CH2M HILL
2485 Natomas Park Drive
Suite 600
Sacramento, CA 95833
Tel 916.920.0300
Fax 916.920.8463

CH2MHILL

DOCKET
05-AFC-3
DATE MAY 1 2006
RECD. MAY 1 2006

May 1, 2006

Mr. Robert Worl
Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: Applicant's Responses to CEC Staff Data Requests 81-90
Sun Valley Energy Project (05-AFC-03)

Dear Mr. Worl:

Attached are an original and 12 copies of Valle del Sol, LLC's responses to California Energy Commission Staff Data Requests 81 through 90 for the Application for Certification for the Sun Valley Energy Project (05-AFC-03).

If you have any questions about this matter, please contact me at (916) 286-0278 or Jenifer Morris at (949) 841-7522.

Sincerely,

Douglas M. Davy, Ph.D.
AFC Project Manager

Attachment

cc: J. Morris
T. McCabe
L. Kostrzewa
D. Benham

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT COMMISSION
OF THE STATE OF CALIFORNIA

APPLICATION FOR CERTIFICATION FOR THE **SUN VALLEY ENERGY PROJECT (SVEP)**	DOCKET NO. **05-AFC-3** **(Revised 3/3/2006)**

PROOF OF SERVICE LIST

DOCKET UNIT

Send the original signed document plus the required 12 copies to the address below:

CALIFORNIA ENERGY COMMISSION
DOCKET UNIT, MS-4
Attn: Docket No. **05-AFC-3**
1516 Ninth Street
Sacramento, CA 95814-5512
Email: docket@energy.state.ca.us

* * * *

In addition to the documents sent to the Commission Docket Unit, also send individual copies of any documents to:

APPLICANT

Jenifer Morris
Project Manager
NJ Resources, LLC
7240 Heil Ave.
Huntington Beach, CA 92647
jenifer@njr.net

***Tom McCabe**
Edison Mission Energy
18101 Von Karman Avenue
Irvine, CA 92612
tmccabe@edisonmission.com

APPLICANT'S CONSULTANT

CH2M HILL
Douglas M. Davy, Ph.D
Project Manager
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COUNSEL FOR APPLICANT

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Plaza Towers
555 Capitol Mall, Suite 600
Sacramento, CA 95814
sgalati@gb-llp.com

INTERESTED AGENCIES

None listed as of 3/3/2006

INTERVENORS

California Unions for Reliable Energy
(CURE)
C/O Marc D. Joseph
Gloria D. Smith
Adams Broadwell Joseph & Cardozo
601 Gateway Boulevard, Suite 1000
South San Francisco, California 94080

DECLARATION OF SERVICE

I, Sheralynn Johnson declare that on May 1, 2006 I deposited copies of the attached Applicant's Responses to CEC Staff Data Requests 81-90, Sun Valley Energy Project (05-AFC-03) in the United Stated mail at Sacramento, CA with first class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above. Transmission via electronic mail was consistent with the requirements of California Code of Regulations, title 20, sections 1209, 1209.5, and 1210.

I declare under penalty and perjury that the foregoing is true and correct.

[signature]

Supplemental Filing

Response to Data Requests
81 through 90

In support of the

Application for Certification

for the

Sun Valley Energy Project

Romoland, California
(05-AFC-03)

Submitted to the:
California Energy Commission

Submitted by:
Valle del Sol Energy, LLC
A wholly owned subsidiary of

EDISON MISSION ENERGY®
An EDISON INTERNATIONAL® Company

With Technical Assistance by:

CH2MHILL

Sacramento, California
April 2006

Contents

Introduction

Attached are Valle del Sol Energy's, LLC's (VSE's), responses to California Energy Commission Staff Data Requests 81 through 90 for the Sun Valley Energy Project (SVEP) (05-AFC-03). The CEC Staff served these data requests on March 30, 2006, as part of the discovery process for the SVEP project. The responses belong to a single discipline area, Soil and Water. New or revised graphics or tables are numbered in reference to the Data Request number. For example, the first table used in response to Data Request #80 is numbered Table DR80-1.

Supporting information in response to data request 90, (Drainage, Erosion, and Sedimentation Control Plan) is found at the end the document as Attachment S&W-1. This document is not sequentially page-numbered consistently with the remainder of the document, but has its own internal page numbering system.

Soils and Water Resources (81-90)

Domestic Wastewater Discharge Permit

81. *Please provide the information that is required to assure that the SVEP will meet the requirements for an EMWD Waste Discharge Permit that complies with Ordinance No. 59.5, which allows SVEP to discharge 0.12 million gallons per year of domestic wastewater into EMWD's sewer system. The information should include the following:*

    a. *Discharge limitations,*
    b. *Pretreatment requirements,*
    c. *Peak flow restrictions,*
    d. *Monitoring and reporting requirements.*

Response: EMWD Ordinance 59.5 applies to all industrial and commercial dischargers to the EMWD system, including SVEP (Lankey pers. comm.). SVEP's wastewater discharges to the EMWD system will not have the characteristics of industrial or commercial wastewater, however, because all industrial process wastewater (such as cooling water) will be discharged to the EMWD non-reclaimable wastewater line as described in the AFC and, from there, into the Santa Ana Regional Interceptor (SARI). The only SVEP wastewater discharged to the EMWD system will be sanitary wastewater from conventional sources such as toilets and sinks used by the nine onsite staff. Anticipated constituent concentrations from SVEP sanitary wastewater have not been developed, but are assumed to be similar to concentrations in typical domestic waste streams that EMWD's treatment facilities are designed to accept, treat, and/or remove (that is, they are compatible pollutants as defined in Ordinance 59.5). Compatible pollutants include biological oxygen demand (BOD), total suspended solids (TSS), pH, and fecal coliform. The numeric standards for BOD and TSS, as defined by Ordinance 59.5, are both 3,150 milligrams per liter (mg/L). Typical domestic waste streams may include BOD and TSS concentrations of 200 and 240 mg/L, respectively, and thus are well within EMWD's standards. Ordinance 59.5 does not include numeric standards for pH and fecal coliform.

Other numeric standards in Ordinance 59.5 include metals and other industrial chemicals. The presence of other compounds in the SVEP sanitary waste stream is unknown, but they are not expected to occur at concentrations greater than influent (source waters) levels. Pursuant to Ordinance 59.5, SVEP will comply with all applicable flow requirements and will be required to sample its sanitary waste stream and submit baseline monitoring reports in a manner to be established by EMWD when a connection permit is issued.

Nonreclaimable Wastewater Permit

82. *Please provide the information that is required to assure that the SVEP will meet the requirements for an EMWD Waste Discharge Permit that complies with Ordinance No. 91, which will allow SVEP to discharge 39.5 million gallons per year of nonreclaimable wastewater into the EMWD/OCSD's nonreclaimable sewer system. The information should include the following:*

    a. *Discharge limitations,*

b. Pretreatment requirements,
c. Peak flow restrictions,
d. Monitoring and reporting requirements.

Response:

a. Discharge limitations. See Table DR82-1 for the EMWD/OCSD's discharge standards.

TABLE DR82-1
Comparison of EMWD/OCSD Discharge Standards and SVEP Non-reclaimable Wastewater Effluent

Constituent	EMWD/OCSD Allowable Concentrations, mg/L	SVEP Effluent, mg/L[a]
Arsenic	2.0	0.016
Cadmium	1.0	0.0004
Chromium	2.0	0.0348
Copper	3.0	0.037
Lead	2.0	0.00259
Mercury	0.03	0.000348
Nickel	10.0	0.0103
Silver	5.0	0.0044
Zinc	10.0	1.035
Cyanide (total)	5.0	-
Cyanide (Amenable)	1.0	-
Polychlorinated Biphenyls	0.01	-
Pesticides	0.01	-
Total Toxic Organics	0.58	-
Sulfide (total)	5.0	-
Sulfide (dissolved)	0.5	-
Oil and grease (TPH)	100	-

Source: EMWD Ordinance 91

[a] Estimate, based on the reclaimed water supply data

b. Pretreatment requirements. The categorical pretreatment standards found at 40 CFR Chapter I, Subchapter N, Parts 405-471 are applicable to the project. SVEP will comply with all applicable pretreatment requirements established by EMWD when the Waste Discharge Permit is issued.

c. Peak flow restrictions. EMWD Ordinance 91 requires all industrial users who discharge 25,000 gallons per day or more of industrial wastewater to install a continuous monitoring flow meter capable of measuring all wastewater discharges. Limits on the average and/or maximum rate of discharge, time of discharge, and/or requirements for flow regulation

may be contained in the Waste Discharge Permit. SVEP will comply with all applicable flow requirements established by EMWD when the Waste Discharge Permit is issued.

d. Monitoring and reporting requirements. Monitoring and reporting requirements will include an identification of pollutants to be monitored, sampling location frequency, and sample type based on federal, state, and local laws. SVEP will comply with all applicable monitoring and reporting requirements established by EMWD when the Waste Discharge Permit is issued.

Industrial Wastewater Discharge

83. *Section 8.15.5.1 of the AFC states that the industrial wastewater discharge from the SVEP would flow to either OCSD's Reclamation Plant No. 1 or Treatment Plant No. 2, both of which operate under an existing NPDES permit. Section 18.15.2.2 of the AFC states that the SVEP industrial wastewater discharge would be conveyed to OCSD's wastewater treatment plant, Plant No.1. Please clarify this discrepancy.*

Response: The SVEP's industrial discharge will be conveyed to the OCSD system. OCSD will determine whether it is routed to Plant No. 1 or No. 2.

Backup Cooling Water

84. *In the event of an unforced outage to the recycled water system or a recycled water pipeline failure that causes a seven day interruption of recycled water to the SVEP, please provide a contingency plan for a backup source of non-potable water for plant cooling and process makeup, which is estimated to be 1,500 gallons per minute.*

Response: The EMWD reclaimed water system is supplied through four different treatment plants. Because of this redundancy, the system is highly reliable. A forced outage is highly unlikely. For this reason, VSE has not prepared a contingency plan for backup water.

Recycled Water Agreement

85. *Please provide a Recycled Water Agreement that complies with Ordinance No. 68.2 and allows for the use of potable water for dust control, equipment washdown, and hydrostatic testing during power plant construction.*

Response: VSE anticipates using reclaimed water for dust control, equipment washdown, and hydrostatic testing.

Railroad Grade

86. *Please discuss whether the elevated railroad grade is designed as a flood protection structure and provide its elevation?*

Response: The railroad grade was constructed in 1888, a time when there was little settlement in the project area. For this reason, it is likely that the grade was constructed to create a level roadbed for operating efficiency and not as a flood protection structure.

Elevation of the Railroad Bed

87. *Please provide the grade elevation of the railroad bed and tracks near the project site.*

Response: The railroad bed is 4 feet above grade in this area, reaching an elevation, adjacent to the project parcel, of approximately 1,462 feet above mean sea level.

Flooding Potential

88. Please discuss whether the potential flooding from the 100-year storm west of the SVEP site is a result of drainage or seepage through the railroad grade.

Response: Drainage patterns in the area run northeast to southwest and form a broad drainage area that has loosely been called Ethanac Wash. This is the area mapped in the FEMA flood plain maps, although Ethanac Wash has no clearly definable channel. Sheet flow in the Ethanac Wash area encounters the railroad berm, and crosses under the berm in two locations, roughly 1,000 feet and 1,700 feet, respectively, northeast of the project site. Water apparently can back up on the northeastern side of the railroad berm adjacent to the project. There is no culvert to permit this water to pass under the railroad berm, and there is no significant evidence of seepage under the berm. In addition, the SVEP will be designed to drain internally. Even if seepage were to occur, it would not enter the project site.

Elevation of the 100-Year Floodplain

89. Please discuss whether the elevation of the SVEP is above the elevation of the 100-year flood event.

Response: The SVEP is above the elevation of the 100-year floodplain (see AFC Figure 8.15-3).

Drainage, Erosion, and Sediment Control Plan

90. Please provide a draft DESCP that includes the following elements:

a. An outline of the site management activities to be implemented during site mobilization, excavation, and construction of all project elements including all pipelines and the off-site conductor support tower for the stub transmission line.

b. Within the draft DESCP, please provide a discussion of those additional requirements of Order No. 01-34 and the Riverside County Flood Control and Water Conservation District's Water Quality Management Plan.

Response: The Preliminary Draft Drainage, Erosion, and Sediment Control Plan is included as Attachment S&W-1.

Attachment S&W-1

Preliminary Draft Drainage, Erosion, and Sediment Control Plan

Preliminary Draft Plan

Drainage, Erosion, and Sediment Control Plan

Sun Valley Energy Park

Romoland, California

(05-AFC-03)

Submitted to the:
California Energy Commission

Submitted by:
Valle del Sol Energy, LLC
A wholly owned subsidiary of

EDISON MISSION ENERGY®
An EDISON INTERNATIONAL® Company

With Technical Assistance by:

CH2MHILL

Sacramento, California
April 2006

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Tables

Figures

Appendices

SECTION 1

Introduction

This Preliminary Draft Drainage, Erosion, and Sediment Control Plan (DESCP) has been prepared in anticipation of the California Energy Commission's (CEC) approval of the proposed Sun Valley Energy Project (SVEP) (05-AFC-03). The SVEP will be a nominal 500 megawatt (MW) peaking facility consisting of five GE Energy LMS100 natural gas-fired turbine-generators and associated equipment. It will be located near Romoland in unincorporated Riverside County, California. This preliminary draft DESCP, prepared in response to CEC Staff Data Request #90, demonstrates that the project will not cause an increase in offsite flooding potential or sedimentation during the construction phase by using standard Best Management Practices (BMPs) and dewatering controls. This DESCP also demonstrates that the project will meet all local, state, and federal regulatory requirements associated with the protection of water quality and soil resources. In addition, this DESCP will ensure compliance with the requirements of Order No. 01-34 and the Riverside County Flood Control and Water Conservation District's Water Quality Management Plan.

This draft DESCP is preliminary because it is prepared in advance of the final phase of construction planning and engineering design, during which the details regarding construction schedule and certain aspects of erosion control design will be finalized. This will take place after licensing and will be included in a future draft of the DESCP. This document contains placeholders for some of these future items (detailed schedule and final BMP map).

1.1 Drainage, Erosion, and Sediment Control Plan Elements

Staff Data Request #90 requests a draft DESCP "outlining site management activities to be implemented during site mobilization, excavation, and construction." This draft DESCP includes the following elements:

- **Vicinity Map –** This map indicates the location of all Project elements with depiction of significant geographic features to include watercourses, creeks, wetlands, and sensitive habitat.
- **Site Delineation –** The SVEP site and all Project elements are delineated on a map showing boundary lines of all construction areas and the location of existing and proposed structures, pipelines, roads, and drainage facilities.
- **Watercourses and Critical Areas –** The DESCP shows the location of watercourses and critical areas such as creeks, rivers, wetlands, and other environmentally sensitive areas.
- **Drainage –** The DESCP provides a topographic site map showing existing, interim, and proposed drainage systems; drainage area boundaries; watershed size in acres; and the hydraulic analysis to support the selection of BMPs to divert off-site drainage around and through the plant and laydown areas.

- **Clearing and Grading –** The DESCP provides elevations, slope, location, and extent of proposed gradings.
- **Project Schedule –** The DESCP provides a general outline of the construction schedule. This information will be updated as construction activities are planned in greater detail after licensing.
- **Best Management Practices –** The DESCP describes the location, timing, and maintenance schedule of BMPs to be used. Final design and placement of the BMPs will take place during the final phase of construction planning after licensing.

1.2 Project Overview

The Sun Valley Energy Project (SVEP) will be a nominal 500 megawatt (MW) peaking facility consisting of five GE Energy LMS100 natural gas-fired turbine-generators and associated equipment. The facility will be located near Romoland in unincorporated Riverside County on an approximately 20-acre parcel. Although the project site is currently in agricultural use, the land is zoned Manufacturing - Service Commercial. The project site is located at 29500 Rouse Road, Romoland, California. The Assessor's Parcel Numbers are 331-250-019 and -020. The site is located in Township 5S, Range 3W, Section 14 (San Bernardino Base and Meridian). Figure 1 shows the regional location of the project (figures are at the end of each section).

Figure 2 shows the project site and new linear facilities locations, including the electric transmission line, natural gas supply line and non-reclaimable wastewater disposal line. Figure 3 shows the site plan. Three of the appurtenant facilities will connect to utility lines located on easements immediately adjacent to the project parcel (reclaimed water, potable water, sanitary sewer). The project will require a 750-foot-long natural gas pipeline between the project boundary and Menifee Road that will be entirely located within one of the project parcels. It also will require a 0.75-mile-long non-reclaimable water pipeline.

SVEP will connect to Southern California Edison's (SCE) electrical transmission system at the Valley Substation, which is approximately 600 feet north of the project site (Figure 4). This connection will require approximately 600 feet of 115 kV transmission line connecting to the south end of the Valley Substation and one off-site transmission tower in an existing SCE transmission easement. Interconnection at this specific substation minimizes downstream impacts to the SCE's transmission system while providing efficient peaking power for use during peak demand, as projected by SCE.

Reclaimed water for cooling tower and evaporative cooler makeup, site landscape irrigation, and demineralized water makeup will be supplied via a 12-inch-diameter direct connection to a reclaimed water pipeline in a utility easement immediately north of the project site. The Eastern Municipal Water District will supply, on average, approximately 581 acre-feet per year (afy) of reclaimed water for the project.

Potable water will be supplied through a 4-inch-diameter pipeline, fire water will be supplied through a 10-inch-diameter connection, and domestic sewage will discharge to an existing line located in the same utility easement adjacent to and north of the project site. Non-reclaimable wastewater will be discharged through an 8-inch-diameter pipeline that

will run west from the project in McLaughlin Road for 0.75 miles and it will connect with the Inland Empire Energy Center's non-reclaimable wastewater line located at McLaughlin and Antelope Roads.

The project will connect with Southern California Gas Company's (SoCal Gas's) natural gas pipeline via a 12-inch-diameter and 750-foot-long connection to the existing pipeline that runs along Menifee Road east of the project site.

The project will comply with all local, state, and federal regulatory requirements associated with the protection of water quality and soil resources, as indicated in the Application for Certification for the Sun Valley Energy Project (filed December 1, 2005) and described in Section 2.0, Regulatory Requirements.

1.3 Watercourses and Critical Areas

The project site is located within the Menifee Valley portion of the San Jacinto River watershed, with limited surface drainage in the project area. The San Jacinto River watershed encompasses an area of 753 square miles and the San Jacinto River ends at Lake Elsinore, a terminal lake. Figure 5 shows the regional water resources.

The SVEP site is located in the Perris Valley and Hills subsection of the Southern California Mountains and Valleys Ecological sub-region, which includes the area between the San Jacinto Fault to the northeast and the Elsinore Fault zone to the southwest. Figure 6 shows the regional biological resources. The proposed project site includes approximately 20 acres of agricultural land that is currently cultivated in wheat, but the area has been zoned for light industrial land use. There are no natural habitats, trees or wetland areas at the proposed project site.

1.4 Project Ownership

The SVEP will be owned by Valle del Sol Energy, a wholly owned subsidiary of Edison Mission Energy.

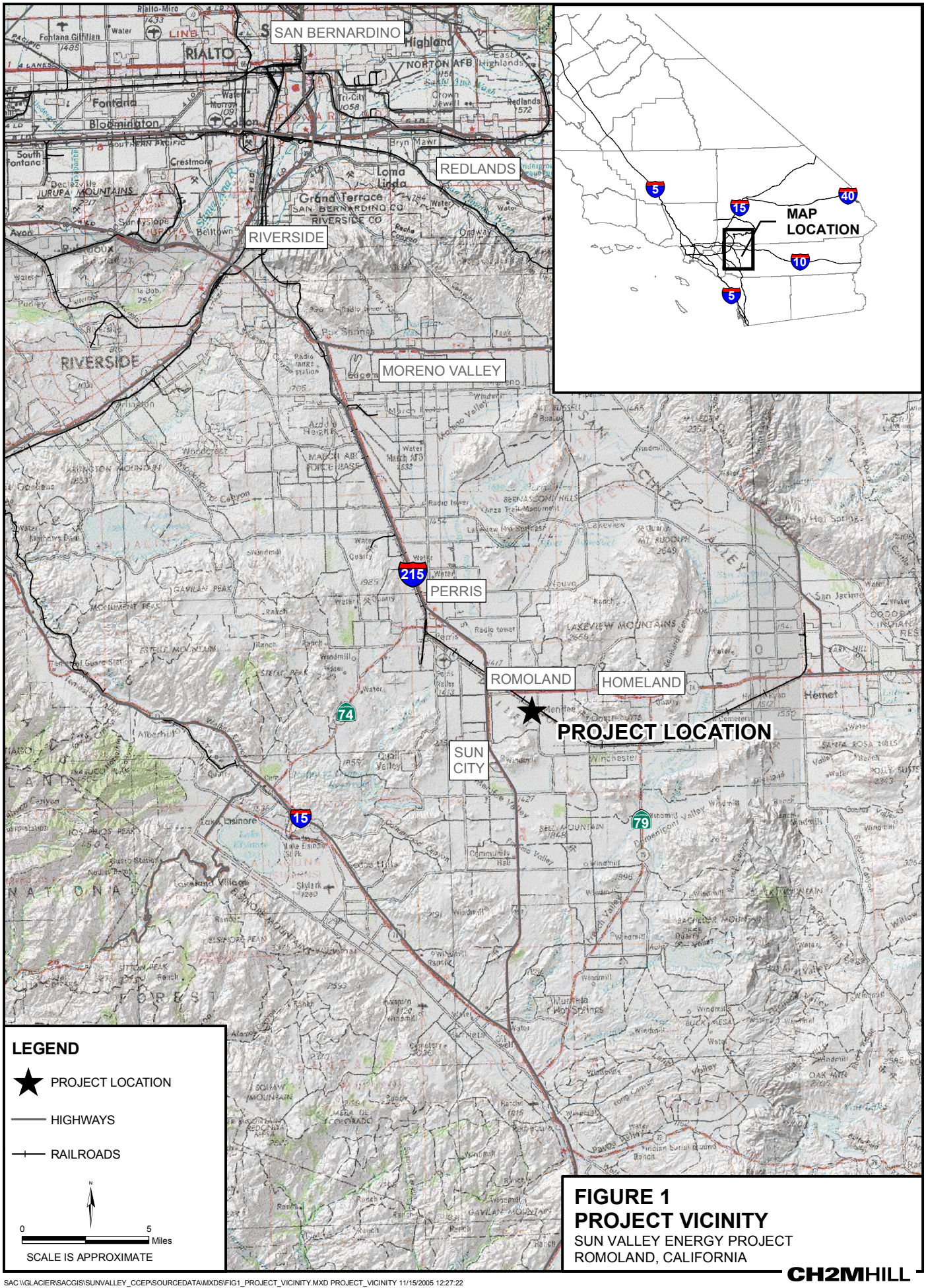

FIGURE 1
PROJECT VICINITY
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

CH2MHILL

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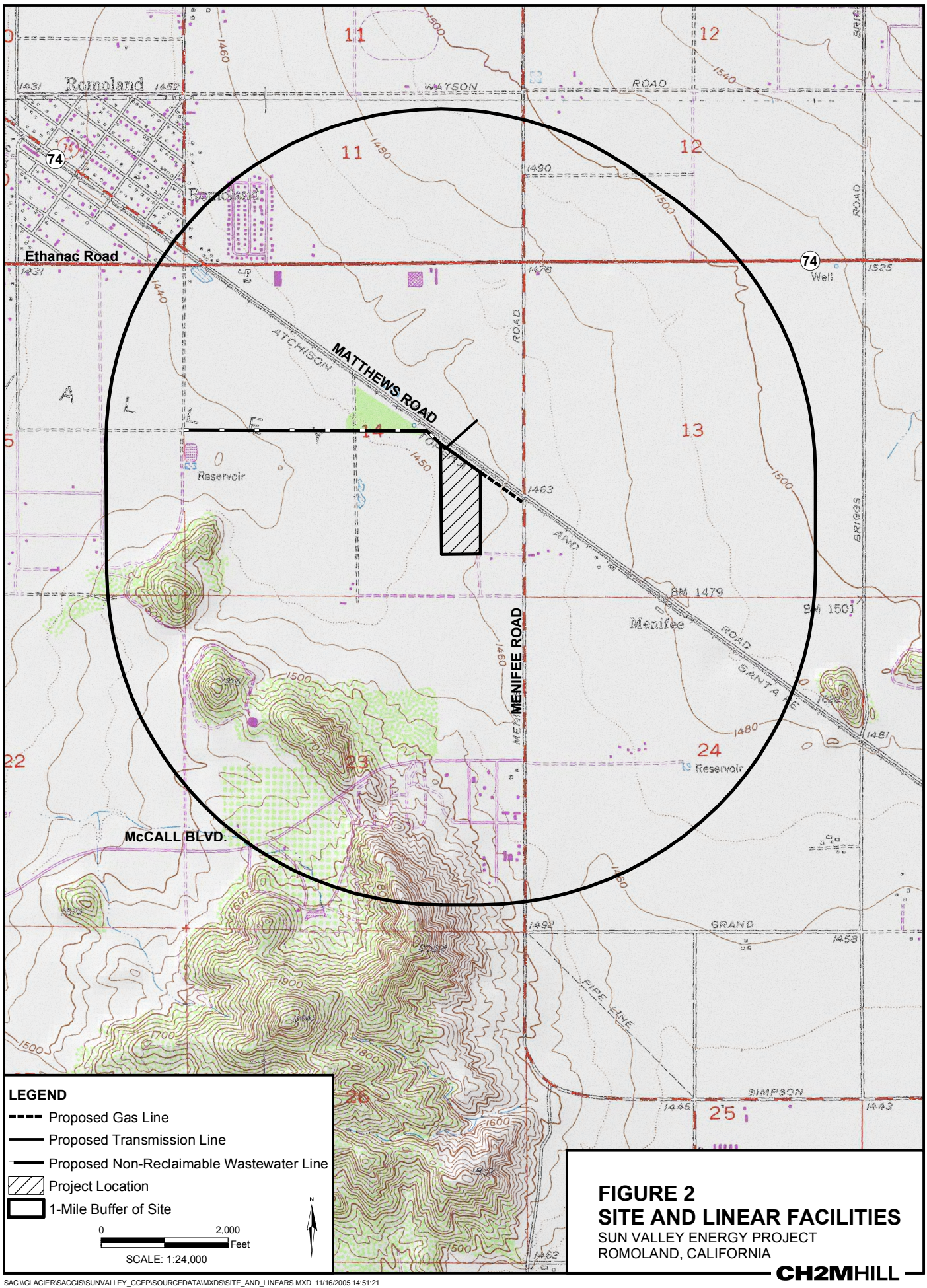

FIGURE 2
SITE AND LINEAR FACILITIES
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

CH2MHILL

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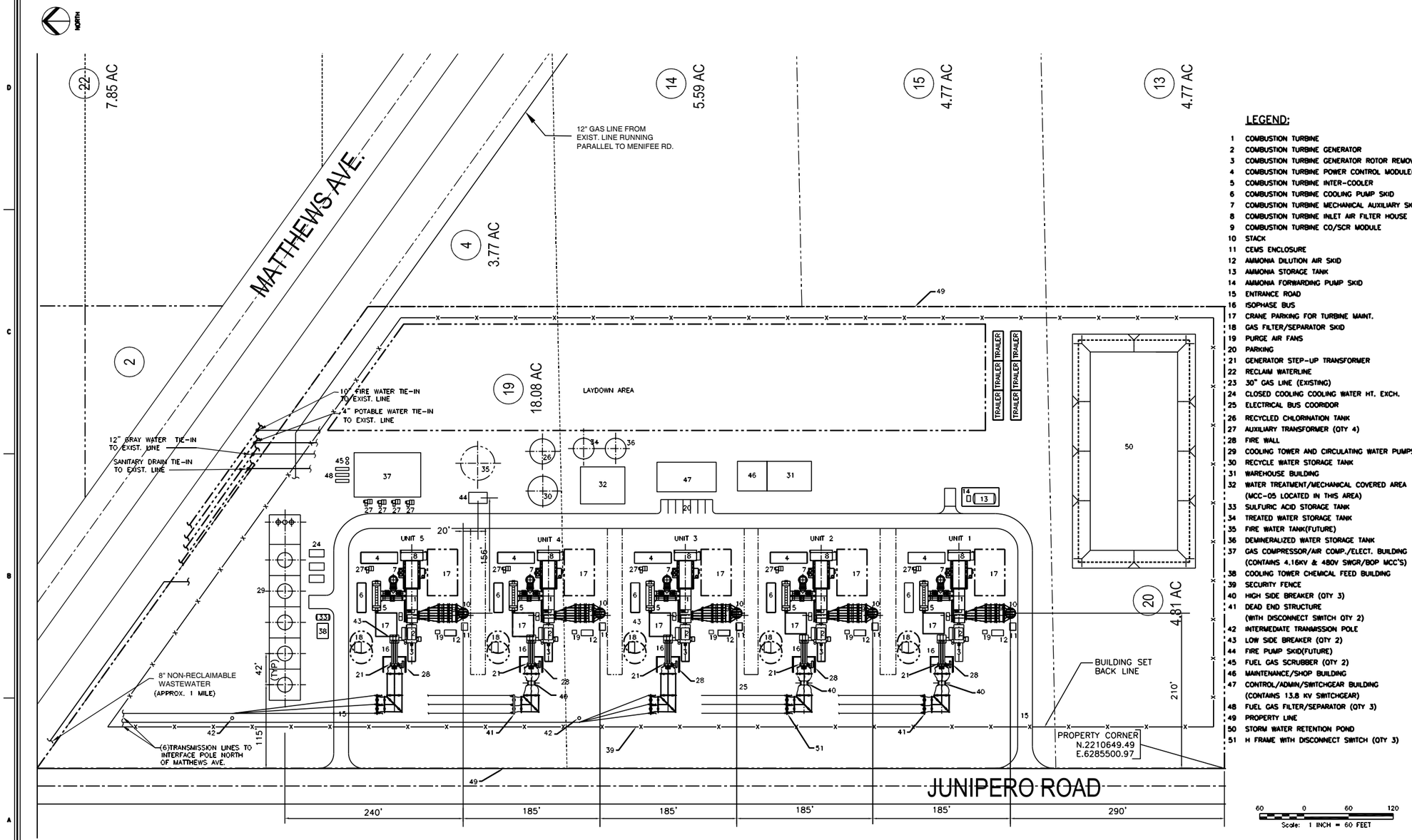

LEGEND:

1 COMBUSTION TURBINE
2 COMBUSTION TURBINE GENERATOR
3 COMBUSTION TURBINE GENERATOR ROTOR REMOVAL
4 COMBUSTION TURBINE POWER CONTROL MODULE(PCM)
5 COMBUSTION TURBINE INTER-COOLER
6 COMBUSTION TURBINE COOLING PUMP SKID
7 COMBUSTION TURBINE MECHANICAL AUXILIARY SKID
8 COMBUSTION TURBINE INLET AIR FILTER HOUSE
9 COMBUSTION TURBINE CO/SCR MODULE
10 STACK
11 CEMS ENCLOSURE
12 AMMONIA DILUTION AIR SKID
13 AMMONIA STORAGE TANK
14 AMMONIA FORWARDING PUMP SKID
15 ENTRANCE ROAD
16 ISOPHASE BUS
17 CRANE PARKING FOR TURBINE MAINT.
18 GAS FILTER/SEPARATOR SKID
19 PURGE AIR FANS
20 PARKING
21 GENERATOR STEP-UP TRANSFORMER
22 RECLAIM WATERLINE
23 30" GAS LINE (EXISTING)
24 CLOSED COOLING COOLING WATER HT. EXCH.
25 ELECTRICAL BUS COORIDOR
26 RECYCLED CHLORINATION TANK
27 AUXILIARY TRANSFORMER (QTY 4)
28 FIRE WALL
29 COOLING TOWER AND CIRCULATING WATER PUMPS
30 RECYCLE WATER STORAGE TANK
31 WAREHOUSE BUILDING
32 WATER TREATMENT/MECHANICAL COVERED AREA (MCC-05 LOCATED IN THIS AREA)
33 SULFURIC ACID STORAGE TANK
34 TREATED WATER STORAGE TANK
35 FIRE WATER TANK(FUTURE)
36 DEMINERALIZED WATER STORAGE TANK
37 GAS COMPRESSOR/AIR COMP./ELECT. BUILDING (CONTAINS 4.16KV & 480V SWGR/BOP MCC'S)
38 COOLING TOWER CHEMICAL FEED BUILDING
39 SECURITY FENCE
40 HIGH SIDE BREAKER (QTY 3)
41 DEAD END STRUCTURE (WITH DISCONNECT SWITCH QTY 2)
42 INTERMEDIATE TRANMISSION POLE
43 LOW SIDE BREAKER (QTY 2)
44 FIRE PUMP SKID(FUTURE)
45 FUEL GAS SCRUBBER (QTY 2)
46 MAINTENANCE/SHOP BUILDING
47 CONTROL/ADMIN/SWITCHGEAR BUILDING (CONTAINS 13.8 KV SWITCHGEAR)
48 FUEL GAS FILTER/SEPARATOR (QTY 3)
49 PROPERTY LINE
50 STORM WATER RETENTION POND
51 H FRAME WITH DISCONNECT SWITCH (QTY 3)

NO	DATE	REVISION	BY	CK.	APPR.
E	07-SEP-2005	FOR INFORMATION	JWC		
D	31-AUG-2005	FOR INFORMATION	JWC		
C	19-AUG-2005	FOR INFORMATION	JWC		
G	03-OCT-2005	FOR INFORMATION	JWC		
F	15-SEP-2005	REVISED COORDINATE LOCATION	JWC		

DESIGNED BY J. CRAWFORD
CHECKED BY
APPR. BY
CLIENT APPR.

