, and by 120 degrees horizontally (refer to Figure 3).

Because basins are not maintained for infiltration, water loss by infiltration should be disregarded when designing the hydraulic capacity of the outlet structure.

Care must be taken in the selection of "C"; 0.60 is most often recommended and used. However, based on actual tests, GKY (1989), "Outlet Hydraulics of Extended Detention Facilities for Northern Virginia Planning District Commission", recommends the following:

$C = 0.66$  for thin materials; where the thickness is equal to or less than the orifice diameter, or

$C = 0.80$  when the material is thicker than the orifice diameter

- The Contractor should verify that the outlet is properly designed to handle the design and peak flows.
- If rock is used for energy dissipation or to prevent erosion, it must comply with Highway Design Manual Chapter 860.
- 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 should be clearly marked on the riser pipe.
- Basins with an impounding levee greater than 5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and basins capable of impounding more than 35,300 cubic feet, should be designed by a professional Civil Engineer registered with the state of California. The design must be submitted to the RE for approval at least 7 days prior to the basin construction. The design should include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

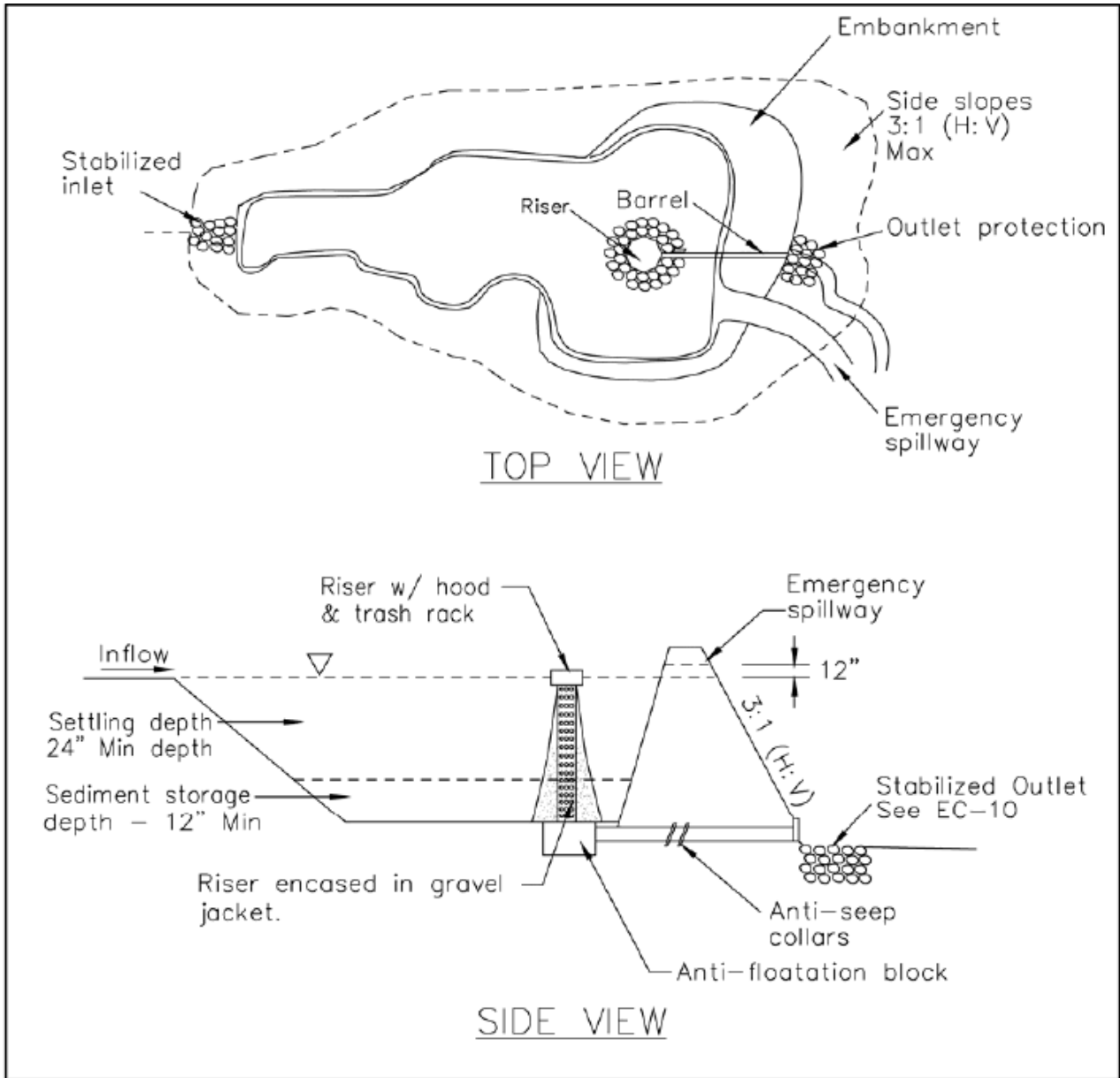
## Maintenance and Inspection

- Inspect sediment basins before and after rainfall events and weekly year round. 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.
- Remove standing water from the basin within 72 hours after accumulation.
- Check inlet and outlet area for erosion and stabilize if required.
- Remove accumulated sediment when its volume reaches one-third the volume of the sediment storage. Properly dispose of sediment and debris removed from the basin.
- Check fencing for damage and repair.

## SWPPP or WPCP

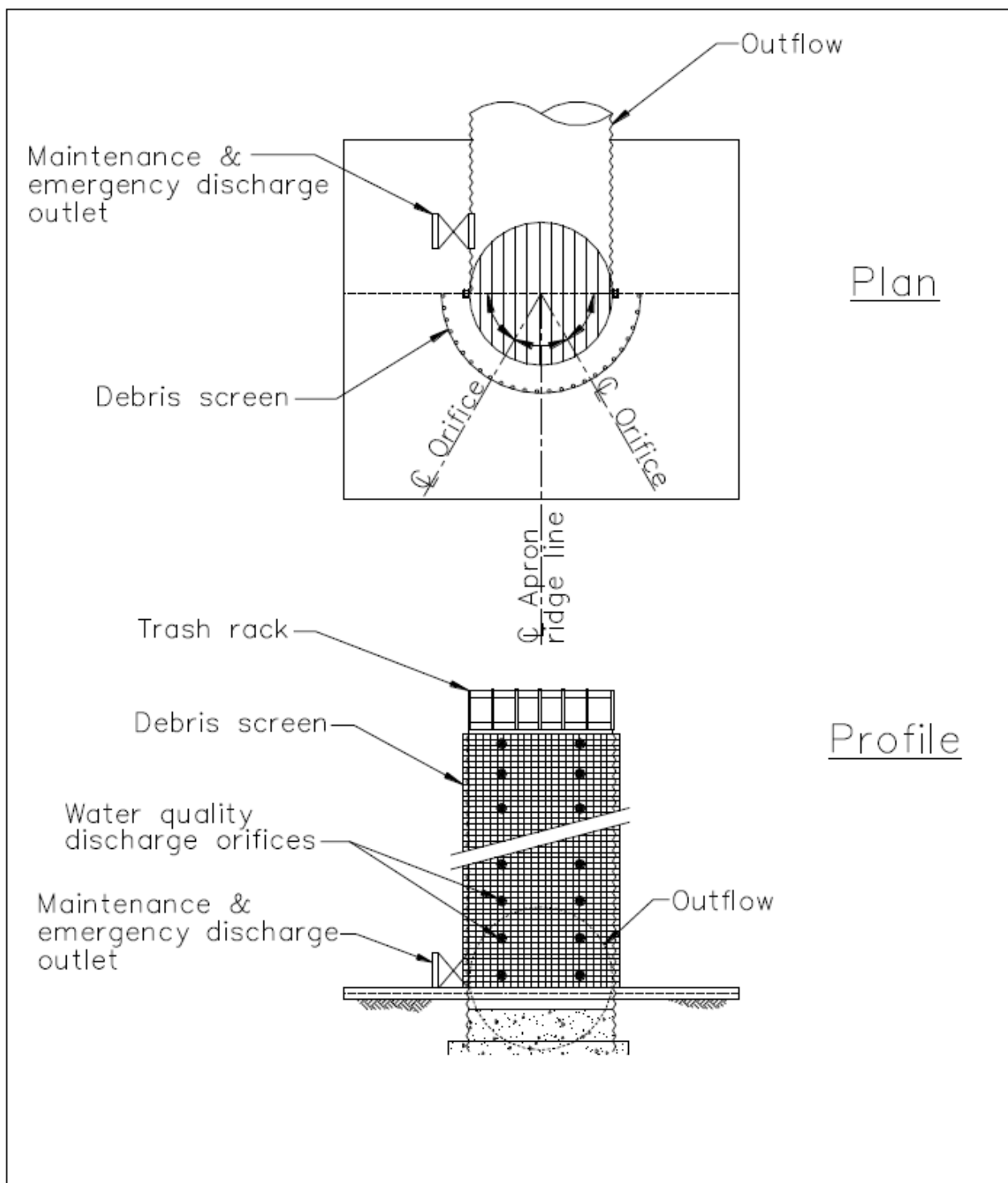
- Sediment/Desilting Basin must be discussed in Section 500.3.3 of the SWPPP or Section 30.2.2 of the WPCP.





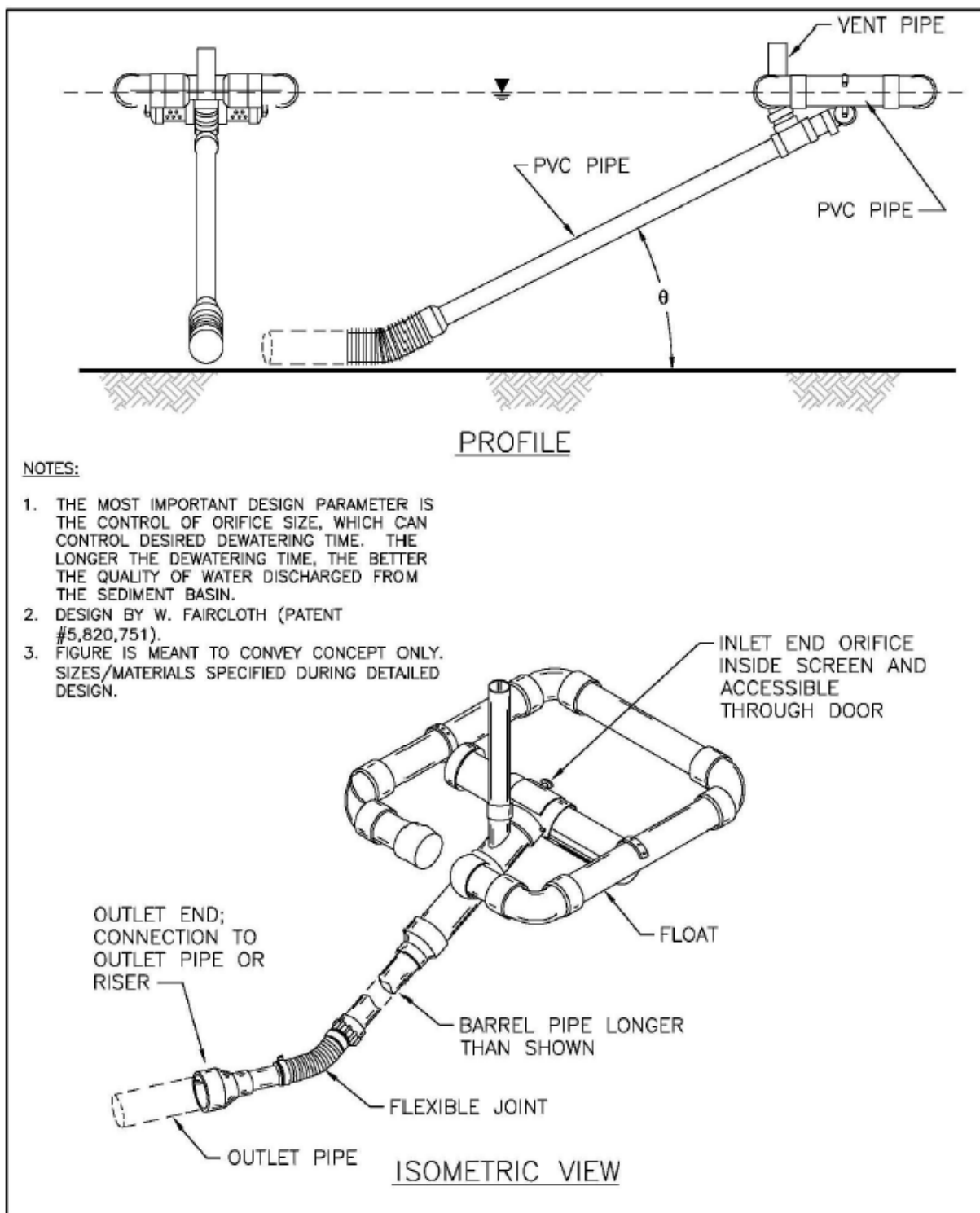
**FIGURE 1: TYPICAL TEMPORARY SEDIMENT BASIN  
MULTIPLE ORIFICE DESIGN  
NOT TO SCALE**

Source: CASQA



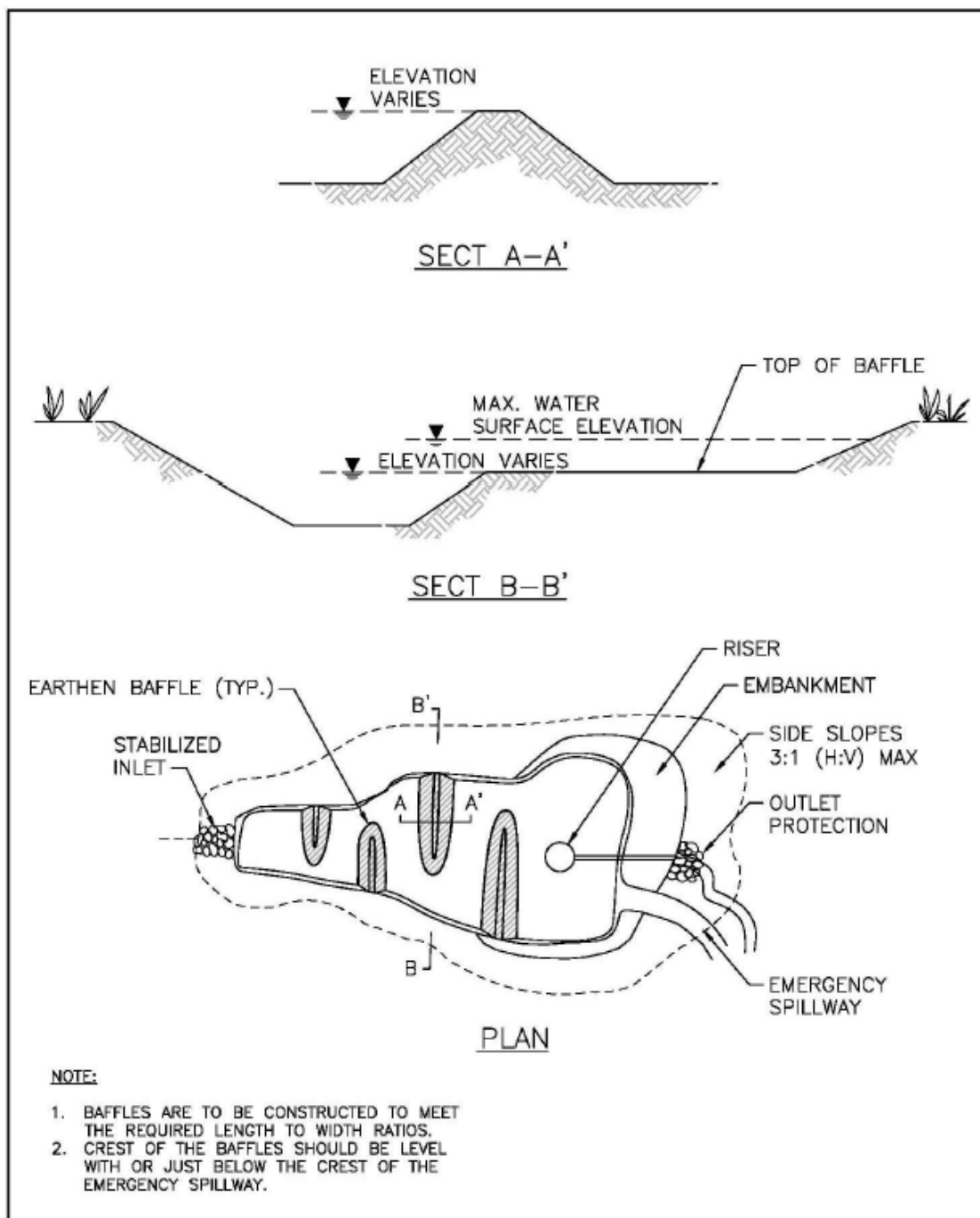
**FIGURE 2: MULTIPLE ORIFICE OUTLET RISER**  
NOT TO SCALE

Source: CASQA



**FIGURE 3: TYPICAL SKIMMER**  
NOT TO SCALE

Source: CASQA



**FIGURE 4: TYPICAL TEMPORARY SEDIMENT BASIN WITH BAFFLES**  
NOT TO SCALE

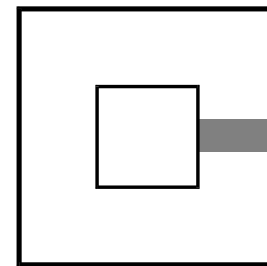
Source: CASQA

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# Temporary Sediment Trap/Curb Cutback

**SC-3**



Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** A sediment trap/curb cutback is a temporary containment area that allows sediment in collected storm water to settle out during infiltration or before the runoff is discharged through a stabilized spillway. Sediment traps are formed by excavating or constructing an earthen embankment.