CH2MHILL
Lockwood Greene
Atlanta, Georgia

SHEET TITLE
SUN VALLEY ARRANGEMENT
500MW-(5) LMS100'S
SIMPLE CYCLE

JOB NAME
EDISON MISSION ENERGY

JOB NO.
FILENAME P-2000.DWG
REV. NO. G
SCALE 1"=60'-0"
DWG. NO. P-2000

LOAD_3, ANSI B, 22 x 34 in.

FIGURE 3
SITE PLAN
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

CH2MHILL

FIGURE 4
TRANSMISSION CONNECTION TO VALLEY SUBSTATION
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

CH2MHILL

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Lake Matthews

SAN JACINTO RIVER

San Jacinto Reservoir

POPPET CREEK

BAUTISTA CREEK

SAN JACINTO RIVER

ROMOLAND

HOMELAND

PROJECT SITE

SUN CITY

WINCHESTER

Railroad Canyon Reservoir

TEMESCAL WASH

Lake Elsinore

Decker Canyon

SAN DIEGO AQUEDUCT

Rawson Canyon

Pixley Canyon

Willow Canyon

TUCALOTA CREEK

Lake Skinner

TUCALOTA CREEK

WARM SPRINGS CREEK

MURRIETA CREEK

Los Alamos Canyon

LEGEND

- Project Site
- Streams and Rivers
- Waterbodies
- City Boundaries

Sources: California Department of Water Resources (1994) .

N

2 0 2 Miles

SCALE 1:126,720

FIGURE 5
REGIONAL WATER RESOURCES
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

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San Jacinto Wildlife Area

Perris Reservoir

Lake Matthews

Project Site

San Bernardino National Forest

Lee Lake

Cleveland National Forest

Railroad Canyon Res.

Lake Elsinore

Lake Skinner

Vail Res

RIVERSIDE

74 79 243 215 15

Legend

- Project Location
- Parks and Recreation
- CA Fish and Game
- Bureau of Indian Affairs
- Bureau of Land Management
- U.S. Forest Service
- Stephens' Kangaroo Rat Habitat

N

0 3 Miles

SCALE 1:190,080

FIGURE 6
REGIONAL BIOLOGICAL RESOURCES
SUN VALLEY ENERGY PROJECT
ROMOLAND, CALIFORNIA

CH2MHILL

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SECTION 2

Regulatory Requirements

Staff Data Request #90 requests "a discussion of those additional requirements of Order No. 01-34 and the Riverside County Flood Control and Water Conservation District's Water Quality Management Plan." Regulatory requirements are discussed below.

2.1 Industrial Storm Water NPDES Permit

The State Water Resources Control Board (SWRCB) implements regulations under the federal Clean Water Act requiring that point source discharges of storm water associated with industrial activity that discharge either directly to surface waters or indirectly through municipal separate storm sewers must be regulated by an NPDES permit. The SWRCB has issued Waste Discharge Requirements (WDRs) for discharges of storm water associated with industrial activities, such as the proposed project, and excluding construction activities. Urban runoff occurring within Riverside County is regulated under an existing NPDES permit (Order No. R8-2002-0011), as regulated by the Santa Ana Regional Water Quality Control Board (RWQCB).

2.2 Construction Storm Water NPDES Permit

The federal Clean Water Act effectively prohibits discharges of storm water from construction sites unless the discharge is in compliance with an NPDES permit. The Santa Ana RWQCB has issued Order No. 01-34, which regulates storm water discharges associated with new developments (construction activities) including clearing, grading, and excavation activities that disturb one acre or more of total land area. This permit was issued specifically to regulate pollutants in discharges from storm water associated with new development to surface waters tributary to Lake Elsinore and Canyon Lake (both located within the San Jacinto River Watershed). Within the San Jacinto watershed, the provisions of Order No. 01-34 supersede those of the SWRCB's General Storm Water Construction Activity (Water Quality Order No. 99-08-DWQ), also called the General Construction NPDES permit.

Order No. 01-34 requires SWPPPs for projects in the San Jacinto watershed, as does the General Construction NPDES permit, but it also contains additional SWPPP specifications. These include: (1) additional monitoring and reporting requirements, (2) a monitoring program, and (3) a post-construction management plan that must be submitted for approval in advance of construction activities, and (4) additional offset provisions. Approval under the NPDES permit for storm water discharges associated with construction activities is administered by the Riverside County Flood Control and Water Conservation District. The project will comply with Order No. 01-34 for all storm water discharges associated with construction by preparing an SWPPP and adhering to the additional requirements.

2.3 County of Riverside, Water Quality Management Plan

The Riverside County Flood Control and Water Conservation District, acting as the main permittee for Order No. R8-2002-0011, has developed a Water Quality Management Plan (WQMP) identifying Best Management Practices (BMPs), including design standards for source controls and structural BMPs that are to be applied to new development. The WQMP addresses regional and sub-regional source controls and structural BMPs and provides guidelines for site specific, post-construction BMPs to address management of urban runoff quantity and quality. The WQMP addresses management of urban runoff quality for new development projects, including industrial and commercial development where the land area is 100,000 square feet, or more. The WQMP specifies at which point in the land use approval process the provisions of the WQMP should be considered. The project will comply with Order No. R8-220-0011 for all discharges to the storm water sewer system and will prepare a WQMP.

SECTION 3

Drainage

The existing site is unpaved and storm water runoff currently percolates to the ground. Construction of the SVEP will increase the impervious area of the project site, causing an increase in storm water runoff. This excess runoff will be collected on the project site in a storm water retention pond (see Figure 3, Site Plan). This storm water retention pond will collect storm water runoff from all parts of the SVEP site and will hold the water for percolation into the ground water. Appendix A includes drainage diagrams showing the project site before and after construction and the direction of storm water flow after construction. Appendix B contains drainage calculations used to determine the size of the storm water pond, which will be capable of containing the 25-year storm.

General plant drains will collect area washdown, sample drains, and drainage from facility equipment areas. Water from these areas will be collected in a system of floor drains, hub drains, sumps, and piping and routed to the wastewater collection system. Drains that potentially could contain oil or grease will first be routed through an oil/water separator. Wastewater from combustion turbine water washes will be collected in a holding tank. If cleaning chemicals were not used during the water wash procedure, the wastewater will be discharged to the oil/water separator and then recycled as makeup to the cooling tower. Wastewater containing cleaning chemicals will be trucked offsite for disposal at an approved wastewater disposal facility.

Construction wastewater could include storm water runoff, groundwater from dewatering, equipment wash down water, and water from pressure testing the gas lines. During construction, development and implementation of the site-specific Construction DESCP and SWPPP will ensure that storm water runoff and construction wastewater do not present a risk of impact to water quality. Storm water pollution prevention measures during construction will include, but not be limited to, those established by the *Storm water Best Management Practice Handbook for Construction* (CASQA, 2003). Measures may include collection of all construction wastewater in baker tanks for subsequent disposal or placement of erosion and runoff containment practices to prevent accidental discharge or release of construction wastewater.

Three of the linear facilities will connect to utility lines located on easements immediately adjacent to the project parcel (reclaimed water, potable water, sanitary sewer). SVEP also will connect to Southern California Edison's (SCE) electrical transmission system at the Valley Substation, approximately 600 feet north of the project site. Drainage from these areas will flow to the Riverside County Flood Control and Water Conservation District storm collection system.

SECTION 4

Clearing and Grading

4.1 Areas to be Cleared and Graded

The proposed project site includes approximately 20 acres of agricultural land that is currently cultivated in wheat, but it is zoned Manufacturing - Service Commercial. The wheat crops will be harvested prior to construction. Given the nearly level site conditions, active soil grading is expected to occur over a two-month period within the project site and laydown area. Approximately 3 acres of the site will be used as a construction laydown area and approximately 10 acres would be exposed for an additional 10-month construction period.

The total off-site area for five-foot-wide linear trenches would be 0.541 acres within existing roadway or railroad rights-of-way. Minimal clearing of ruderal roadside vegetation may be required in some areas. Active grading and exposed soils would occur for 250-foot (gas line) or 200-foot (brine line) segments or a total 500 square feet footing area for the electrical transmission line. Each open segment and the two transmission tower footings will be actively graded during a two-week period before they are completed and re-surfaced (McLaughlin Road or Antelope Road) or re-graveled (railroad).

4.2 Location of Disposal Areas, Fills, or Other Special Areas

It is anticipated that all excavated soil will be used onsite for grading and leveling purposes. In the event that some of the excavated soil will not be reused onsite, classification of the soil for disposal would be made on the basis of sampling. Sampling would be completed once the soil is excavated and stockpiled. Soil that is determined to be nonhazardous could be suitable for reuse at a construction site or disposal at a regional disposal facility, depending on the chemical quality.

4.3 Existing and Proposed Topography

The existing site is relatively flat. At completion of the SVEP, runoff from the site and laydown area will either percolate to groundwater or occur as overland flow to a detention pond. Appendix A contains drawings that show topography before and after construction.

4.4 Volumes of Cut and Fill

The grading of the site to design elevations will require the following: A cut volume of approximately 40,664 cubic yards and fill of approximately 5,130 cubic yards for a net cut of 35,533 cubic yards. All excess cut will be spread evenly around the site after construction. There will be no topsoil removed from the site.

4.4.1 Gas Pipeline

The proposed 12-inch-diameter natural gas pipeline will run approximately 750 feet from the facility site to the southeast along northern property boundary to SoCal Gas high pressure pipelines at Menifee Road. The primary method of construction is excavation of a 4-foot-deep and 3- to 7-foot-wide open trench, with a construction corridor of 50 to 75 feet that will be used to store excavated soils, pipeline materials and construction equipment. The trench will be entirely refilled. No surplus soil is expected.

4.4.2 Water Pipelines

The reclaimed and potable water pipelines will be located on easements immediately adjacent to the project parcel. The trenches will be constructed and filled to satisfy local jurisdictional requirements.

SECTION 5

Project Schedule

The SVEP construction schedule is shown in Table 1. Appendix D includes a more detailed project schedule.

TABLE 1
Project Schedule Construction Milestones

Activity	Date
Mobilization	Spring 2007
Clearing and grading, installation of erosion and sedimentation control best management practices (BMPs)	Spring 2007
Stabilize laydown area	Spring 2007
Construct foundation	Summer 2007
Install underground piping	Summer and Fall 2007
Install electrical conduits	Fall 2007
Finish construction	Spring 2008
Commissioning	Summer 2008

SECTION 6

Best Management Practices

The project has been designed to impact as small an area as possible at any given time, thereby limiting the amount of exposed soil. Construction is expected to proceed as expediently and efficiently as possible, thereby ensuring that as little soil is exposed for as short a time as possible. The following sections present standard construction Best Management Practices (BMPs) most of which are described in the *California Storm Water Best Management Practice Handbook* (2003) and the *Caltrans Storm Water Quality Handbook* (2003). These resource handbooks provide comprehensive details on BMP implementation and will be obtained and reviewed by managers for all construction contractors that may have an impact on implementation of the DESCP. Appendix C contains the Caltrans BMP factsheets with detailed descriptions of the BMPs discussed in the following sections. The fact sheets also include the maintenance practices for each BMP. Figure 7 will show the location of all BMPS to be used and will be developed during the final project design phase.

The following sections present the recommended construction BMPs for storm water pollution prevention at the SVEP construction laydown areas, plant site, and linear facilities. Each section provides information on BMP implementation as it relates to the activity being performed. BMPs that may have an impact on implementation of the DESCP will be reviewed by managers and construction contractors. While performing the work, the contractors may implement additional control measures if necessary.

6.1 General Erosion Control Measures

The project has been designed to impact as small an area as possible at any given time, thereby limiting the amount of exposed soil. BMPs will be used to help maintain water quality, protect property from erosion damage, and prevent accelerated soil erosion or dust generation. Temporary erosion control measures would be implemented before construction begins and they would be evaluated and maintained during construction. These measures typically include revegetation, mulching, physical stabilization, dust suppression, berms, ditches, and sediment barriers. These measures would be removed from the site after the completion of construction.

A mitigation monitoring plan will also be developed in conjunction with CEC Staff to set performance standards and monitor the effectiveness of BMPs. This plan will address the timing and methods of such measures, as well as reporting and response requirements. Personnel will receive training to conduct their jobs properly and recognize and report abnormal/adverse situations so that they can be quickly corrected.

The following general control measures may be used during various phases of the project:

- Proper scheduling and sequencing of activities (SS-1)
- Preservation of existing vegetation (EC-2)
- Silt fences and fiber rolls (SC-1 and SC-5)

- Drainage swales (EC-9)
- Straw mulch (SS-6)
- Placement of geotextiles, plastic covers, and erosion control blankets/mats (SS-7)
- Placement of hydro seeding (EC-4), mulching (EC-6), or geotextile/erosion control blankets (EC-7) on slopes
- Gravel bag berm (SC-6)
- Street sweeping (SC-7)
- Sandbag barrier (SC-8)
- Storm drain inlet protection (SC-10)
- Stockpile management (WM-3)
- Dust control (WE-1)
- Solid and hazardous waste management (WM-5 and WM-6)
- Sanitary and septic waste management (WM-9)
- Vehicle and equipment maintenance (NS-10)
- Vehicle and equipment fueling (NS-9)
- Spill prevention and control (WM-4)
- Sediment basins (SC-2)
- Employee and contractor training

6.1.1 Access Road, Entrance and Parking, and Laydown Areas

During construction, primary access to the SVEP site will be from a paved entrance via Matthews Road. The entrance will be maintained to limit sediment tracking and creation of dust. The parking and laydown areas will be covered with protective gravel to provide all weather use and to minimize soil erosion potential. Heavy equipment stored onsite will be placed on dunnage to protect it from ground moisture. Once construction is completed, the gravel will either be removed from the site or incorporated into the site paving.

All surfaces will be regularly watered to reduce generation of dust, but will not be excessively watered so as to generate runoff. Silt fencing may be used at edges of these areas, as necessary to minimize sediment discharges from the site.

All construction equipment will be maintained to control leaks and spills, and fueling will only be conducted within contained areas. Any contaminated soils resulting from spills will be dug up as quickly as possible, and then removed from the site for proper disposal.

The following BMPs are recommended for construction access areas:

- Silt fencing (SC-1)
- Stabilizing entrances and surfaces with coarse aggregate (TC-1 and TC-2)
- Compacting access road surfaces (TC-2)
- Proper scheduling and sequencing of activities (SS-1)
- Street sweeping and vacuuming (SC-7)
- Placement of hydro seeding (SS-4), mulching (SS-6), or geotextile/erosion control blankets (SS-7).
- Dust control (WE-1)
- Temporary drains and swales (SS-9)
- Hay/straw bale barriers (SC-9)

- Vehicle and equipment cleaning (NS-8)
- Establishing vehicle and equipment fueling (NS-9) and maintenance areas (NS-10)

6.1.2 SVEP Site and Linear Facilities

The site will be constructed on relatively level ground; therefore, it is not considered necessary to place barriers around the property boundary. However, some barriers would be placed in locations where offsite drainage could occur to prevent sediment from leaving the site and all drains on surface streets surrounding the site will be protected with gravel bags and/or silt sacks. If used, sediment barriers would be properly installed, then removed or used as mulch after construction. Runoff detention basins, drainage diversions, and other large-scale sediment traps are not considered necessary due to the level topography and surrounding paved areas. Any soil stockpiles, including sediment barriers around the base of the stockpiles, would be stabilized and covered.

The project linear features (gas and brine lines) will be constructed within the rights-of-way associated with the BNSF railroad and McLaughlin Road and Antelope Road. Temporary erosion control might include compacting and resurfacing the currently unpaved McLaughlin Road or asphalt patching in Antelope Road until permanent paving can be completed. On non-paved areas in the railroad right-of-way disturbed by the pipeline construction, protection would be accomplished using either gravel cover or locally prevalent, fast-growing plant species compatible with adjacent existing plant species, depending on the requirements of BNSF.

During construction of the project and the related linear facilities, dust erosion control measures would be implemented to minimize wind erosion from the site. Water of a quality equal to or better than existing surface runoff would be sprayed on the soil in construction areas to control dust during revegetation.

In addition, SVEP will connect to Southern California Edison's (SCE) electrical transmission system at the Valley Substation, which is approximately 600 feet north of the project site. This connection will require approximately 600 feet of 115 kV transmission line connecting to the south end of the Valley Substation and one off-site transmission tower in an existing SCE transmission easement. During construction, temporary erosion control might include outlet protection and hay or straw bale barriers. The following BMPs will be considered during site and linear facilities constructions:

- Preservation of existing vegetation (SS-2)
- Temporary drains and swales (SS-9)
- Petroleum-absorbing fabric (WM-4)
- Check dams (SC-4)
- Fiber rolls (SC-5)
- Hay/straw bale barriers (SC-9)
- Sediment basins (SC-2)
- Outlet protection (SS-10)

6.1.3 Foundations

During construction of the foundations, a concrete washout area will be required. Dumping of excess concrete and washing out of delivery vehicles will be prohibited at other locations onsite. Notices will be posted to inform all drivers.

The following BMPs will be considered during the construction of foundations:

- Solid waste management (WM-5)
- Concrete waste management (WM-8)

6.1.4 Site Stabilization and Demobilization

As construction nears completion, areas used for parking, storage and laydown will be cleared and stabilized. Areas that will continue to be used for parking or storage will have permanent storm water collection and conveyance structures provided.

6.2 Other Controls

6.2.1 Material Handling and Storage

There will be a variety of chemicals stored and used during the construction and operation of SVEP. The storage, handling, and use of all chemicals will be conducted in accordance with applicable laws, ordinances, regulations, and standards (LORS). Chemicals will be stored in appropriate chemical storage facilities. Bulk chemicals will be stored in storage tanks, and other chemicals will be stored in returnable delivery containers. Chemical storage and chemical feed areas will be designed to contain leaks and spills. Berm and drain piping design will allow a full-tank capacity spill without overflowing the berms. For multiple tanks located within the same bermed area, the capacity of the largest single tank will determine the volume of the bermed area and drain piping. Drain piping for volatile chemicals will be trapped and isolated from other drains to eliminate noxious or toxic vapors. After neutralization, if required, water collected from the chemical storage areas will be directed to the cooling tower basin, or trucked offsite for disposal at an approved wastewater disposal facility.

The aqueous ammonia storage area will have spill containment and ammonia vapor detection equipment.

Safety showers and eyewashes will be provided in the vicinity of all chemical storage and use areas. Hose connections will be provided near the chemical storage and feed areas to flush spills and leaks to the plant wastewater collection system. Approved personal protective equipment will be used by plant personnel during chemical spill containment and cleanup activities. Personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow in case of a chemical spill or accidental release. Adequate supplies of absorbent material will be stored onsite for spill cleanup.

The following BMPs will be considered for material handling and storage:

- Solid waste management (WM-5)
- Vehicle and equipment refueling (NS-9)
- Vehicle and equipment maintenance (NS-10)

- Material delivery and storage (WM-1)
- Material use (WM-2)
- Concrete waste management (WM-8)

6.2.2 Solid and Hazardous Waste Management

Solid nonhazardous waste, wastewater, and liquid and solid hazardous waste will be generated at the SVEP site during facility construction and operation. Solid nonhazardous waste also will be generated during the construction of the electric transmission lines, the natural gas supply pipeline, and water pipelines. During construction, the primary waste generated will be solid nonhazardous waste. However, some nonhazardous liquid waste and hazardous waste (solid and liquid) will also be generated. Most of the hazardous wastes will be generated at the plant site, but a minimal quantity of hazardous waste will be generated during construction of the electric transmission lines. The types of waste and their estimated quantities are described below.

Solid Nonhazardous Waste

Approximately 60 tons of paper, wood, glass, and plastics will be generated from packing materials, waste lumber, insulation, and empty nonhazardous chemical containers during project construction. These wastes will be recycled where practical. Waste that cannot be recycled will be disposed of weekly in a Class III landfill. Onsite, the waste will be placed in dumpsters.

Approximately 40 tons of excess concrete will be generated during construction. Waste concrete will be disposed of weekly in a Class III landfill or at clean fill sites, if available or will be recycled and disposed of at a construction and demolition (C&D) site.

Approximately 15 tons of metal, including steel from welding/cutting operations, packing materials, and empty nonhazardous chemical containers, and aluminum waste from packing materials and electrical wiring will be generated during construction. Waste will be recycled where practical and nonrecyclable waste will be deposited in a Class III landfill.

Nonhazardous solid waste generated during construction will be collected in onsite dumpsters and picked up periodically by Waste Management Corporation. The waste will then be taken to the El Sobrante Landfill or another local landfill. Recyclable materials can be segregated and transported by construction contractors or other private haulers to an area recycling facility. Waste Management Corporation provides drop boxes or debris boxes for large quantities of recyclables.

Wastewater. Wastewater generated during construction will include sanitary waste, storm water runoff, equipment washdown water, and water from excavation dewatering during construction (if dewatering is required). Depending on the chemical quality of these wastewaters, they could be classified as hazardous or nonhazardous. The wastewaters would be sampled and if they are hazardous would be trucked offsite for disposal at an approved wastewater disposal facility.

Sanitary waste will be collected in portable, self-contained toilets. Excavation dewatering water will be contained in portable tanks and sampled prior to disposal offsite. Equipment washwater will be contained at designated wash areas and will be disposed of offsite. Storm

water runoff will be managed in accordance with a storm water management permit, which will be obtained prior to the start of construction. The generation of nonhazardous wastewater will be minimized through water conservation and reuse measures.

Hazardous Waste. Most of the hazardous waste generated during construction will consist of liquid waste, such as water from excavation dewatering, flushing and cleaning fluids, passivating fluid (to prepare pipes for use), and solvents. Some hazardous solid waste, such as welding materials and dried paint, may also be generated.

Flushing and cleaning waste liquid will be generated as pipes are cleaned and flushed. The volume of flushing and cleaning liquid waste generated is estimated to be one to two times the internal volume of the pipes cleaned. The quantity of welding, solvent, and paint waste is expected to be minimal. Wastewaters generated during construction could also be considered hazardous, if demonstrated so by sampling.

The construction contractor will be considered the generator of hazardous construction waste and will be responsible for proper handling of hazardous waste in compliance with all applicable federal, state, and local laws and regulations. This responsibility will include licensing, personnel training, accumulation limits and times, and reporting and recordkeeping. The hazardous waste will be collected in satellite accumulation containers near the points of generation. It will be moved daily to the contractor's 90-day hazardous waste storage area located at the site construction laydown area. The waste will be removed from the site by a certified hazardous waste collection company and delivered to an authorized hazardous waste management facility, before expiration of the 90-day storage limit.

The following BMPs will be considered at the designated storage locations:

- Cover or store hazardous materials indoors, if possible (WM-1)
- Material delivery and storage (WM-1)
- Material use (WM-2)
- Spill prevention and control (WM-4)
- Solid waste management (WM-5)
- Hazardous waste management (WM-6)
- Use of covered dumpsters and containers for waste (WM-5)

6.2.2 Potential Contaminated Soil

It is unlikely that contaminated soil will be encountered during construction. However, operators and construction personnel will be asked to report unusual conditions to the appropriate personnel and the area and/or material will be properly contained during investigative actions. If soils require temporary stockpiling, piles will be covered with plastic sheeting or tarps that are secured safely with sand bags and bermed with hay bales or silt fencing to prevent runoff from leaving the area. If required, samples will be collected and sent to a certified analytical laboratory for characterization. If contamination is detected, the waste will be handled and properly disposed of in an authorized waste management facility.

6.2.3 Groundwater/Dewatering Controls

The construction phase of SVEP will require no groundwater removal. If groundwater is encountered and if any contamination is detected via odors or visible sheens, the collected water will be handled and properly disposed in a manner consistent with federal, state, and local regulations. The following control methods will be considered for groundwater/dewatering controls, as necessary:

- Dewatering operations (NS-2)
- Hazardous waste management (WM-6)

6.2.4 Offsite Vehicle Tracking

Because sediment reaching public roads generally has a clear path to wetlands and water bodies, controls will be in place to minimize or eliminate soils from being tracked off the project site from vehicles. The site will have paved access roads and entrances/exits made of coarse aggregate to limit the amount of material adhering to tires. These areas will be inspected daily and cleaned as necessary using manual or mechanical street sweepers. The following control methods will be considered for offsite vehicle tracking, as necessary:

- Stabilized construction entrance/exit (TC-1)
- Stabilized construction roadway (TC-2)
- Entrance/exit tire wash (TC-3)

6.2.5 Dust Suppression and Control

During construction of the project and the related linear facilities, dust erosion control measures would be implemented to minimize the wind-blown loss of soil from the site. Water of a quality equal to or better than existing surface runoff would be sprayed on the soil in construction areas to control dust during revegetation.

The following control method will be considered for dust suppression, as necessary:

- Wind erosion control (WE-1)

FIGURE 7
BMP Location Map

BMP location map to be provided in a future draft after final construction design is completed.

APPENDIX A

Pre- and Post-Construction Drainage Plans

MENIFEE RD.

MATHEWS AVENUE

A.T. & S.F. RR

LEGEND

FLOW DIRECTION

1460

1450

ROUSE RD.

JUNIPERO ROAD

80 40 0 80 160

Scale: 1 INCH = 80 FEET

NORTH

PRELIMINARY ISSUE

NO	DATE	REVISION	BY	CK.	APPR.
A	16-SEP-2005	PRELIMINARY ISSUE	JGY		

DESIGNED BY J. GARCIA
CHECKED BY
APPR. BY
CLIENT APPR.

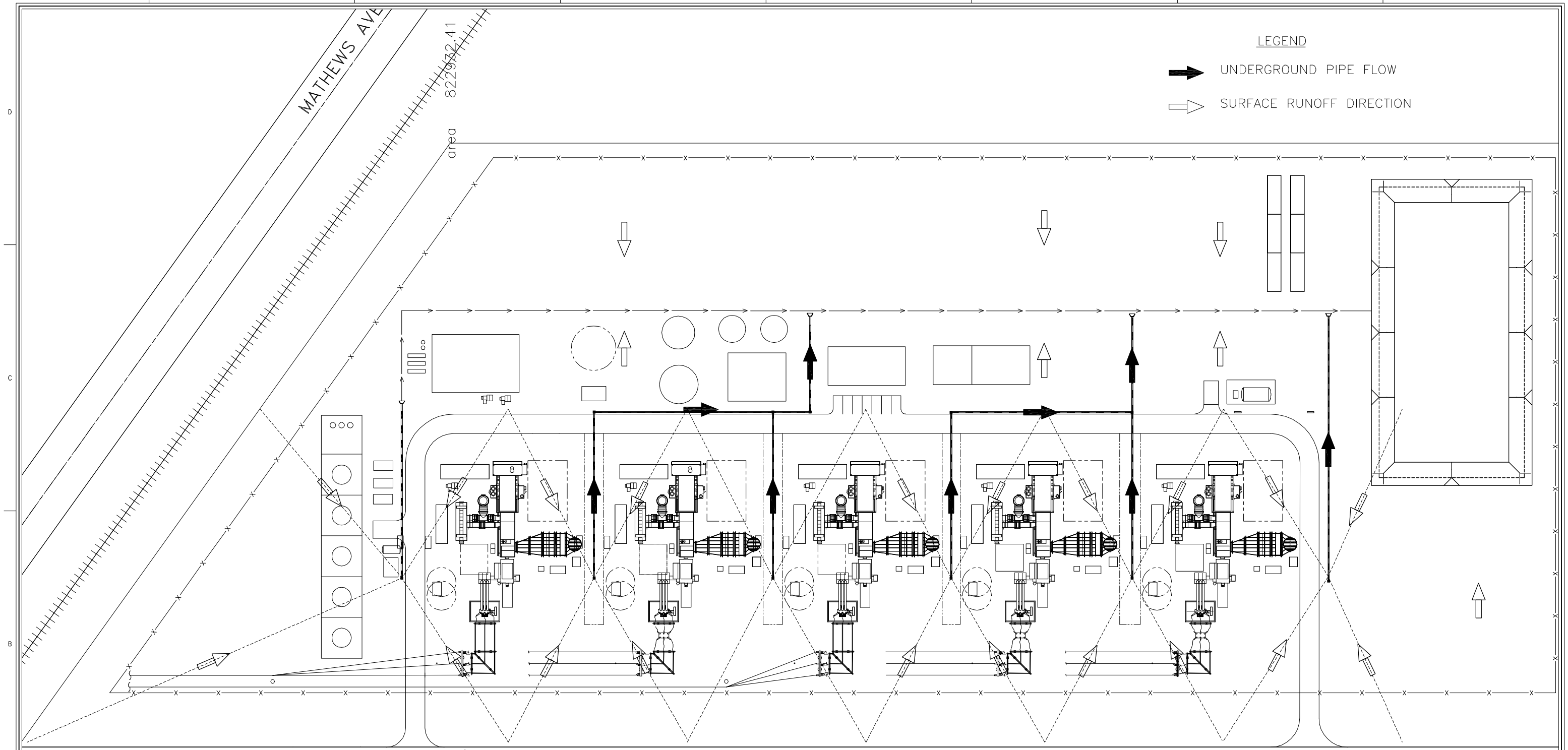
CH2MHILL
Lockwood Greene
Atlanta, Georgia

SHEET TITLE
SUN VALLEY
PRE-CONSTRUCTION
DRAINAGE PATTERNS

JOB NAME
EDISON
MISSION ENERGY

JOB NO. 023482.00
FILENAME CSUNVLLY.DWG
SCALE 1"=80'-0"
REV. NO. A
DWG. NO. C-2

LGAD_3, ANSI D, 22 x 34 in.



PRELIMINARY ISSUE

NO	DATE	REVISION	BY	CK.	APPR.
A	16-SEP-05	PRELIMINARE ISSUE	JGY		

DESIGNED BY J. GARCIA
CHECKED BY
APPR. BY
CLIENT APPR.

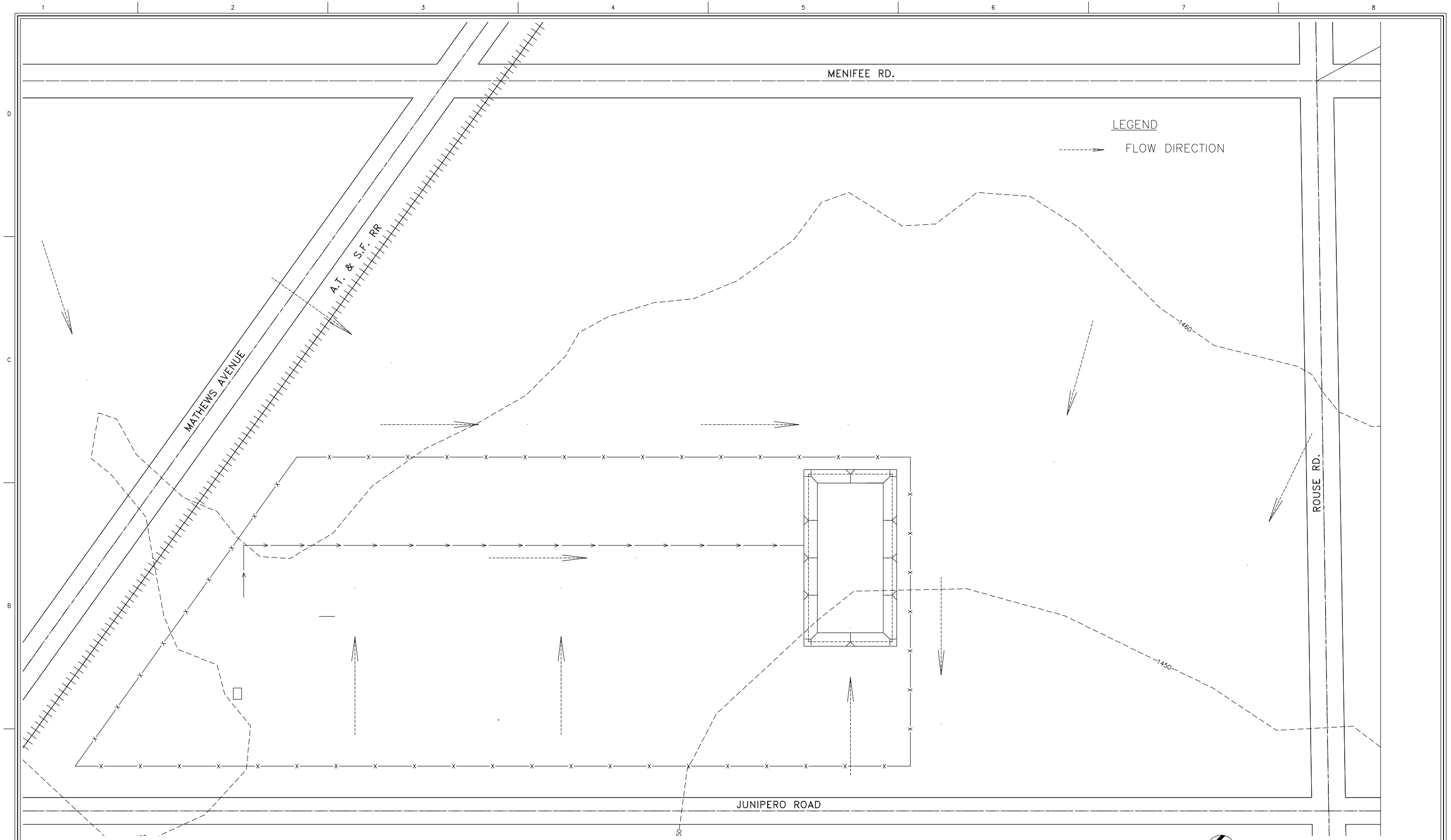
CH2MHILL
Lockwood Greene
Atlanta, Georgia

SHEET TITLE
SUN VALLEY
STORM WATER
DRAINAGE DIAGRAM

JOB NAME
EDISON
MISSION ENERGY

JOB NO. 023482.00
FILENAME CSUNVLLY.DWG
SCALE 1"=50'-0"
REV. NO. A
DWG. NO. C-1

LGAD_3, ANSI D, 22 x 34 in.



PRELIMINARY ISSUE

NO	DATE	REVISION	BY	CK.	APPR.
A	16-SEP-2005	PRELIMINARY ISSUE	JGY		

DESIGNED BY J. GARCIA
CHECKED BY
APPR. BY
CLIENT APPR.

CH2MHILL
Lockwood Greene
Atlanta, Georgia

SHEET TITLE
SUN VALLEY
POST-COSTRUCTION
DRAINAGE PATTERN

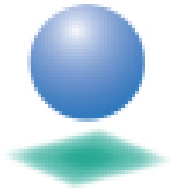
JOB NAME
EDISON
MISSION ENERGY

JOB NO. 023482.00
FILENAME CSUNVLLY.DWG
REV. NO. A
SCALE 1"=80'-0"
DWG. NO. C-3

LGAD_3. ANSI D. 22 x 34 in.

APPENDIX B

Drainage Calculations



CH2MHILL
Lockwood Greene

EDISON
MISSION ENERGY

An *EDISON INTERNATIONAL* Company

SUN VALLEY SIMPLE CYCLE

STORM DRAIN CALCULATIONS

Lockwood Greene

Project number: 050-025482.00

CH2MHILL
Lockwood Greene

Preliminary
(to be verified in final design)

Edison Mission Energy, Sun Valley, CA.

Storm drainage, Rational Method

Design Criteria:

Rainfall Intensity: 25 yr, 5 min Storm Event
Tc = 5 min
i = 4.23 in/hr (Based on the IDF curve, from NOAA Atlas 14)

$$Q = CiA$$

Units:

Q = CFS

C = see table 3. (Recommended Runoff Coefficient)

i = 4.33 in/hr

A= see drawing. CSK – 1 Drainage Areas

Pipe:

A.D.S. N12 Corrugated HDPE Pipe with smooth interior.

Manning Coefficient:

N = .012 (From Table 4)

EDISON MISSION ENERGY, - ROMOLAND, CA.
STORM DRAINAGE RUNOFF (POST DEVELOPMENT)

Preliminary
(to be verified in final design)

Computed by JGY
Checked by DEM
Date 9/16/2005

DRAINAGE AREA	TYPE OF SURFACE	AREA	AREA (ACRES)	COEFFICIENT ©	I (25yr) (in/hr)	Q (25yr) (cfs)	Q'(25yr) (cfs) LINE TOTAL	BRANCH TOTAL	Q CUM (cfs)	PIPE SIZE, SLOPE, & CAPACITY AT THE INLET
A1	ASPHALT	9084.22	0.209	0.8	4.23	0.71				
	CONCRETE	904.59	0.021	0.9	4.23	0.08				
	EQUIPMENT	18666.64	0.429	1	4.23	1.81				
	GRAVEL/GRASS	101191.77	2.323	0.2	4.23	1.97	4.56			15" HDPE @ 0.75% Q = 6.06 cfs
								4.56		
									4.56	15" HDPE @ 0.75% Q = 6.06 cfs
A2-1	ASPHALT	7643.02	0.175	0.8	4.23	0.59				
	CONCRETE	3445.11	0.079	0.9	4.23	0.30				
	EQUIPMENT	10210.66	0.234	1	4.23	0.99				
	GRAVEL/GRASS	42342.39	0.972	0.2	4.23	0.82	2.71			12" HDPE @ 0.75% Q = 3.34 cfs
A2-2	ASPHALT	7643.02	0.175	0.8	4.23	0.59				
	CONCRETE	3445.11	0.079	0.9	4.23	0.30				
	EQUIPMENT	10210.66	0.234	1	4.23	0.99				
	GRAVEL/GRASS	42342.39	0.972	0.2	4.23	0.82	2.71			12" HDPE @ 0.75% Q = 3.34 cfs
								5.42		15" HDPE @ 0.75% Q = 6.06 cfs
									9.98	
A2-3	ASPHALT	7643.02	0.175	0.8	4.23	0.59				
	CONCRETE	3445.11	0.079	0.9	4.23	0.30				
	EQUIPMENT	10210.66	0.234	1	4.23	0.99				
	GRAVEL/GRASS	42342.39	0.972	0.2	4.23	0.82	2.71			12" HDPE @ 0.75% Q = 3.34 cfs
A2-4	ASPHALT	7643.02	0.175	0.8	4.23	0.59				
	CONCRETE	3445.11	0.079	0.9	4.23	0.30				
	EQUIPMENT	10210.66	0.234	1	4.23	0.99				
	GRAVEL/GRASS	42342.39	0.972	0.2	4.23	0.82	2.71			12" HDPE @ 0.75% Q = 3.34 cfs
								5.42		15" HDPE @ 0.75% Q = 6.06 cfs
									15.40	
A3	ASPHALT	8431.5	0.194	0.8	4.23	0.66				
	CONCRETE	2540.52	0.058	0.9	4.23	0.22				
	EQUIPMENT	3582.2	0.082	1	4.23	0.35				
	GRAVEL/GRASS	49086.96	1.127	0.2	4.23	0.95	2.18			12" HDPE @ 0.75% Q = 3.334 cfs
								2.18		15" HDPE @ 0.75% Q = 6.06 cfs
									17.58	
A4	ASPHALT	0	0.000	0.8	4.23	0.00				
	CONCRETE	5400	0.124	0.9	4.23	0.47				
	EQUIPMENT	8452.36	0.194	1	4.23	0.82				
	GRAVEL/GRASS	122804.61	2.819	0.2	4.23	2.39	3.68			
								3.68		SHEET FLOW INTO DITCH
									21.25	
A5	ASPHALT	0	0.000	0.8	4.23	0.00				
	CONCRETE	7200	0.165	0.9	4.23	0.63				
	EQUIPMENT	0	0.000	1	4.23	0.00				
	GRAVEL/GRASS	84376.35	1.937	0.2	4.23	1.64	2.27			
								2.27		SHEET FLOW INTO DITCH
									23.52	
A6	ASPHALT	0	0.000	0.8	4.23	0.00				
	CONCRETE	0	0.000	0.9	4.23	0.00				
	EQUIPMENT	0	0.000	1	4.23	0.00				
	GRAVEL/GRASS	77282.99	1.774	0.2	4.23	1.50	1.50			
								1.50		SHEET FLOW INTO DITCH
TOTAL			**17.29957369**						**25.02**	

PRELIMINARY

(to be verified in final design)

EME - SUN VALLEY

Romoland, California

Job No.	023482.01
Sheet No.	1 of 2
Date	15-Sep-05
Computed By	D. MICKANEN
Checked By	J. GARCIA

Hydraulics: Manning's Equation

$Q=1.49/n*A*(R_H)^{2/3}*S^{1/2}$

Where:

Q = flow rate, cfs (ft^3/s)

n = Manning's roughness coefficient. It is 0.025 for natural channels in good condition.

A = cross-sectional area of ditch in flow (ft^2)

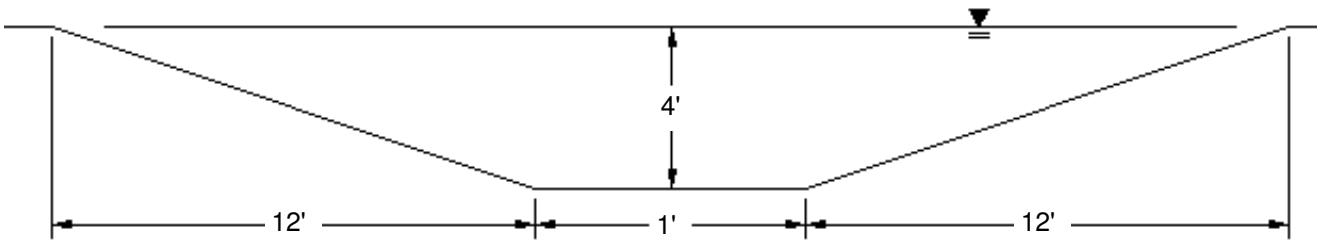
R_H = hydraulic radius, cross-sectional area divided by wetteed perimeter, (ft)

S = slope of energy grade line, equal to the slope of the ditch bottom, (ft/ft)

P = wetted perimeter (ft)

Capacity Calculation for Perimeter Drainage Ditch

1. Drainage ditch will be designed for post-development storm runoff flows using rational method flows.
2. Based on Rational Method calculations for 25-yr storm, design ditch for a minimum peak flow (QP) of 25 cfs.
2. Assume new ditch will be constructed of native/earth materials and will be in good condition.
3. Assume trapazoidal shape ditch with 3:1 side slopes (horizontal:vertical).
4. Assume ditch constant slope of 0.005.
5. Assume ditch flows full.
6.



A = 1/2*h*(w+b) = 1/2 * (4 ft) * (25 ft + 1 ft)

A = 52 ft^2

Where:

h =	4 ft
w =	25 ft
b =	1 ft

P = 2*SQRT[(12ft)^2 + (4ft)^2] + 1ft

P = 26 ft

R_H = A/P = 52 ft^2 / 26 ft

R_H = 2 ft

EME - SUN VALLEY

Romoland, California

Job No.	023482.01
Sheet No.	2 of 2
Date	15-Sep-05
Computed By	D. MICKANEN
Checked By	J. GARCIA

Capacity Calculation for West Ditch (cont.)

$Q = V*A = 1.49/n * A*R_H^{2/3}*S^{1/2}$

Where:

n =	0.025	
A =	52	ft^2
R_H =	2	ft
S =	0.005	ft/ft

Q = 1.49/0.025 * (52) * (2)^0.667 * (0.005)^0.5

Q =	**348 cfs**	**>>**	**Q_P =**	**25 cfs**	**OK**

POINT PRECIPITATION FREQUENCY ESTIMATES FROM NOAA ATLAS 14

California 33.603 N 117.056 W 2125 feet

from "Precipitation-Frequency Atlas of the United States" NOAA Atlas 14, Volume 1, Version 3
G.M. Bonnin, D. Todd, B. Lin, T. Parzybok, M.Yekta, and D. Riley
NOAA, National Weather Service, Silver Spring, Maryland, 2003

Extracted: Thu Sep 15 2005

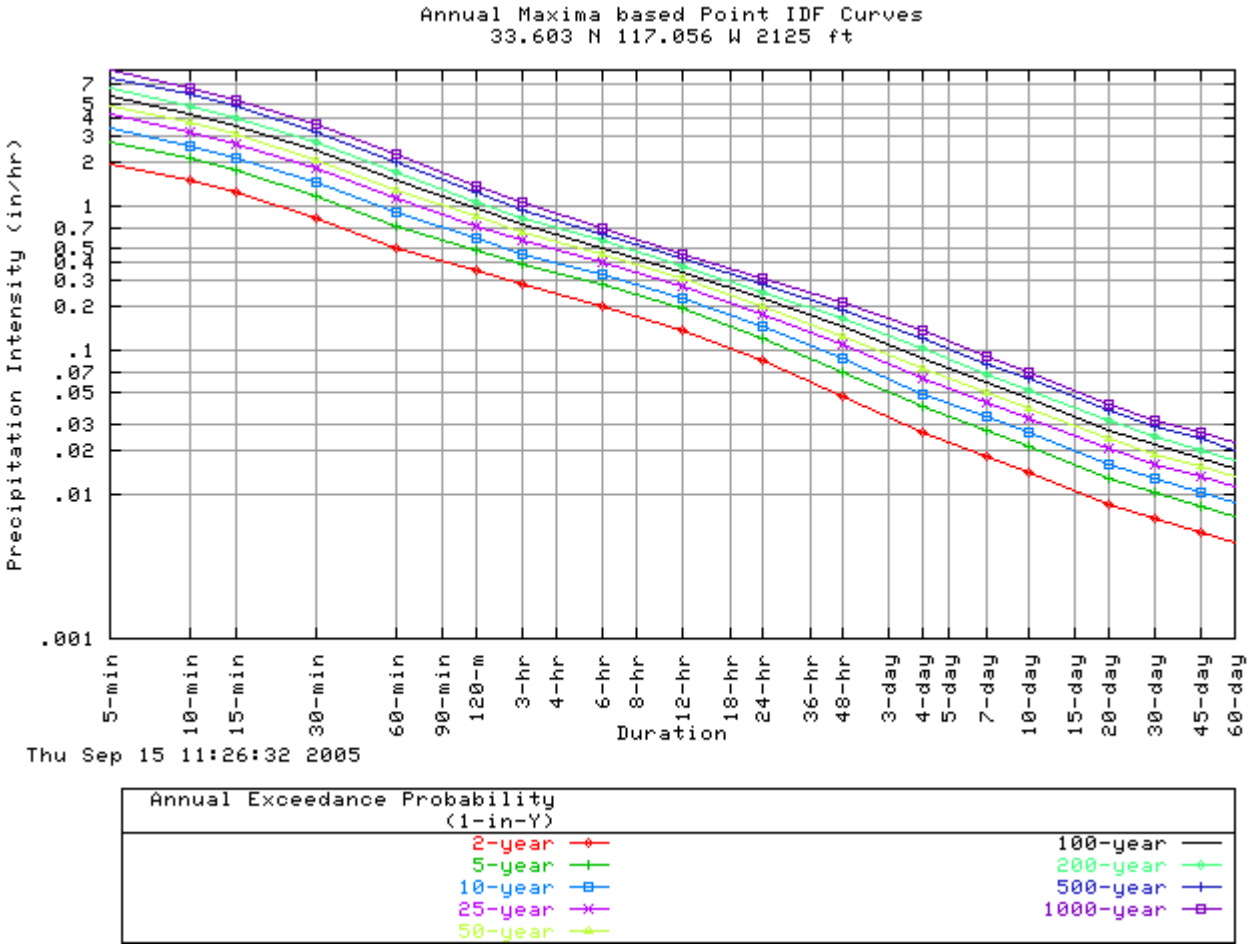
Confidence Limits | Seasonality | Location Maps | Other Info. | Grids | Maps | Help | Docs | U.S. Map

Precipitation Intensity Estimates (in/hr)

AEP* (1-in-Y)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	1.96	1.49	1.23	0.83	0.51	0.35	0.28	0.20	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01	0.00
5	2.78	2.11	1.74	1.17	0.73	0.49	0.39	0.28	0.19	0.12	0.07	0.04	0.03	0.02	0.01	0.01	0.01	0.01
10	3.39	2.58	2.13	1.43	0.89	0.59	0.47	0.33	0.23	0.14	0.09	0.05	0.03	0.03	0.02	0.01	0.01	0.01
25	4.23	3.22	2.66	1.79	1.11	0.72	0.57	0.40	0.27	0.18	0.11	0.06	0.04	0.03	0.02	0.02	0.01	0.01
50	4.94	3.76	3.10	2.09	1.29	0.83	0.65	0.46	0.31	0.20	0.13	0.08	0.05	0.04	0.02	0.02	0.02	0.01
100	5.69	4.33	3.58	2.41	1.49	0.95	0.73	0.51	0.34	0.23	0.14	0.09	0.06	0.05	0.03	0.02	0.02	0.02
200	6.50	4.95	4.09	2.75	1.71	1.07	0.82	0.57	0.38	0.25	0.16	0.10	0.07	0.05	0.03	0.02	0.02	0.02
500	7.71	5.86	4.84	3.26	2.02	1.24	0.94	0.64	0.43	0.29	0.19	0.12	0.08	0.06	0.04	0.03	0.02	0.02
1000	8.68	6.60	5.46	3.68	2.27	1.38	1.04	0.70	0.46	0.32	0.21	0.14	0.09	0.07	0.04	0.03	0.03	0.02

Text version of table

* These precipitation frequency estimates are based on an annual maxima series. **AEP** is the Annual Exceedance Probability. Please refer to the documentation for more information. NOTE: Formatting forces estimates near zero to appear as zero.



Confidence Limits -

* Upper bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)																		
AEP** (1-in-Y)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	2.28	1.73	1.43	0.96	0.60	0.40	0.32	0.23	0.15	0.09	0.05	0.03	0.02	0.02	0.01	0.01	0.01	0.01
5	3.21	2.44	2.02	1.36	0.84	0.55	0.43	0.32	0.22	0.14	0.08	0.05	0.03	0.02	0.01	0.01	0.01	0.01
10	3.90	2.97	2.45	1.65	1.02	0.66	0.52	0.37	0.26	0.16	0.10	0.06	0.04	0.03	0.02	0.01	0.01	0.01
25	4.85	3.70	3.06	2.06	1.27	0.81	0.63	0.45	0.31	0.20	0.12	0.07	0.05	0.04	0.02	0.02	0.01	0.01
50	5.65	4.30	3.55	2.39	1.48	0.93	0.72	0.51	0.35	0.23	0.14	0.08	0.06	0.04	0.03	0.02	0.02	0.02
100	6.49	4.94	4.08	2.75	1.70	1.06	0.81	0.57	0.39	0.25	0.16	0.10	0.07	0.05	0.03	0.02	0.02	0.02
200	7.41	5.64	4.66	3.14	1.94	1.19	0.91	0.63	0.43	0.28	0.18	0.11	0.08	0.06	0.04	0.03	0.02	0.02
500	8.74	6.65	5.49	3.70	2.29	1.39	1.04	0.72	0.48	0.32	0.22	0.14	0.09	0.07	0.04	0.03	0.03	0.02
1000	9.81	7.47	6.17	4.16	2.57	1.54	1.15	0.78	0.52	0.35	0.24	0.16	0.10	0.08	0.05	0.04	0.03	0.03

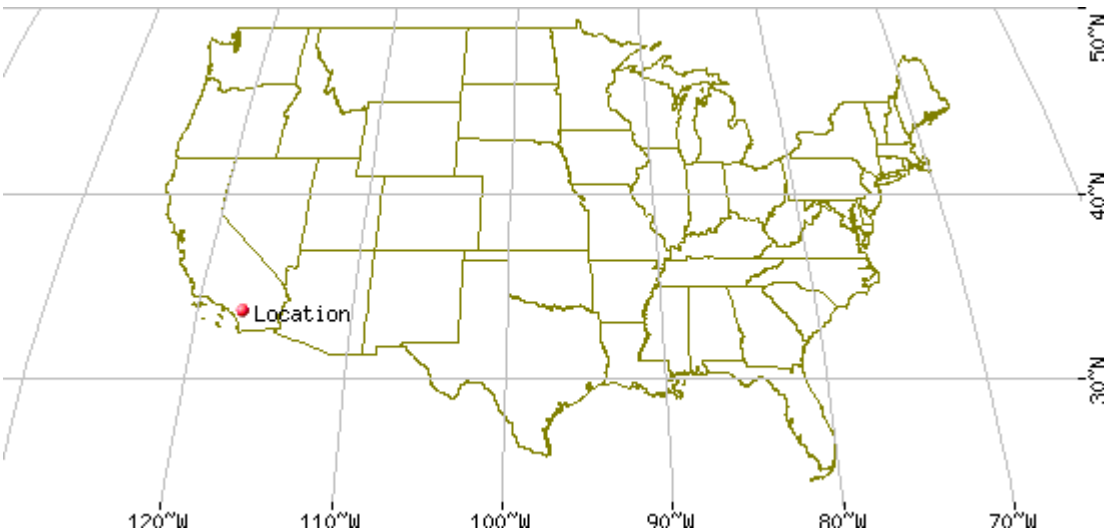
* The **upper** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **greater** than.
** These precipitation frequency estimates are based on an annual maxima series. **AEP** is the Annual Exceedance Probability.
Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

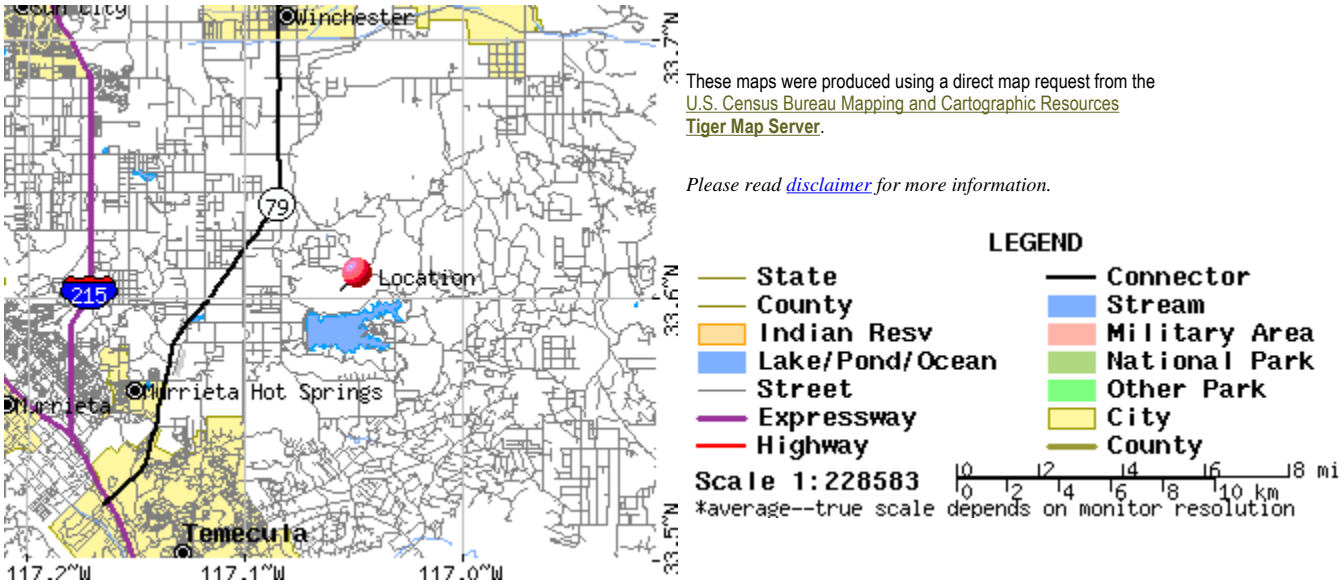
* Lower bound of the 90% confidence interval Precipitation Intensity Estimates (in/hr)																		
AEP** (1-in-Y)	5 min	10 min	15 min	30 min	60 min	120 min	3 hr	6 hr	12 hr	24 hr	48 hr	4 day	7 day	10 day	20 day	30 day	45 day	60 day
2	1.71	1.30	1.07	0.72	0.45	0.32	0.25	0.18	0.12	0.07	0.04	0.02	0.02	0.01	0.01	0.01	0.00	0.00
5	2.41	1.84	1.52	1.02	0.63	0.44	0.35	0.25	0.17	0.11	0.06	0.04	0.02	0.02	0.01	0.01	0.01	0.01
10	2.95	2.24	1.85	1.25	0.77	0.52	0.42	0.30	0.20	0.13	0.08	0.04	0.03	0.02	0.01	0.01	0.01	0.01
25	3.65	2.78	2.30	1.55	0.96	0.64	0.50	0.36	0.24	0.16	0.09	0.06	0.04	0.03	0.02	0.01	0.01	0.01
50	4.24	3.23	2.67	1.80	1.11	0.73	0.57	0.40	0.27	0.18	0.11	0.07	0.04	0.03	0.02	0.02	0.01	0.01
100	4.85	3.69	3.05	2.05	1.27	0.83	0.64	0.45	0.30	0.20	0.12	0.08	0.05	0.04	0.02	0.02	0.02	0.01
200	5.51	4.20	3.47	2.33	1.44	0.93	0.72	0.50	0.33	0.22	0.14	0.09	0.06	0.05	0.03	0.02	0.02	0.01
500	6.44	4.90	4.05	2.73	1.69	1.07	0.82	0.56	0.37	0.25	0.16	0.10	0.07	0.05	0.03	0.02	0.02	0.02
1000	7.18	5.47	4.52	3.04	1.88	1.18	0.89	0.61	0.40	0.27	0.18	0.11	0.08	0.06	0.04	0.03	0.02	0.02

* The **lower** bound of the confidence interval at 90% confidence level is the value which 5% of the simulated quantile values for a given frequency are **less** than.
** These precipitation frequency estimates are based on an annual maxima series. **AEP** is the Annual Exceedance Probability.

Please refer to the documentation for more information. NOTE: Formatting prevents estimates near zero to appear as zero.

Maps -





Other Maps/Photographs -

View USGS digital orthophoto quadrangle (DOQ) covering this location from TerraServer; **USGS Aerial Photograph** may also be available from this site. A DOQ is a computer-generated image of an aerial photograph in which image displacement caused by terrain relief and camera tilts has been removed. It combines the image characteristics of a photograph with the geometric qualities of a map. Visit the USGS for more information.

Watershed/Stream Flow Information -

Find the Watershed for this location using the U.S. Environmental Protection Agency's site.

Climate Data Sources -

Precipitation frequency results are based on data from a variety of sources, but largely NCDC. The following links provide general information about observing sites in the area, regardless of if their data was used in this study. For detailed information about the stations used in this study, please refer to our documentation.

Using the **National Climatic Data Center's (NCDC)** station search engine, locate other climate stations within:

+/-30 minutes ...OR... +/-1 degree of this location (33.603/-117.056). Digital ASCII data can be obtained directly from **NCDC**.

Find Natural Resources Conservation Service (NRCS) SNOTEL (SNOwpack TELemetry) stations by visiting the
Western Regional Climate Center's state-specific SNOTEL station maps.