Curb cutback is implemented when the construction project utilizes the removed section of pavement and uses the depression of the curb as a temporary containment to collect sediment before reaching a storm drain.

**Appropriate Applications**

- Sediment traps may be used on construction projects where the drainage area is less than 5 ac. Traps should be placed where sediment-laden stormwater enters a storm drain or watercourse.

- 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 infiltration and settling of sediment.
- Size may be limited by availability of right-of-way.
- Not appropriate for drainage areas greater than 5 ac.
- Only removes large and medium sized particles and requires upstream erosion control.
- Sediment traps may appear attractive and dangerous to children, requiring protective fencing.
- Sediment traps should not to be located in live streams.
- Curb cutback typically does not allow for a large storage area and therefore requires frequent maintenance to prevent sediment laden discharges.



# Temporary Sediment Trap/Curb Cutback

**SC-3**

## Standards and Specifications

### **General Requirements**

- Areas under embankments, structural works, and sediment traps must be cleared and stripped of vegetation in accordance with Standard Specifications Section 17-2 – “Clearing and Grubbing.”
- Earthwork must be in accordance with Standard Specifications Section 19 – “Earthwork”. Contractor is specifically directed to Standard Specifications Sections 19-5 and 19-6 entitled, “Compaction” and “Embankment Construction,” respectively.
- Fencing, in accordance with Standard Specifications Section 80 – “Fences,” should be provided to prevent unauthorized entry.
- Remove and dispose of deposited solids from sediment traps under Standard Specifications Section 14-10 – “Solid Waste Disposal and Recycling,” unless another method is authorized.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- The outflow from sediment traps may be provided with outlet protection to prevent erosion and scouring of the embankment and channel. See BMP SS-10, “Outlet Protection/Velocity Dissipation Devices.”
- For curb cutback, excavate soil from behind the curb, sidewalk, or roadway at least 3-4 inches down from the top of the hardscape and bring the soil back at a minimum 3-4 feet back from the hardscape. Site conditions might allow for increase in capacity.

### **Other Considerations**

- The sediment trap should be situated according to the following criteria: (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.
- Sediment traps should be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 67 yd<sup>3</sup>/ac and 33 yd<sup>3</sup>/ac of contributing drainage area, respectively, based on 0.5 inch of runoff volume over a 24-hour period. Multiple traps and/or additional volume may be required to accommodate site specific rainfall and soil conditions.
- Use rock or vegetation to protect the trap outlets against erosion.
- Traps with an impounding levee greater than 4.5 ft tall, measured from the lowest point to the impounding area to the highest point of the levee, and traps capable of impounding more than 35,000 cubic feet, must be designed by a Civil Engineer registered with the state of California. The design must be submitted to the RE for approval at least 7 days prior to the basin construction. The design should include maintenance requirements to ensure continuous function of the trap outlet and bypass structures.



# Temporary Sediment Trap/Curb Cutback

**SC-3**

- 
- |                            |  |
|----------------------------|--|
| Maintenance and Inspection | <ul style="list-style-type: none"><li>■ Inspect sediment traps/curbs before, during and after rainfall events and weekly year-round. During extended rainfall events, inspect sediment traps at least every 24 hours.</li><li>■ If captured runoff has not completely infiltrated within 96 hours, then the sediment trap must be dewatered.</li><li>■ Inspect trap banks for embankment seepage and structural soundness.</li><li>■ Inspect outlet structure and rock spillway for any damage or obstructions. Repair damage and remove obstructions as needed or as directed by the RE.</li><li>■ Inspect outlet area for erosion and stabilize if required, or as directed by the RE.</li><li>■ Remove accumulated sediment when the volume has reached one-third the original trap volume.</li><li>■ Inspect fencing for damage and repair as needed or as directed by the RE.</li><li>■ Temporary Sediment Trap/ Curb Cutback locations must be shown in the WPCDs along with other BMPs.</li></ul> |
| SWPPP or WPCP              | <ul style="list-style-type: none"><li>■ Temporary Sediment Trap/ Curb Cutback must be discussed in Section 500.3.3 of the SWPPP or Section 30.2.2 of the WPCP.</li></ul>   |





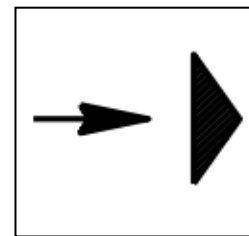
# Temporary Sediment Trap/Curb Cutback

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**SC-3**

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Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** Temporary check dams reduce scour and channel erosion by reducing flow velocity and encouraging sediment settlement. A check dam is a small device constructed of rock, gravel bags, compost socks, fiber rolls, or other proprietary product placed across a natural or man-made channel or drainage ditch.

- Appropriate Applications**
- Check dams may be installed:
    - In small open channels that drain 10 ac or less.
    - In steep channels where storm water runoff velocities exceed 5 ft/sec.
    - During the establishment of grass linings in drainage ditches or channels.
    - In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.

- Limitations**
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
  - Not to be used in live streams.
  - Not appropriate in channels that drain areas greater than 10 ac.
  - Not to be placed in channels that are already grass lined unless erosion is expected, as installation may damage vegetation.
  - Require extensive maintenance following high velocity flows.
  - 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 silt fence.

## Standards and Specifications

### **General Requirements**

- Remove obstructions, rocks, clods, and debris greater than 1 inch in diameter from the ground before installing temporary check dams.
- If check dams are used in combination with Rolled Erosion Control Product (RECP) or blanket, install the RECP or blanket first.
- Place a temporary check dam perpendicular to the centerline of the ditch or drainage line.
- Install the check dam with enough spillway depth to prevent flanking of a concentrated flow around its ends.
- Type 1 or Type 2 check dams are appropriate for unlined ditches. Type 2 check dams are appropriate if the ditch is concrete lined.

### **Fiber Roll (Type 1) Check Dam**

Refer to SC-5 “Fiber Rolls.”

- Secure the fiber rolls with rope and notched wood stakes.
- Drive the stakes into the soil until the notch is even with the top of the fiber roll.
- Lace rope between the stakes and over the fiber roll. Knot the rope at each stake.
- Tighten by driving the stakes further into the soil and forcing the fiber roll against the surface of the ditch or drainage line.

### **Gravel-filled Bag (Type 2) Check Dam**

**Bag Material:** Bags are a geosynthetic material, either polypropylene, polyethylene or polyamide woven fabric, minimum unit weight 4 ounces per yd<sup>2</sup>, mullen burst strength exceeding 300 psi in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

**Bag Size:** Each gravel-filled bag shall have a length of 24 in to 32 in, width of 16 in to 20 in, and thickness of 3 in. Alternative bag sizes must be submitted to the RE for approval prior to deployment.

**Gravel:** Fill material is between 3/8 and 3/4 inch in diameter, and must be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags should be secured such that gravel does not escape. Gravel-filled bags are between 30 and 50 lb in weight. Fill material is subject to approval by the RE.

- Place a Type 2 temporary check dam as a single layer of gravel-filled bags, placed end-to-end to eliminate gaps.
- If you need to increase the height of the dam, add more layers of gravel-filled bags. Stack the bags in the upper row to overlap the joints in the lower row. Stabilize the rows by adding more rows of bags in the lower layers.

- Tightly abut bags and stack gravel bags using a pyramid approach. Gravel bags should not be stacked any higher than 3 ft.
- Upper rows of gravel bags should overlap joints in lower rows.

### **Other Considerations**

- Check dams should be placed at a distance and height to allow small pools to form behind them. Install the first check dam approximately 15 ft 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 should reach the toe of the upstream dam.
- High flows (typically a 2-year storm or larger) should 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 should be removed when grass has matured sufficiently to protect the ditch or swale from erosion.
- Check dam materials should consist of biodegradable materials whenever feasible.
- Rock check dams might be more applicable if concentrated flows might be a potential.

### **Maintenance and Inspection**

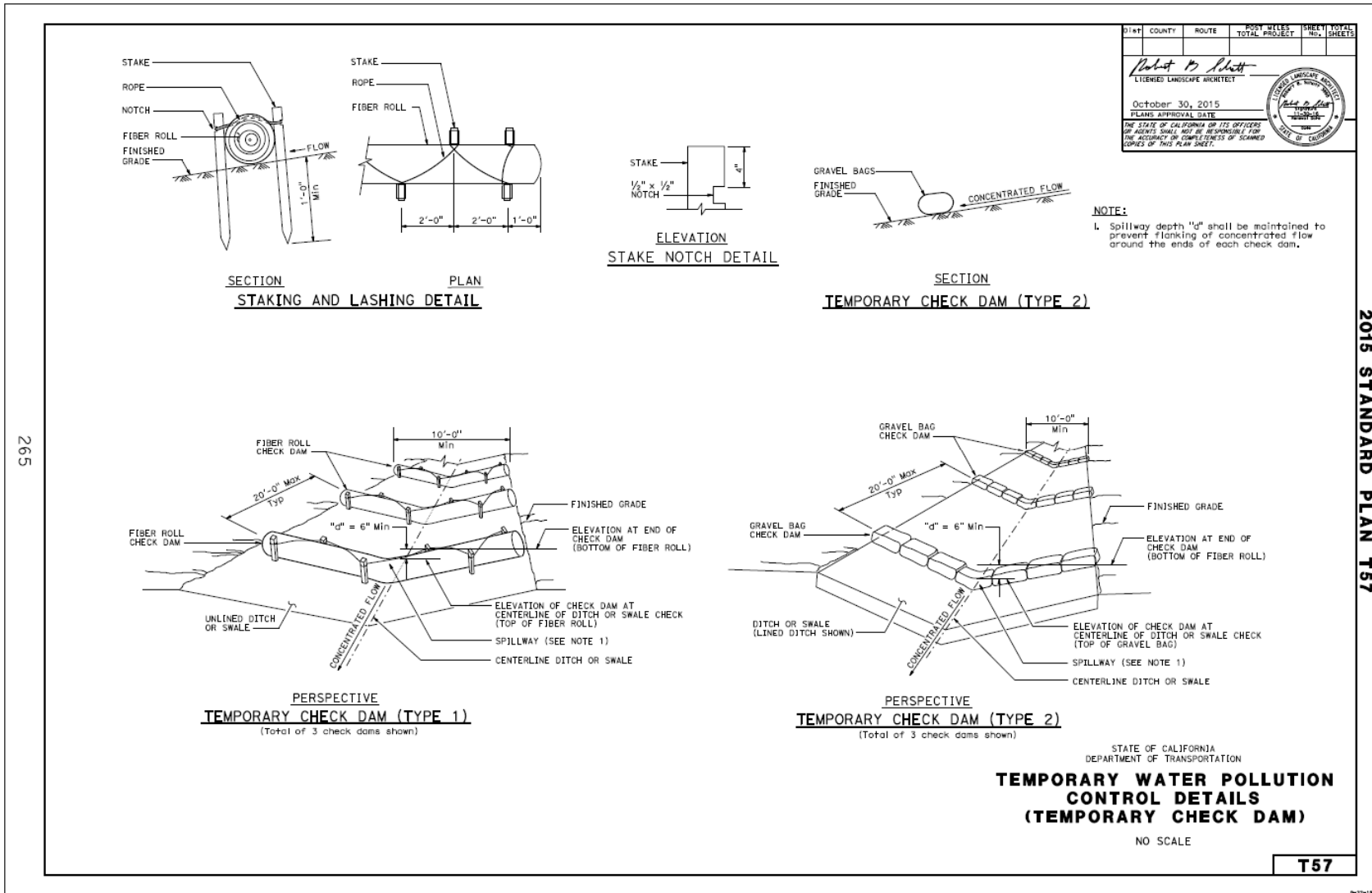
- Check dams must be inspected at a minimum weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Replace missing rock, bags, fiber rolls, etc. that have degraded or become damaged.
- Remove sediment when depth reaches one-third of the 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 directed by the RE.
- Removed sediment can 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.

### **SWPPP or WPCP**

- Temporary Check Dams must be discussed in Section 500.3.3 of the SWPPP or Section 30.2.2 of the WPCP.

# Check Dams

SC-4





Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** A fiber roll consists of wood excelsior, rice or wheat straw, or coconut fibers that is rolled or bound into a tight tubular roll and placed on the toe and face of slopes to intercept runoff, reduce its flow velocity, release the runoff as sheet flow and provide removal of sediment from the runoff. Fiber rolls may also be used for drainage inlet protection and as check dams under certain situations.

- Appropriate Applications**
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
  - Fiber rolls may be applied as both temporary and permanent sediment controls.
  - Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
  - Below the toe of exposed and erodible slopes.
  - Fiber rolls may be used as check dams in unlined ditches or as temporary drainage inlet protection Down-slope of exposed soil areas.
  - Around temporary stockpiles.
  - Along the perimeter of a project.

- Limitations**
- Runoff and erosion may occur if fiber roll is not adequately trenched in.
  - Fiber rolls at the toe of slopes greater than 5:1 (H:V) may require the use of a large sediment barrier as specified in Standard Specifications Section 13-10.03D Temporary Large Sediment Barrier or installations achieving the same protection (i.e., stacked smaller diameter fiber rolls, etc.).
  - Difficult to move once saturated.

- Fiber rolls could be transported by high flows if not properly staked and trenched in.
- Fiber rolls have limited sediment capture zone.
- Do not use fiber rolls on slopes subject to creep, slumping, or landslide.
- Plastic netting should not be used when regulatory permits prohibit their use or if there is a potential for plastic netting to endanger wildlife.
- Plastic netting is only allowed where fiber rolls will be for short duration and will be removed.

## Standards and Specifications

### **Materials**

- Fiber rolls must be premanufactured and filled with weed-free rice or wheat straw, wood excelsior, or coconut fiber. Fiber roll must be covered with biodegradable jute, sisal, or coir fiber netting secured tightly at each end.
- Fiber rolls must have a minimum functional longevity of 1 year.
- Fiber rolls must be:
  - 8 to 10 inches in diameter and at least 1.1 lb/ft
  - 10 to 12 inches in diameter and at least 3 lb/ft
- Large sediment barriers are a subset of fiber rolls. Large sediment barriers must be:
  - 18 to 22 inches in diameter
  - At least 8 ft in length
  - At least 6.5 lb/ft
- Fiber rolls used within the jurisdiction of the Lahontan RWQCB must be made entirely of biodegradable materials if the project is near an ESA area, they are intended to be left in place after construction is completed or there are regulatory permits prohibiting the use of non-photo/biodegradable fiber rolls.
- Submit a Certificate of Compliance for fiber rolls.
- Rope to fasten fiber rolls must be 1/4 inch in diameter and biodegradable, such as sisal or manila.
- Wood stakes must be untreated fir, redwood, cedar, or pine and cut from sound timber. The ends must be pointed for driving into the ground. Notched stakes must be at least 1 by 2 by 24 inches in size. Stakes without notches must be at least 1 by 1 by 24 inches.

## **Typical Fiber Roll Installation**

- Before installing fiber roll, remove obstructions from the ground, including rocks, clods, and debris greater than 1 inch in diameter.
- For any 20-foot section of fiber roll, prevent the fiber roll from varying more than 5 percent from level.
- Use the following spacing unless otherwise noted on the project plans or special provisions:
  - 10 feet apart for slopes steeper than 2:1 (H:V)
  - 15 feet apart for slopes from 2:1 to 4:1 (H:V)
  - 20 feet apart for slopes from 4:1 to 10:1 (H:V)
  - 50 feet apart for slopes flatter than 10:1 (H:V)
- For Type 1 installations:
  - Place in a furrow that is from 2 to 4 inches deep.
  - Fasten with wood stakes every 4 feet along the length of the fiber roll.
  - Fasten the ends of the fiber roll by placing a stake 6 inches from the end of the roll.
  - Drive the stakes into the soil so the top of the stake is less than 2 inches above the top of the fiber roll.
- For Type 2 installations:
  - Fasten with notched wood stakes and rope.
  - Drive stakes into the soil until the notch is even with the top of the fiber roll.
  - Lace the rope between stakes and over the fiber roll. Knot the rope at each stake.
  - Tighten the fiber roll to the surface of the slope by driving the stakes further into the soil.
- If more than one fiber roll is placed in a row, the rolls should be overlapped; not abutted. Stagger overlapping joints in adjacent rows by 5 to 10 feet.