Hydrometeorological Design Studies Center
DOC/NOAA/National Weather Service
1325 East-West Highway
Silver Spring, MD 20910

(301) 713-1669
Questions?: HDSC.Questions@noaa.gov

Disclaimer

MATHEWS AVE

A-1

area 6628.46
area 612.75
area 896.03
area 10529.40
area 129847.22
area 9084.22
area 904.59

270.75'

PIPE A1
Q(req)=4.56 cfs
Q(cap)=6.06 cfs

A-5

area 128204.61
area 5400.00
area 375.00
area 1661.90
area 1256.64
area 907.92
area 3000.00
area 635.15
area 615.75

421.81'

A2-1

area 63641.18
area 7643.02
area 904.59
area 2540.52
area 6628.46
area 3582.20

PIPE A2-1
Q(req)=2.71 cfs
Q(cap)=3.34 cfs

184.77'

A2-2

area 63641.18
area 7643.02
area 904.59
area 2540.52
area 6628.46
area 3582.20

PIPE A2-2
Q(req)=2.71 cfs
Q(cap)=3.34 cfs

38.47'

105.26'

PIPE A2
Q(req)=5.42 cfs
Q(cap)=6.06 cfs

A3-1

area 63641.18
area 7643.02
area 904.59
area 2540.52
area 6628.46
area 3582.20

171.23'

PIPE A3-1
Q(req)=2.71 cfs
Q(cap)=3.34 cfs

area 91576.35
area 3200.00
area 4000.00

332.63'

A-6

186.96'

PIPE A3
Q(req)=5.42 cfs
Q(cap)=6.06 cfs

A3-1

area 63641.18
area 7643.02
area 904.59
area 2540.52
area 6628.46
area 3582.20

PIPE A3-2
Q(req)=2.71 cfs
Q(cap)=3.34 cfs

98.66'

area 77282.99

202.76'

A-7

A-4

273.41'

area 3582.20
area 2540.52
area 63641.18
area 8431.50

PIPE A4
Q(req)=2.18 cfs
Q(cap)=3.34 cfs

44.23'

area 106958.64

JUNIPERO ROAD

Scale: 1 INCH = 50 FEET

50 0 50 100

NORTH

PRELIMINARY ISSUE

NO	DATE	REVISION	BY	CK.	APPR.
A	16-SEP-05	PRELIMINARY ISSUE	JGY		

DESIGNED BY J. GARCIA
CHECKED BY
APPR. BY
CLIENT APPR.

CH2MHILL
Lockwood Greene
Atlanta, Georgia

SHEET TITLE
SUN VALLEY
DRAINAGE AREAS

JOB NAME

EDISON
MISSION ENERGY

JOB NO.	REV. NO.
023482.00	A
FILENAME: CSUNVLLY.DWG	DWG. NO. CSK-1
SCALE: 1"=50'-0"	

PRELIMINARY ISSUE

LGAD_3. ANSI D. 22 x 34 in.

RATIONAL METHOD

TABLE 3.4 Recommended Runoff Coefficients[a]

Description of Area	Runoff Coefficients
Business	
Downtown	0.70 to 0.95
Neighborhood	0.50 to 0.70
Residential	
Single-family	0.30 to 0.50
Multi-units, detached	0.40 to 0.60
Multi-units, attached	0.60 to 0.75
Residential (suburban)	0.25 to 0.40
Apartment	0.50 to 0.70
Industrial	
Light	0.50 to 0.80
Heavy	0.60 to 0.90
Parks, cemeteries	0.10 to 0.25
Playgrounds	0.20 to 0.35
Railroad yard	0.20 to 0.35
Unimproved	0.10 to 0.30

It often is desirable to develop a composite runoff based on the percentage of different types of surface in the drainage area. This procedure often is applied to typical "sample" blocks as a guide to selecton of reasonable values of the coefficient for an entire area. Coefficients with respect to surface type currently in use are:

Character of Surface	Runoff Coefficients
Pavement	
Asphalt and Concrete	0.70 to 0.95
Brick	0.70 to 0.85
Roofs	0.75 to 0.95
Lawns, sandy soil	
Flat, 2 percent	0.13 to 0.17
Average, 2 to 7 percent	0.18 to 0.22
Steep, 7 percent	0.25 to 0.35

The coefficients in these two tabulations are applicable for storms of 5-to 10-yr frequencies. Less frequent, higher intensity storms will require the use of higher coefficients because infiltration and other losses have a proportionally smaller effect on runoff. The coefficients are based on the assumption that the design storm does not occur when the ground surface is frozen.

Appendix A: Design Use Values of Manning's n

channel material	n
clean, uncoated cast iron	0.013–0.015
clean, coated cast iron	0.012–0.014
dirty, tuberculated cast iron	0.015–0.035
riveted steel	0.015–0.017
lock-bar and welded	0.012–0.013
galvanized iron	0.015–0.017
brass and glass	0.009–0.013
wood stave	
small diameter	0.011–0.012
large diameter	0.012–0.013
concrete	
with rough joints	0.016–0.017
dry mix, rough forms	0.015–0.016
wet mix, steel forms	0.012–0.014
very smooth, finished	0.011–0.012
vitrified sewer	0.013–0.015
common-clay drainage tile	0.012–0.014
asbestos	0.011
planed timber	0.011
canvas	0.012
unplaned timber	0.014
brick	0.016
rubble masonry	0.017
smooth earth	0.018
firm gravel	0.023
corrugated metal pipe	0.022
natural channels, good condition	0.025
natural channels with stones and weeds	0.035
very poor natural channels	0.060

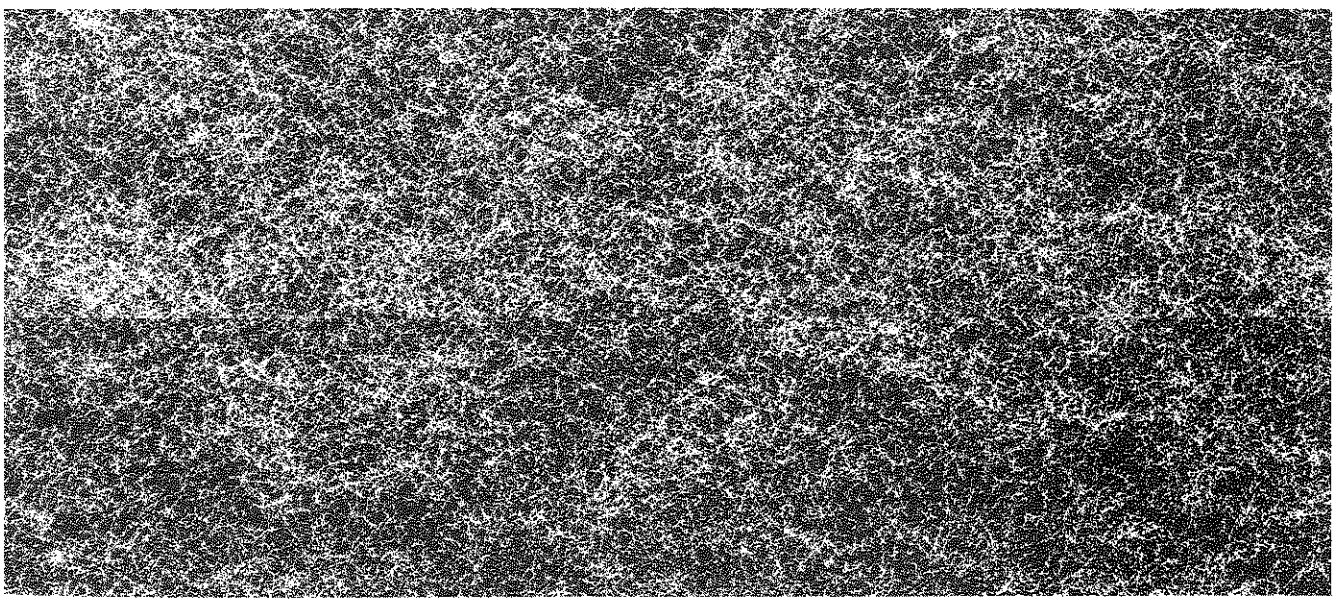


TABLE 4

CIRCULAR PIPE FLOW CAPACITY
Full Flow (cubic feet per second)

Mannings "n"= 0.012

Dia. (in.)	*Conv. Factor	% Slope (feet per 100 feet) 0.02	0.05	0.10	0.20	0.35	0.50	0.75	1.00	1.25	1.50	1.75	2.0	2.5	5.0	10.0	20.0
		(c.f.s.)															
3	0.957	0.014	0.021	0.030	0.043	0.057	0.068	0.083	0.096	0.107	0.12	0.13	0.14	0.15	0.21	0.30	0.43
4	2.062	0.029	0.046	0.065	0.092	0.122	0.146	0.179	0.206	0.231	0.25	0.27	0.29	0.33	0.46	0.65	0.92
5	3.738	0.053	0.084	0.118	0.167	0.221	0.264	0.324	0.374	0.418	0.46	0.49	0.53	0.59	0.84	1.18	1.67
6	6.079	0.086	0.136	0.192	0.272	0.360	0.430	0.526	0.608	0.680	0.74	0.80	0.86	0.96	1.36	1.92	2.72
8	13.091	0.185	0.293	0.414	0.585	0.774	0.926	1.134	1.309	1.464	1.60	1.73	1.85	2.07	2.93	4.14	5.85
10	23.74	0.34	0.53	0.75	1.06	1.40	1.68	2.06	2.37	2.65	2.91	3.14	3.36	3.75	5.31	7.51	10.61
12	38.60	0.55	0.86	1.22	1.73	2.28	2.73	3.34	3.86	4.32	4.73	5.11	5.46	6.10	8.63	12.21	17.26
15	69.98	0.99	1.56	2.21	3.13	4.14	4.95	6.06	7.00	7.82	8.57	9.26	9.90	11.06	15.65	22.13	31.30
18	113.80	1.61	2.54	3.60	5.09	6.73	8.05	9.86	11.38	12.72	13.94	15.05	16.09	17.99	25.45	35.99	50.89
21	171.65	2.43	3.84	5.43	7.68	10.16	12.14	14.87	17.17	19.19	21.02	22.71	24.28	27.14	38.38	54.28	76.77
24	245.08	3.47	5.48	7.75	10.96	14.50	17.33	21.22	24.51	27.40	30.02	32.42	34.66	38.75	54.80	77.50	109.60
27	335.51	4.74	7.50	10.61	15.00	19.85	23.72	29.06	33.55	37.51	41.09	44.38	47.45	53.05	75.0	106.1	150.0
30	444.35	6.28	9.94	14.05	19.87	26.29	31.42	38.48	44.44	49.68	54.42	58.78	62.84	70.26	99.4	140.5	198.7
36	722.57	10.22	16.16	22.85	32.31	42.75	51.09	62.58	72.26	80.79	88.50	95.59	102.19	114.25	161.6	228.5	323.1
42	1089.9	15.41	24.37	34.47	48.74	64.5	77.1	94.4	109.0	121.9	133.5	144.2	154.1	172.3	243.7	344.7	487.4
48	1556.1	22.01	34.80	49.21	69.59	92.1	110.0	134.8	155.6	174.0	190.6	205.9	220.1	246.0	348.0	492.1	695.9

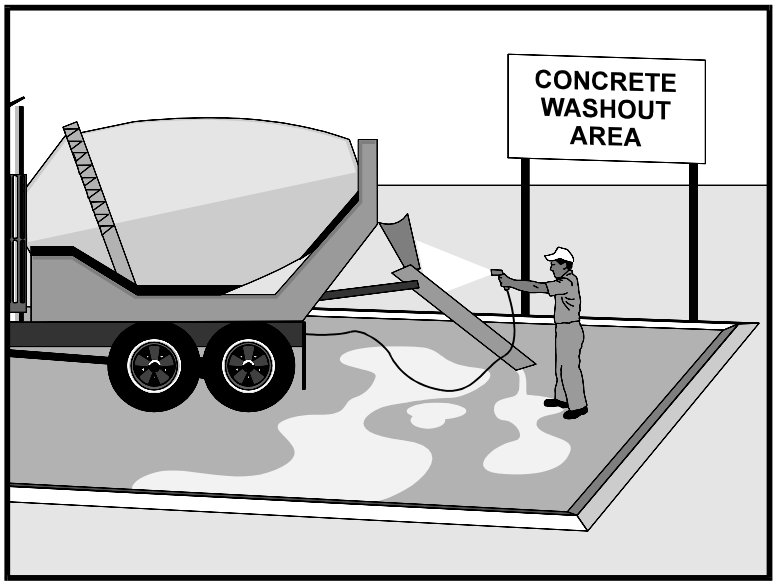
* Conveyance Factor = (1.486 x R2/3 x A) / n

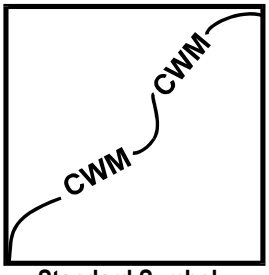
APPENDIX C

Best Management Practices

Concrete Waste Management

WM-8





Standard Symbol

BMP Objectives

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

Definition and Purpose

These are procedures and practices that are designed to minimize or eliminate the discharge of concrete waste materials to the storm drain systems or watercourses.

Appropriate Applications

- Concrete waste management procedures and practices are implemented on construction projects where concrete is used as a construction material or where concrete dust and debris result from demolition activities.
- Where slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition.
- Where concrete trucks and other concrete-coated equipment are washed on site, when approved by the Resident Engineer (RE). See also NS-8, "Vehicle and Equipment Cleaning."
- Where mortar-mixing stations exist.

Limitations

- None identified.

Standards and Specifications

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce concrete waste management procedures.

Concrete Demolition Wastes

- Stockpile concrete demolition wastes in accordance with BMP WM-3, "Stockpile Management."
- Disposal of hardened PCC and AC waste shall be in conformance with

Standard Specifications Section 7-1.13 or 15-3.02.

Concrete Slurry Waste Management and Disposal

- PCC and AC waste shall not be allowed to enter storm drainage systems or watercourses.
- A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities as shown on Page 7.
- A foreman and/or construction supervisor shall monitor onsite concrete working tasks, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Residue from saw cutting, coring and grinding operations shall be picked up by means of a vacuum device. Residue shall not be allowed to flow across the pavement and shall not be left on the surface of the pavement. See also BMP NS-3, "Paving and Grinding Operations."
- Vacuumed slurry residue shall be disposed in accordance with BMP WM-5, "Solid Waste Management" and Standard Specifications Section 7-1.13. Slurry residue shall be temporarily stored in a facility as described in "Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures" below), or within an impermeable containment vessel or bin approved by the Engineer.
- Collect and dispose of all residues from grooving and grinding operations in accordance with Standard Specifications Section 7-1.13, 42-1.02 and 42-2.02.

Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures

- Temporary concrete washout facilities shall be located a minimum of 15 m (50 ft) from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the RE. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. The sign shall be installed as shown on the plans and in conformance with the provisions in Standard Specifications Section 56-2, Roadside Signs.
- Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete

materials generated during washout procedures.

- Perform washout of concrete mixers, delivery trucks, and other delivery systems in designated areas only.
- Wash concrete only from mixer chutes into approved concrete washout facility. Washout may be collected in an impermeable bag or other impermeable containment devices for disposal.
- Pump excess concrete in concrete pump bin back into concrete mixer truck.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02.

Temporary Concrete Washout Facility Type "Above Grade"

- Temporary concrete washout facility Type "Above Grade" shall be constructed as shown on Page 6 or 7, with a recommended minimum length and minimum width of 3 m (10 ft), but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval from the RE.
- Straw bales, wood stakes, and sandbag materials shall conform to the provisions in BMP SC-9, "Straw Bale Barrier."
- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.
- Portable delineators shall conform to the provisions in Standard Specifications Section 12-3.04, "Portable Delineators." The delineator bases shall be cemented to the pavement in the same manner as provided for cementing pavement markers to pavement in Standard Specifications Section 85-1.06, "Placement." Portable delineators shall be applied only to a clean, dry surface.

Temporary Concrete Washout Facility (Type Below Grade)

- Temporary concrete washout facility Type "Below Grade" shall be constructed as shown on page 6, with a recommended minimum length and minimum width of 3m (10 ft). The quantity and volume shall be sufficient to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense,

upon approval of the RE. Lath and flagging shall be commercial type.

- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.

- The soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, as determined by the RE, the hardened concrete shall be removed and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02. Disposal of PCC dried residues, slurries or liquid waste shall be disposed of outside the highway right-of-way in conformance with provisions of Standard Specifications Section 7-1-13. Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and shall be disposed of outside the highway right-of-way in conformance with the provisions of the Standard Specifications, Section 7-1.13.

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities shall be backfilled and repaired in conformance with the provisions in Standard Specifications Section 15-1.02, "Preservation of Property."

Maintenance and Inspection

- The Contractor's Water Pollution Control Manager (WPCM) shall monitor on site concrete waste storage and disposal procedures at least weekly or as directed by the RE.

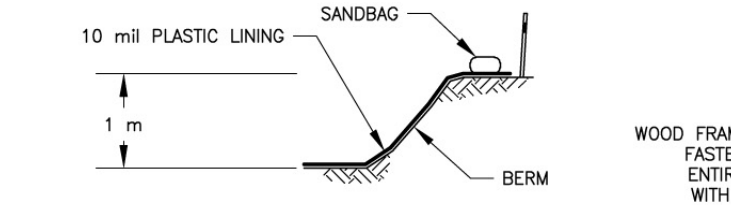
- The WPCM shall monitor concrete working tasks, such as saw cutting, coring, grinding and grooving daily to ensure proper methods are employed or as directed by the RE.

- Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 100 mm (4 inches) for above grade facilities and 300 mm (12 inches) for below grade facilities. Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02.

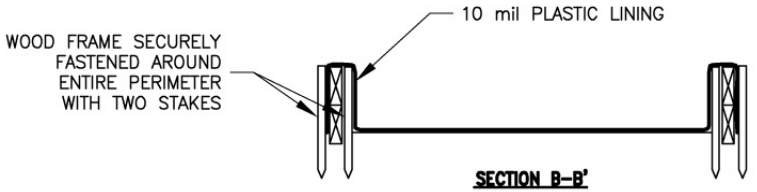
- Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

- Temporary concrete washout facilities shall be inspected for damage (i.e.

tears in polyethylene liner, missing sandbags, etc.). Damaged facilities shall be repaired.



SECTION A–A'
NOT TO SCALE



SECTION B–B'
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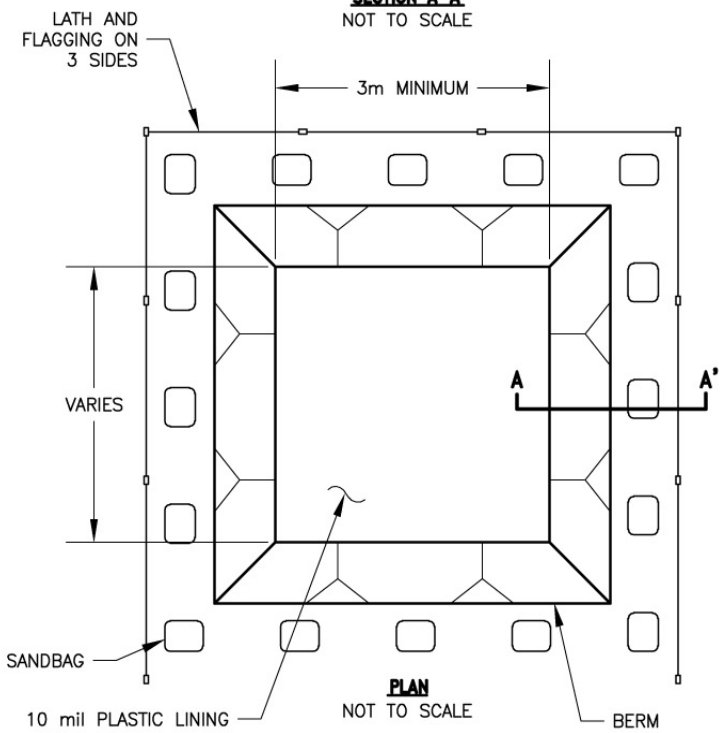
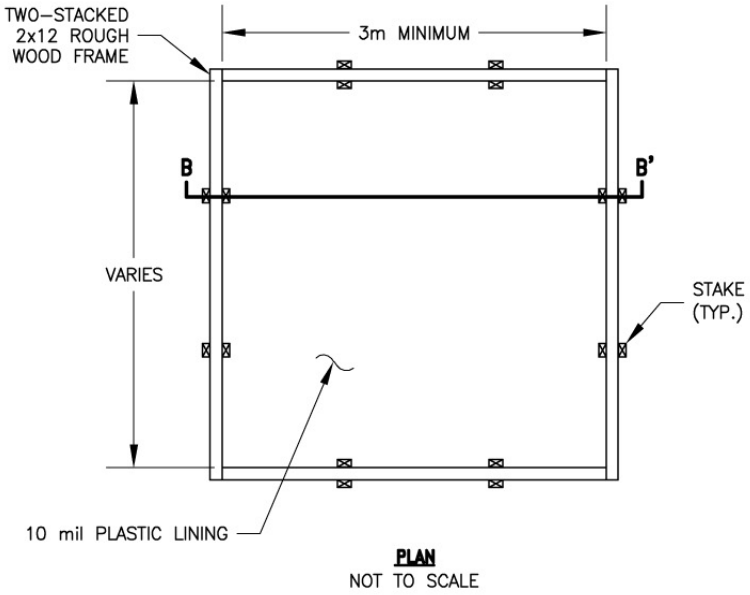


PLAN
NOT TO SCALE

TYPE "BELOW GRADE"

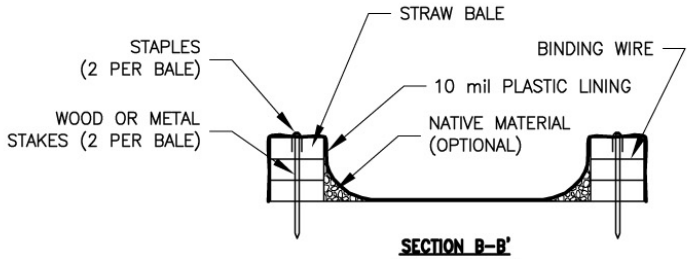


PLAN
NOT TO SCALE

TYPE "ABOVE GRADE" WITH WOOD PLANKS

NOTES:

1. ACTUAL LAYOUT DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN (SEE PAGE 6) SHALL BE INSTALLED WITHIN 10 m OF THE TEMPORARY CONCRETE WASHOUT FACILITY.



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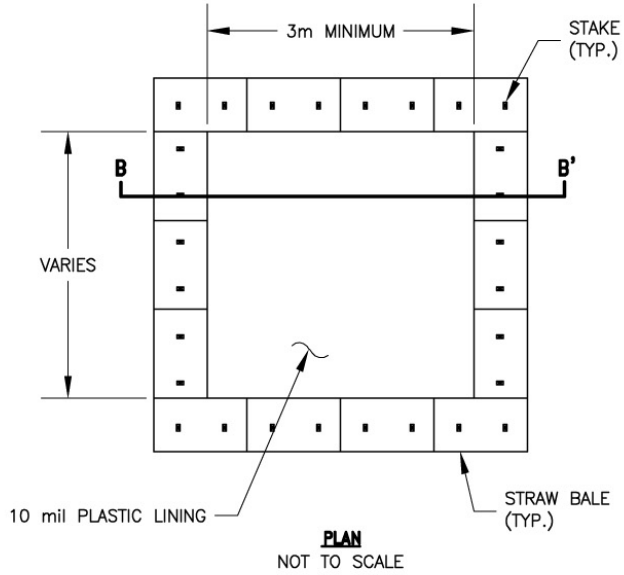
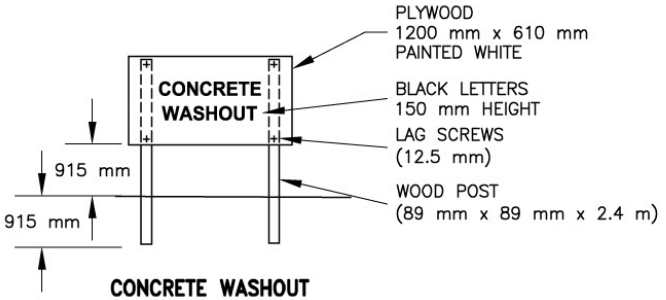
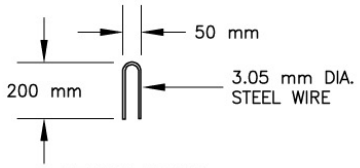


PLAN
NOT TO SCALE

**TYPE "ABOVE GRADE"
WITH STRAW BALES**



**CONCRETE WASHOUT
SIGN DETAIL
(OR EQUIVALENT)**



STAPLE DETAIL

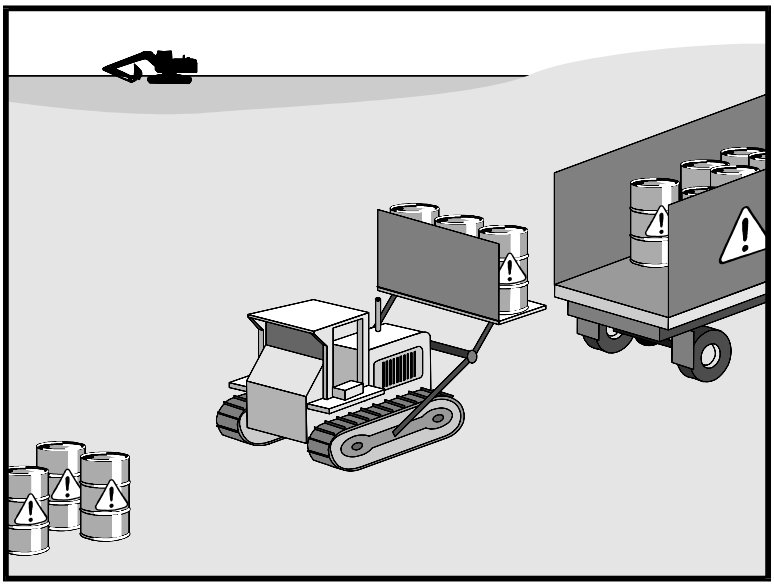
NOTES:

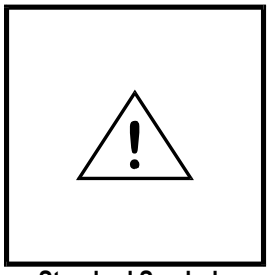
1. ACTUAL LAYOUT DETERMINED IN THE FIELD.
2. THE CONCRETE WASHOUT SIGN (SEE FIG. 4–15) SHALL BE INSTALLED WITHIN 10 m OF THE TEMPORARY CONCRETE WASHOUT FACILITIY.

CALTRANS/FIG4–14.DWG SAC 8–14–02

Hazardous Waste Management

WM-6





Standard Symbol

BMP Objectives

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

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharge of pollutants from construction site hazardous waste to the storm drain systems or to watercourses.

Appropriate Applications

- This best management practice (BMP) applies to all construction projects.
- Hazardous waste management practices are implemented on construction projects that generate waste from the use of:
  - Petroleum Products,
  - Asphalt Products,
  - Concrete Curing Compounds,
  - Pesticides,
  - Acids,
  - Paints,
  - Stains,
  - Solvents,
  - Wood Preservatives,
  - Roofing Tar, or
  - Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302.

Limitations

- Nothing in this BMP relieves the Contractor from responsibility for compliance with federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.
- This BMP does not cover aerially deposited lead (ADL) soils. For ADL soils refer to BMP WM-7, "Contaminated Soil Management," and the project special provisions.

Standards and Specifications

Education

- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper hazardous waste management procedures and practices.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.

Storage Procedures

- Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172,173, 178, and 179.
- All hazardous waste shall be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.
- Waste containers shall be stored in temporary containment facilities that shall comply with the following requirements:
  - Temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater.

- Temporary containment facility shall be impervious to the materials stored there for a minimum contact time of 72 hours.

- Temporary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks accumulated rainwater and spills shall be placed into drums after each rainfall. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.

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

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

- Throughout the rainy season, temporary containment facilities shall be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs. A storage facility having a solid cover and sides is preferred to a temporary tarp. Storage facilities shall be equipped with adequate ventilation.

- Drums shall not be overfilled and wastes shall not be mixed.

- Unless watertight, containers of dry waste shall be stored on pallets.

- Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, watercourses or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.

- Ensure that adequate hazardous waste storage volume is available.

- Ensure that hazardous waste collection containers are conveniently located.

- Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

- Minimize production or generation of hazardous materials and hazardous waste on the job site.

- Use containment berms in fueling and maintenance areas and where the potential for spills is high.

- Segregate potentially hazardous waste from non-hazardous construction site debris.
- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.

Disposal Procedures

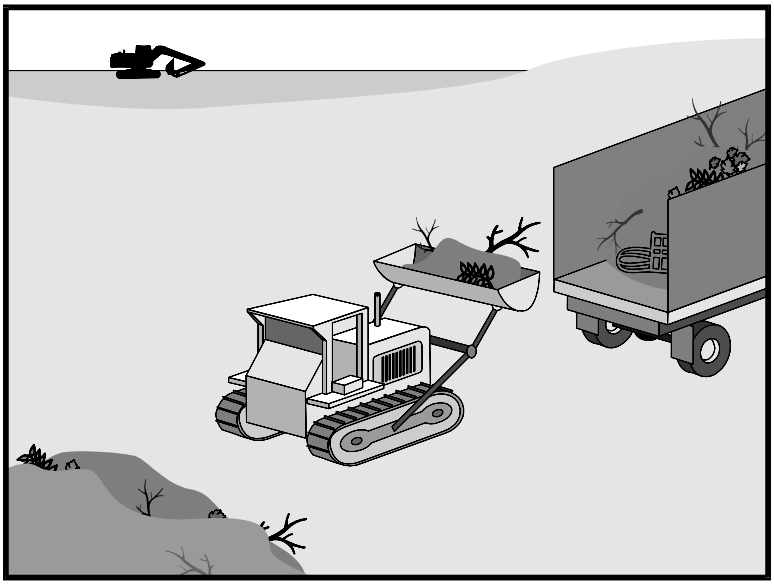
- Waste shall be disposed of outside the highway right-of-way within 90 days of being generated, or as directed by the Resident Engineer (RE). In no case shall hazardous waste storage exceed requirements in Title 22 CCR, Section 66262.34.
- Waste shall be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A Department of Health Services (DHS) certified laboratory shall sample waste and classify it to determine the appropriate disposal facility.
- Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for solid waste construction debris.
- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.
- Recycle any useful material such as used oil or water-based paint when practical.
- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

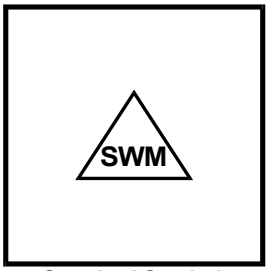
Maintenance and Inspection

- A foreman and/or construction supervisor shall monitor on-site hazardous waste storage and disposal procedures.
- Waste storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Storage areas shall be inspected in conformance with the provisions in the contract documents.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Hazardous spills shall be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, shall be notified of spills of Federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.
- Copy of the hazardous waste manifests shall be provided to the RE.

Solid Waste Management

WM-5





Standard Symbol

BMP Objectives

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

Definition and Purpose

Solid waste management procedures and practices are designed to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling, or removal of construction site wastes.

Appropriate Applications

Solid waste management procedures and practices are implemented on all construction projects that generate solid wastes.

Solid wastes include but are not limited to:

- Construction wastes including brick, mortar, timber, steel and metal scraps, sawdust, pipe and electrical cuttings, non-hazardous equipment parts, styrofoam and other materials used to transport and package construction materials.
- Highway planting wastes, including vegetative material, plant containers, and packaging materials.
- Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers, and smoking materials, including litter generated by the public.

Limitations

- Temporary stockpiling of certain construction wastes may not necessitate stringent drainage related controls during the non-rainy season or in desert areas with low rainfall.

Standards and Specifications

Education

- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper solid waste procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Wherever possible, minimize production of solid waste materials.