## **Typical Large Sediment Barrier Installation**

- Place a single row of fiber rolls end-to-end, approximately parallel with the slope contour. For any 20-foot section of fiber roll, do not allow the fiber roll to vary by more than 5 percent from level.
- Place the fiber rolls in a furrow that is from 6 to 8 inches deep.
- Secure the fiber rolls with wood stakes 4 feet apart.
- Place a stake 18 inches from each end of each fiber roll.



- Drive the stakes into the soil such that the top of the stakes are less than 2 inches above the top of the fiber rolls.
- Angle the last 6 feet upslope at the downhill end of the run.

### **Removal**

#### Maintenance and TInspection

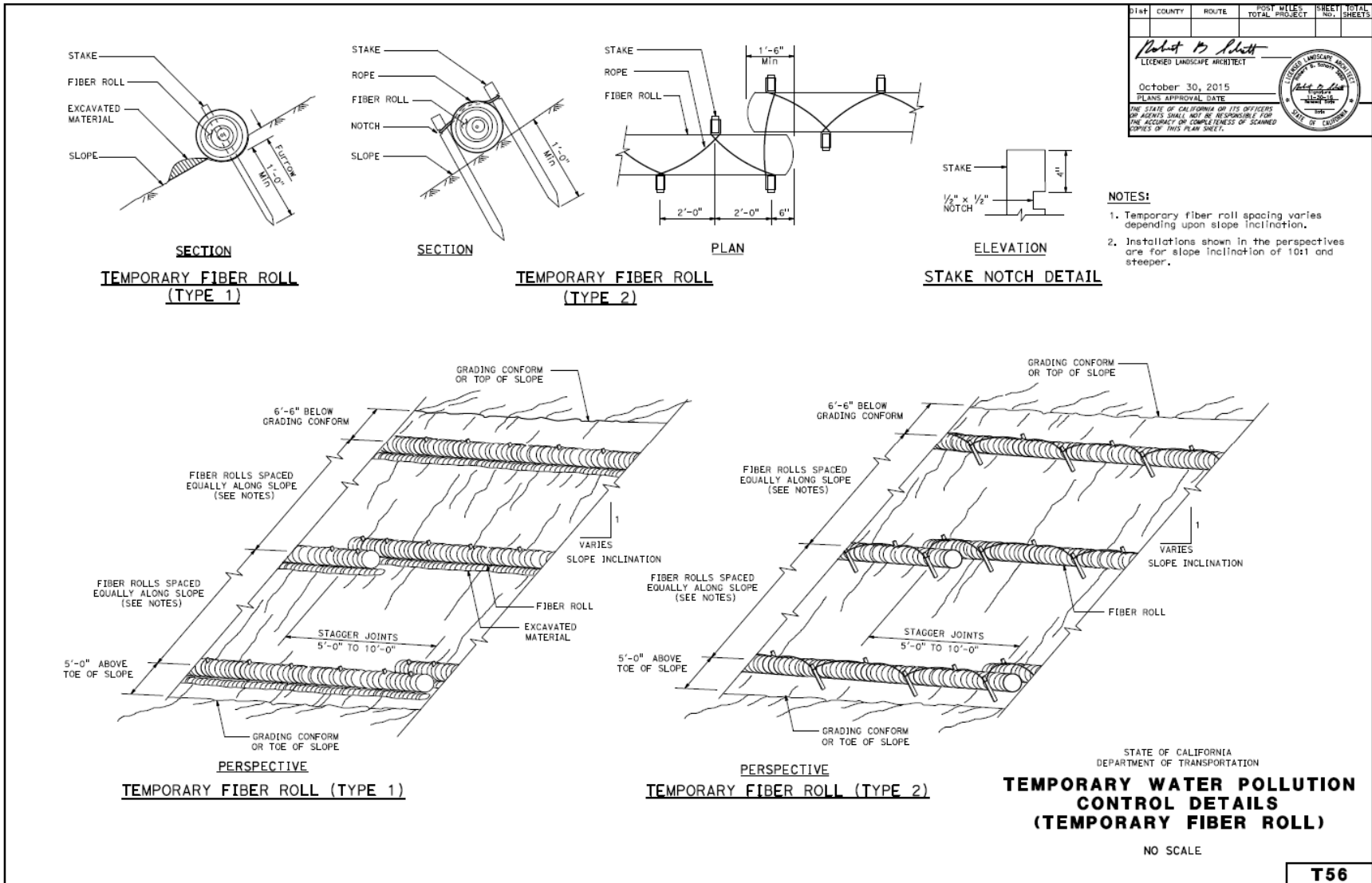
- For permanent installations, do not remove fiber rolls. Fiber rolls will degrade over time, while underlying soils are stabilized by other BMPs.
- For temporary installations, remove fiber rolls, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.
- Remove sediment from behind the fiber roll if sediment is 1/3 of fiber roll height above ground.
- Repair or adjust the fiber roll if rills or other evidence of concentrated runoff occur beneath the fiber roll.
- Repair or replace the fiber roll if they become split, torn, or unraveled.
- Add stakes if the fiber roll slumps or sags.
- Replace broken or split wood stakes.
- Remove sediment deposits, trash, and debris from fiber roll as needed. If removed sediment is deposited within project limits, it must be stabilized and not exposed to erosion by wind or water.
- Perform maintenance as needed or as required by the RE or CGP or LTCGP requirements.
- Inspect fiber rolls before and following rainfall events and a least daily during prolonged rainfall. Perform maintenance as needed or as required by the RE.
- Maintain fiber rolls to provide an adequate sediment holding capacity and runoff velocity reduction.
- Fiber roll placement must be shown on the WPCDs

#### SWPPP or WPCP

- Fiber rolls must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.

# Fiber Rolls

SC-5



2015 STANDARD PLAN T56



# Fiber Rolls

SC-5

DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

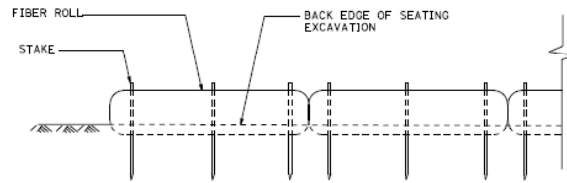
*Robert D. Bluth*  
 LICENSED LANDSCAPE ARCHITECT

October 30, 2015  
 PLANS APPROVAL DATE

THE STATE OF CALIFORNIA AND ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

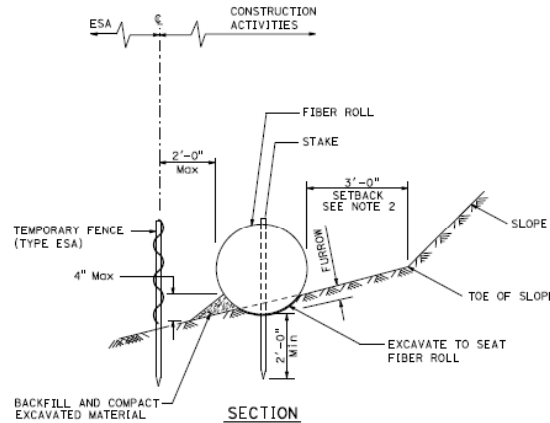
**NOTES:**

1. Temporary fence (Type ESA) shown for reference purposes only.
2. Setback dimension may vary according to field conditions or as designated on plans.



FRONT ELEVATION

TEMPORARY LARGE SEDIMENT BARRIER



SECTION

PLACEMENT DETAIL FOR TEMPORARY FENCE (TYPE ESA) USED WITH TEMPORARY LARGE SEDIMENT BARRIER

(See Note 1)

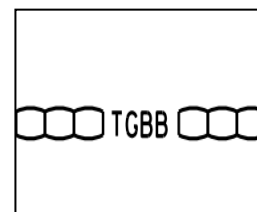
STATE OF CALIFORNIA  
 DEPARTMENT OF TRANSPORTATION  
**TEMPORARY WATER POLLUTION CONTROL DETAILS**  
**(TEMPORARY LARGE SEDIMENT BARRIER)**

NO SCALE

**T66**

2015 STANDARD PLAN T66





Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

## Definition and Purpose

A gravel bag berm consists of a single row of gravel bags that are installed end to end to form a barrier across a slope to intercept runoff, reduce its flow velocity, release the runoff as sheet flow and provide some sediment removal. Gravel bags can be used where flows are moderately concentrated, such as ditches, swales, and storm drain inlets (see SC-10 “Drainage Inlet Protection”) to divert and/or detain flows.

Earthen berms are linear sediment barriers designed to intercept sheet flows. Water gets impounded upstream of the earthen berm, allowing sediment to settle out and releasing runoff as sheet flow, preventing erosion.

## Appropriate Applications

- BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- 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.
- Along the perimeter of a site.
- 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 5 ac.
- When extended construction period limits the use of either silt fences or straw bale barriers.
- When site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction.
- At grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

## Limitations

- Degraded gravel bags may rupture when removed, spilling contents.
- Installation can be labor intensive.
- Limited durability for long term projects.
- When used to detain concentrated flows, maintenance requirements increase.
- Earthen berms should not be used to intercept flows with moderate to high velocities that may erode the earthen berm.
- Earthen berms are susceptible to erosion from concentrated flows.

## Standards and Specifications

### **Materials**

- **Bag Material:** Bags must be a geosynthetic material, either polypropylene, polyethylene or polyamide woven fabric, minimum unit weight 4 ounces per yard<sup>2</sup>, mullen burst strength exceeding 300 psi in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.
- **Bag Size:** Each gravel-filled bag should have a length of 24 to 32 inches, width of 16 to 20 inches, and thickness of 3 inches. Alternative bag sizes must be submitted to the RE for approval prior to deployment.
- **Gravel:** Fill material should be between 3/8 and 3/4 inch in diameter, and be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags must be secured such that gravel does not escape. Gravel-filled bags are between 30 and 50 lb in weight. Fill material is subject to approval by the RE.
- Earthen berms must comply with Standard Specifications Section 13-10.03I.

### **Installation**

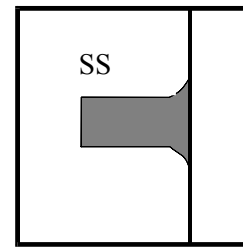
- When used as a linear control for sediment removal:
  - Install along a level contour.
  - Place gravel-filled bags end-to-end to eliminate gaps in a gravel bag berm.
  - Angle the last 6 feet upslope at the downhill end of the run.

- Stack the bags such that the upper row overlaps the joints in the lower row.
- Add layers of gravel-filled bags to increase the height of a temporary gravel bag berm if needed. Stack the bags in the upper row to overlap the joints in the lower row. Stabilize the rows by adding rows of bags in the lower layers.

- Generally, gravel bag barriers can be used in conjunction with temporary soil stabilization controls up slope.
- Construct gravel bag barriers with a set-back from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the gravel bag barrier may be constructed at the toe of the slope, but be constructed as far from the toe of the slope as practicable.
- Refer to SC-4 “Check Dams” when used for concentrated flows.
- Submit a certificate of compliance for gravel-filled bag material.
- Earthen berms are constructed with either native soil or an alternative selected material.
- Earthen berms must be at least 8 inches in height and 36 inches in width.
- Earthen berms must be compacted by manual or mechanical methods.
- Gravel bag/earthen berms must be inspected in accordance with CGP requirements for the associated project type and risk level or with LTCGP. At a minimum, BMPs must be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- 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/earthen berms for sediment accumulations and remove sediment when accumulation reaches one-third of the berm height. Removed sediment can 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 accumulations and clean, re-grade, and stabilize the area.
- If using earthen berm, ensure soil remains compacted through the duration of the berm
- Maintain earthen berms to provide sediment-holding capacity and to reduce concentrated flow velocities.
- Repair the berm if rills or other evidence of concentrated runoff over it.
- Gravel Bag/Earthen Berm placement must be shown on the WPCDs and reflect site conditions.

## Maintenance and Inspection

- Gravel Bag/Earthen Berm must be discussed in Section 500.3 SWPPP or Section 30.2 of the WPCP.



Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input checked="" type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose**

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

**Appropriate Applications**

These practices are implemented anywhere sediment is tracked from the project site onto public or private paved roads, typically at jobsite entrances and exits.

**Limitations**

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

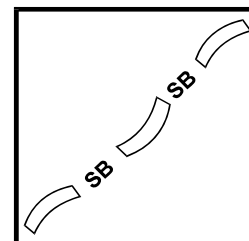
**Standards and Specifications**

**General Requirements**

- Sweep by hand or mechanical methods, such as vacuuming. Kick brooms or sweeper attachments may not be used.
- At least one street sweeper in good working order must be at the job site at all times when street sweeping work is required.
- Use one of the following types of street sweepers:
  - Mechanical sweeper followed by a vacuum-assisted sweeper;
  - Vacuum-assisted, dry, waterless, sweeper; or
  - Regenerative-air sweeper.
- Submit the number and type of street sweepers that will be used on the project for each activity at least 5 business days before starting the activities listed above. Keep and submit street sweeping activity records including sweeping times, locations, and the quantity of material collected.



- Sweep paved roads at construction entrance and exit locations and onsite paved areas:
    - During clearing and grubbing, earthwork, trenching, and pavement-structure construction activities.
    - When vehicles are entering and leaving the job site.
    - After soil-disturbing activities.
    - After observing off-site tracking of material.
  - Sweep within 1 hour if sediment or debris is observed during the activities described above that require sweeping.
  - Sweep within 24 hours if sediment or debris is observed during activities that do not require sweeping.
  - Keep dust to a minimum during street sweeping activities. Use water for dust control or a vacuum whenever dust generation is excessive or sediment pickup is ineffective. Refer to WE-1 for “Wind Erosion Control” BMPs.
  - Remove collected material, including sediment, from paved shoulders, drainage inlets, curbs and dikes, and other drainage areas.
  - After sweeping is finished, collected material may be stockpiled. If not mixed with debris, trash or potentially hazardous objects, consider incorporating the removed sediment back into the project if approved by the RE. Otherwise, dispose of stockpiled material at least once per week according to Standard Specifications Section 14-10.
  - Street sweeping does not void the requirements for residue collection included in other work activities, such as grooving, grinding, or asphalt concrete planing.
- Maintenance and Inspection
- Inspect potential sediment tracking locations daily.
  - Monitor and inspect tracking control BMPs such as TC-1, “Temporary Construction Entrance/Exit,” to reduce sediment accumulation on roads.
  - 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.
  - Sweeper material must be disposed in compliance with waste regulations.
- SWPPP or WPCP
- Street Sweeping must be discussed in Section 500.3.4 and 600.2 of the SWPPP or Section 30.2.3 of the WPCP.



Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**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.

- 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/desilting basin.
  - During construction activities in stream beds when the contributing drainage area is less than 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-stormwater 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.
- Limitations
- Limit the drainage area upstream of the barrier to 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.
  - Consider using gravel bags whenever possible since they often do not require as much maintenance or impact wildlife when used near ESAs.

## Standards and Specifications

### **Materials**

- Sandbag Material: Sandbag can be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight four ounces per square yard, mullen burst strength exceeding 300 psi in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not acceptable.
- Sandbag Size: Each sand-filled bag should have a length of 18 in, width of 12 in, thickness of 3 in, and mass of approximately 33 lb. Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes must be submitted to the RE for approval prior to deployment.
- Fill Material: All sandbag fill material can be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material, conforming to the provisions in Standard Specifications Section 47-2.02D “Permeable Material”. The requirements for the Durability Index and Sand Equivalent do not apply. Fill material is subject to approval by the RE.

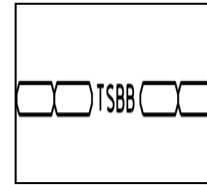
### **Installation**

- When used as a linear sediment control:
  - Install along a level contour.
  - Turn ends of sandbag row up slope to prevent flow around the ends.
  - Generally, sandbag barriers may be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.
- Construct sandbag barriers with a set-back of at least 3 ft from the toe of a slope. Where it is determined to be not practical due to specific site conditions, the sandbag barrier may be constructed at the toe of the slope, but should 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 year round.
  - 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 can 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 14-10.
  - Remove sandbags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilized the area.
- SWPPP or WPCP
  - Sandbag Barrier must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.

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Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**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 WM-8, “Concrete Waste Management”).
  - Parallel to a roadway to keep sediment off paved areas.

- Limitations**
- 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.
- Not to be used in areas of concentrated flow.
- Can be an attractive food source for some animals.
- May introduce undesirable non-native plants to the area.

## Standards and Specifications

### **Materials**

- Straw must conform to the provisions in Standard Specifications Section 21-2.02H, "Straw."
- Each straw bale should be a minimum of 14 in wide, 18 in high, 36 in long and have a minimum weight of 50 lb.
- The straw bale must be composed entirely of vegetative matter, except for the binding material.
- Bales can be bound by either wire, nylon, or polypropylene string placed horizontally. Jute and cotton binding may not be used. Baling wire should be at least 16 gauge. Nylon or polypropylene string should have a diameter of approximately 0.08 in with a breaking strength of 80 lbs.
- Wood or metal posts should be used as stakes. Posts for straw bale barriers must comply with Standard Specifications Section 16-2.03 "High-Visibility Fences."

### **Installation**

- Place a single row of straw bales end-to-end and parallel with the slope contour. For any 20-foot section of straw bale barrier, do not allow it to vary by more than 5% from level.
- Place straw bales in a trench or key them into the slope. Place the bales such that the binding wire or string does not come in contact with the soil. Use wood or metal posts as stakes.

- Secure each straw bale with two posts. The first post in each bale must be driven toward the previously laid bale to force the bales together. Drive the posts into the soil such that the top of the post is less than 2 in. above the top of the straw bale. The post must extend a minimum of 2 ft in the ground below the bottom of the straw bales.
- Angle the last 6 feet upslope at the downhill end of the run.
- See page 5 of this BMP for installation detail.

### **Other Considerations**

- Construct straw bale barriers with a set-back of at least 3 ft from the toe of a slope. Where it is determined to be not practical due to specific site conditions, the straw bale barrier may be constructed at the toe of the slope, but be constructed as far from the toe of the slope as practical.
- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the RE.
- Straw bale barriers may be used in combination with a silt fence (see SC-2 “Silt Fence”) for additional sediment control.

### **Maintenance and Inspection**

- At a minimum, BMPs must be inspected weekly, prior to forecasted rain events, daily during extended rain events, and after the conclusion of rain events.
- Inspect straw bale barriers for sediment accumulations and remove sediment when depth reaches one-third the barrier height. Removed sediment should be disposed of outside the highway right-of-way in conformance with the Standard Specifications.
- Replace or repair damaged 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.
- Straw Bale Barrier placement must be shown on the WPCDs and reflect current site conditions.

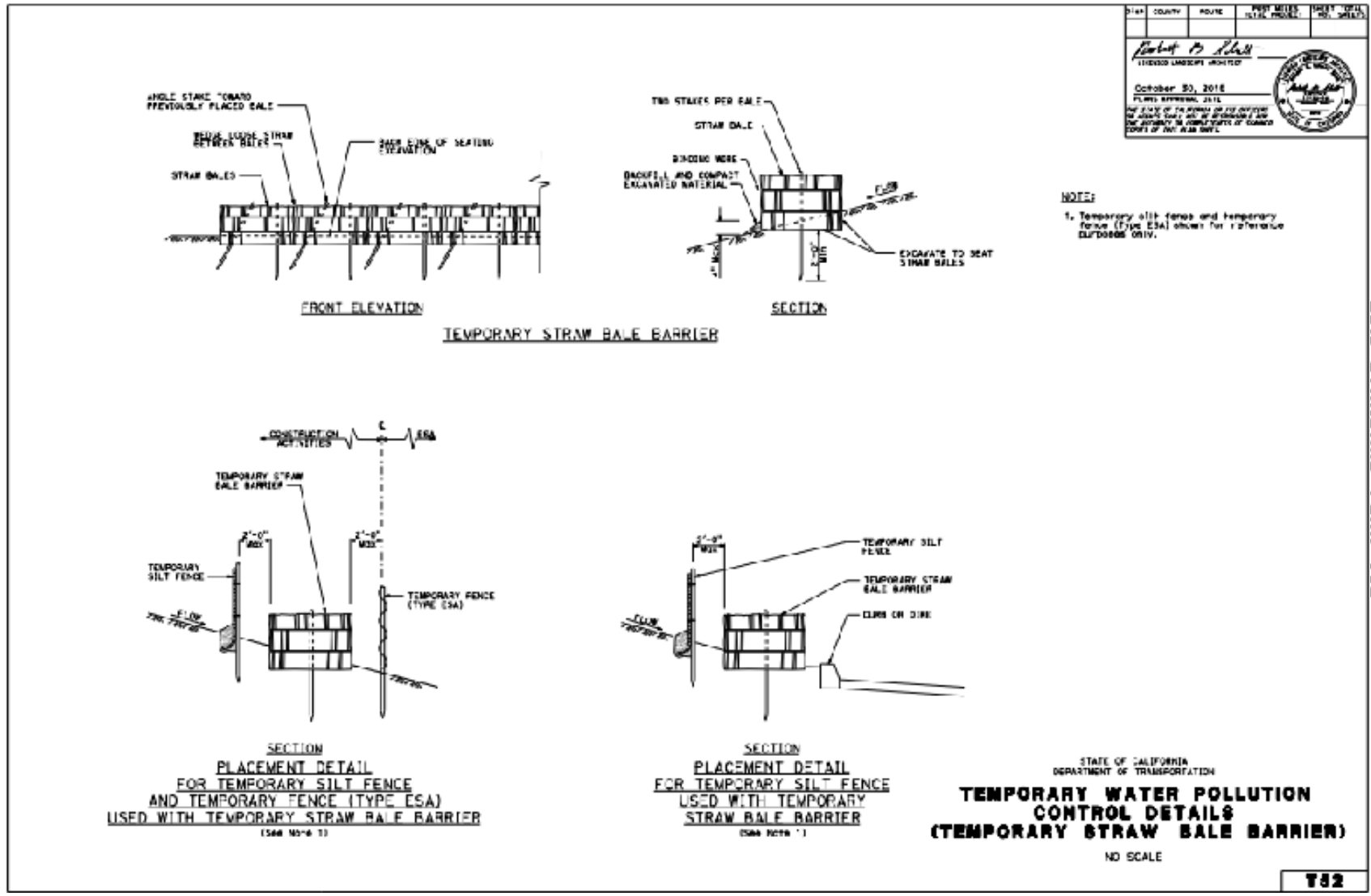
### **SWPPP or WPCP**

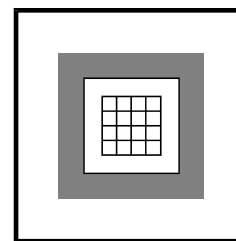
- Straw Bale Barrier must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.



# Straw Bale Barrier

SC-9





Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose** Temporary drainage inlet protection consists of devices used at storm drain inlets that detain and/or filter sediment-laden runoff prior to discharge into storm drainage systems. This is achieved by allowing sediment to settle and/or filtering sediment upstream of a linear sediment barrier.
- 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 1 ac or less.
  - Used year-round.
- Limitations**
- Requires an adequate area for water to pond without encroaching upon traveled way and should not present an obstacle to oncoming traffic.
  - May require other methods of temporary protection to prevent sediment-laden stormwater and non-stormwater discharges from entering 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, such as SC-4 “Check Dams,” in conjunction with temporary drainage inlet protection.
  - Frequent maintenance is required.
  - Silt fence inlet protection is appropriate in open areas that are subject to sheet flow and for flows not exceeding 0.5 cfs.

- Gravel bag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.5 cfs, and it is necessary to allow for overtopping to prevent flooding.
- Fiber rolls and foam barriers are not appropriate for locations where they cannot be properly anchored to the surface.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.
- For drainage areas larger than 1 ac, runoff should be routed to a sediment trapping device designed for larger flows. See BMPs SC-2, “Sediment/Desilting Basin,” and SC-3 “Sediment Trap/Curb Cutback.”

## Standards and Specifications

### **General Requirements**

- Refer to Standard Specifications Section 13-6.03C for “Temporary Drainage Inlet Protection” and 13-6.03F for “Rigid Plastic Barriers.”
- 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 or combination of methods to use. Update inlet protection as site conditions change.
- Use a linear sediment barrier to redirect runoff and control ponding in order to prevent ponding from encroaching on the traveled way or overtopping the curb or dike.
- Prior to installation, clear the area around each inlet of obstructions, including rocks, clods, and debris greater than 1-in. in diameter.
- Install linear sediment barriers upstream of the inlet and parallel with the curb, dike, or flow line to keep sediment from entering the inlet.
- Remove accumulated sediment according to Maintenance and Inspection recommendations. Accumulated sediment may be disposed of outside the highway right-of-way in conformance with the Standard Specifications Section 14-10.

### **Type 1 - Silt Fence**

- This method should be used for drain inlets requiring protection in areas where finished grade is established and erosion control seeding has been applied or is pending. The silt fence (Type 1) protection is illustrated on Page 6. 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.
- Type 2 - Excavated Drop Inlet Sediment Trap
- This method may be used for drainage inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas are subject to grading. The excavated drop inlet sediment trap (Type 2) is illustrated on Page 7. Similar to constructing a temporary silt fence; see BMP SC-1, “Silt Fence.” Size the excavated trap to provide a minimum storage capacity calculated at the rate of 67 yd<sup>3</sup>/ac of drainage area.

## **Type 3A – Gravel Bag Berm for Combined Inlets**

- This method may be used for drain inlets surrounded by AC or paved surfaces. The gravel bag berm for combined inlets (Type 3A) is illustrated on Pages 8-9. Flow from a severe storm must not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with BMP SC-6, “Gravel Bag Berm.” Gravel bags are used due to their high permeability.

## **Type 3B – Gravel Bag Berm for Grate Inlets**

- This method may be used for drainage inlets surrounded by AC or paved surfaces. The gravel bag berm for grate inlets (Type 3B) is illustrated on Page 10. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Place gravel bags in accordance with BMP SC-6, “Gravel Bag Berm.” Gravel bags are used due to their high permeability.

## **Type 4A – Flexible Sediment Barrier for Grate Inlets**

- This method may be used for drainage inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas subject to grading. Flexible Sediment Barrier for Grate Inlets (Type 4A) is placed around the inlet and keyed and anchored to the surface. Flexible Sediment Barriers are intended for use as inlet protection where the area around the inlet is unpaved and the foam barrier or fiber roll can be secured to the surface. Place fiber rolls over the erosion control blanket. RE or appropriate licensed professional approval is required.

## **Type 4B – Flexible Sediment Barrier for Combined Inlets**

- This method may be used for drainage inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas subject to grading. Flexible Sediment Barrier for Combined Inlets (Type 4B) is placed in rows upstream of the inlet and along the curb or dike. The barriers are keyed and anchored to the surface. Flexible Sediment Barriers are intended for use as inlet protection where the area around the inlet is unpaved and the foam barrier or fiber roll can be secured to the surface. Place the barrier to provide a tight joint with the curb or dike. Cut the cover fabric or jacket to ensure a tight fit. RE and Construction Storm Coordinator approval is required.

## **Type 5 – Sediment Filter Bag**

- This method may be used in areas with vehicle and equipment traffic that could damage aboveground inlet protection devices. The Sediment Filter Bags are installed as follows: (1) Remove the drainage inlet grate, (2) Place the sediment filter bag in the opening, and (3) Replace the grate to secure the sediment filter bag in place.

## **Type 6A – Catch Basin with Grate**

- Catch Basin with Grate (Type 6A) is shown on page 16. Cover grate inlet with rigid plastic barrier and secure on each end with gravel-filled bags. If using a rigid sediment barrier and the grated inlet does not have a curb opening, place the barrier using a gasket to prevent runoff from flowing under the barrier. Secure the barrier to the pavement with nails and adhesive, gravel-filled bags, or a combination of both.

## **Type 6B – Curb Inlet without Grate**

- Curb Inlet without Grate (Type 6B) is shown on page 16. Place the flexible sediment barrier across the curb inlet opening and secure with gravel-filled bags.

## Maintenance and Inspection

### **General Requirements**

- Inspect all drainage inlet protection devices before and after every rainfall event and weekly year round. During extended rainfall events, inspect inlet protection devices at least once every 24 hours.
- Inspect the storm drain inlet after severe storms to check for bypassed material.
- Remove all drainage 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.

### **Type 1 - Filter Fabric Fence**

- Make sure the stakes are securely driven in the ground and are structurally sound (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 RE.
- At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height.

### **Type 2 – Excavated Drop Inlet Sediment Trap**

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

### **Type 3A - Gravel Bag Berm for Combined Inlets**

- Inspect bags for holes, gashes, and snags.
- Check gravel bags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier.

## **Type 3B - Gravel Bag Berm for Grate Inlets**

- Inspect bags for holes, gashes, and snags.
- Check gravel bags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier.

## **Type 4A Flexible Sediment Barrier for Grate Inlets**

- Check flexible sediment barrier for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier.

## **Type 4B Flexible Sediment Barrier for Combined Inlets**

- Check flexible sediment barrier for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier.

## **Type 5 Sediment Filter Bag**

- Change sediment filter bag carefully ensuring not to spill captured sediment into the drainage inlet.

## **Type 6A Catch Basin with Grate**

- Check barrier and gravel-filled bags for proper arrangement and displacement. Routinely remove accumulated sediment

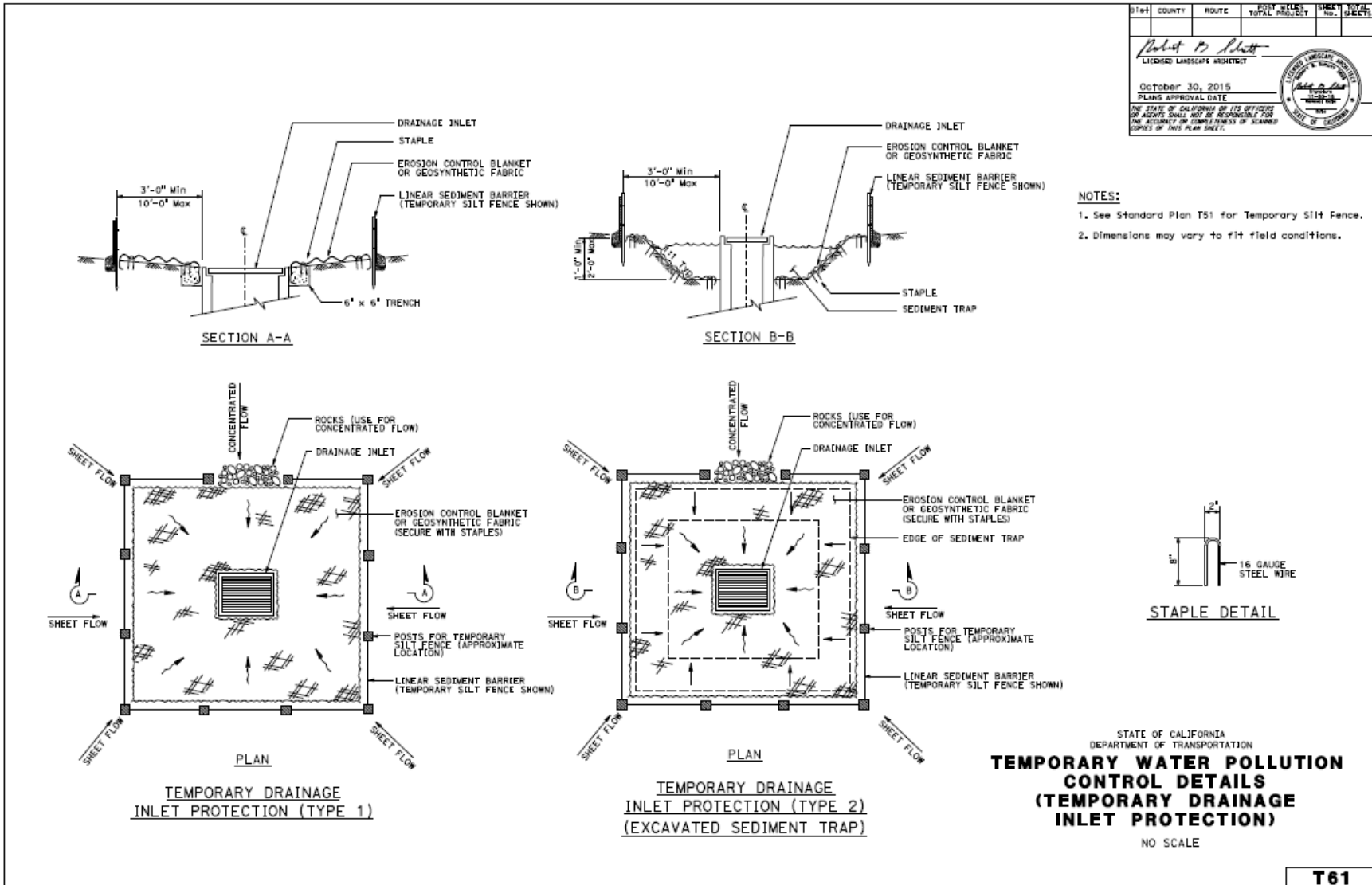
## **Type 6B Curb Inlet without Grate**

- Check barrier and gravel-filled bags for proper arrangement and displacement.
- Remove the sediment behind the barrier when it reaches one-third the height of the barrier.