Collection, Storage, and Disposal

- Dumpsters of sufficient size and number shall be provided to contain the solid waste generated by the project and properly serviced.
- Littering on the project site shall be prohibited.
- To prevent clogging of the storm drainage system litter and debris removal from drainage grates, trash racks, and ditch lines shall be a priority.
- Trash receptacles shall be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Construction debris and litter from work areas within the construction limits of the project site shall be collected and placed in watertight dumpsters at least weekly regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to drain inlets, storm water drainage systems or watercourses.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of outside the highway right-of-way in conformance with the provisions in the Standard Specifications Section 7-1.13.
- Litter stored in collection areas and containers shall be handled and disposed of by trash hauling contractors.
- Construction debris and waste shall be removed from the site every two weeks or as directed by the RE.

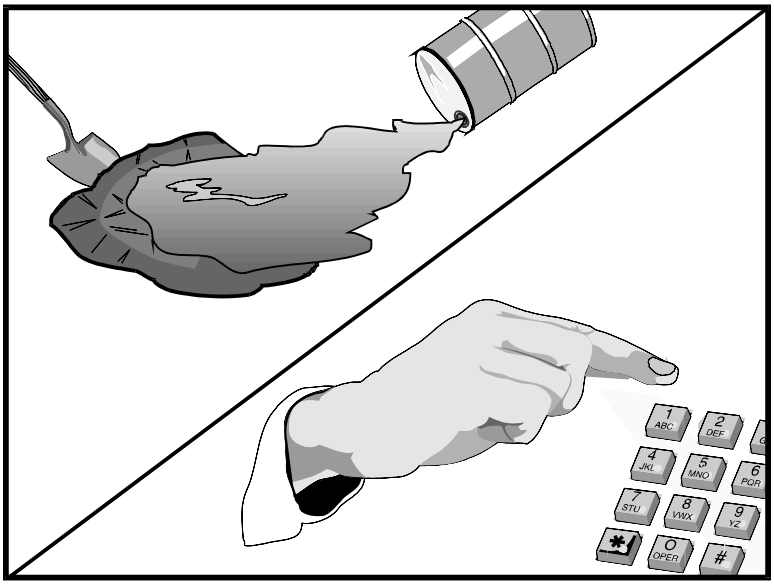
- Construction material visible to the public shall be stored or stacked in an orderly manner to the satisfaction of the RE.
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas shall be located at least 15 m (50 ft) from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be securely covered from wind and rain by covering the waste with tarps or plastic sheeting or protected in conformance with the applicable Disturbed Soil Area protection section.
- Dumpster washout on the project site is not allowed.
- Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site.
- Plan for additional containers during the demolition phase of construction.
- Plan for more frequent pickup during the demolition phase of construction.
- Construction waste shall be stored in a designated area approved by the RE.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Keep the site clean of litter debris.
- Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Dispose of non-hazardous waste in accordance with Standard Specification 7-1.13, Disposal of Material Outside the Highway Right of Way.
- For disposal of hazardous waste, see BMP WM-6, “Hazardous Waste Management.” Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Maintenance and Inspection

- The WPCM shall monitor onsite solid waste storage and disposal procedures.
- Police site for litter and debris.

Spill Prevention and Control

WM-4



Standard Symbol

BMP Objectives

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

Definition and Purpose

These procedures and practices are implemented to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses.

Appropriate Application

This best management practice (BMP) applies to all construction projects. Spill control procedures are implemented anytime chemicals and/or hazardous substances are stored. Substances may include, but are not limited to:

- Soil stabilizers/binders.
- Dust Palliatives.
- Herbicides.
- Growth inhibitors.
- Fertilizers.
- Deicing/anti-icing chemicals.
- Fuels.
- Lubricants.
- Other petroleum distillates.

To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110, 117, and 302, and sanitary and septic wastes shall be contained and cleaned up immediately.

Limitations

- This BMP only applies to spills caused by the contractor.
- Procedures and practices presented in this BMP are general. Contractor shall identify appropriate practices for the specific materials used or stored on-site.

Standards and Specifications

- To the extent that it doesn't compromise clean up activities, spills shall be covered and protected from storm water run-on during rainfall.
- Spills shall not be buried or washed with water.
- Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose shall be stored and disposed of in conformance with the special provisions.
- Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses and shall be collected and disposed of in accordance with BMP WM-10, "Liquid Waste Management."
- Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or watercourses.
- Proper storage, clean-up and spill reporting instruction for hazardous materials stored or used on the project site shall be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas shall be kept clean, well organized and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed to maintain proper function.

Education

- Educate employees and subcontractors on what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.
- The Contractor's Water Pollution Control Manager (WPCM) shall oversee and enforce proper spill prevention and control measures.

Cleanup and Storage Procedures

- Minor Spills
  - Minor spills typically involve small quantities of oil, gasoline, paint, etc., which can be controlled by the first responder at the discovery of the spill.
  - Use absorbent materials on small spills rather than hosing down or burying the spill.
  - Remove the absorbent materials promptly and dispose of properly.
  - The practice commonly followed for a minor spill is:
    - Contain the spread of the spill.
    - Recover spilled materials.
    - Clean the contaminated area and/or properly dispose of contaminated materials.
- Semi-Significant Spills
  - Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.
  - Clean up spills immediately:
    - Notify the project foreman immediately. The foreman shall notify the Resident Engineer (RE).
    - Contain spread of the spill.
    - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.
    - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil.
    - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

- Significant/Hazardous Spills
  - For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:
    - Notify the RE immediately and follow up with a written report.
    - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
    - Notify the Governor's Office of Emergency Services Warning Center, (805) 852-7550.
    - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor shall notify the National Response Center at (800) 424-8802.
    - Notification shall first be made by telephone and followed up with a written report.
    - The services of a spills contractor or a Haz-Mat team shall be obtained immediately. Construction personnel shall not attempt to clean up the spill until the appropriate and qualified staff have arrived at the job site.
    - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, RWQCB, etc.

Maintenance and Inspection

- Verify weekly that spill control clean up materials are located near material storage, unloading, and use areas.
- Update spill prevention and control plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals used or stored onsite.

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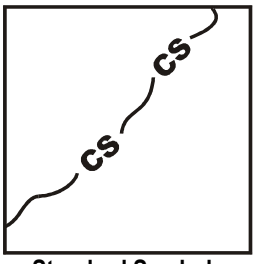
Stockpile Management

WM-3



Standard Symbol

BMP Objectives

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

Definition and Purpose

Stockpile management procedures and practices are designed to reduce or eliminate air and storm water pollution from stockpiles of soil, and paving materials such as portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate subbase or pre-mixed aggregate, asphalt binder (so called "cold mix" asphalt) and pressure treated wood.

Appropriate Applications

Implemented in all projects that stockpile soil and other materials.

Limitations

- None identified

Standards and Specifications

- Protection of stockpiles is a year-round requirement.
- Locate stockpiles a minimum of 15 m (50 ft)away from concentrated flows of storm water, drainage courses, and inlets.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information see BMP WE-1, "Wind Erosion Control."
- Stockpiles of contaminated soil shall be managed in accordance with BMP WM-7, "Contaminated Soil Management."
- Bagged materials should be placed on pallets and under cover.

Protection of Non-Active Stockpiles

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

- ***Soil stockpiles:***
  - During the rainy seasons, soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
  - During the non-rainy season, soil stockpiles shall be covered and protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
- ***Stockpiles of portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate subbase:***
  - During the rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier at all times.
  - During the non-rainy season, the stockpiles shall be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.
- ***Stockpiles of "cold mix":***
  - During the rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material at all times.
  - During the non-rainy season, cold mix stockpiles shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.
- ***Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate:***
  - During the rainy season, treated wood shall be covered with plastic or comparable material at all times.
  - During the non-rainy season, treated wood shall be covered with plastic or comparable material and shall be placed on pallets prior to the onset of precipitation.

Protection of Active Stockpiles

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

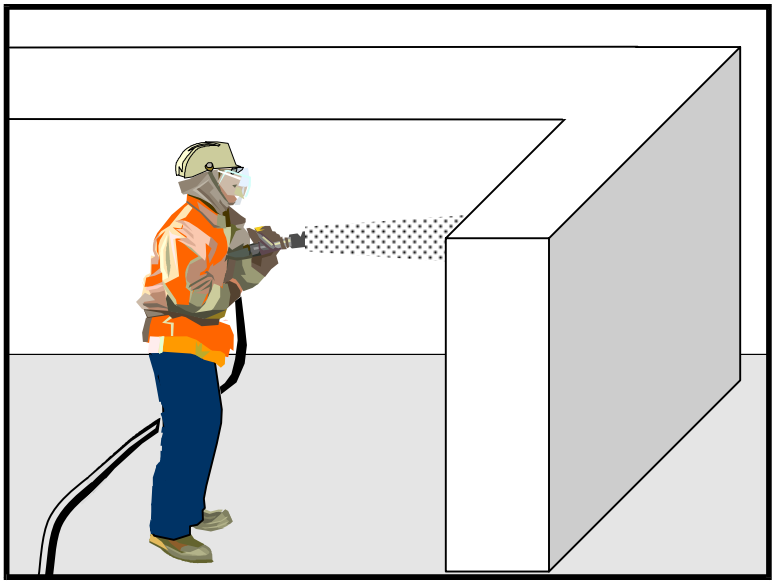
- All stockpiles shall be covered, stabilized, or protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

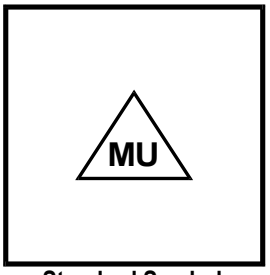
Maintenance and Inspections

- Repair and/or replace perimeter controls and covers as needed, or as directed by the RE, to keep them functioning properly. Sediment shall be removed when sediment accumulation reaches one-third (1/3) of the barrier height.

Material Use

WM-2





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

- Hazardous chemicals such as:

  Acids,
  lime,
  glues,
  adhesives,
  paints,
  solvents, and
  curing compounds.

- Soil stabilizers and binders.
- Fertilizers.
- Detergents.
- Plaster.
- Petroleum products such as fuel, oil, and grease.
- Asphalt and concrete components.
- Pesticides and herbicides.
- Other materials that may be detrimental if released to the environment.

Material Use

WM-2

Limitations

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

Standards and Specifications

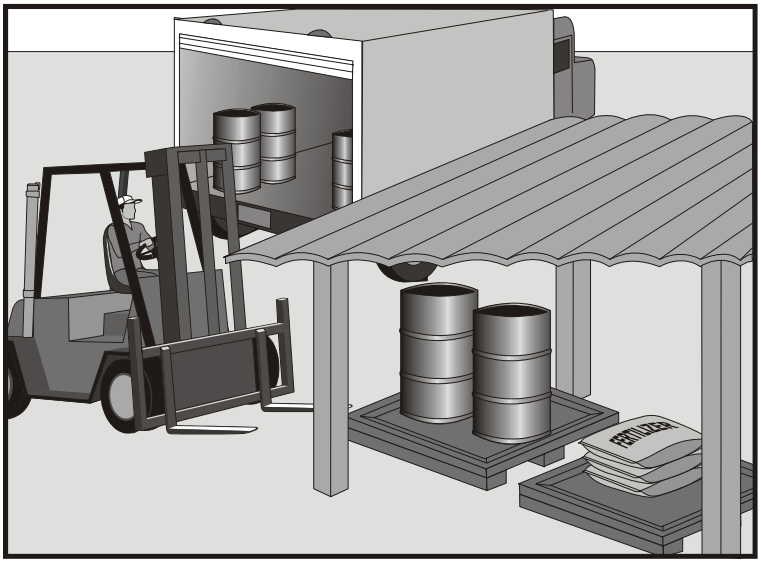
- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials.
- Latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, may be disposed of with other construction debris.
- Do not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

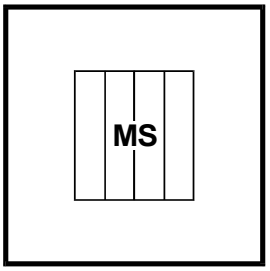
Maintenance and Inspections

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

Material Delivery and Storage

WM-1





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

- Hazardous chemicals such as:
  - Acids,
  - lime,
  - glues,
  - adhesives,
  - paints,
  - solvents, and
  - curing compounds.
- Soil stabilizers and binders.
- Fertilizers.
- Detergents.
- Plaster.
- Petroleum products such as fuel, oil, and grease.
- Asphalt and concrete components.
- Pesticides and herbicides.

- Other materials that may be detrimental if released to the environment.

Limitations

- Space limitation may preclude indoor storage.
- Storage sheds must meet building & fire code requirements.

Standards and Specifications

General

- Train employees and subcontractors on the proper material delivery and storage practices.
- Temporary storage area shall be located away from vehicular traffic.
- Material Safety Data Sheets (MSDS) shall be supplied to the Resident Engineer (RE) for all materials stored.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall be placed in temporary containment facilities for storage.
- Throughout the rainy season, each temporary containment facility shall have a permanent cover and side wind protection or be covered during non-working days and prior to and during rain events.
- A temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids shall be sent to an approved disposal site.
- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.

-
- Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain, throughout the rainy season, bagged and boxed materials shall be covered during non-working days and prior to rain events.
- Stockpiles shall be protected in accordance with BMP WM-3, "Stockpile Management."
- Minimize the material inventory stored on-site (e.g., only a few days supply).
- Have proper storage instructions posted at all times in an open and conspicuous location.
- Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and when possible, under cover in secondary containment.
- Keep hazardous chemicals well labeled and in their original containers.
- Keep ample supply of appropriate spill clean up material near storage areas.
- Also see BMP WM-6, "Hazardous Waste Management", for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored on-site.
- Employees trained in emergency spill clean-up procedures shall be present when dangerous materials or liquid chemicals are unloaded.

Spill Clean-up

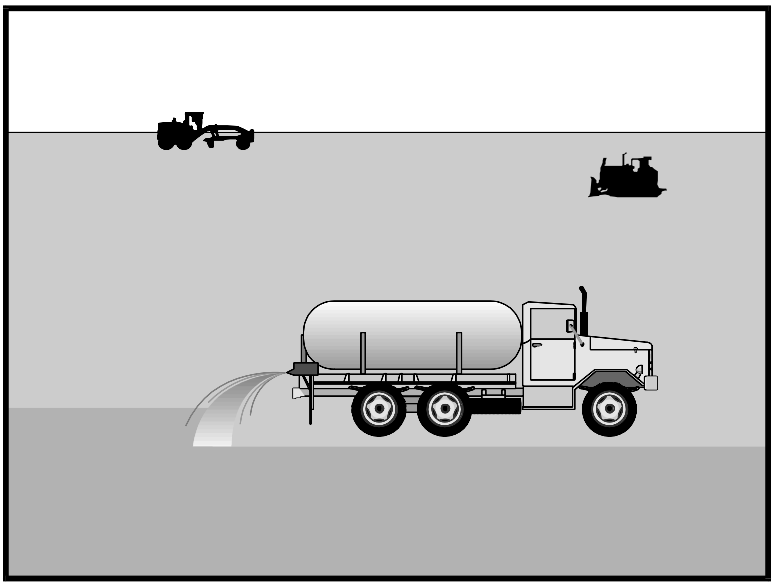
- Contain and clean up any spill immediately.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.
- See BMP WM-4, "Spill Prevention and Control", for spills of chemicals and/or hazardous materials.

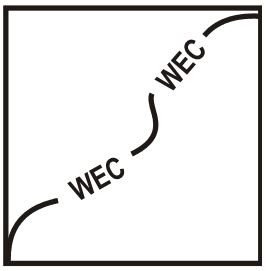
Maintenance and Inspection

- Storage areas shall be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Inspect storage areas before and after rainfall events, and at least weekly during other times. Collect and place into drums any spills or accumulated rainwater.

Wind Erosion Control

WE-1





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

Limitations

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

Standards and Specifications

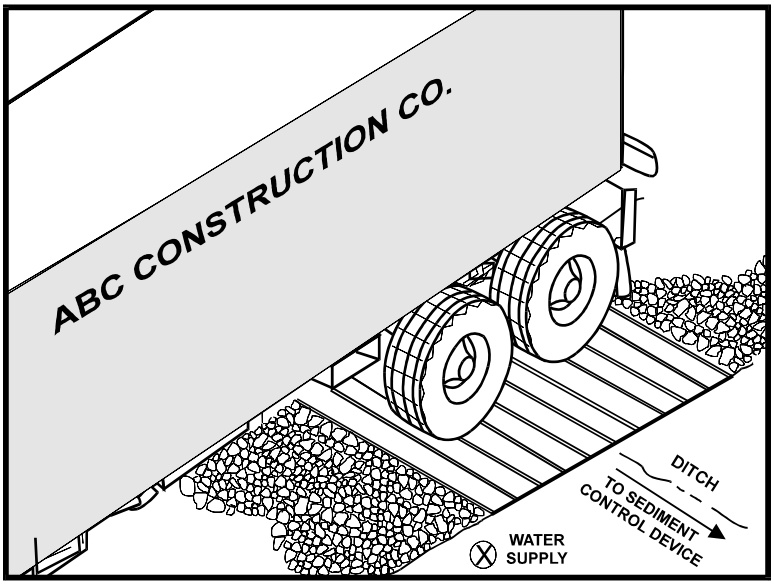
- Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment shall be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit shall be available at all times to apply water or dust palliative to the project.
- If reclaimed water is used, the sources and discharge must meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements. Non-potable water shall not be conveyed in tanks or drain pipes that will be used to convey potable water and there shall be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances shall be marked "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers and soil binders will also provide wind erosion control benefits.

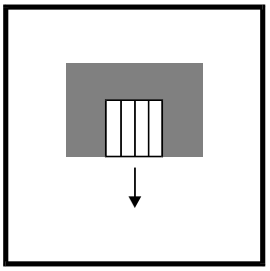
Maintenance and Inspection

- Check areas that have been protected to ensure coverage.

Entrance/Outlet Tire Wash

TC-3





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

- Requires a supply of wash water.
- Requires a turnout or doublewide exit to avoid having entering vehicles drive through the wash area.

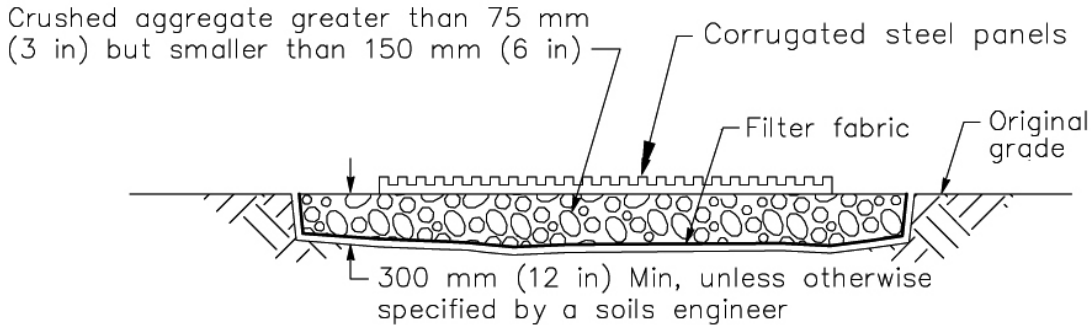
Standards and Specifications

- Incorporate with a stabilized construction entrance/exit. See BMP TC-1, "Stabilized Construction Entrance/Exit."
- Construct on level ground when possible, on a pad of coarse aggregate, greater than 75 mm (3 inches) and smaller than 150 mm (6 inches). A geotextile fabric shall be placed below the aggregate.
- Wash rack shall be designed and constructed/manufactured for anticipated traffic loads.
- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch shall be of sufficient grade, width, and depth to carry the wash runoff.

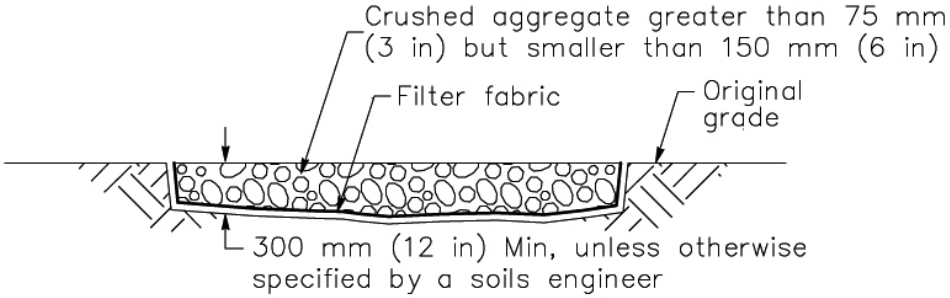
- Require all employees, subcontractors, and others that leave the site with mud-caked tires and/or undercarriages to use the wash facility.
- Implement BMP SC-7, "Street Sweeping and Vacuuming" as needed.
- Use of constructed or prefabricated steel plate with ribs for entrance/exit access is allowed with written approval of RE.

Maintenance and Inspection

- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.



SECTION A–A
NOT TO SCALE



SECTION B–B
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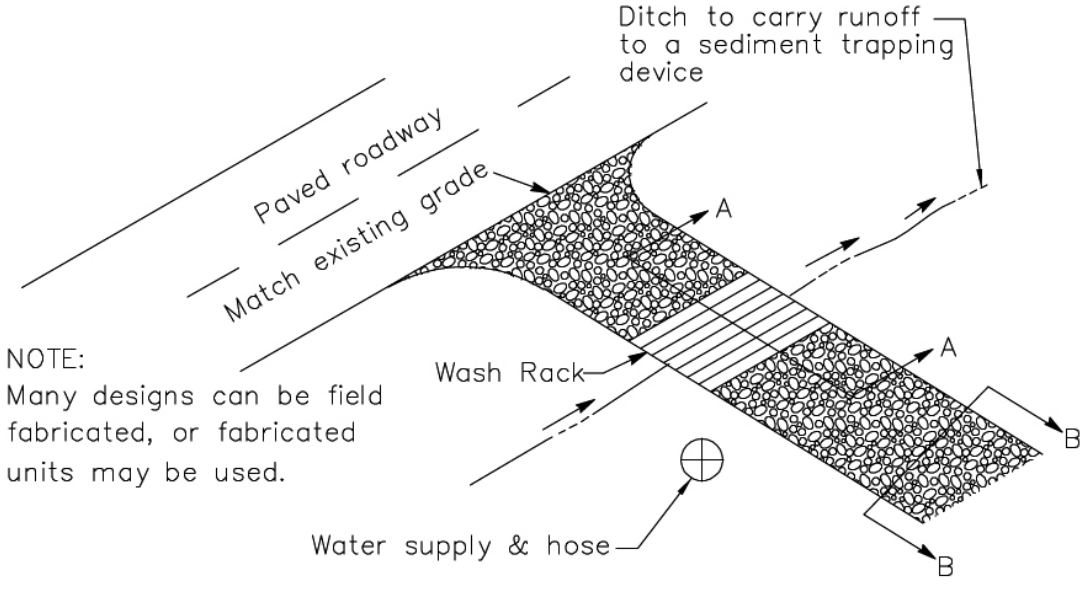
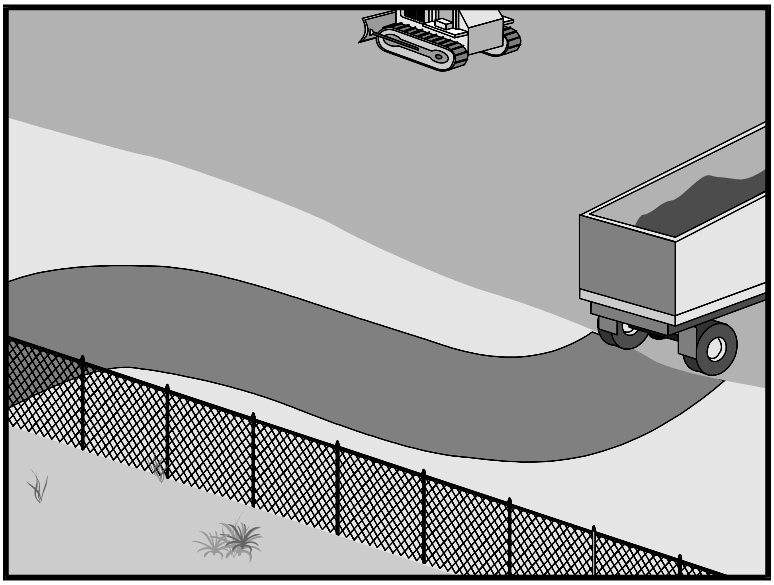
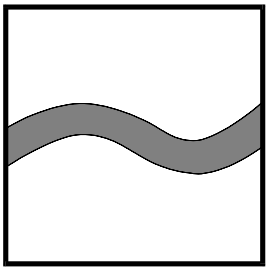


TYPICAL TIRE WASH
NOT TO SCALE

Stabilized Construction Roadway

TC-2





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- Construction roadways and short-term detour roads:
  - Where mud tracking is a problem during wet weather.
  - Where dust is a problem during dry weather.
  - Adjacent to water bodies.
  - Where poor soils are encountered.
  - Where there are steep grades and additional traction is needed.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

- Materials will likely need to be removed prior to final project grading and stabilization.
- Site conditions will dictate design and need.
- May not be applicable to very short duration projects.
- Limit speed of vehicles to control dust.

Stabilized Construction Roadway

TC-2

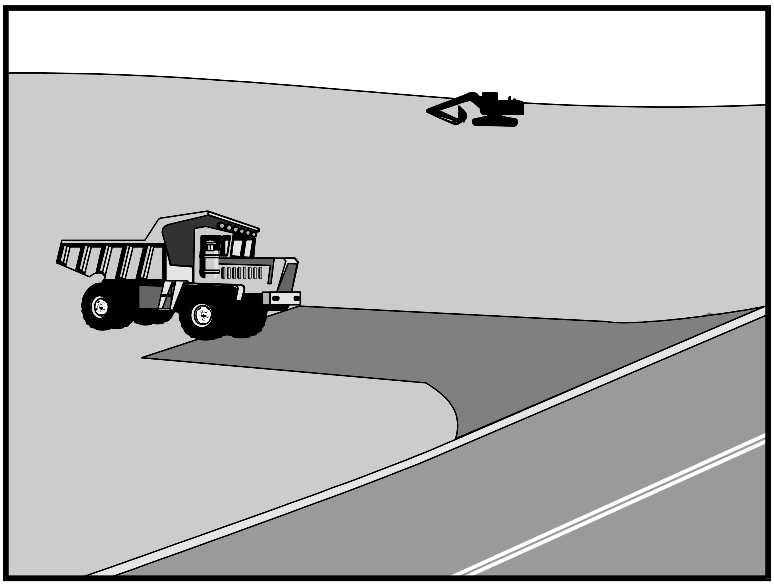
Standards and Specifications

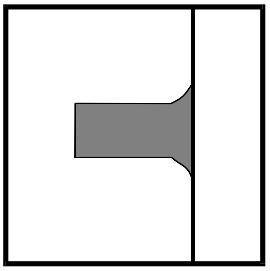
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support the heaviest vehicles and equipment that will use it.
- Stabilize roadway using aggregate, asphalt concrete, or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or asphalt concrete (AC) grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 300 mm (12 in) depth, or place aggregate to a depth recommended by the RE or Construction Storm Water Coordinator. Crushed aggregate greater than 75 mm (3 inches) and smaller than 150 mm (6 inches) shall be used.

Maintenance and Inspection

- Inspect routinely for damage and repair as needed, or as directed by the RE.
- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.

Stabilized Construction Entrance/Exit TC-1





Standard Symbol

BMP Objectives

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

Definition and Purpose

A stabilized construction access is 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

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

Limitations

- Site conditions will dictate design and need.

Standards and Specifications

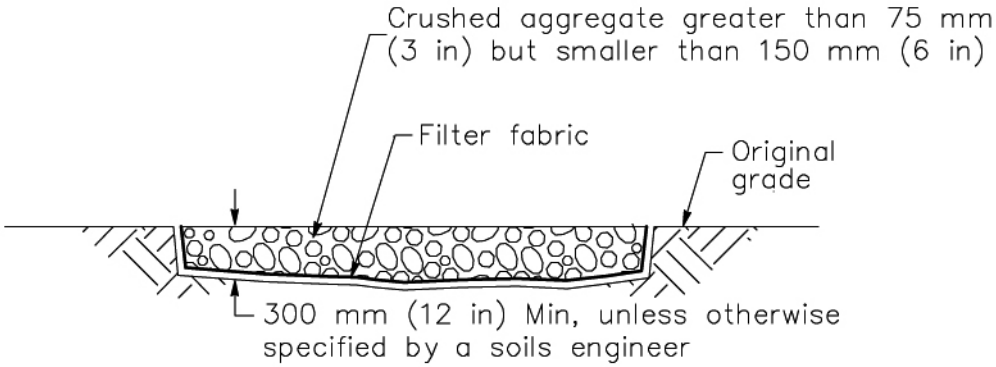
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment-trapping device before discharge.
- Design stabilized entrance/exit to support the heaviest vehicles and equipment that will use it.

- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. The use of asphalt concrete (AC) grindings for stabilized construction access/roadway is not allowed.
- Use of constructed/manufactured steel plates with ribs for entrance/exit access is allowed with written approval from the RE.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 300 mm (12 in) depth, or place aggregate to a depth recommended by the RE. Crushed aggregate greater than 75 mm (3 inches) and smaller than 150 mm (6 inches) shall be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Implement BMP SC-7, "Street Sweeping and Vacuuming" as needed and as required.
- Require all employees, subcontractors, and suppliers to utilize the stabilized construction access.
- All exit locations intended to be used continuously and for a period of time shall have stabilized construction entrance/exit BMPs (TC-1 "Stabilized Construction Entrance/Exit" or TC-3 "Entrance/Outlet Tire Wash").

Maintenance and Inspection

- Inspect routinely for damage and assess effectiveness of the BMP. Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment or as directed by the RE.
- Keep all temporary roadway ditches clear.
- Inspect for damage and repair as needed.