- SWPPP or WPCP
- Temporary Drainage Inlet Protection must be discussed in Section 500.3.2 of SWPPP and/or Section 30.2.2 of the WPCP. Temporary Drainage Inlet Protection placement type must be shown on the WPCDs and reflect site temporary conditions.

# Temporary Drainage Inlet Protection

SC-10

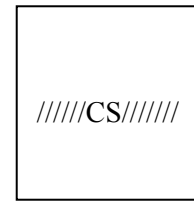


DIST.	COUNTY	ROUTE	PROJECT TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

*Robert P. Blunt*  
 LICENSED LANDSCAPE ARCHITECT  
 October 30, 2015  
 PLANS APPROVAL DATE  
THE STATE OF CALIFORNIA AND ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

- NOTES:**
1. See Standard Plan T51 for Temporary Silt Fence.
  2. Dimensions may vary to fit field conditions.

2015 STANDARD PLAN T61



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- |                              |   |
|------------------------------|---|
| Definition and Purpose       | <ul style="list-style-type: none"> <li>■ Compost socks are a mesh sock containing compost that act as three dimensional, biodegradable structures that intercept and filter sheet flow. Compost socks can filter runoff, retain sediment, and reduce sheet flow velocities. Compost socks may be used as either a temporary or permanent sediment control measure.</li> </ul>   |
| Appropriate Applications     | <ul style="list-style-type: none"> <li>■ Compost socks may be applied as both temporary and permanent sediment controls.</li> <li>■ Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.</li> <li>■ Along the perimeter of a project.</li> <li>■ As check dams in unlined ditches.</li> <li>■ Down-slope of exposed soil areas.</li> <li>■ At operational storm drains as a form of inlet protection.</li> <li>■ Around temporary stockpiles.</li> </ul> |
| Limitations                  | <ul style="list-style-type: none"> <li>■ Compost can potentially leach nutrients into runoff and negatively affect water quality. Compost should not be used directly upstream from a nutrient-impaired water body.</li> <li>■ Compost socks are susceptible to damage by traffic. Compost socks may be used around heavy machinery, but frequent disturbance decreases sock performance.</li> </ul>  |
| Standards and Specifications | <p><b>General Requirements</b></p> <ul style="list-style-type: none"> <li>■ Compost socks must comply with Standard Specifications 21-2.02Q and 21-2.03Q.</li> </ul>  |



- Compost for compost socks must comply with Standard Specifications Section 21-2.02K, except the particle size must be for coarse compost.
- Compost sock installation is illustrated in Standard Plan H51.
- Compost socks consist of a 12-inch diameter mesh tube that is filled with compost. The mesh tube must be composed of a natural biodegradable product such as cotton, jute, sisal, burlap, or coir. The mesh tube must be clean, evenly woven, and free of encrusted concrete or other contaminating materials, cuts, tears, broken or missing yarns, and thin, open, or weak places.
- Compost socks must have a functional longevity of one year.

## ***Installation***

- Before installing compost sock, remove obstructions from the ground including rocks, clods, and debris greater than 1 inch in diameter.
- For any 20-foot section of compost sock, prevent the compost sock from varying more than 5 percent from level.
- Use the following spacing unless otherwise noted on the project plans or special provisions:
  - 10 feet apart for slopes steeper than 2:1 (H:V)
  - 15 feet apart for slopes from 2:1 to 4:1 (H:V)
  - 20 feet apart for slopes from 4:1 to 10:1 (H:V)
  - 50 feet apart for slopes flatter than 10:1 (H:V)
- Place mesh tube, secure the end, and fill uniformly with compost. Secure the remaining end.
- For Type 1 installations:
  - Place in a furrow that is from 2 to 4 inches deep.
  - Fasten with wood stakes every 4 feet along the length of the compost sock.
  - Fasten the ends of the compost sock by placing a stake 6 inches from the end of the sock.
  - Drive the stakes into the soil so the top of the stake is less than 2 inches above the top of the compost sock.
- For Type 2 installations:
  - Fasten with notched wood stakes and rope.
  - Drive stakes into the soil until the notch is even with the top of the compost sock.
  - Lace the rope between stakes and over the compost sock. Knot the rope at each stake.

- Tighten the fiber roll to the surface of the slope by driving the stakes further into the soil.

- If more than one compost sock is placed in a row, the socks should be overlapped; not abutted. Stagger overlapping joints in adjacent rows by 5 to 10 feet.

### **Removal**

- For permanent installations: do not remove compost socks. Compost socks will degrade over time.
- For temporary installations: remove sock, rope and stakes if ordered by the RE. Cut sock and empty contents in place.

### **Other Considerations**

- Compost may be pre-seeded before placement into the mesh tube to assist in establishing vegetation. Once established, vegetation root systems provide additional soil stability and runoff filtration.
- Permanent compost sock applications are particularly advantageous below embankments, especially adjacent streams, by limiting re-entry and the disturbance to sensitive areas.
- Organic material in compost is important for pollutant removal and vegetation establishment. Organic content of the compost should range from 30 to 65% depending on site conditions.

### **Maintenance and Inspection**

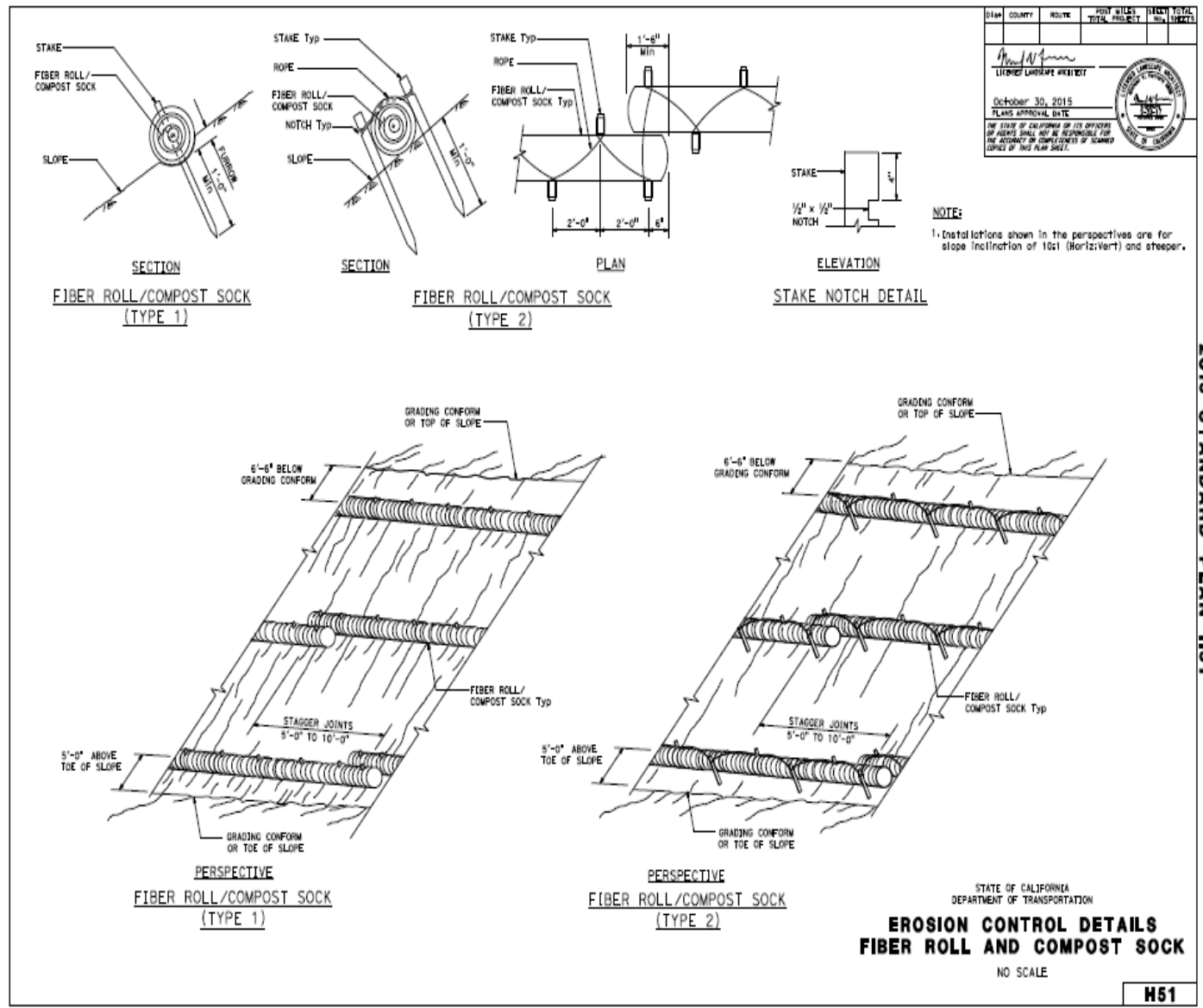
- Inspect compost socks before and after each rainfall event, and weekly year round.
- Remove sediment from behind the compost sock if sediment is 1/3 of compost sock height above ground.
- Repair or adjust the compost sock if rills or other evidence of concentrated runoff occur beneath the sock.
- Repair or replace compost socks if they become split, torn, or unraveled.
- Add stakes if the compost sock slumps or sags.
- Replace broken or split wood stakes.
- Maintain compost socks to provide an adequate sediment holding capacity and runoff velocity reduction.

### **SWPPP or WPCP**

- Compost Socks must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.

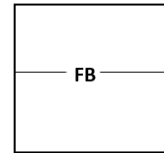
# Compost Socks

SC-11



2015 STANDARD PLAN H51





Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose**
- Flexible sediment barriers are synthetic alternatives to fiber rolls, compost socks, and straw bale barriers. Flexible sediment barriers consist of a geosynthetic fabric with a urethane foam-filled core and a fabric apron that helps to prevent undermining and scour. These synthetic linear sediment barriers are generally more robust sediment controls than standard fiber rolls, and may be appropriate for continuous use in stormwater collection areas.
- Appropriate Applications**
- Along the perimeter of a project.
  - As check dams in ditches, channels, or other stormwater collection areas.
  - Down-slope of exposed soil areas.
  - At operational storm drains as a form of inlet protection.
  - Around temporary stockpiles.
  - On either paved surfaces or soil.
  - As a linear sediment control for SC-10 “Temporary Drain Inlet Protection.”
- Limitations**
- Frequent maintenance is required if sediment-laden discharges are upstream of the BMP to maintain it operational.
- Standards and Specifications**
- General Requirements**
- Flexible sediment barriers must comply with Standard Specifications Sections 13-10.02I and 13-10.03H.
  - Flexible sediment barriers consist of:
    - A urethane foam-filled core.
    - Geosynthetic fabric cover and flap.
    - Triangular, circular, or square cross section.
    - Vertical height of at least 5 inches after installation.

- Horizontal flap at least 8 inches in width.
- Length of at least 4 feet per unit.
- Ability to interlock separate units into a long barrier such that water will not flow between units.
- Geosynthetic fabric for flexible sediment barriers covers must have:
  - Minimum grab break load of 200 lbs., per ASTM D4632.
  - Minimum apparent elongation of 15%, per ASTM D4632.
  - Average water flow rate of 100-150 gallons per minute per square foot, per ASTM D4491.
  - Minimum permittivity of 0.05 1/sec, per ASTM D4491.
  - Maximum apparent opening size of the 40 U.S. standard sieve size, per ASTM D4751.
  - Minimum ultraviolet radiation resistance of 70% retained grab breaking load at 500 hours of exposure, per ASTM D4355.
- Submit a certificate of compliance for flexible sediment barriers.

## ***Installation***

- Remove obstructions, including rocks, clods, and debris greater than 1 inch in diameter, from the ground.
- Secure flexible sediment barriers to pavement with:
  - 1-inch concrete nails, 1-inch washers, and solvent-free adhesive,
  - Gravel-filled bags, or
  - A combination of both of the above methods.
- Secure flexible sediment barriers to soil with 6-inch nails and 1-inch washers.
- Secure connection points of two adjacent sections of flexible sediment barriers with 2 nails.
- Do not pierce the foam core of the barrier with nails.
- Inspect flexible sediment barriers before and after each rainfall event, and weekly year round.
- Maintain a flexible sediment barriers to provide sediment-holding capacity and to reduce concentrated flow velocities.
- Repair or adjust the flexible sediment barriers if rills or other evidence of concentrated runoff occur beneath it.
- Repair or replace split, torn, or unraveled material. Add or replace posts, stakes, or fasteners as needed to prevent sagging or slumping.

## Maintenance and Inspection

- Reattach any flexible sediment barriers that detaches from the pavement.
  - Remove sediment deposits if the sediment exceeds 1/3 of the height above the ground behind a foam barrier.
- SWPPP or WPCP
- Remove Flexible sediment barriers must be discussed in Section 500.3 of the SWPPP or Section 30.2 of the WPCP.

# Flexible Sediment Barrier

SC-12


SLOPE OF ROADWAY (PERCENT)	0 TO 0.9	1 TO 1.9	2 TO 2.9	3 TO 4	5+
INTERVAL BETWEEN BARRIERS	50'	35'	30'	25'	20'
ANGLE FROM FACE OF CURB	70°	70°	70°	45°	45°
SUGGESTED BARRIER LENGTH	6'	6'	6'	6'	6'

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION  
COUNTY: \_\_\_\_\_ ROUTE: \_\_\_\_\_ FROM TOTAL PROJECT: \_\_\_\_\_ SHEET TOTAL: \_\_\_\_\_

*Robert D. Smith*  
LICENSED LANDSCAPE ARCHITECT

October 30, 2015  
PLANS APPROVAL DATE

NO SCALE OF THE DRAWING OR ITS CONTENTS OR ANY DATA SHALL BE USED OR REPRODUCED FOR ANY PURPOSE OR FOR ANY LIABILITY OF THE ENGINEER OR ARCHITECT UNLESS SPECIFICALLY STATED TO THE CONTRARY ON THESE PLANS.



**NOTES:**

- See Standard Plan T51 for Temporary Silt Fence.
- Dimensions may vary to fit field conditions.
- Install a minimum of 3 flexible sediment barriers upstream of each drainage inlet to be protected.
- Position erosion control blanket or geosynthetic fabric at edge of concrete apron and secure in trench.
- Erosion control blanket or geosynthetic fabric is not required if the area adjacent to the drainage inlet is vegetated.

**SECTION A-A**

**SECTION**

**FLEXIBLE SEDIMENT BARRIER DETAIL (FOAM BARRIER SHOWN)**

**PERSPECTIVE**

**PLAN**

**TEMPORARY DRAINAGE INLET PROTECTION (TYPE 4A)**

**PLAN**

**TEMPORARY DRAINAGE INLET PROTECTION (TYPE 4B)**

**FLEXIBLE SEDIMENT BARRIER**

**STAPLE DETAIL**

16 GAUGE STEEL WIRE

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

**TEMPORARY WATER POLLUTION CONTROL DETAILS (TEMPORARY DRAINAGE INLET PROTECTION)**

NO SCALE

2015 STANDARD PLAN T63

T63



## Section 5

# Wind Erosion Control BMP

### 5.1 Wind Erosion Control

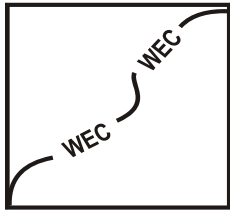
Wind erosion control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance. Wind erosion control BMPs are shown in Table 5-1.

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 to control wind erosion are BMPs SS-3 through SS-7, shown in Section 3 of this Manual; BMP TC-2, shown in Section 6; and BMP NS-7, shown in the Section 7. The remainder of this Section describe the working details for the Wind Erosion Control BMP.



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Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input checked="" type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose**

- Wind erosion control consists of applying water or other dust palliatives as necessary to prevent or alleviate erosion by the forces of wind. Dust control must be applied in accordance with Caltrans standard practices. Covering of small stockpiles or areas is an alternative to applying water or other dust palliatives; see SS-7 for “Temporary Cover and Rolled Erosion Control Products”

- Must comply with local agencies such as Air Quality Management District’s requiring dust control plans or dust control permits as well as any Air Clean Act requirements.

**Appropriate Applications** This practice is generally implemented on all exposed soils subject to wind erosion.

**Limitations**

- Effectiveness depends on soil, temperature, humidity and wind velocity.
- Chemically treated subgrades could cause soil to become water repellant, preventing infiltration or the long-term re-vegetation of the site.

**Standards and Specifications** Standard Specification Section 10-5 contains general requirements for “Dust Control.”

- Effective dust control is accomplished by applying dust palliatives, temporary Soil Stabilization BMPs, Tracking Controls and managing stockpiles.
- “Dust Palliatives” are covered under Section 18 of the Standard Specifications. Acceptable dust palliatives include water, dust control binders, and dust suppressants. Dust control binders must comply with specifications for tackifier. Dust suppressants include petroleum-based organic product, nonpetroleum-based organic product, hygroscopic product, and synthetic polymer emulsion.

- If a dust suppressant or tackifier is used, submit a Dust Treatment Plan. Submit a certificate of compliance for dust suppressants, tackifiers, and fibers.
  - Identify and stabilize key access points with the use of Tracking Control BMPs.
  - Minimize the impact of dust by anticipating the direction of prevailing winds.
  - Temporary soil stabilization BMPs, such as SS-3 “Hydraulic Mulch”, SS-4 “Hydroseed, SS-5 “Soil Binders, also provide wind erosion control benefits.
  - Ensure proper implementation of BMPs WM-3, “Stockpile Management,” and SC-7, “Street Sweeping,” as these BMPs provide wind erosion control benefits.
  - Ensure that water is applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles to ensure even distribution.
  - All distribution equipment should be equipped with a positive means of shutoff.
  - Chemical dust suppression products could have environmental water quality impacts. Depending on the product and the time of application, water quality sampling for non-visible pollutants should be assessed when a storm even is forecasted.
  - For chemical or petroleum based organics stabilization, there are many products available. These products should not create any adverse effects on stormwater, plant life, groundwater and should meet all applicable regulatory requirements including inspection, documentation, monitoring and reporting requirements.
  - Unless water is applied by means of pipelines, at least one mobile unit should be available at all times to apply water or dust palliative to the project.
  - If reclaimed water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the RWQCB requirements. Non-potable water must not be conveyed in tanks or drain pipes that will be used to convey potable water and there must be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances must be marked “NON-POTABLE WATER - DO NOT DRINK.”
  - Appendix B of this Manual includes additional information on selecting temporary soil stabilization products that could be used for Wind Erosion Control.
- Maintenance and Inspection**
- Check areas where wind erosion controls have been implemented daily for erosion and visible dust.
  - Most water-based dust control measures require frequent application. Obtain vendor or independent information on longevity of chemical dust suppression.

- SWPPP or WPCP ■ Wind Erosion Control must be discussed in Section 500.3.5 of the SWPPP or Section 30.2.4 of the WPCP.

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## Section 6

# Tracking Control BMP

### 6.1 Tracking Control

Tracking control consists of preventing or reducing vehicle tracking from entering a storm drain or watercourse. Tracking control BMPs are shown in Table 6-1.

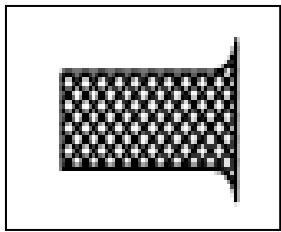
Table 6-1. Tracking Control BMPs	
ID	BMP Name
TC-1	Temporary Construction Entrance/Exit
TC-2	Temporary Construction Roadway
TC-3	Entrance/Outlet Tire Wash

The remainder of this section describe the working details for the tracking control BMPs.

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# Temporary Construction Entrance/ Exit

TC-1



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input checked="" type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** A temporary construction entrance/exit is defined by a 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**
- Where dirt or mud can be tracked onto public roads.
  - Adjacent to water bodies.
  - Where poor soils are encountered.
  - Where dust is a problem during dry weather conditions.

- Limitations**
- Site conditions will dictate design and need.
  - Limit the points of entrance/exit to the construction site.
  - Limit speed of vehicles to control dust.

- Standards and Specifications**
- General Requirements**
- Temporary construction entrance/exit must comply with Standard Specification Section 13-7.03 Temporary Construction Roadways and Entrances.
  - Corrugated steel panels must be pressed or shop welded. They should have a slot or hook for coupling the panels together.
  - Class 8 RSP fabric shall be used to line temporary construction entrance/exit. Do not drive on the fabric until the rock is spread. Repair damaged fabric by placing new fabric over the damaged area with at least an 18-inch overlap on all edges.





# Temporary Construction Entrance/ Exit

TC-1

- Type A rock should be used for a Type 1 temporary construction entrance/exit. Type A rock must comply with Section 13-7.03B (2) of the Standard Specifications.
- Type B rock should be used for a Type 2 temporary construction entrance/exit. Type B rock must comply with Section 13-7.03B (2) of the Standard Specifications.
- Submit details for alternative construction entrances at least 5 business days before installation. This may include alternatives for the sump and corrugated steel panels or to eliminate the sump.

## **Installation**

- Prepare the location for the temporary construction entrance/exit as follows:
  - Remove vegetation and clear debris.
  - Grade the ground to a uniform plane.
  - Remove sharp objects that could damage the fabric.
  - Compact the top 1.5 feet of soil to at least 90 percent relative compaction.
- Construct the temporary construction entrance/exit as follows (standard plans attached below):
  - Place the fabric along the length of the construction entrance/exit.
  - Overlap fabric ends by at least 12 inches.
  - Cover the fabric with rock within 24 hours.
  - Spread rock over the fabric in the direction of traffic.
  - Keep a 6-inch layer of rock over the fabric to prevent damage from the spreading equipment.
- For a Type 2 temporary construction entrance/exit, place rock under the corrugated steel panels. Use at least 6 corrugated steel panels for each entrance. Couple the panels together to prevent movement.
- If a sump is used, install it within 20 ft of the temporary construction entrance/exit.

## **Other Considerations**

- Implement BMP SC-7, “Street Sweeping” as required under Section 13-4.03F and 13-7 of the Standard Specifications.
- Require all employees, subcontractors, and suppliers to utilize the temporary construction entrance/exit. If the construction entrance/exit has metal plates as part of the BMP, all vehicles must be required to utilize them.
- Route runoff from temporary construction entrances/exits through a sediment-trapping device before discharge.



# Temporary Construction Entrance/ Exit

TC-1

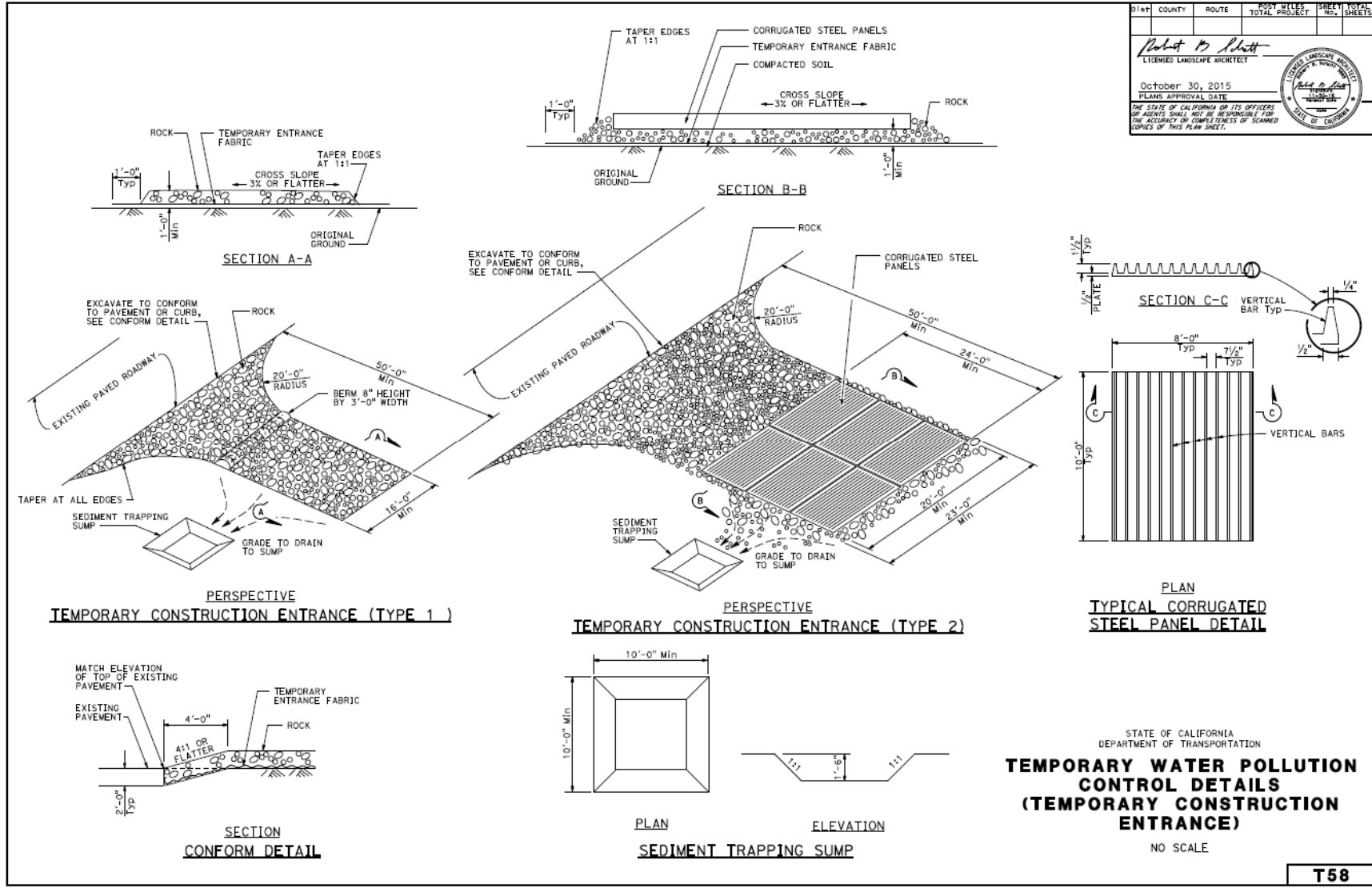
- Design a temporary construction entrance/exit to support the heaviest vehicles and equipment that will use it.
  - The use of asphalt concrete (AC) grindings is not allowed (high potential for leaching hydrocarbons) unless it complies with Section 6.8 of the 2016 Caltrans SWMP. Designate combination or single purpose entrances and exits to the construction site to maintain smooth flow of traffic.
- Maintenance and Inspection
- Inspect before and after each rainfall event, and weekly year round.
  - Inspect immediate site access roads daily, implement SC-7, “Street Sweeping” as needed.
  - Remove aggregate, separate, and dispose of sediment if temporary construction entrance is clogged with sediment.
  - Keep all temporary construction entrance/exit ditches clear.
- SWPPP or WPCP
- Tracking Control BMPs are to be included and discussed in section 500.3.4 or Section 600.2<sup>1</sup> for SWPPP and Section 30.2.3 of the WPCP.

<sup>1</sup>Section 600.2 for the LTCGP SWPPP



# Temporary Construction Entrance/ Exit

**TC-1**



DIST	COUNTY	ROUTE	POST MILES TOTAL PROJECT	SHEET NO.	TOTAL SHEETS

Robert D. Robert  
LICENSED LANDSCAPE ARCHITECT

October 30, 2015  
PLANS APPROVAL DATE

THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.

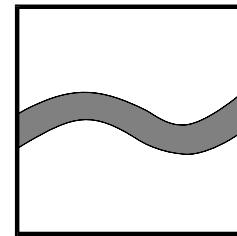
2015 STANDARD PLAN T58

STATE OF CALIFORNIA  
DEPARTMENT OF TRANSPORTATION

**TEMPORARY WATER POLLUTION CONTROL DETAILS  
(TEMPORARY CONSTRUCTION ENTRANCE)**

NO SCALE

**T58**



Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input checked="" type="checkbox"/>
Wind Erosion Control	<input checked="" type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** A temporary construction roadway is a stabilized access road. It is designed for the control of dust and erosion created by vehicular tracking.

- Appropriate Applications**
- Use construction roadways and short-term detour roads:
    - Where mud tracking is a problem during wet weather.
    - Where dust is a problem during dry weather.
    - When road is adjacent to water bodies.
    - Where poor soils are encountered.
    - Where there are steep grades and additional traction is needed.

- Limitations**
- Materials will likely need to be removed prior to final 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 **General Requirements**

- Refer to Standard Specification Section 13-7.03 for temporary roadway standards.
- Class 10 RSP fabric must be used to line temporary construction roadways. Do not drive on the fabric until the rock is spread. Repair damaged fabric by placing new fabric over the damaged area with at least an 18-inch overlap on all edges.
- Type A or Type B rock may be used for temporary construction roadways. Type A and B rock must comply with Standard Specifications Section 13-7.03B(2). Coordinate materials with those used for stabilized construction entrance. Refer to TC-1, “Temporary Construction Entrance/Exit.”
- The use of cold mix asphalt, AC grindings, or blast furnace slag for stabilized construction roadway is not allowed (high potential to leach hydrocarbons) unless it complies with Section 6.8 of the 2016 Caltrans SWMP.

### **Installation**

- Prepare the location for the temporary roadway as follows:
  - Remove vegetation and clear debris.
  - Grade the ground to a uniform plane.
  - Grade the ground surface to drain in a way that prevents runoff from leaving the construction site.
  - Remove sharp objects that could damage the fabric.
  - Compact the top 1.5 feet of soil to at least 90% relative compaction.
- Construct the temporary construction roadway as follows (standard plans attached below):
  - Place the fabric along the length of the roadway.
  - Overlap fabric ends by at least 12 inches.
  - Cover the fabric with rock within 24 hours.
  - Spread rock over the fabric in the direction of traffic.
  - Keep a 6-inch layer of rock over the fabric to prevent damage from the spreading equipment.

## **Other Considerations**

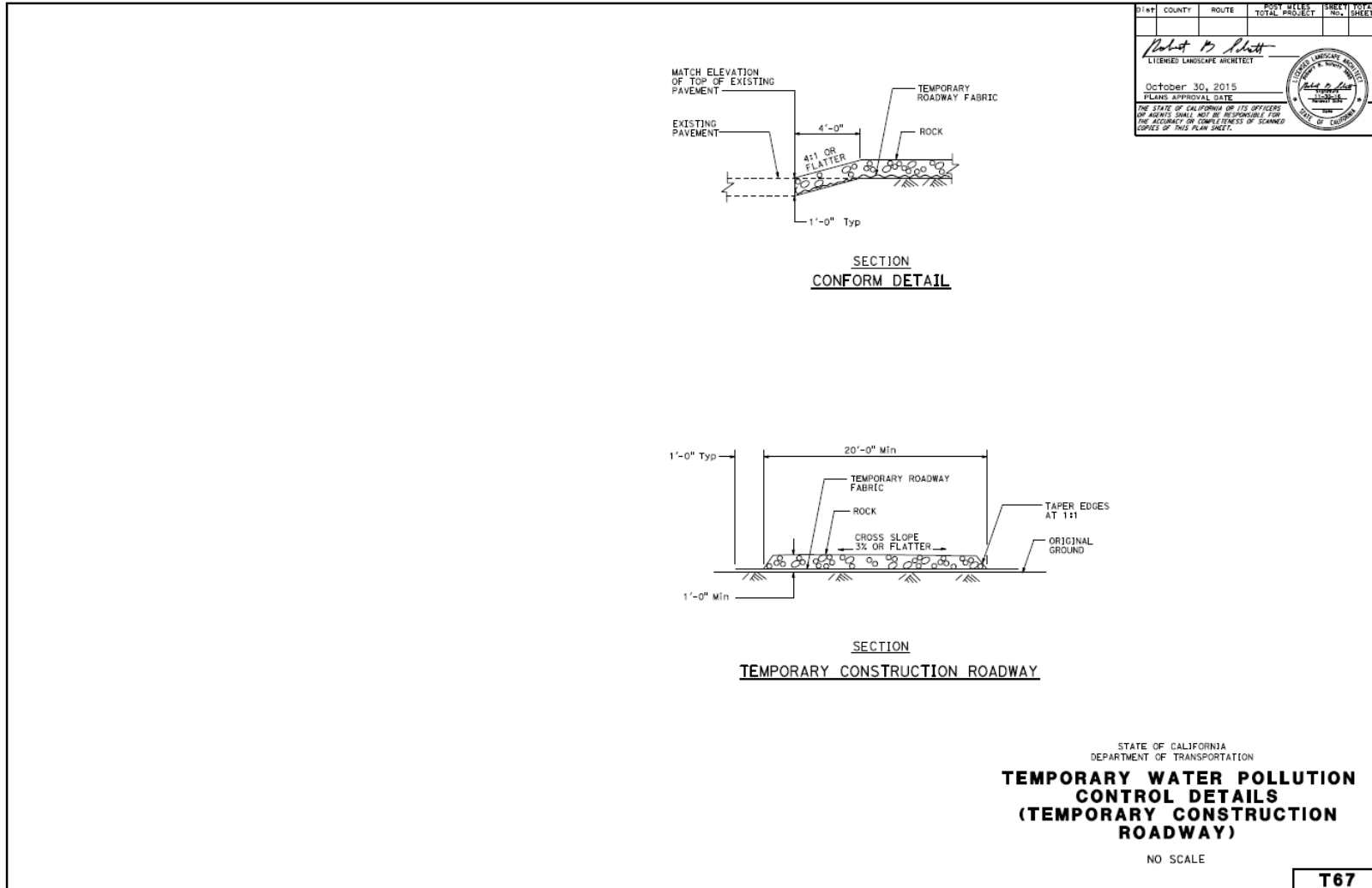
- Design stabilized access to support the heaviest vehicles and equipment that will use it.
  - Implement TC-1 “Temporary Construction Entrance/Exit” and TC-3 “Entrance/Outlet Tire Wash” in combination with temporary construction roadway for maximum tracking control.
- Maintenance and Inspection
- Inspect before and after each rainfall event, and weekly year round.
  - Inspect immediate site access roads daily, implement SC-7, “Street Sweeping” as needed.
  - Keep all temporary roadway ditches clear.
  - When no longer required, remove stabilized construction roadway and re-grade, re-vegetate and repair slopes.
- SWPPP or WPCP
- Tracking Control BMPs are to be included and discussed in Section 500.3.4 or Section 600.2 SWPPP<sup>1</sup> or Section 30.2.3 of the WPCP.