Stabilized Construction Entrance/Exit TC-1



SECTION B–B
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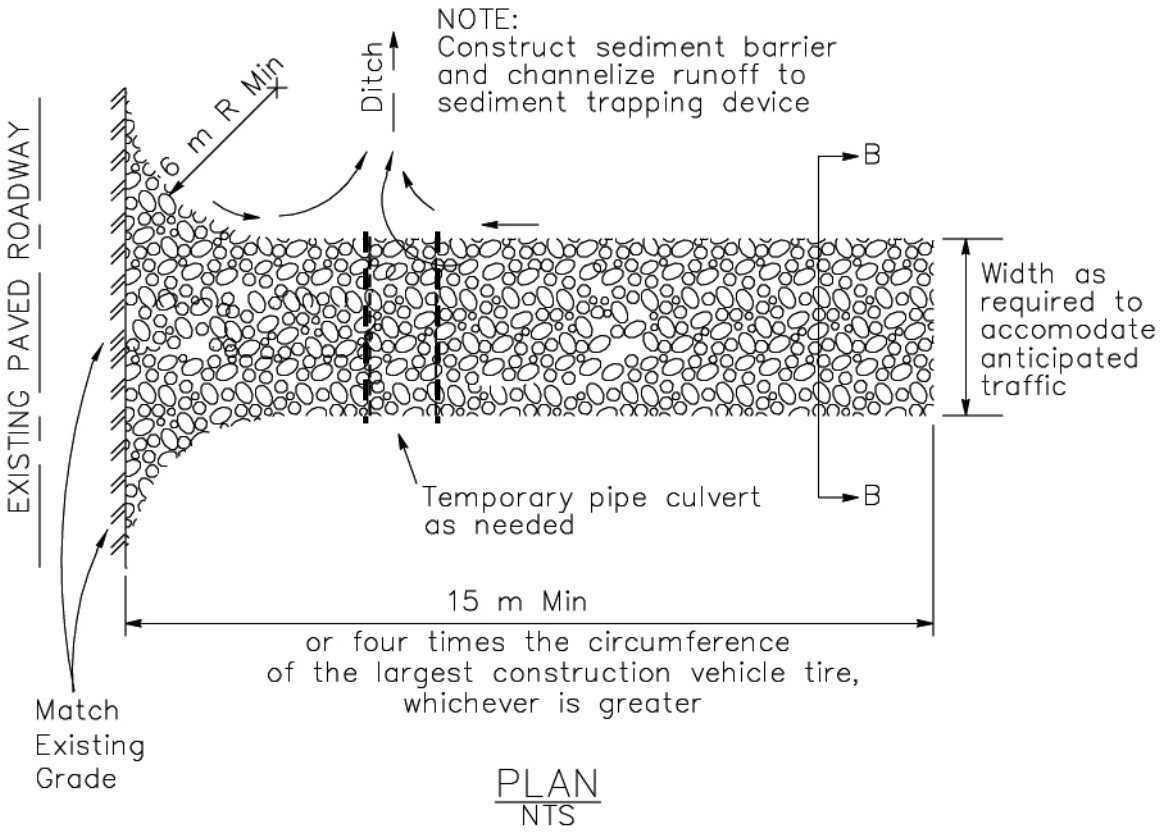
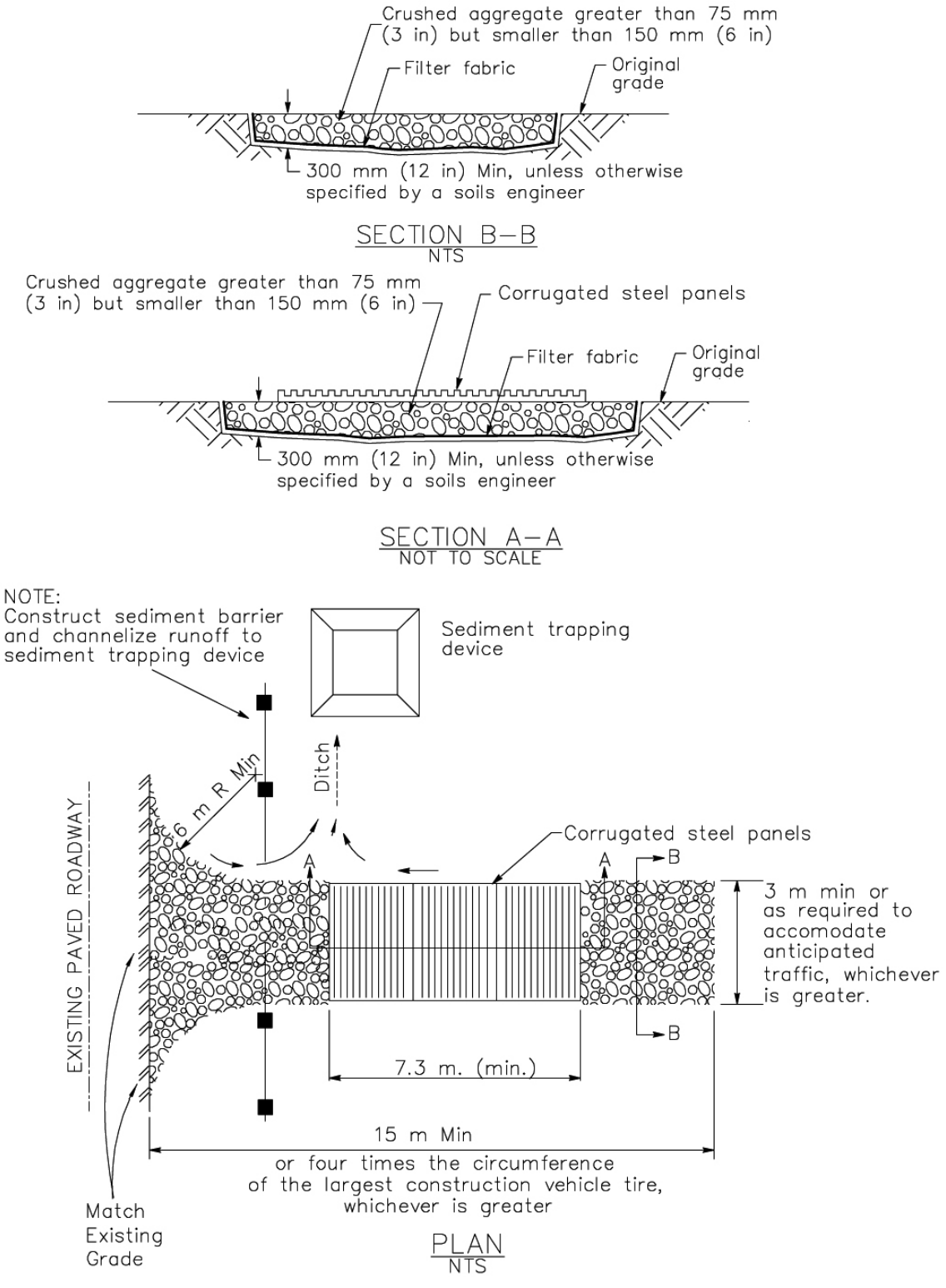


PLAN
NTS

Stabilized Contraction Entrance/Exit (Type 1)

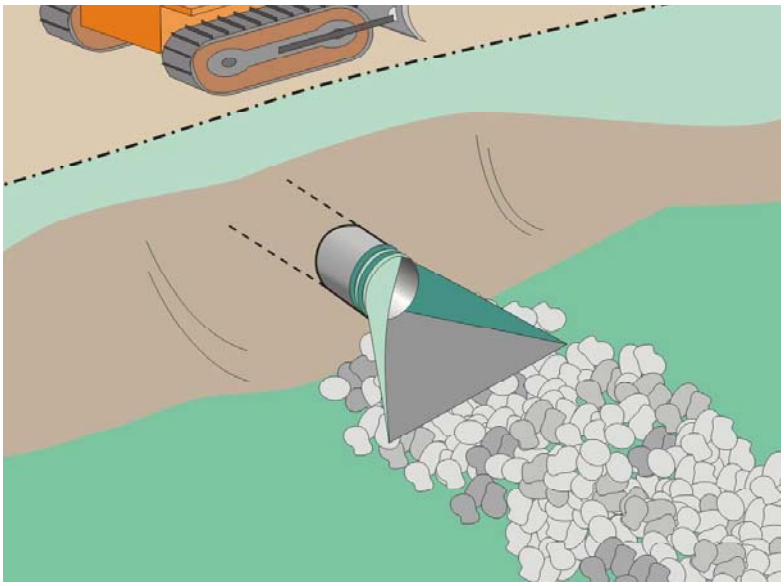
Stabilized Construction Entrance/Exit TC-1

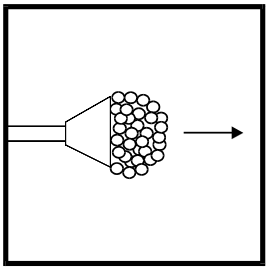


Stabilized Construction Entrance/Exit (Type 2)

Outlet Protection/Velocity Dissipation Devices

SS-10





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- These devices may be used at the following locations:
  - Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits or channels.
  - Outlets located at the bottom of mild to steep slopes.
  - Discharge outlets that carry continuous flows of water.
  - Outlets subject to short, intense flows of water, such as flash floods.
  - Points where lined conveyances discharge to unlined conveyances.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

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

Outlet Protection/Velocity Dissipation Devices

SS-10

Standards and Specifications

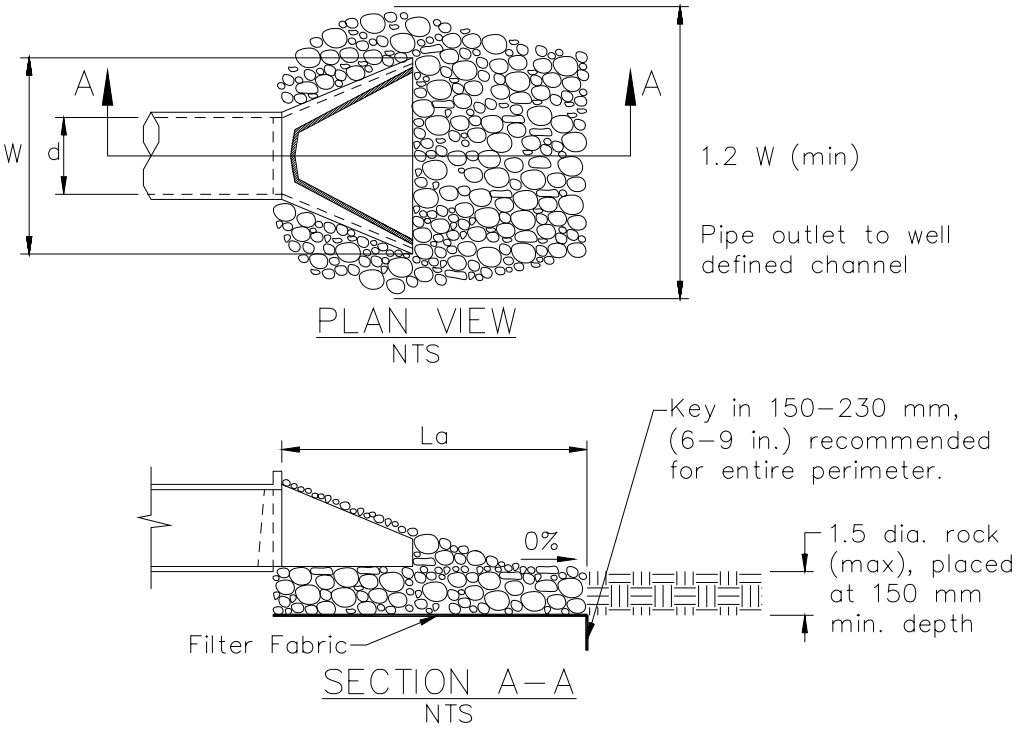
- There are many types of energy dissipaters, with rock being the one that is represented in the figure on Page 3. Please note that this is only one example and the RE may approve other types of devices proposed by the contractor.
- Install riprap, grouted riprap, or concrete apron at selected outlet. Riprap aprons are best suited for temporary use during construction.
- Carefully place riprap to avoid damaging the filter fabric.
- For proper operation of apron:
  - Align apron with receiving stream and keep straight throughout its length. If a curve is needed to fit site conditions, place it in upper section of apron.
  - If size of apron riprap is large, protect underlying filter fabric with a gravel blanket.
- Outlets on slopes steeper than 10% shall have additional protection.

Maintenance and Inspection

- Inspect temporary measures prior to the rainy season, after rainfall events, and regularly (approximately once per week) during the rainy season.
- Inspect apron for displacement of the riprap and/or damage to the underlying fabric. Repair fabric and replace riprap that has washed away.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying filter fabric immediately.
- Temporary devices shall be completely removed as soon as the surrounding drainage area has been stabilized, or at the completion of construction.

Outlet Protection/Velocity Dissipation Devices

SS-10

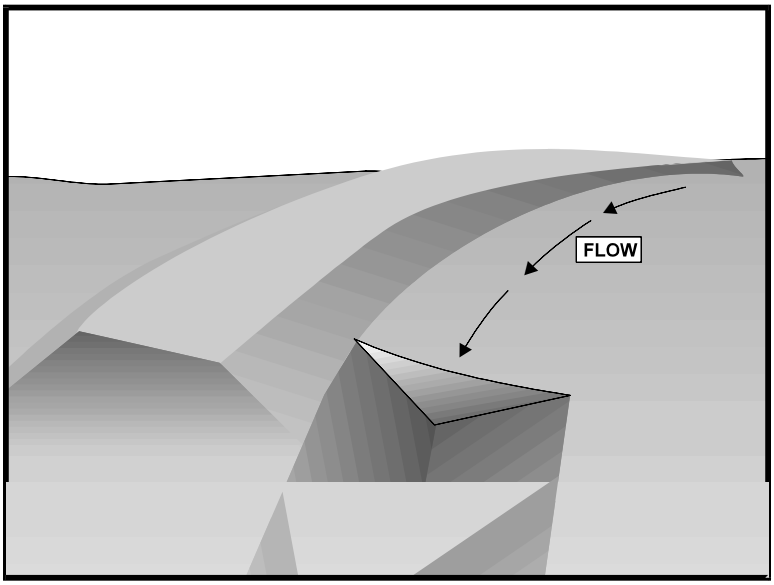


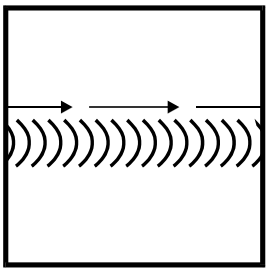
Pipe Diameter mm	Discharge m^3/s	Apron Length, La m	Rip Rap D_{50} Diameter Min mm
300	0.14	3	100
	0.28	4	150
450	0.28	3	150
	0.57	5	200
	0.85	7	300
	1.13	8	400
600	0.85	5	200
	1.13	8	200
	1.42	8	300
	1.70	9	400
For larger or higher flows, consult a Registered Civil Engineer			

Source: USDA – SCS

Earth Dikes/Drainage Swales and Lined Ditches

SS-9





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- Earth dikes/drainage swales and lined ditches may be used to:
  - Convey surface runoff down sloping land.
  - Intercept and divert runoff to avoid sheet flow over sloped surfaces.
  - Divert and direct runoff towards a stabilized watercourse, drainage pipe or channel.
  - Intercept runoff from paved surfaces.
- Earth dikes/drainage swales and lined ditches also may be used:
  - Below steep grades where runoff begins to concentrate.
  - Along roadways and facility improvements subject to flood drainage.
  - At the top of slopes to divert run-on from adjacent or undisturbed slopes.
  - At bottom and mid-slope locations to intercept sheet flow and convey concentrated flows.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Earth Dikes/Drainage Swales and Lined Ditches

SS-9

Limitations

- Earth dikes/drainage swales and lined ditches are not suitable as sediment trapping devices.
- May be necessary to use other soil stabilization and sediment controls, such as check dams, plastics, and blankets, to prevent scour and erosion in newly graded dikes, swales and ditches.

Standards and Specifications

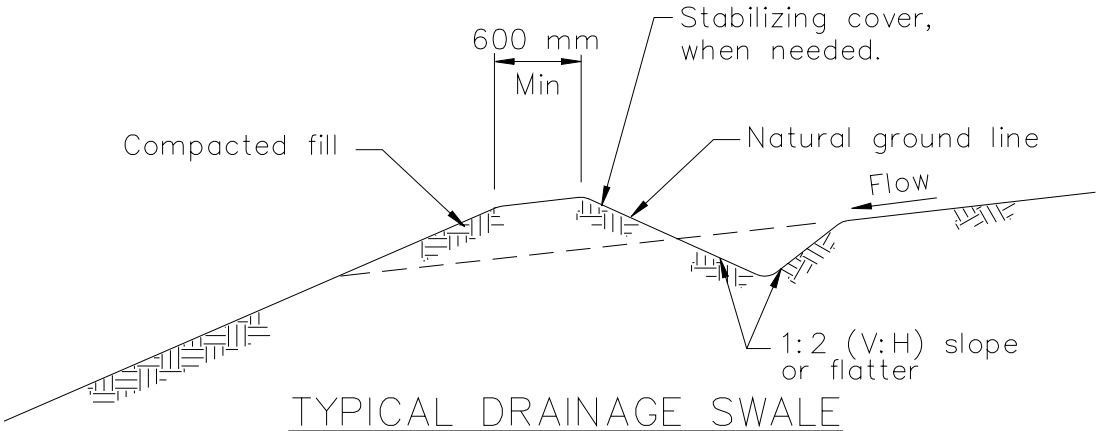
- Care must be applied to correctly size and locate earth dikes, drainage swales and lined ditches. Excessively steep, unlined dikes and swales are subject to erosion and gully formation.
- Conveyances shall be stabilized.
- Use a lined ditch for high flow velocities.
- Select flow velocity based on careful evaluation of the risks due to erosion of the measure, soil types, over topping, flow backups, washout, and drainage flow patterns for each project site.
- Compact any fills to prevent unequal settlement.
- Do not divert runoff from the highway right-of-way onto other property.
- When possible, install and utilize permanent dikes, swales and ditches early in the construction process.
- Provide stabilized outlets. Refer to SS-10, "Outlet Protection/Velocity/ Dissipation Devices."

Maintenance and Inspections

- Inspect temporary measures prior to the rainy season, after rainfall events, and regularly (approximately once per week) during the rainy season.
- Inspect ditches and berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- Inspect channel linings, embankments, and beds of ditches and berms for erosion and accumulation of debris and sediment. Remove debris and sediment, and repair linings and embankments as needed or as directed by the RE.
- Temporary conveyances shall 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

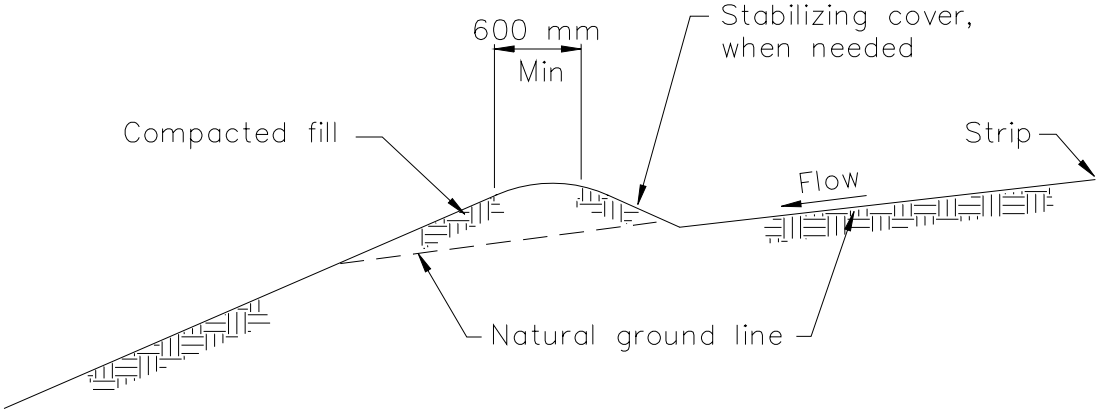
SS-9



TYPICAL DRAINAGE SWALE
NOT TO SCALE

NOTES:

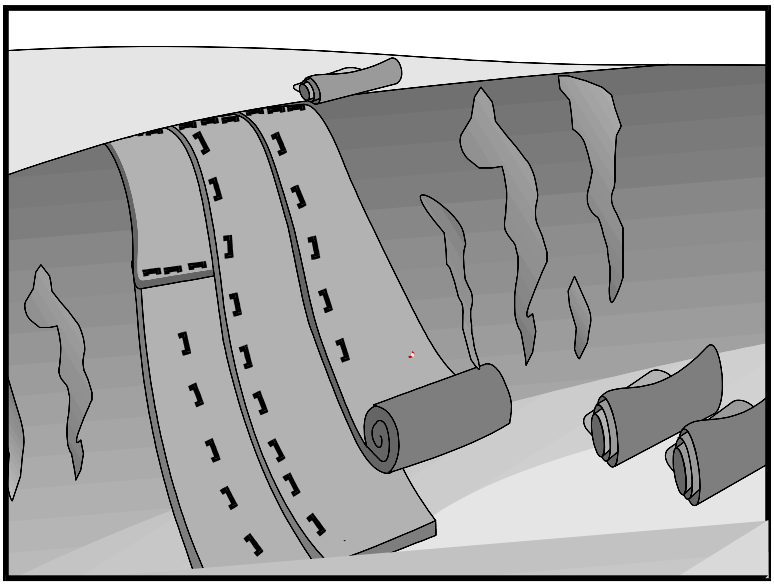
1. Stabilize inlet, outlets and slopes.
2. Properly compact the subgrade, in conformance with Section 19–5 of the Caltrans Standard Specifications.

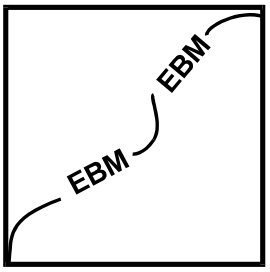


TYPICAL EARTH DIKE
NOT TO SCALE

Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

SS-7





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

- Steep slopes, generally steeper than 1:3 (V:H).
- Slopes where the erosion potential is high.
- Slopes and disturbed soils where mulch must be anchored.
- Disturbed areas where plants are slow to develop.
- Channels with flows exceeding 1.0 m/s (3.3 ft/s).
- Channels to be vegetated.
- Stockpiles.
- Slopes adjacent to water bodies of Environmentally Sensitive Areas (ESAs).

Limitations

- Blankets and mats are more expensive than other erosion control measures, due to labor and material costs. This usually limits their application to areas inaccessible to hydraulic equipment, or where other measures are not applicable, such as channels.
- Blankets and mats are generally not suitable for excessively rocky sites, or areas where the final vegetation will be mowed (since staples and netting can catch in mowers).
- Blankets and mats must be removed and disposed of prior to application of permanent soil stabilization measures.
- Plastic sheeting is easily vandalized, easily torn, photodegradable, and must be disposed of at a landfill.
- Plastic results in 100% runoff, which may cause serious erosion problems in the areas receiving the increased flow.
- The use of plastic shall be limited to covering stockpiles, or very small graded areas for short periods of time (such as through one imminent storm event), until alternative measures, such as seeding and mulching, may be installed.
- Geotextiles, mats, plastic covers, and erosion control covers have maximum flow rate limitations; consult the manufacturer for proper selection.

Standards and Specifications

Material Selection

There are many types of erosion control blankets and mats, and selection of the appropriate type shall be based on the specific type of application and site conditions. Selection(s) made by the Contractor must be approved by the Resident Engineer (RE); certification of compliance shall be in accordance with Standard Specifications Section 6-1.07.

Geotextiles

- Material shall be a woven polypropylene fabric with minimum thickness of 1.5 mm (0.06 inch), minimum width of 3.7 m (12 ft) and shall have minimum tensile strength of 0.67 kN (warp) 0.36 kN (fill) in conformance with the requirements in ASTM Designation: D 4632. The permittivity of the fabric shall be approximately 0.07 sec –1 in conformance with the requirements in ASTM Designation: D4491. The fabric shall have an ultraviolet (UV) stability of 70 percent in conformance with the requirements in ASTM designation: D4355. Geotextile blankets shall be secured in place with wire staples or sandbags and by keying into tops of slopes and edges to prevent infiltration of surface waters under Geotextile. Staples shall be made of 3.05-mm (0.12-inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.
- Geotextiles may be reused if, in the opinion of the RE, they are suitable for the use intended.

Plastic Covers

- Plastic sheeting shall have a minimum thickness of 6 mil, and shall be keyed in at the top of slope and firmly held in place with sandbags or other weights placed no more than 3 m (10 ft) apart. Seams are typically taped or weighted down their entire length, and there shall be at least a 300 mm to 600 mm (12 to 24 inches) overlap of all seams. Edges shall be embedded a minimum of 150 mm (6 inches) in soil.

- All sheeting shall be inspected periodically after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures shall be repaired immediately. If washout or breakages occurs, the material shall be re-installed after repairing the damage to the slope.

Erosion Control Blankets/Mats

- Biodegradable 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% biodegradable, the netting, sewing or adhesive system that holds the biodegradable mulch fibers together must also be biodegradable.

  - **Jute** is a natural fiber that is made into a yarn, which is 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, which shall be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

  - **Excelsior (curled wood fiber)** blanket material shall consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 150 mm (6 inches) or longer. The excelsior blanket shall be of consistent thickness. The wood fiber shall be evenly distributed over the entire area of the blanket. The top surface of the blanket shall be covered with a photodegradable extruded plastic mesh. The blanket shall be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Excelsior blanket shall be furnished in rolled strips, a minimum of 1220 mm (48 inches) wide, and shall have an average weight of 0.5 kg/m^2 (12 lb/ft^2), ±10 percent, at the time of manufacture. Excelsior blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.

- **Straw blanket** shall be machine-produced mats of straw with a lightweight biodegradable netting top layer. The straw shall be attached to the netting with biodegradable thread or glue strips. The straw blanket shall be of consistent thickness. The straw shall be evenly distributed over the entire area of the blanket. Straw blanket shall be furnished in rolled strips a minimum of 2 m (6.5 ft) wide, a minimum of 25 m (80 ft) long and a minimum of 0.27 kg/m2 (6.4 lb/ft2). Straw blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.

- **Wood fiber blanket** is composed of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance revegetation. The material is furnished in rolled strips, which shall be secured to the ground with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Coconut fiber blanket** shall be machine-produced mats of 100% coconut fiber with biodegradable netting on the top and bottom. The coconut fiber shall be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket shall be of consistent thickness. The coconut fiber shall be evenly distributed over the entire area of the blanket. Coconut fiber blanket shall be furnished in rolled strips with a minimum of 2 m (6.5 ft) wide, a minimum of 25 m (80 ft) long and a minimum of 0.27-kg/m2 (6.4 lb/ft2). Coconut fiber blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.

- **Coconut fiber mesh** is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which shall be secured to the soil with U-shaped staples or stakes in accordance with manufacturers' recommendations.

- **Straw coconut fiber blanket** shall be machine-produced mats of 70% straw and 30% coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber shall be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket shall be of consistent thickness. The straw and coconut fiber shall be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket shall be furnished in rolled strips a minimum of 2 m (6.5 ft) wide, a minimum of 25 m (80 ft) long and a minimum of 0.27 kg/m2 (6.4 lb/ft2). Straw coconut fiber blankets shall be secured in place with wire staples. Staples shall be made of 3.05-mm (0.12-inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.

- 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.

  - **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 shall 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 0.5 cm (0.2 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 shall 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 shall 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% 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 shall 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 shall 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 so that the installed blankets or mats will have complete, direct contact with the soil.
- Prepare seedbed by loosening 50 mm (2 in) to 75 mm (3 in) of topsoil.

Seeding

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

Anchoring

- U-shaped wire staples, metal geotextile stake pins or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Staples shall be made of 3.05 mm (0.12 inch) steel wire and shall be U-shaped with 200-mm (8-inch) legs and 50-mm (2-inch) crown.
- Metal stake pins shall be 5 mm (0.188 in) diameter steel with a 40 mm (1.5 in) steel washer at the head of the pin.
- Wire staples and metal stakes shall be driven flush to the soil surface.
- All anchors shall be 150 mm (6 in) to 450 mm (18 in) long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes

Installation shall be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Begin at the top of the slope and anchor the blanket in a 150 mm (6 in) deep by 150 mm (6 in) wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket downslope in the direction of water flow.

- Overlap the edges of adjacent parallel rolls 50 mm (2 in) to 75 mm (3 in) and staple every 1 m (3 ft).
- When blankets must be spliced, place blankets end over end (shingle style) with 150 mm (6 in) overlap. Staple through overlapped area, approximately 300 mm (12 in) apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (V:H) to 1:2 (V:H), require a minimum of 2 staples/m2 (2 staples/yd2). Moderate slopes, 1:2 (V:H) to 1:3 (V:H), require a minimum of 1½ staples/m2 (1 ½ staples/yd2), placing 1 staple/m (1 staple/yd) on centers. Gentle slopes require a minimum of 1 staple/m2 (1 staple/yd2).

Installation in Channels

Installation shall be in accordance with the manufacturer's recommendations. In general, these will be as follows:

- Dig initial anchor trench 300 mm (12 in) deep and 150 mm (6 in) wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 150 mm (6 in) deep and 150 mm (6 in) wide across the channel at 8 m to 10 m (25 ft to 30 ft) intervals along the channels.
- Cut longitudinal channel anchor slots 100 mm (4 in) deep and 100 mm (4 in) wide along each side of the installation to bury edges of matting, whenever possible extend matting 50 mm (2 in) to 75 mm (3 in) above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 300 mm (12 in) intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 75 mm (3 in).
- Secure these initial ends of mats with anchors at 300 mm (12 in) intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 75 mm (3 in) overlap.

- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 300 mm (12 in) intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.

- Alternate method for non-critical installations: Place two rows of anchors on 150 mm (6 in) centers at 8 m (25 ft) to 10 m (30 ft) intervals in lieu of excavated check slots.

- Shingle-lap spliced ends by a minimum of 300 mm (12 in) apart on 300 mm (12 in) intervals.

- Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soil.

- Anchor, fill and compact upstream end of mat in a 300 mm (12 in) by 150 mm (6 in) terminal trench.

- Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.

- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement)

- Always consult the manufacturer's recommendations for installation.

- Do not drive tracked or heavy equipment over mat.

- Avoid any traffic over matting if loose or wet soil conditions exist.

- Use shovels, rakes or brooms for fine grading and touch up.

- Smooth out soil filling, just exposing top netting of mat.

Temporary Soil Stabilization Removal

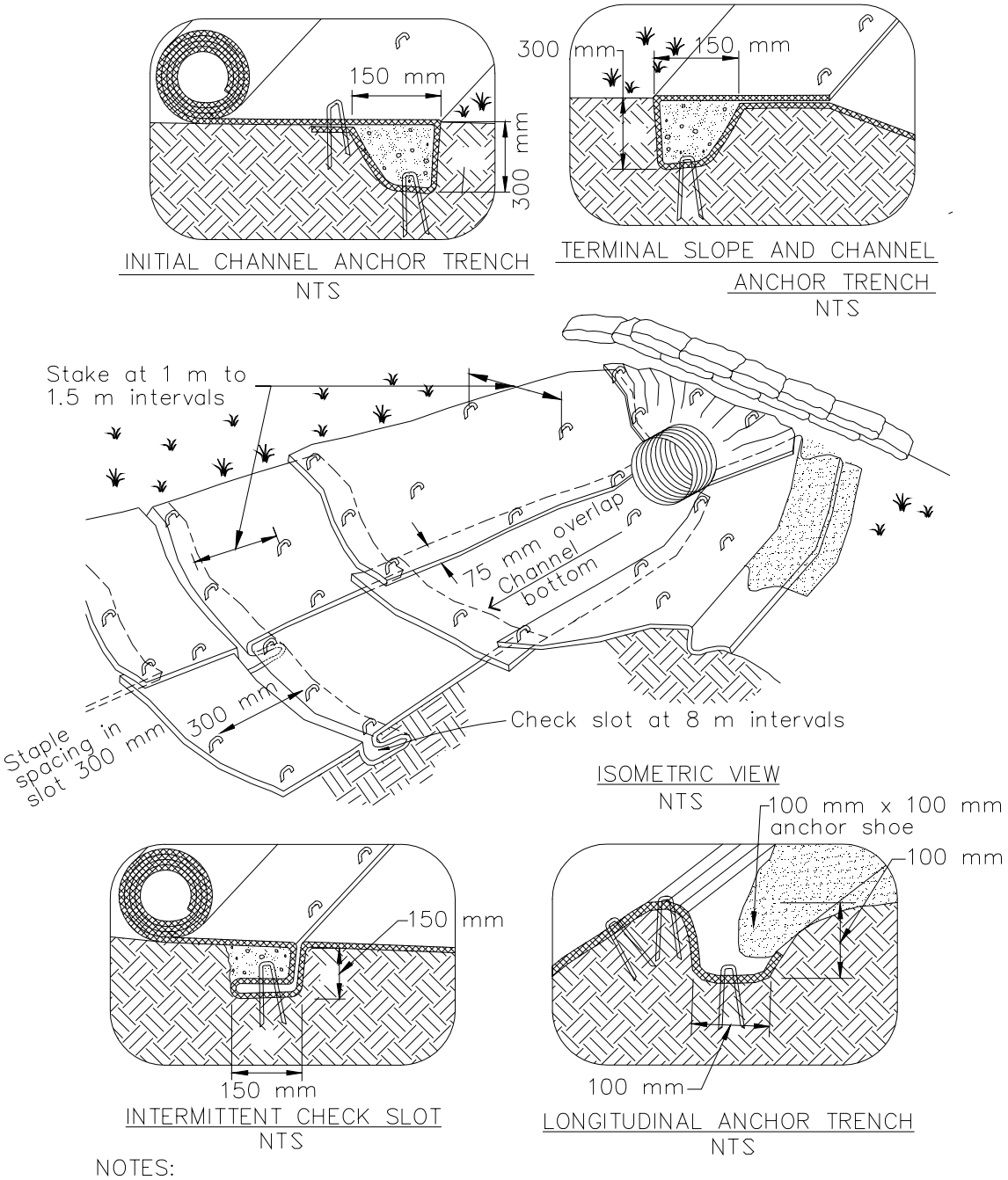
- When no longer required for the work, temporary soil stabilization shall become the property of the Contractor. Temporary soil stabilization removed from the site of the work shall be disposed of outside the highway right-of-way in conformance with the provisions in Standard Specifications Section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

Maintenance and Inspection

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

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

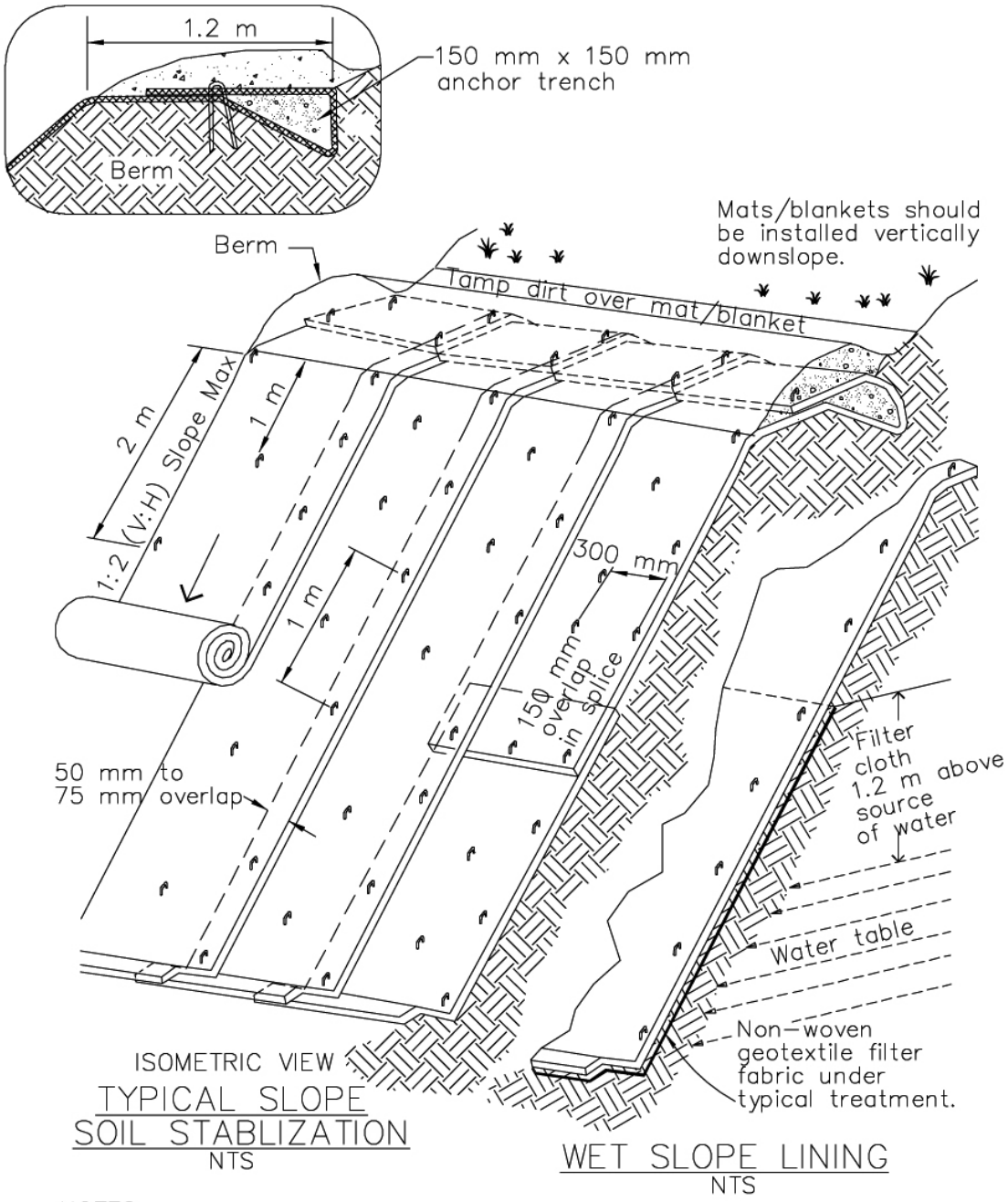
Typical Installation Detail



NOTES:

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

Typical Installation Detail

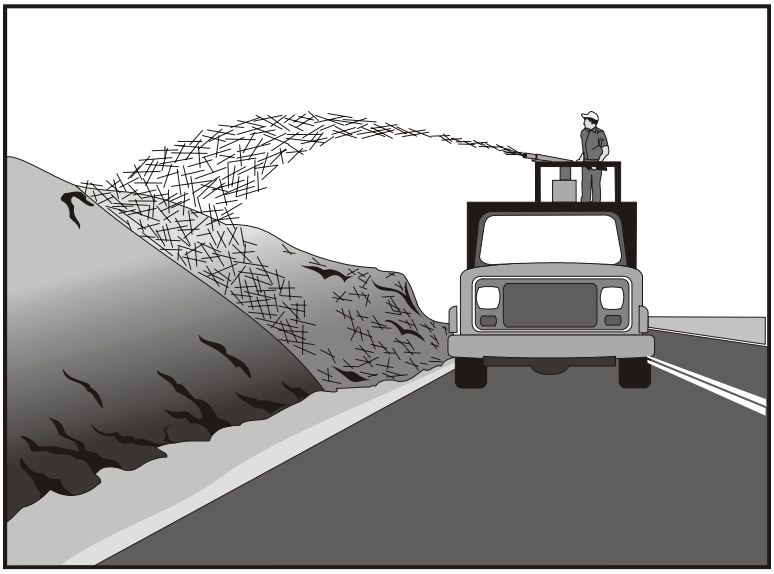


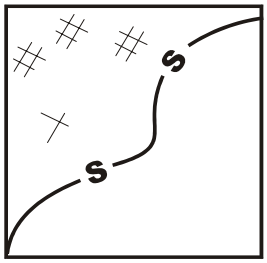
NOTES:

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

Straw Mulch

SS-6





Standard Symbol

BMP Objectives

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

Definition and Purpose

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a stabilizing emulsion. This is one of five 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 rainy season due to high demand.
- There is a potential for introduction of weed-seed and unwanted plant material.
- When straw blowers are used to apply straw mulch, the treatment areas must be within 45 m (150 ft) of a road or surface capable of supporting trucks.
- Straw mulch applied by hand is more time intensive and potentially costly.
- May have to be removed prior to permanent seeding or soil stabilization.
- "Punching" of straw does not work in sandy soils.

Standards and Specifications

- Straw shall be derived from wheat, rice, or barley.
- All materials shall conform to Standard Specifications Sections 20-2.06, 20-2.07 and 20-2.11.
- A tackifier is the preferred method for anchoring straw mulch to the soil on slopes.
- Crimping, punch roller-type rollers, or track-walking may also be used to incorporate straw mulch into the soil on slopes. Track walking shall only be used where other methods are impractical.
- Avoid placing straw onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.
- Straw mulch with tackifier shall not be applied during or immediately before rainfall.

Application Procedures

- Apply loose straw at a minimum rate of 3,570 kg/ha (4,000 lb/ac), or as indicated in the project's special provisions, either by machine or by hand distribution.
- If stabilizing emulsion 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 or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.
- The straw mulch must be evenly distributed on the soil surface.
- Anchor the mulch in place by using a tackifier or by "punching" it into the soil mechanically (incorporating).
- A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier shall be selected based on longevity and ability to hold the fibers in place.
- A tackifier is typically applied at a rate of 140 kg/ha (125 lb/ac). In windy conditions, the rates are typically 200 kg/ha (178 lb/ac).
- Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions and longevity. If the selected method is incorporation of straw mulch into the soil, then do as follows:
  - Applying and incorporating straw shall follow the requirements in Standard Specifications Section 20-3.03.
  - On small areas, a spade or shovel can be used.

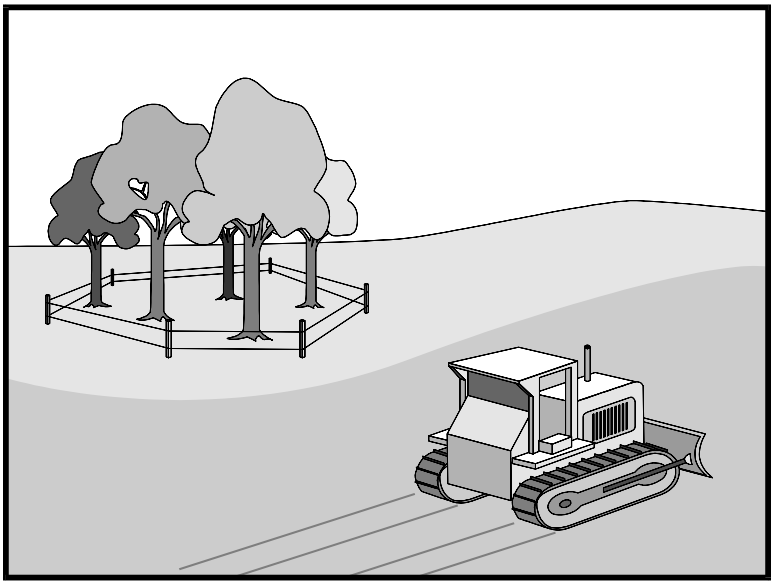
- On slopes with soils, which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be "punched" into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a "crimper."
- On small areas and/or steep slopes, straw can also be held in place using plastic netting or jute. The netting shall be held in place using 11 gauge wire staples, geotextile pins or wooden stakes. Refer to BMP SS-7, "Geotextiles, Plastic Covers and Erosion Control Blankets/Mats."

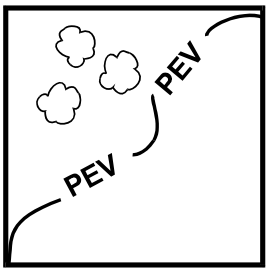
Maintenance and Inspections

- The key consideration in Maintenance and Inspection is that the straw needs to last long enough to achieve erosion control objectives.
- Maintain an unbroken, temporary mulched ground cover while DSAs are non-active. Repair any damaged ground cover and re-mulch exposed areas.
- Reapplication of straw mulch and tackifier may be required by the Resident Engineer (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.

Preservation of Existing Vegetation

SS-2





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- Preserve existing vegetation at areas on a site where no construction activity is planned or will occur at a later date. Specifications for preservation of existing vegetation can be found in Standard Specifications, Section 7-1.11.
- 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.

Limitations

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

Standards and Specifications

Timing

- Preservation of existing vegetation shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas identified on the plans to be preserved, especially on areas designated as Environmentally Sensitive Areas (ESAs).
- Preservation of existing vegetation shall conform to scheduling requirements set forth in the special provisions.

Design and Layout

- Mark areas to be preserved with temporary fencing made of orange polypropylene that is stabilized against ultraviolet light. The temporary fencing shall be at least 1 meter (3.2. ft) tall and shall have openings not larger than 50 mm by 50 mm (2 in by 2 in).

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

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

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

Installation

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

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

- Maintain existing irrigation systems.

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

Trenching and Tunneling

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

- Tree roots shall not be left exposed to air; they shall be covered with soil as soon as possible, protected, and kept moistened with wet burlap or peat moss until the tunnel and/or trench can be completed.

- The ends of damaged or cut roots shall be cut off smoothly.

- Trenches and tunnels shall be filled as soon as possible. Careful filling and tamping will eliminate air spaces in the soil which can damage roots.

- Remove any trees intended for retention if those trees are damaged seriously enough to affect their survival. If replacement is desired or required, the new tree shall be of similar species, and at least 50 mm (2 in) caliper, unless

otherwise required by the contract documents.

- After all other work is complete, fences and barriers shall be removed last. This is because protected trees may be destroyed by carelessness during the final cleanup and landscaping.

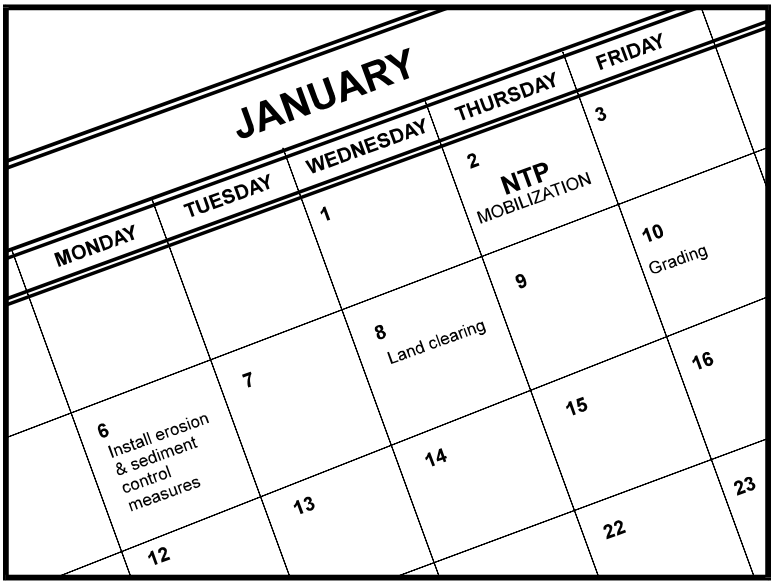
Maintenance and Inspection

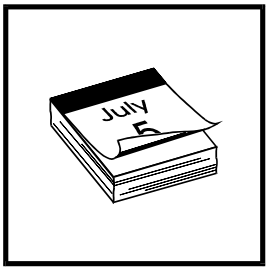
During construction, the limits of disturbance shall remain clearly marked at all times. Irrigation or maintenance of existing vegetation shall conform to the requirements in the landscaping plan. If damage to protected trees still occurs, maintenance guidelines described below shall be followed:

- Serious tree injuries shall be attended to by an arborist.
- During construction, District Environmental shall be contacted to ensure that ESAs are protected.

Scheduling

SS-1





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

Construction sequencing shall be scheduled to minimize land disturbance for all projects during the rainy and non-rainy season. Appropriate BMPs shall be implemented during both rainy and non-rainy seasons.

Limitations

None identified.

Standards and Specifications

- Developing a schedule and planning the project are the very first steps in an effective storm water program. The schedule shall clearly show how the rainy season relates to soil-disturbing and re-stabilization activities. The construction schedule shall be incorporated into the SWPPP or WPCP.
- The schedule shall include detail on the rainy season implementation and deployment of:
  - Temporary soil stabilization BMPs.
  - Temporary sediment control BMPs.
  - Tracking control BMPs.
  - Wind erosion control BMPs.

  - Non-storm water BMPs.
  - Waste management and materials pollution control BMPs.

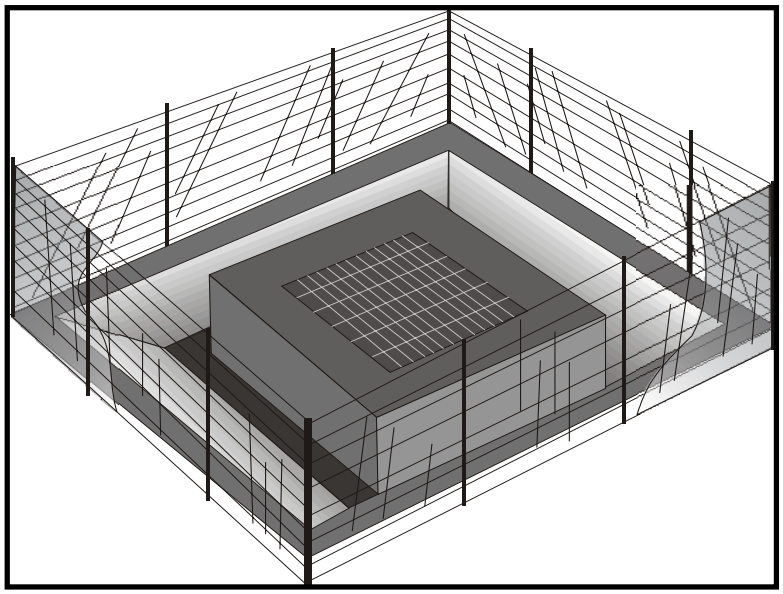
- Schedule shall also include dates for significant long-term operations or activities that may have planned non-storm water discharges such as dewatering, sawcutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, bridge cleaning, etc.
- Schedule work to minimize soil disturbing activities during the rainy season.
- 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 during the rainy season.
- Schedule major grading operations for the non-rainy season when practical.
- Stabilize non-active areas within 14 days from the cessation of soil-disturbing activities or one day prior to the onset of precipitation, whichever occurs first.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment controls and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year-round to deploy soil stabilization and sediment control practices as required by Section 2 of this Manual. Erosion may be caused during dry seasons by unseasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year-round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Sequence trenching activities so that most open portions are closed before new trenching begins.
- Incorporate staged seeding and re-vegetation of graded slopes as work progresses.
- Consider scheduling when establishing permanent vegetation (appropriate planting time for specified vegetation).
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.

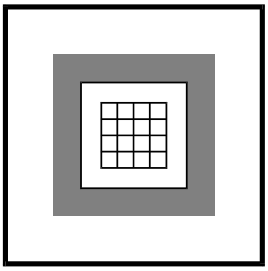
Maintenance and Inspection

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

Storm Drain Inlet Protection

SC-10





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- Where ponding will not encroach into highway traffic.
- Where sediment laden surface runoff may enter an inlet.
- Where disturbed drainage areas have not yet been permanently stabilized.
- Where the drainage area is 0.4 ha (1 ac) or less.
- Appropriate during wet and snow-melt seasons.

Limitations

- Requires an adequate area for water to pond without encroaching upon traveled way and should not present itself to be an obstacle to oncoming traffic.
- May require other methods of temporary protection to prevent sediment-laden storm water and non-storm water 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 (e.g. check dams) in conjunction with inlet protection.
- Frequent maintenance is required.
- For drainage areas larger than 0.4 ha (1 ac), runoff shall be routed to a sediment trapping device designed for larger flows. See BMPs SC-2, "Sediment/Desilting Basin," and SC-3 "Sediment Trap."

- Filter fabric fence inlet protection is appropriate in open areas that are subject to sheet flow and for flows not exceeding 0.014 m3/s (0.5 cfs).
- Gravel bag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.014 m3/s (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.

Standards and Specifications

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

Methods and Installation

- ***DI Protection Type 1 - Filter Fabric Fence -*** The filter fabric fence (Type 1) protection is illustrated on Page 5. Similar to constructing a silt fence. See BMP SC-1, "Silt Fence." Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
- ***DI Protection Type 2 - Excavated Drop Inlet Sediment Trap -*** The excavated drop inlet sediment trap (Type 2) is illustrated in Page 6. Similar to constructing a temporary silt fence, See BMP SC-1, "Silt Fence." Size excavated trap to provide a minimum storage capacity calculated at the rate of 130 m3/ha (67 yd3/ac) of drainage area.
- ***DI Protection Type 3 – Gravel bag -*** The gravel bag barrier (Type 3) is illustrated in Page 7. Flow from a severe storm shall not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with BMP SC-6, "Gravel Bag Berm." Gravel bags shall be used due to their high permeability.
- ***DI Protection Type 4 – Foam Barriers and Fiber Rolls –*** Foam barrier or fiber roll (Type 4) is placed around the inlet and keyed and anchored to the surface. Foam barriers and fiber rolls 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. RE or Construction Storm Water Coordinator approval is required.

Maintenance and Inspection

General

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

- Inspect the storm drain inlet after severe storms in the rainy season to check for bypassed material.
- Remove all inlet protection devices within thirty days after the site is stabilized, or when the inlet protection is no longer needed.
  - Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
  - Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

Requirements by Method

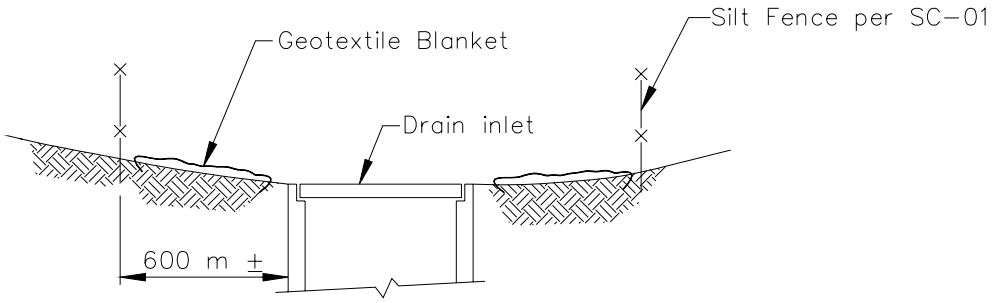
- ***Type 1 - Filter Fabric Fence***
  - This method shall be used for drain inlets requiring protection in areas where finished grade is established and erosion control seeding has been applied or is pending.
  - Make sure the stakes are securely driven in the ground and are structurally sound (i.e., 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. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications Section 7-1.13.
- ***Type 2 – Excavated Drop Inlet Sediment Trap***
  - This method may be used for drain inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas are subject to grading.
  - Remove sediment from basin when the volume of the basin has been reduced by one-half.
- ***Type 3 - Gravel Bag Barrier***
  - This method may be used for drain inlets surrounded by AC or paved surfaces.
  - 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. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications Section 7-1.13.

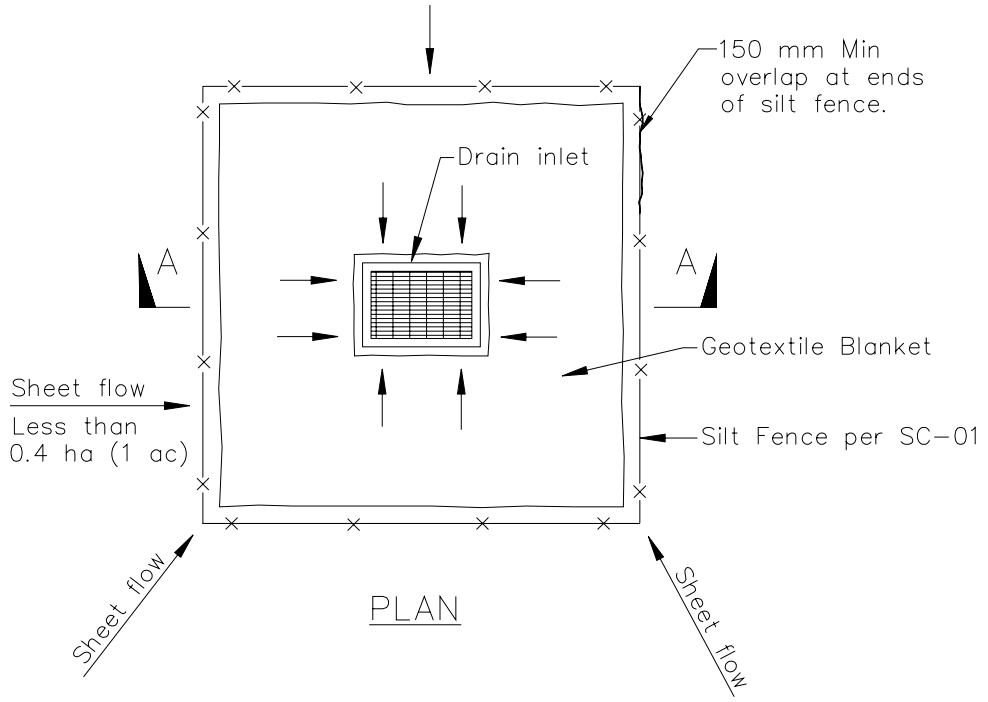
■ ***Type 4 Foam Barriers and Fiber Rolls***

- This method may be used for drain inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas subject to grading. RE or Construction Storm Coordinator approval is required.

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



SECTION A–A

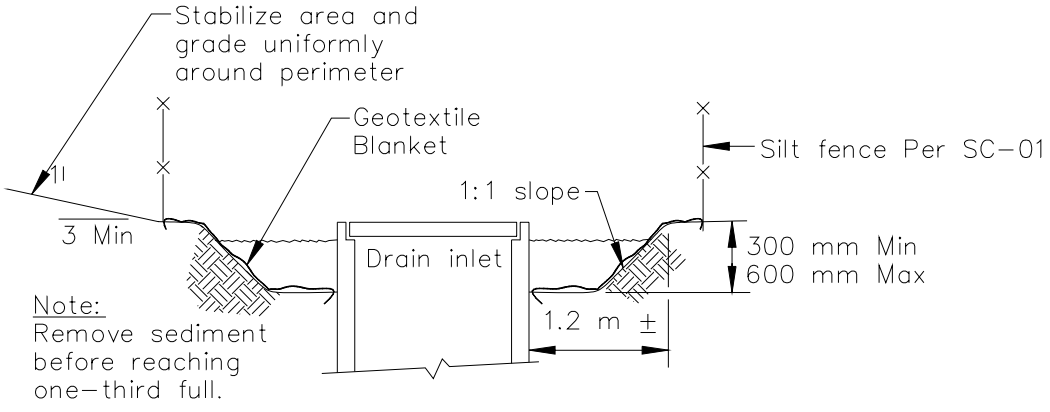


PLAN

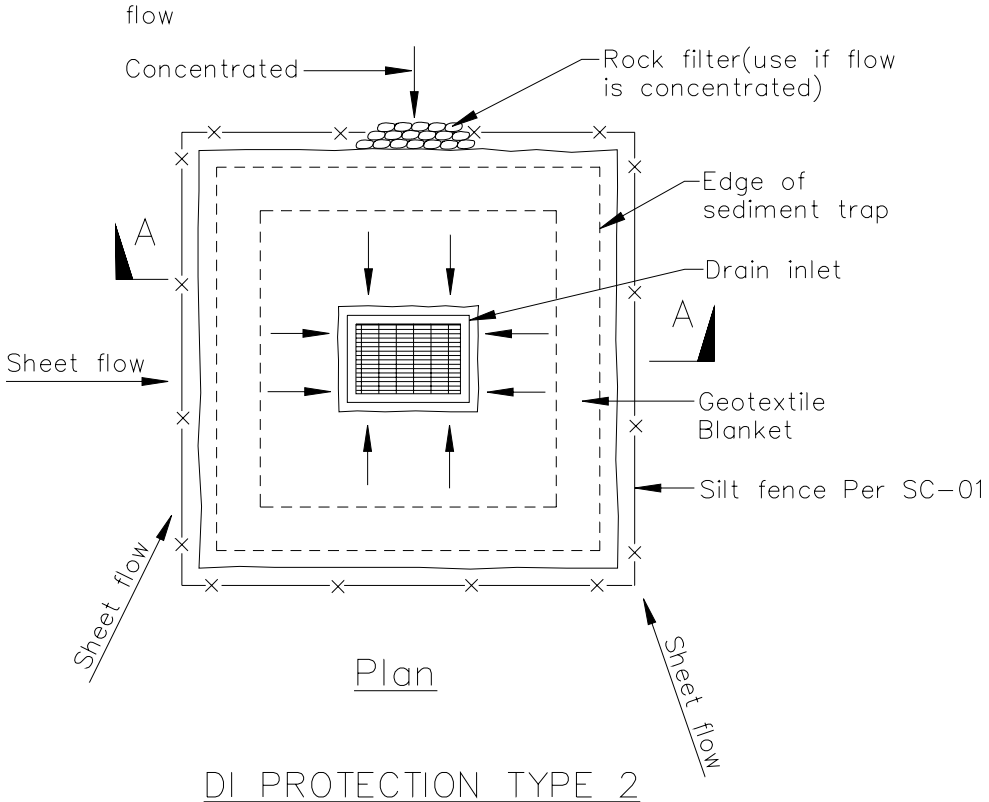
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

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



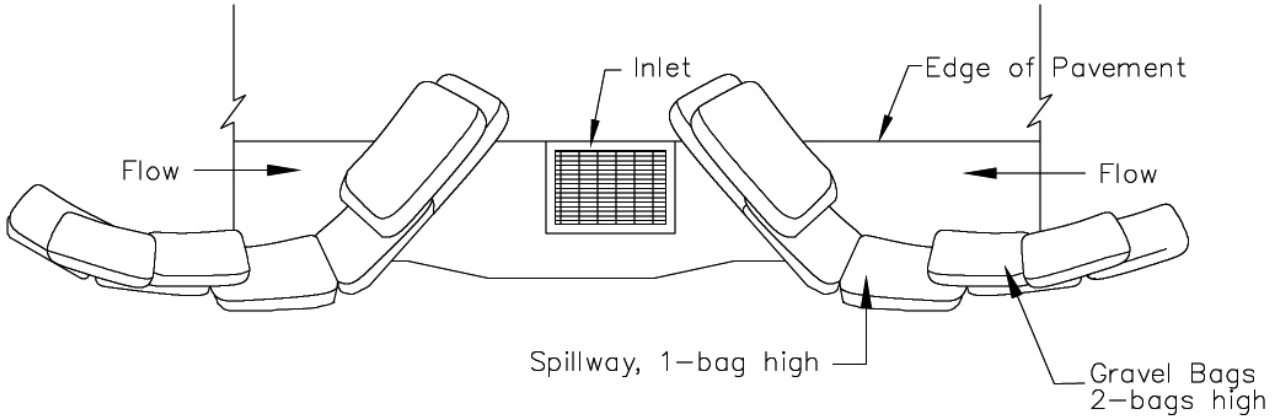
Section A–A



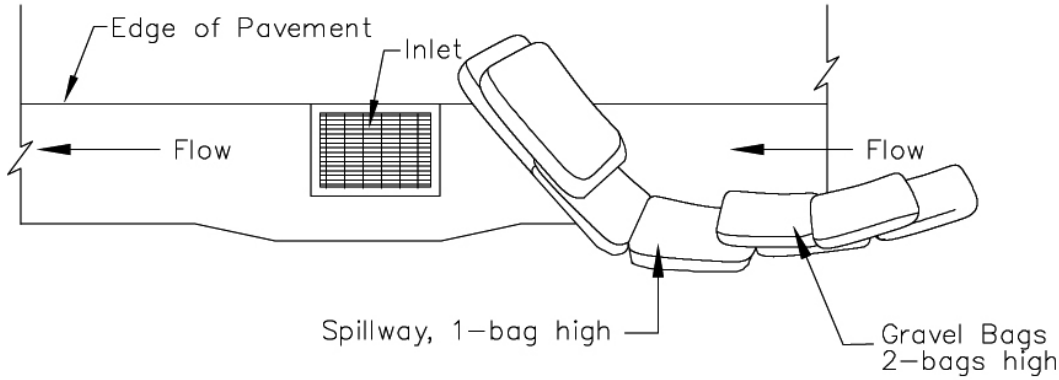
Plan

DI PROTECTION TYPE 2
NOT TO SCALE

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



TYPICAL PROTECTION FOR INLET WITH OPOSING FLOW DIRECTIONS



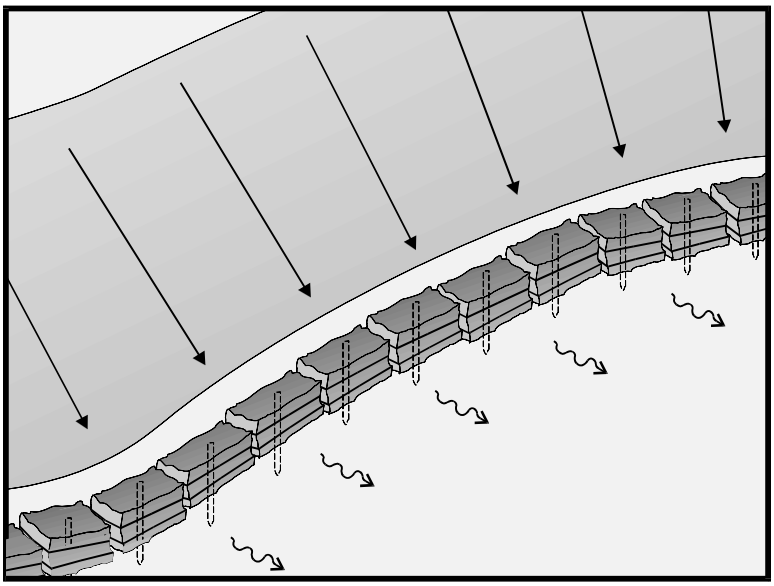
TYPICAL PROTECTION FOR INLET WITH SINGLE FLOW DIRECTION

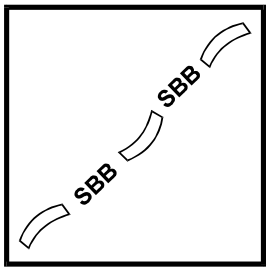
NOTES:

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

Straw Bale Barrier

SC-9





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).
- Along the perimeter of a site.
- Along streams and channels.
- Below the toe of exposed and erodible slopes.
- Down slope of exposed soil areas.
- Around stockpiles.
- Across minor swales or ditches with small catchments.
- Around above grade type temporary concrete washouts (See BMP WM-8, "Concrete Waste Management").
- Parallel to a roadway to keep sediment off paved areas.