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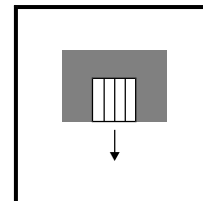
<sup>1</sup> Section 600.2 for the LTCGP SWPPP

# Temporary Construction Roadway

TC-2



# Temporary Entrance/Outlet Tire Wash TC-3



Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input checked="" type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose** A tire wash is an area located at stabilized construction access points to remove sediment from tires and undercarriages, and to prevent sediment from being transported onto public roadways.
- Appropriate Applications**
- Tire washes may be used on construction sites where construction vehicles may track dirt and mud onto public roads.
  - This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.
- Limitations**
- Requires a supply of wash water and way to collect or capture tire wash area runoff.
  - Requires a turnout or doublewide exit to prevent entering vehicles from driving through the wash area.
- Standards and Specifications**
- Require all employees, subcontractors, and others that leave the site with mud-caked tires and/or undercarriages to use the wash facility.
  - Incorporate with a temporary construction entrance/exit. See TC-1, “Temporary Construction Entrance/Exit.”
  - Construct on level ground when possible, on a pad of Type A or Type B rock. Either Class 8 or 10 RSP fabric should be placed below the rock.
  - Wash rack must be designed and constructed/manufactured for anticipated traffic loads.
  - Vehicle wash water is non-stormwater that requires management and disposal. See NS-8, “Vehicle and Equipment Cleaning.”
  - Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device or similar device. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
  - Implement BMP SC-7, “Street Sweeping” as needed.



## Maintenance and Inspection

- Refer to TC-1, “Temporary Construction Entrance/Exit,” for details regarding design and installation of construction entrance and exits to the project site.
- Inspect before, daily during extended rain events, after each rain event, and weekly year round.
- Inspect immediate site access roads daily, implement SC-7, “Street Sweeping” as needed.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system capacity and performance.
- Inspect routinely for damage and repair as needed. Document non-stormwater (sediment trapping device or similar device) in appropriate inspection form.

## SWPPP or WPCP

- Temporary Entrance/Outlet Tire Wash is to be included and discussed in section 500.3.4 or Section 600.2<sup>1</sup> for a SWPPP or Section 30.2.3 of the WPCP.

<sup>1</sup> Section 600.2 applies for the LTCGP SWPPP

## Section 7

# Non-Storm Water Management BMP

## 7.1 Non-Storm Water Management

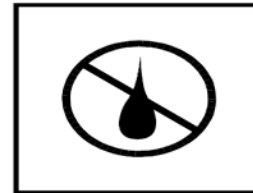
Non-stormwater management (BMPs) are source control BMPs that prevent pollution by limiting or reducing potential pollutants at their source before they come in contact with stormwater. These practices involve day-to-day operations of the construction site and are usually under the control of the Contractor.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

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

Table 7-1. Non-Stormwater Management BMPs	
ID	BMP Name
NS-1	Water Conservation Practices
NS-2	Dewatering Operations
NS-3	Paving, Sealing, Sawcutting and Grinding Operations
NS-4	Temporary Stream Crossing
NS-5	Clear Water Diversion
NS-6	Illicit Connection and Illegal Discharge Detection and Reporting
NS-7	Potable Water/Irrigation
NS-8	Vehicle and Equipment Cleaning
NS-9	Vehicle and Equipment Fueling
NS-10	Vehicle and Equipment Maintenance
NS-11	Pile Driving Operations
NS-12	Concrete Curing
NS-13	Material and Equipment Use Over Water
NS-14	Concrete Finishing
NS-15	Structure Demolition/Removal Over or Adjacent to Water

The remainder of this Section describe the working details for each of the non-stormwater management BMPs.

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Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input checked="" type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

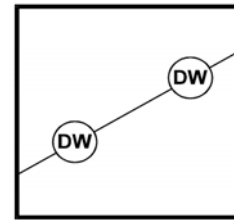
**Definition and Purpose** Water conservation practices are construction methods that minimize the use of water onsite or use water in a manner that avoids causing runoff, erosion and/or the discharge of pollutants to the storm drain system or receiving waters. Proper utilization of this BMP reduces or prevents non-stormwater discharges.

**Appropriate Applications** Water conservation practices are implemented on all construction sites wherever water is used.

**Limitations** ■ If not implemented correctly, discharges may trigger reporting and monitoring requirements and delay construction work.

- Standards and Specifications**
- Keep water equipment in good working condition.
  - Ensure tracking controls are implemented in, near and around water truck filling areas.
  - Repair water leaks promptly.
  - Authorization is required for activities that could potentially discharge water into a storm drain system or receiving waters.
  - Avoid using water to clean construction areas. Do not wash paved areas with water. Paved areas and roadways should be swept and vacuumed in accordance with SC-7 “Street Sweeping.”
  - Apply water for dust control in accordance with Standard Specifications Section 10-4 Water Usage and BMP WE-1, “Wind Erosion Control.”
  - Direct construction water runoff to areas where it can infiltrate into the ground or be collected and reused.
  - Manage run-on to minimize contact with job site.

- Retain water spilled while filling water trucks within the designated water truck filling areas. Prevent tracking from water trucks and other equipment.
- Report discharges to the RE and the WPC Manager immediately.
- Maintenance and Inspection
  - Inspect water equipment areas at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
  - Inspect non-stormwater BMPs daily when non-stormwater operations are ongoing.
  - Repair water equipment as needed.
- SWPPP or WPCP
  - Water Conservation Practices must be discussed in Section 500.3.5 of the SWPPP or Section 30.3.1 of the WPCP.



Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input checked="" type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

- Definition and Purpose** Dewatering Operations are practices that manage the discharge of pollutants when non-stormwater and accumulated precipitation (stormwater) must be removed from a work location so that construction work may be accomplished.
- Appropriate Applications**
- These practices are implemented for the collection and discharge of non-stormwater and stormwater (accumulated rain water) from excavations or temporary containment facilities. Non-stormwater includes, but is not limited to, groundwater, dewatering of piles, water from cofferdams, water diversions, and water used during construction activities that must be removed from a work area.
  - Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (stormwater) from depressed areas at a construction site.
  - Stormwater mixed with non-stormwater should be managed as non-stormwater.
- Limitations**
- Dewatering operations for non-stormwater will require, and must comply with, applicable local permits, project-specific permits, and regulations.
  - Site conditions will dictate design and use of dewatering operations.
  - Avoid dewatering discharges where possible by infiltrating, reusing the water for dust control, etc.
- Standards and Specifications**
- General Requirements**
- Dewatering shall be conducted in accordance with the Caltrans Field Guide to Construction Site Dewatering Manual and Standard Specification Section 13-4.03C.
  - A dewatering and discharge work plan shall be submitted at least 15 days before the start of dewatering activities detailing the location of dewatering and discharge activities, quantity of water, equipment, and discharge point. The dewatering and discharge work plan must conform to Standard Specifications Section 13-4.01C.

- Dewatering discharges must not cause erosion, scour, or sedimentation that could impact natural bedding materials.
- Discharge the water within the project limits. Dispose of the water if it cannot be discharged within project limits due to site constraints or contamination.
- Do not discharge stormwater or non-stormwater that has an odor, discoloration other than sediment, an oily sheen, or foam on the surface. Immediately notify the RE upon discovering any such condition.
- The RWQCB may require a separate NPDES permit for a dewatering operation. These permits will have specific testing, monitoring, and discharge requirements.
- Discharges must comply with regional and watershed-specific discharge requirements.
- Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering records shall be kept with the SWPPP or WPCP and maintained for a minimum of 3 years after the construction project is terminated.
- The controls discussed in this BMP address sediment only. If the presence of polluted water with hazardous substances 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 RE and comply with Standard Specifications Section 4-1.06, "Differing Site Conditions."

## ***Sediment Treatment***

- A variety of methods can be used to treat water during dewatering operations from the construction site. The size of particles present in the sediment and/or RWQCB Dewatering Permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate.
- Refer to the Sediment Treatment Options described in Appendix B of the Field Guide to Construction Site Dewatering to determine the optimal method to achieve sediment removal.
- Refer to the applicable project dewatering and/or stormwater permit for monitoring and sampling forms and requirements.
- Inspect dewatering operation areas at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Accumulated sediment removed during the maintenance of a dewatering device may be disposed of outside the right-of-way in conformance with Standard Specifications Section 14-10 Solid Waste Disposal and Recycling.
- Accumulated sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations.

## **Maintenance and Inspection**

- The WPC Manager must take immediate action to prevent non-stormwater discharges from being discharged.
- SWPPP or WPCP
- Dewatering Operations must be discussed in Section 500.4.1 of SWPPP and specific sample collection, collection and parameters in Section 700.2.3.1 if required by a specific RWQCB Dewatering Permit or Section 30.3.1 of the WPCP.

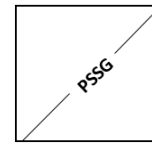


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# Paving, Sealing, Sawcutting, and Grinding Operations

NS-3



Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input checked="" type="checkbox"/>
Materials and Waste Management	<input checked="" type="checkbox"/>

**Definition and Purpose** Procedures and practices for conducting paving, sealing, sawcutting, and grinding activities to minimize the transport of pollutants to the storm drain system or receiving water body.

**Appropriate Applications** These procedures are implemented where operations such as paving, surfacing, resurfacing, grinding, coring, grooving, sealing and sawcutting generate spoils, residue, or process water that may pollute storm water runoff or discharge to the storm drain system or receiving water body.

- Limitations**
- Activities related to paving, sealing, sawcutting, grooving, and grinding operations should be limited when precipitation is forecasted to prevent the triggering for visible and non-visible pollutant monitoring.
  - Discharges of freshly paved surfaces can raise pH and trigger permit violations.

**Standards and Specifications** **General Requirements**

- Refer to Standard Specifications Section 13-4.03E (7) Paving, Sealing, Sawcutting, Grooving, and Grinding Activities.
- Do not allow the following materials to enter storm drain system and receiving waters: cementitious material, asphaltic material, aggregate or screenings, sawcutting, grooving, and grinding residue, pavement chunks, shoulder backing, methacrylate resin, and sandblasting residue. This list is not exhaustive.
- Drainage inlets shall be protected and linear sediment barriers (such as silt fences, gravel bag berms, or fiber rolls) shall be used to protect receiving waters during operations related to paving, sealing, sawcutting, or grinding.

# Paving, Sealing, Sawcutting, and Grinding Operations

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- Drainage inlets and manholes shall be protected during application of seal coat, tack coat, slurry seal, and/or fog seal. Refer to SE-10, “Temporary Drainage Inlet Protection.”
- Whenever precipitation is forecasted, limit paving, sawcutting, and grinding to places where runoff can be captured. Grinding or grooving of pavement shall not be conducted when precipitation is forecasted unless runoff can be captured.
- Seal coat, tack coat, slurry seal, or fog seal shall not be applied when precipitation is forecasted during the application or curing period.
- Slurry shall be removed with a vacuum immediately after it is produced and shall be prevented from running off the pavement or into lanes open to traffic.
- The residue from grooving and grinding activities shall be collected with a vacuum attachment on the grinding machine and shall be prevented from flowing across the pavement. See also WM-8, “Concrete Waste Management,” and WM-10, “Liquid Waste Management.”
- Material removed from existing roadways may be stockpiled, if allowed, away from drainage inlets and receiving waters in accordance with BMP WM-3, “Stockpile Management” and Standard Specification 13-4.03C(3) Stockpile Management.
- Drip pans or absorbent materials shall be placed under paving equipment when not in use. Refer to WM-4, “Spill Prevention and Control.” Equipment shall be cleaned in accordance with NS-8, “Vehicle and Equipment Cleaning.”
- Do not coat asphalt trucks and equipment with substances that contain soap, foaming agents, or toxic chemicals.

## ***Asphalt Concrete and Concrete Pavement Handling***

- Prevent sand and gravel from entering streets, storm drains, and receiving waters.
- Substances used to coat asphalt transport trucks, asphalt trucks, and asphalt spreading equipment shall not contain soap, foaming agents, or toxic chemicals.
- Asphalt spoils must be recycled or disposed of in accordance with WM-5, “Solid Waste Management,” and/or WM-6, “Hazardous Waste Management.”
- AC and PCC grindings, pieces, or chunks approved by the RE for reuse in embankments or shoulder backing shall not be at risk of entering storm drain systems or receiving waters.
- Temporarily protect inlets and receiving waters until the structure is stabilized or permanent controls are in place.

# Paving, Sealing, Sawcutting, and Grinding Operations

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- The reuse of AC or PCC grindings, pieces, or chunks as road base must be placed at least five feet above the seasonal high groundwater elevation with the approval of the RE. Shoulder backing containing Recycled Asphalt Pavement (RAP) shall not be placed within 100 feet measured horizontally from a culvert, watercourse, or bridge and must comply with the 2016 SWMP.
- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate must not be allowed to enter storm drains or receiving waters. Temporarily protect inlets and receiving waters until stabilized.
- Clean asphalt-coated equipment off-site whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris in accordance with WM-5, “Solid Waste Management,” and/or WM-6, “Hazardous Waste Management,” and NS-8 “Vehicle and Equipment Cleaning” whichever is applicable.
- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a temporary pit as described in WM-8, “Concrete Waste Management,” or dispose in accordance with WM-5, “Solid Waste Management.”

## ***Thermoplastic Striping and Pavement Markers***

- Contractor shall not pre-heat, transfer, or load thermoplastic within 50 feet of drainage inlets or receiving waters.
- Do not unload, transfer, or load bituminous material for pavement markers within 50 feet of drainage inlets or receiving waters.
- All thermoplastic striper and pre-heater equipment shutoff valves shall be inspected to ensure that they are working properly to prevent thermoplastic from leaking.
- 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.
- Melting tanks shall be loaded with care, a minimum of six inches of freeboard in case of splashing when vehicle is deadheaded. When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.
- Immediately remove drips, overspray, improper markings, paint, and thermoplastic tracked by traffic with an authorized method.
- Collect and dispose of bituminous material from the roadway after removal of markers in accordance with WM-5, “Solid Waste Management.”

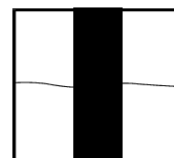
# Paving, Sealing, Sawcutting, and Grinding Operations

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NS-3

- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material. Thermoplastic waste shall be disposed of in accordance with BMP WM-5, “Solid Waste Management” and/or WM-6, “Hazardous Waste Management, as applicable.
- Maintenance and Inspection
  - Inspect and maintain machinery and BMPs regularly to minimize leaks and drips.
  - Ensure that employees and subcontractors are implementing appropriate measures during paving operations.
  - If project operations trigger the IGP (industrial operations located within project limits regardless of whether the facility is within or outside Caltrans’ right-of-way and outside Caltrans’ right-of-way but within project limits), ensure that any run-on or run-off from IGP activities does not have potential to create pollution onto Caltrans right-of-way. Refer to 2016 SWMP Section 7.2 for additional guidance.
- SWPPP or WPCP
  - Paving, Sealing, Sawcutting and Grinding Operations must be discussed in Section 500.4 of the SWPPP or Section 30.3.1 of the WPCP.





Standard Symbol

BMP Objectives	
Soil Stabilization	<input checked="" type="checkbox"/>
Sediment Control	<input type="checkbox"/>
Tracking Control	<input type="checkbox"/>
Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input checked="" type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** A temporary stream crossing is a structure placed across a stream or water body that allows vehicles to cross during construction and minimize, reduce, or manage erosion and downstream sedimentation caused by the vehicles.

- Appropriate Applications**
- Where appropriate regulatory permits have been secured and requirements strictly followed.
  - 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**
- Typically, stream crossings require regulatory permits such as RWQCB 401 Certification, U.S. Army Corps of Engineers 404 permit and approval by California Department of Fish and Wildlife.
  - If numerical-based water quality standards are mentioned in any of these regulatory permits, monitoring and water quality sampling may be required and must comply with Standard Specification 13-1.01C (4) Water Quality Monitoring or the contract special provisions. If monitoring related to these numerical-based water quality standards is not addressed in the contract documents, contact the RE.
  - Ensure that project specific requirements from regulatory permits for the installation, removal or restoration of creek banks are fully implemented.
  - Will usually disturb the waterway during installation and removal.

- Installation may require dewatering or temporary diversion of the stream. See NS-2, “Dewatering Operations” and NS-5, “Clear Water Diversion.”
- 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.
- Use of natural or other gravel in the stream for construction of Cellular Confinement System (CCS) ford crossing will be contingent upon approval by fisheries agencies.
- Ford crossings may degrade water quality due to contact with vehicles and equipment.
- CCS should not be used in excessively high or fast flows.
- Upon completion of construction activities, CCS blocks must be removed from stream.

## 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, and low flow perennial streams. CCS, a type of ford crossing is also appropriate for use in 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 during high flow periods.

- 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.
- Avoid using oil, AC or other potentially hazardous waste materials for the temporary traveled surface over the stream crossing.

## **Construction Considerations**

- Stabilize construction roadways, adjacent work area and stream bed 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.
- Install temporary sediment control BMPs in accordance with sediment control BMPs presented in Section 4 to minimize embankment scour due to flow conditions.
- 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 construction project regulatory permits, 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. Disturbed vegetation shall be replaced with the appropriate soil stabilization measures. Appropriate use of ESA fencing should be conducted and maintained in accordance with SS-2 “Preservation of Existing Vegetation.”
- 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, 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.

### **Specific Considerations**

- 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 a period of high flows if thunderstorms are likely, or if the stream is perennial.
- CCS crossing structures consist of clean, washed gravel and cellular confinement system blocks. CCS are appropriate for streams that would benefit from an influx of gravel; for example, salmonid streams, streams or rivers below reservoirs, and urban, channelized streams. Many urban stream systems are gravel-deprived due to human influences, such as dams, gravel mines, and concrete channels.
- CCS allow designers to use either angular or naturally-occurring, rounded gravel, because the cells provide the necessary structure and stability. In fact, natural gravel is optimal for this technique, because of the habitat improvement it will provide after removal of the CCS.
- A gravel depth of 6 to 12 inches for a CCS structure is sufficient to support most construction equipment.
- An advantage of a CCS crossing structure is that relatively little rock or gravel is needed, because the CCS provides the stability.
- Bridges are generally more expensive to design and construct, but provides the least disturbance of the stream bed and constriction of the waterway flows.

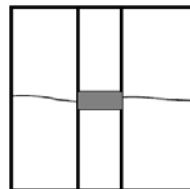
### **Maintenance and Inspection**

- Periodic removal of debris behind fords, in culverts, and under bridges.
- Replacement of lost protective 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, debris buildup in culverts or behind fords, and under bridges.
  - 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.
  - The WPC Manager or QSP must ensure that stream crossings do not create potential for sediment laden discharge or other materials onto the waterbody.
  - Temporary Stream Crossing must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.
- SWPPP or  
WPCP

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Standard Symbol

BMP Objectives	
Soil Stabilization	<input type="checkbox"/>
Sediment Control	<input type="checkbox"/>
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Wind Erosion Control	<input type="checkbox"/>
Non-Stormwater Management	<input checked="" type="checkbox"/>
Materials and Waste Management	<input type="checkbox"/>

**Definition and Purpose** Clear water diversion consists of a system of structures and measures that intercept surface water runoff upstream of a project site, transport it around the work area, and discharge it downstream with minimal water quality degradation from either the project construction operations or the construction of the diversion. Clear water diversions are used to reduce sediment pollution from construction work occurring in or adjacent to water.

**Isolation techniques** are clear water diversion methods that isolate near shore work from a waterbody. Structures commonly used as part of this system include diversion ditches, berms, dikes, slope drains, rock, gravel bags, wood, sheet piles, aqua barriers, cofferdams, filter fabric or turbidity curtains, drainage and interceptor swales, pipes, or flumes.

- Appropriate Applications**
- A clear water diversion is typically implemented where appropriate permits have been secured and work must be performed in a live stream or water body. Work in jurisdictional waters typically require the following, at a minimum, Clean Water Act Section 404, Clean Water Act Section 401 (RWQCB Water Quality Certification), and Fish and Game Code Section 1600 permits.
  - Clear water diversions are appropriate for isolating construction activities occurring within or near a water body such as streambank stabilization, or culvert, bridge, pier or abutment installation. They may also be used in combination with other methods, such as clear water bypasses and/or pumps.
  - Implement SS-12 “Streambank Stabilization” to minimize impacts to streambanks.

- Where working areas encroach on live streams, barriers adequate to prevent the flow of muddy water into streams should be constructed and maintained between working areas and streams. During construction of the barriers, muddying of streams should be held to a minimum.
- Channel diversions are appropriate for small stream where there is adequate right of way to create a temporary channel around a construction work area, and geosynthetics or rock can be used to handle the shear stresses associated with the expected flows.
- Berms are appropriate for small perennial, intermittent, or ephemeral streams with temporary culverts or pipe diversions. Berms may also be used to shift flows to one side or the other within a channel.
- Gravel bag berms (SC-6 “Gravel Bag Berms”) are appropriate for smaller streams where the hydraulic forces and water pressure can be adequately addressed with the weight of gravel-filled bags and plastic sheeting. This method results in a cofferdam-like isolation from the receiving water.
- Cofferdams are appropriate for small streams and lakes to confine flows to one side, create a dry work area, or to berm entire small streams. Typically, this terminology is used in association with structures at Caltrans, though some inflatable cofferdams may be used for smaller applications.
- Pumped diversions are suitable for short-term projects in intermittent and low flow streams. Excavation of a temporary bypass channel, or passing the flow through a pipe (called a “flume”) is appropriate for the diversion of streams less than 20 ft wide, with flow rates less than 100 cfs.
- Piped diversions are appropriate for short-term projects with little base flow.
- Water quality monitoring must typically be performed before and during in-water work, including the installation, operation, and removal of clear water diversions. Follow the requirements outlined in the Standard Specification or special provisions.

## Limitations

- Diversion/encroachment activities will usually disturb the waterway during installation and removal of diversion structures.
- Specific permit requirements or mitigation measures, such as those required by the U.S. Army Corps of Engineers, California Department of Fish and Wildlife, 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, obstruct flood flows and cause flooding or washouts. Diversion structures should not be installed without identifying potential impacts to the stream channel.

- Diversion or isolation activities should not completely dam streamflow.
- The designer should consider the size, depth of water, and risks for temporary stream diversion. Use this BMP and specification for small streams and low risk projects.
- Cofferdams and more elaborate systems should be designed by engineering services staff with the appropriate structural background or by the contractor. The design decision and design parameters should be coordinated by the PDT, so that all permitting and highway design requirements are met.
- Dewatering and removal may require additional sediment control or water treatment (See NS-2, “Dewatering Operations”).
- Heavy equipment driven in wet portions of a water body to accomplish work should be completely clean of petroleum residue, and water levels should be below the gearboxes of the equipment in use, or lubricants and fuels are sealed such that inundation by water should 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 to remove or place fill materials. Only the bucket of the crane/ excavator/backhoe may operate in a water body. The main body of the crane/excavator/backhoe shall not enter the 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.
- Equipment shall not be parked below the high-water mark unless allowed by a regulatory agency permit or approval.
- 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.
- Materials and equipment should be moved from diversion work area prior to forecasted rain events to prevent non-storm water discharges.

## Standards and Specifications

### **General Requirements**

- Most small stream diversions can be designed by the district and coordinated with the HQ OHSD. In many cases the diversion can be located on the plan sheet referencing the non-standard specification for Temporary Creek Diversion.
- Many projects will have multiple culverts, so it may be appropriate to develop a table of the lump sum costs for each system, this should be provided to the RE to help review the Temporary Creek Diversion System Plan, to help them determine if all needed items are included.
- The types of diversion for small to medium sized streams may include:
  - Pumped systems
  - Temporary culverts
  - Inflatable coffer dams (Consult HQ OHSD for specification)
- For larger (large rivers, lakes, bays, and ocean areas) temporary creek diversions that have a higher risk to worker safety and a more extensive design is required to address the forces for the depth and flow of the water, the district's structures representative should be consulted for the design (e.g., larger rivers where coffer dams are required). The engineer must consult and follow the Caltrans Engineering Services Shoring Guidance and consult with Construction as the owner of the specification.
  - Diversion can be constructed from timber, soil, or steel. But in most cases are designed and constructed with steel sheet piles. Refer to 19-3.03C Cofferdams (sheet piles).
  - Guidance: *Caltrans Shoring Guide* (Engineering Services)  
  
Dewatering: *Field Guide to Construction Site Dewatering*, NS-2 "Dewatering Operations," and Section 13-4.03G of the Standard Specifications for use with coffer dams or other large in-water work.
  - May need to treat or control seepage water prior to discharge, consult appropriate requirements for treatment design needs.
- 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.
- Disturbance or removal of vegetation shall not exceed the minimum necessary to complete operations.

- Disturbed vegetation shall be replaced with the appropriate soil stabilization measures and in accordance with the project's special provisions.
- 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 rock to prevent damage to the underlying soil and root structure. The rock shall be removed upon completion of project activities.
- Construct diversion structures with materials free of potential pollutants such as soil, silt, sand, clay, grease, or oil.
- Clear water diversions incorporating clean washed gravel may be appropriate for use in salmon spawning streams.
- Coordination with a variety of functional units at the Department may be required to implement this BMP.

### ***Design Considerations***

- Does the construction of the temporary diversion system cause more environmental damage to the riparian, wetland, or 100-year floodplain area, than to construct the project without the diversion BMP? This is a consideration for all projects, but is usually appropriate for short term construction projects for temporary or ephemeral streams, where scheduling of the project when the stream is dry, may be more effective than the construction of a large diversion system in a sensitive environmental area, where construction equipment could disturb fragile vegetation, roots, sensitive species, soil structure, and root systems.
- Stream hydrology considerations include: Stream channel geometry, tributary watershed area, stream bed material, and predicted flow rates during construction. Follow methods in HDM Section 810 for the appropriate methods and rates for sizing the temporary diversion system.
- Sizing the temporary diversion. In the past many temporary diversion system guidance documents required mandatory minimum return storms for sizing the systems, for example the 2-year, 5-year, or 10-year, 24-hour return period. This can result in temporary diversion system as large as the drainage system they are replacing and result in large impacts to the stream riparian zone, with large disturbed soil areas. Overly conservative approaches for the hydrology sizing to protect the environment can inadvertently cause other impacts to the environment for its construction. Each project should be sized for the appropriate risks and should be based on regulatory restrictions.
- In coordination with District Hydraulics, consider the consequences for diversion exceedance including; public and work safety, environment, legal, regulatory permit requirements, costs, space, and schedule.



## ***Hydrology Sizing Methods***

- The sizing of clear water diversion systems varies by the time of year, local hydrology, and duration of the diversion. If there is a prescriptive storm size in a permit document, then design to the required event size. A 2-year, 24-hour storm event has been used by many as a default event, but more recent studies have shown that this may oversize the system and cause more disturbance in the sensitive stream zone than is necessary.
- Diversion structures must be adequately designed to accommodate fluctuations in water depth or flow volume due to tides, storms, flash floods, etc. Careful analysis of the local hydrology history and risk analysis is required to minimize the diversion impacts.

## ***Temporary Diversions/Encroachments***

- Construct diversion channels in accordance with 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 SS-12 “Streambank Stabilization,” and SS-7, “Plastic Covers & Rolled Erosion Control Products,” 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 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 cofferdams, pass pumped water through a sediment settling device, such as a portable tank, settling basin, or Active Treatment System if necessary, before returning water to the water body; see NS-2, “Dewatering Operations” and Standard Specification 13-8 “Temporary Active Treatment System.”
- 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 RE and comply with Standard Specifications Section 4-1.06 “Differing Site Conditions.”

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

### ***Instream Construction Sediment Control***

There are three different options currently available for reducing turbidity while working in a stream or river. The stream can be:

- Isolated from the area in which work is occurring by means of a water barrier.
- The stream can be diverted around the work site through a pipe or temporary channel.
- One can employ construction practices that minimize sediment suspension.
- The highest hazard for sedimentation from instream construction generally occurs when the sediment control structure is being installed and when it is being removed. Generally, the best time to install the stream isolation or diversion structure is when the stream flow is low. Conversely, the optimum time to remove in-stream diversion or isolation structures may be during the rising limb of a storm hydrograph. A probable “worst time” to release high TSS into a stream system with diminishing aquatic habitat might be when the stream flow is very low; summer low flow, for example. During these times, the flow may be low while the biological activity in the stream is very high. On the other hand, the addition of short-term spike in TSS or sediment during a big storm discharge might have a relatively low impact on the aquatic habitat or turbidity because the stream is already turbid, and the stream energy is capable of transporting both suspended solids, and large quantities of bedload through the system.

### ***Techniques to Minimize Total Suspended Solids (TSS)***

- Padding - Padding laid in the stream below the work site may trap some solids that are deposited in the stream during construction. After work is done, the padding is removed from the stream, and placed on the bank to assist in revegetation.
- Clean, washed gravel - Using clean, washed gravel decreases solid suspension, as there are fewer small particles deposited in the stream.

- Excavation using a large bucket - Each time a bucket of soil is placed in the stream a portion is suspended. Approximately the same amount is suspended whether a small amount of soil is placed in the stream, or a large amount. Therefore, using a large excavator bucket instead of a small one, will reduce the total amount of soil that washes downstream.
- Use of dozer for backfilling - Using a dozer for backfilling instead of a backhoe follows the same principles – the fewer times soil is deposited in the stream, the less soil will be suspended.
- Partial dewatering with a pump - Partially dewatering a stream with a pump reduces the amount of water, and thus the amount of water that can suspend sediment.

### *Washing Fines*

- Partial Washing fines is an “in-channel” sediment control method, which uses water, either from a water truck or hydrant, to wash any stream fines that were brought to the surface of the channel bed during restoration, back into the interstitial spaces of the gravel and cobbles. This technique is useful in both intermittent or ephemeral stream channels with gravelly to cobbly substrate and may be useful in perennial streams just prior to removing isolation structures.
- The purpose of this technique is to reduce or eliminate the discharge of sediment from the channel bottom during the first seasonal flows, or “first flush.” Sediment should not be allowed into stream channels; however, occasionally in-channel restoration work will involve moving or otherwise disturbing fines (sand and silt-sized particles) that are already in the stream, usually below bank-full discharge elevation. Subsequent re-watering (resumption of flows) of the channel can result in a plume of turbidity and sedimentation.
- This technique washes the fines back into the channel bed. Bedload materials, including gravel cobbles, boulders and those fines, are naturally mobilized during higher storm flows. This technique is intended to delay the discharge until the fines would naturally be mobilized.
- This technique should be used when construction work is required in channels. It is especially useful in intermittent or ephemeral streams in which work is performed “in the dry,” and which subsequently become re-watered.

Prior to using this technique consider the following:

- The stream must have sufficient gravel and cobble substrate composition.
- The use of this technique requires consideration of time of year and timing of expected stream flows.
- The optimum time for the use of this technique is in the fall, prior to winter flows.

- Consultation with, and approval from the Department of Fish and Wildlife and the Regional Water Quality Control Board may be required.

The following items should be considered when preparing project plans and specifications when this technique is used:

- Apply sufficient water to wash fines, but not cause further erosion or runoff.
- Apply water slowly and evenly to prevent runoff and erosion.
- Consult with Department of Fish and Wildlife and the Regional Water Quality Control Board for specific water quality requirements of applied water (e.g., chlorine).

**Isolation Techniques** Isolation techniques are methods that isolate near shore work from a waterbody. Techniques include sheet pile enclosures, inflatable cofferdams like Aqua Dam, berms or gravel bag berms (see SC-6, “Gravel Bag Berm”) with impermeable membrane or plastic sheeting, gravel bags, cofferdams, and K-rail.

### ***Filter Fabric Isolation Technique***

A filter fabric isolation structure is a temporary structure built into a waterway to enclose a construction area and reduce sediment pollution from construction work in or adjacent to water. This structure is composed of filter fabric, gravel-filled bags, and steel t-posts.

- Filter fabric may be used for construction activities such as streambank stabilization, or culvert, bridge, pier or abutment installation. It may also be used in combination with other methods, such as clean water bypasses and/or pumps.
- This method involves placement of gravel bags or continuous berms to “key-in” the fabric, and subsequently staking the fabric in place.
- If spawning gravel (gravel between 1 and 4 inches) is used, all other components of the isolation can be removed from the stream, and the gravel can be spread out and left as salmon spawning habitat if permitted in the project’s 404 permit. Whether spawning gravel or other types of gravel are used, only clean washed gravel should be used as infill for the gravel bags or continuous berm.
- This is a method that should be used in relatively calm water, and can be used in smaller streams.
- Prior to using this technique consider the following:
  - Do not use if the installation, maintenance and removal of the structures will disturb sensitive aquatic species of concern.