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.
- Shall not 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 Bale Material:*** Straw bale materials shall conform to the provisions in Standard Specifications Section 20-2.06, "Straw."
- Straw Bale Size: Each straw bale shall be a minimum of 360 mm (14 in) wide, 450 mm (18 in) in height, 900 mm (36 in) in length and shall have a minimum mass of 23 kg (51 lb.) The straw bale shall be composed entirely of vegetative matter, except for the binding material.
- Bale Bindings: Bales shall be bound by either steel wire, nylon or polypropylene string placed horizontally. Jute and cotton binding shall not be used. Baling wire shall be a minimum diameter of 1.57 mm (0.06 inch). Nylon or polypropylene string shall be approximately 2 mm (0.08 inch) in diameter with a breaking strength of 360 N.
- Stakes: Wood stakes shall be commercial quality lumber of the size and shape shown on the plans. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake, or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Steel bar reinforcement shall be equal to a number four designation or greater. End protection shall be provided for any exposed bar reinforcement.

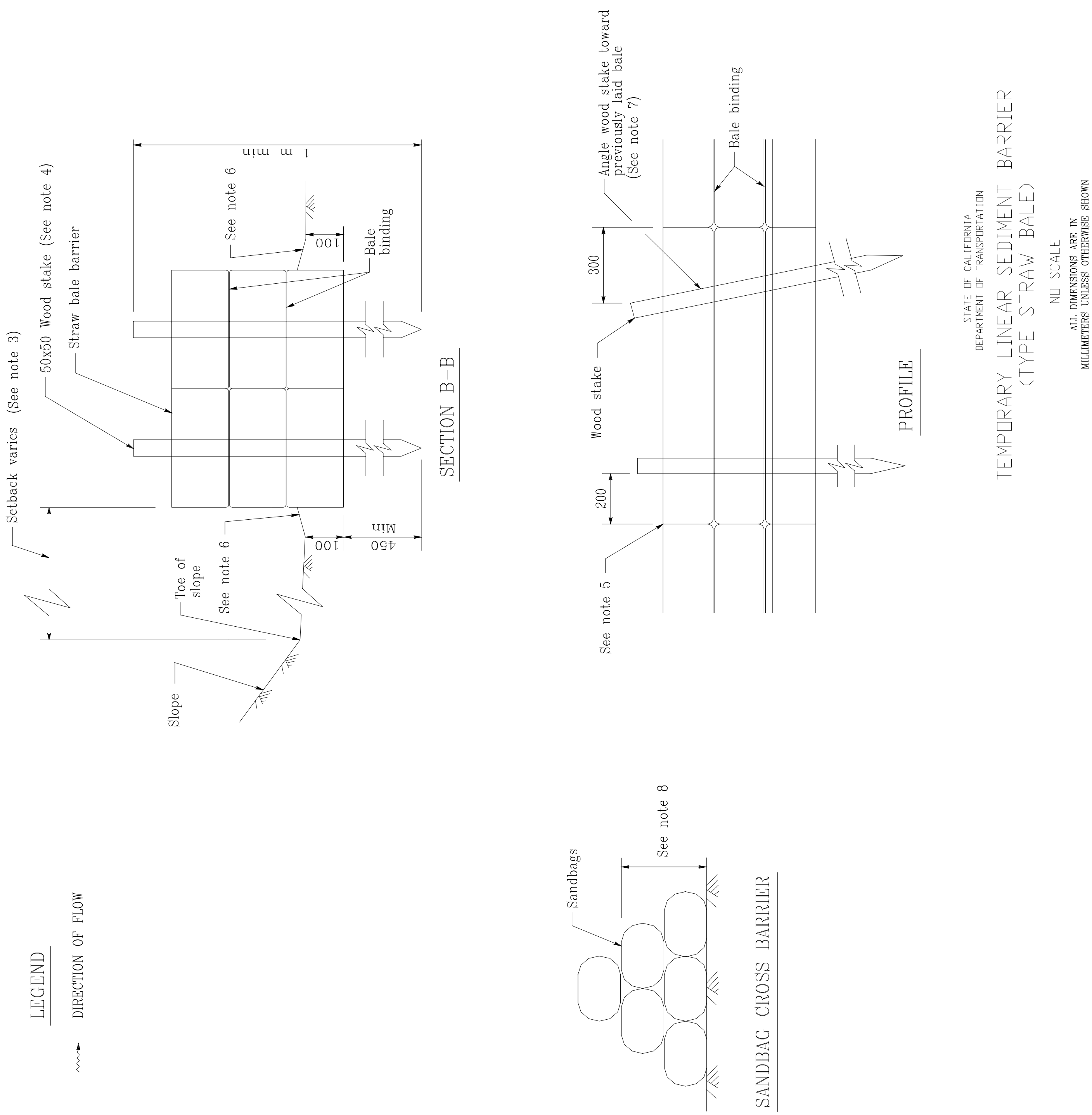
Installation

- Limit the drainage area upstream of the barrier to 0.3 ha/100 m (0.25 ac/100ft) or barrier.
- Limit the slope length draining to the straw bale barrier to 30 m (100 ft.)

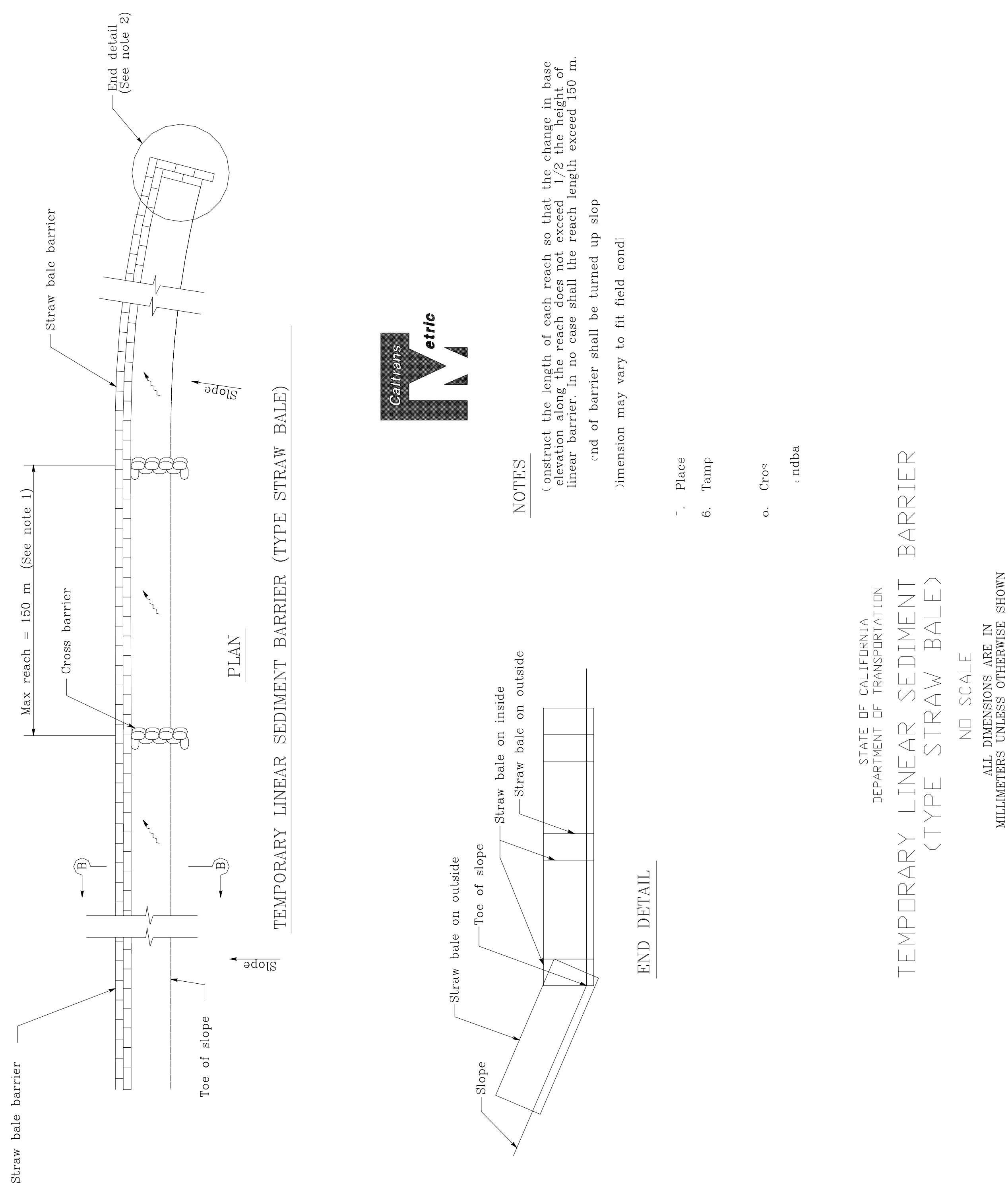
- Slopes of 2:100 (V:H) (2%) or flatter are preferred. If the slope exceeds 1:10 (V:H) (10%), the length of slope upstream of the barrier must be less than 15 m (50 ft).
- Install straw bale barriers along a level contour, with the last straw bale turned up slope.
- Straw bales must be installed in a trench and tightly abut adjacent bales.
- Construct straw bale barriers with a set-back of at least 1 m (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 shall be constructed as far from the toe of the slope as practical.
- See pages 4 and 5 of this BMP for installation detail.

Maintenance and Inspection

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



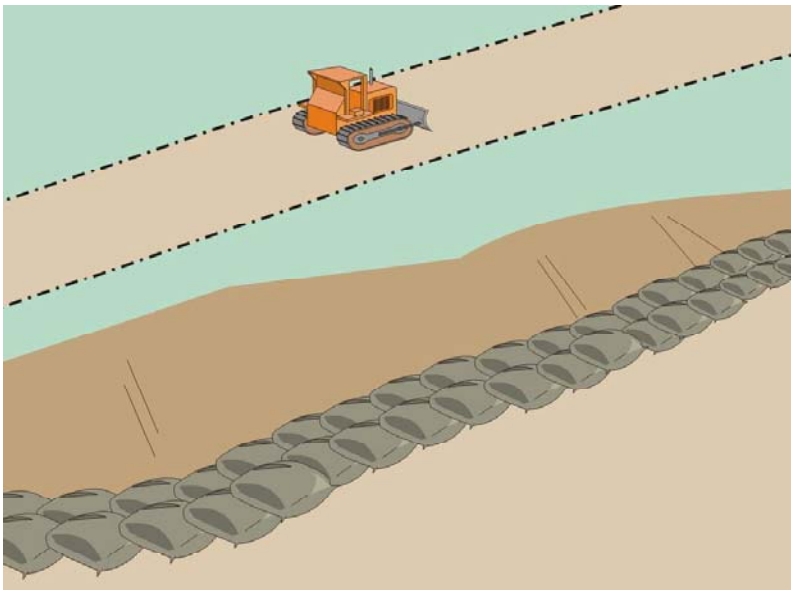
Setback varies (See note 3)
50x50 Wood stake (See note 4)
Straw bale barrier
1 m min
See note 6
100
Bale binding
Toe of slope
See note 6
100
450 Min
Slope
SECTION B-B
Angle wood stake toward previously laid bale (See note 7)
Bale binding
300
Wood stake
200
See note 5
PROFILE
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE STRAW BALE)
NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN
See note 8
Sandbags
SANDBAG CROSS BARRIER
LEGEND
DIRECTION OF FLOW

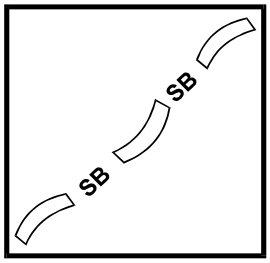


End detail
(See note 2)
Straw bale barrier
Slope
Max reach = 150 m (See note 1)
Cross barrier
B
B
Slope
Straw bale barrier
Toe of slope
PLAN
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE STRAW BALE)
Caltrans
etric
NOTES
(onstruct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of linear barrier. In no case shall the reach length exceed 150 m.
(nd of barrier shall be turned up slop
)imension may vary to fit field condi
Place
6. Tamp
Cro
ndba
Straw bale on outside
Toe of slope
Straw bale on inside
Straw bale on outside
Slope
END DETAIL
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE STRAW BALE)
NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN

Sandbag Barrier

SC-8





Standard Symbol

BMP Objectives

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

Definition and Purpose

A sandbag barrier is a temporary linear sediment barrier consisting of stacked sandbags, designed to intercept and slow the flow of sediment-laden sheet flow runoff. Sandbag barriers allow sediment to settle from runoff before water leaves the construction site.

Appropriate Applications

- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).
- 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 2 ha (5 ac).

Sandbag Barrier

SC-8

Appropriate Applications

- This BMP may be implemented on a project-by-project basis in addition to other BMPs when determined necessary and feasible by the Resident Engineer (RE).
- 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 2 ha (5 ac).
- When extended construction period limits the use of either silt fences or straw bale barriers.
- Along the perimeter of vehicle and equipment fueling and maintenance areas or chemical storage areas.
- To capture and detain non-storm water flows until proper cleaning operations occur.
- When site conditions or construction sequencing require adjustments or relocation of the barrier to meet changing field conditions and needs during construction.
- To temporarily close or continue broken, damaged or incomplete curbs.

Limitations

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

- When used to detain concentrated flows, maintenance requirements increase.

Standards and Specifications

Materials

- Sandbag Material: Sandbag shall be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight 135 g/m2 (four ounces per square yard), mullen burst strength exceeding 2,070 kPa (300 psi) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not acceptable.

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

- Fill Material: All sandbag fill material shall be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material, conforming to the provisions in Standard Specifications Section 68-1.025 "Permeable Material". The requirements for the Durability Index and Sand Equivalent do not apply. Fill material is subject to approval by the RE.

Installation

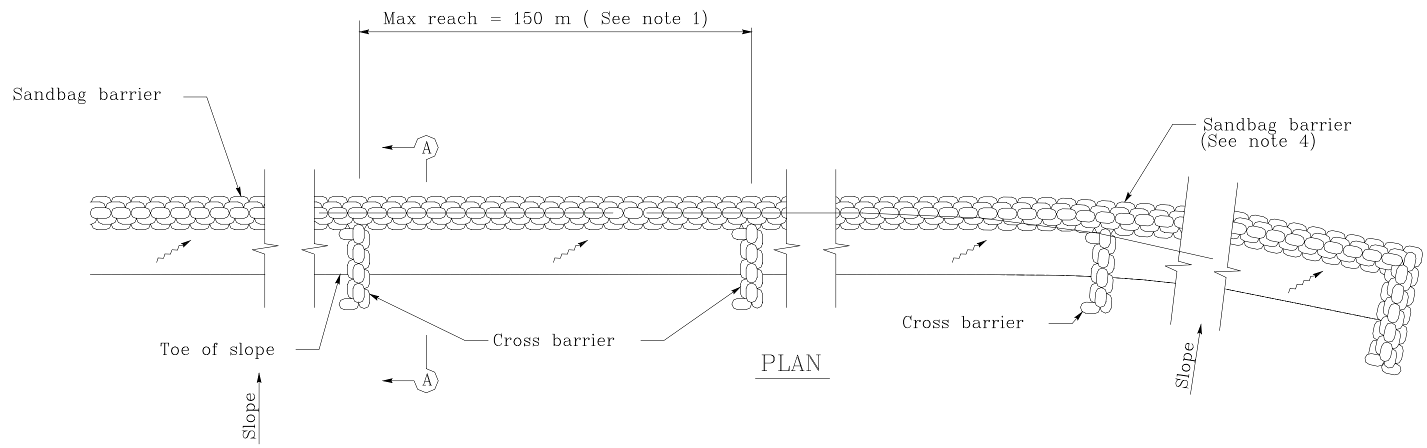
- When used as a linear sediment control:
  - Install along a level contour.
  - Turn ends of sandbag row up slope to prevent flow around the ends.
  - Generally, sandbag barriers shall be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.
  - Install as shown in Pages 4 and 5 of this BMP.

- Construct sandbag barriers with a set-back of at least 1m (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 shall be constructed as far from the toe of the slope as practicable.

Maintenance and Inspection

- Inspect sandbag barriers before and after each rainfall event, and weekly throughout the rainy season.

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



TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SANDBAG)

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

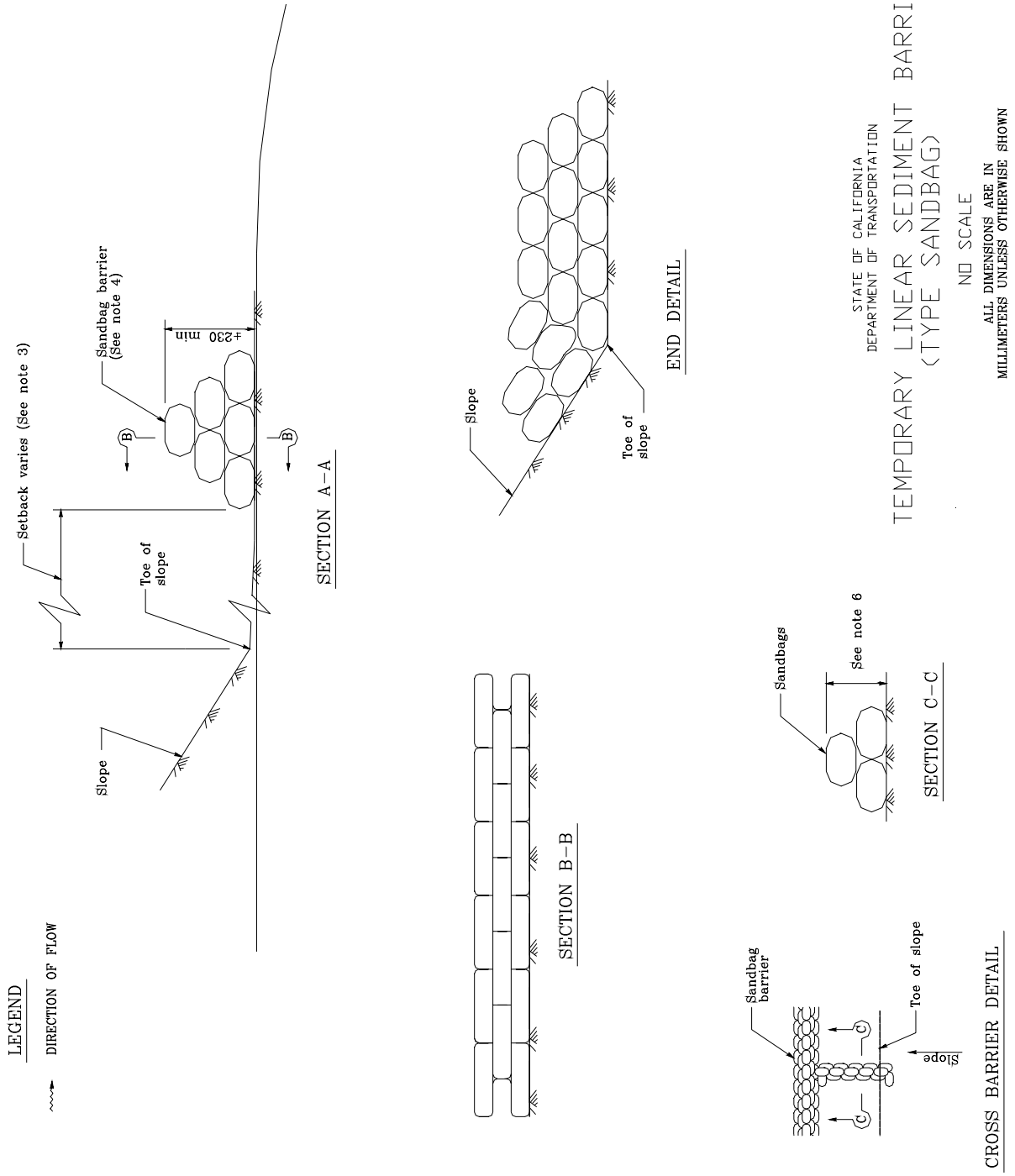
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SANDBAG)

NO SCALE

ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN

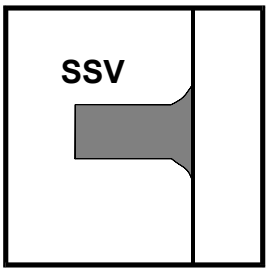
NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 150 m.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.


LEGEND
DIRECTION OF FLOW
Setback varies (See note 3)
Toe of slope
Slope
Sandbag barrier (See note 4)
+230 min
B
B
SECTION A-A
SECTION B-B
Slope
Toe of slope
END DETAIL
Sandbags
See note 6
SECTION C-C
Sandbag barrier
Toe of slope
Slope
C
C
CROSS BARRIER DETAIL
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SANDBAG)
NO SCALE
ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

Street Sweeping and Vacuuming

SC-7



Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

Limitations

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

Standards and Specifications

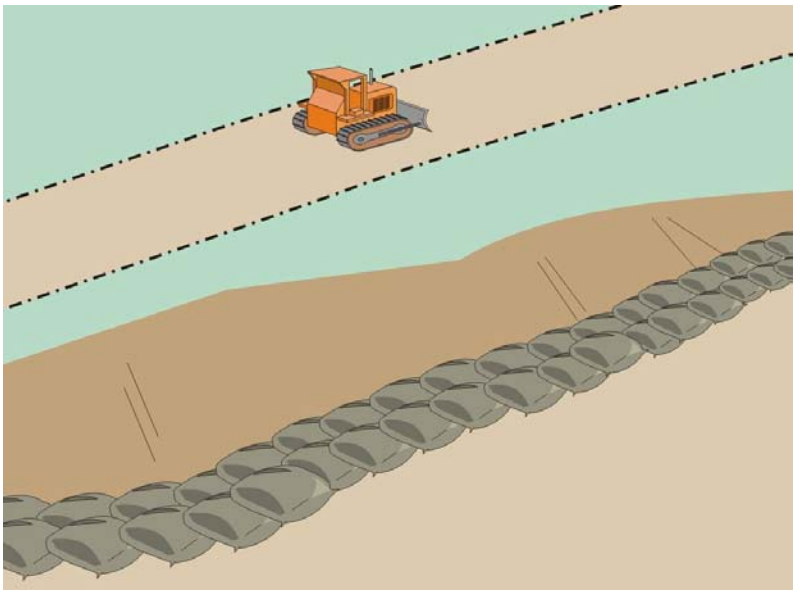
- ■ Kick brooms or sweeper attachments shall not be used.
- ■ Inspect potential sediment tracking locations daily.
- ■ Visible sediment tracking shall be swept and/or vacuumed daily.
- ■ If not mixed with debris or trash, consider incorporating the removed sediment back into the project.

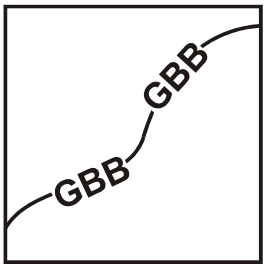
Maintenance and Inspection

- ■ Inspect ingress/egress access points daily and sweep tracked sediment as needed, or as required by the Resident Engineer (RE).
- ■ Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- ■ Adjust brooms frequently; maximize efficiency of sweeping operations.
- ■ After sweeping is finished, properly dispose of sweeper wastes at an approved dumpsite in conformance with the provisions in Standard Specifications Section 7-1.13 .

Gravel Bag Berm

SC-6





Standard Symbol

BMP Objectives

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

Definition and Purpose

A gravel bag berm 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 BMP SC-10, Storm Drain Inlet Protection) to divert and/or detain flows.

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 2 ha (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.

Standards and Specifications

Materials

- Bag Material: Bags shall be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight 135 g/m2 (four ounces per square yard), mullen burst strength exceeding 2,070 kPa (300 psi) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.
- Bag Size: Each gravel-filled bag shall have a length of 450 mm (18 in), width of 300 mm (12 in), thickness of 75 mm (3 in), and mass of approximately 15 kg (33 lb). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the RE for approval prior to deployment.
- Fill Material: Gravel shall be between 10 mm and 20 mm (0.4 and 0.8 inch) in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be between 13 kg and 22 kg (28 and 48 lb) in mass. Fill material is subject to approval by the RE.

Installation

- When used as a linear control for sediment removal:
  - Install along a level contour.
  - Turn ends of gravel bag row up slope to prevent flow around the ends.
  - Generally, gravel bag barriers shall be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment

control.

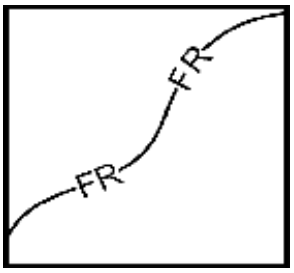
- When used for concentrated flows:
  - Stack gravel bags to required height using a pyramid approach.
  - Upper rows of gravel bags shall overlap joints in lower rows.
- Construct gravel bag barriers with a set-back of at least 1m from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the gravel bag barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.
- Requires Certificate of Compliance per Standard Specifications 6-1.07.

Maintenance and Inspection

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

Fiber Rolls

SC-5



Standard Symbol

BMP Objectives

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

Definition and Purpose

A fiber roll consists of 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 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.
- 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 if approved by the Resident Engineer (RE) or the District Construction Storm Water Coordinator (refer to SC-4 “Check Dams”).
- Fiber rolls may be used for drain inlet protection if approved by the RE or the District Construction Storm Water Coordinator (refer to SC-10 “Storm Drain 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 1:5 may require the use of 500 mm (20" diameter) or installations achieving the same protection (i.e., stacked smaller diameter fiber rolls, etc.).
- Fiber rolls may be used for drainage inlet protection if they can be properly anchored.
- 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.

Standards and Specifications

Fiber Roll Materials

- Fiber rolls shall be either:

  (1) Prefabricated rolls.

  (2) Rolled tubes of erosion control blanket.

Assembly of Field Rolled Fiber Roll

- Roll length of erosion control blanket into a tube of minimum 200 mm (8 in) diameter.
- Bind roll at each end and every 1.2 m (4 ft) along length of roll with jute-type twine.

Installation

- Slope inclination of 1:4 or flatter: fiber rolls shall be placed on slopes 6.0 m apart.
- Slope inclination of 1:4 to 1:2: fiber rolls shall be placed on slopes 4.5 m apart.
- Slope inclination 1:2 or greater: fiber rolls shall be placed on slopes 3.0 m apart.
- Stake fiber rolls into a 50 to 100 mm (2 to 4 in) trench.

- Drive stakes at the end of each fiber roll and spaced 600 mm (2 ft) apart if Type 2 installation is used (refer to Page 4). Otherwise, space stakes 1.2 m (4 ft) maximum on center if installed as shown on Pages 5 and 6.
- Use wood stakes with a nominal classification of 19 by 19 mm (3/4 by 3/4 in), and minimum length of 600 mm (24 in).
- If more than one fiber roll is placed in a row, the rolls shall be overlapped; not abutted.

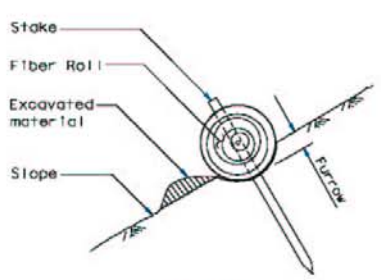
Removal

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

Maintenance and Inspection

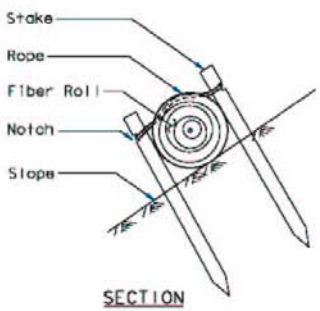
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast. Perform maintenance as needed or as required by the RE.
- Inspect fiber rolls following rainfall events and a least daily during prolonged rainfall. Perform maintenance as needed or as required by the RE.
- Maintain fiber rolls to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches three quarters (3/4) of the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

Fiber Rolls

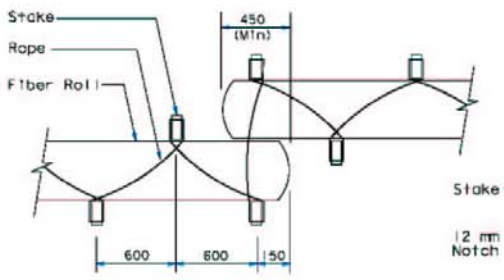


SECTION

TEMPORARY FIBER ROLL
(TYPE 1)

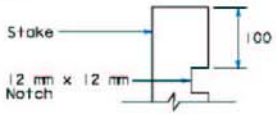


SECTION



PLAN

TEMPORARY FIBER ROLL
(TYPE 2)

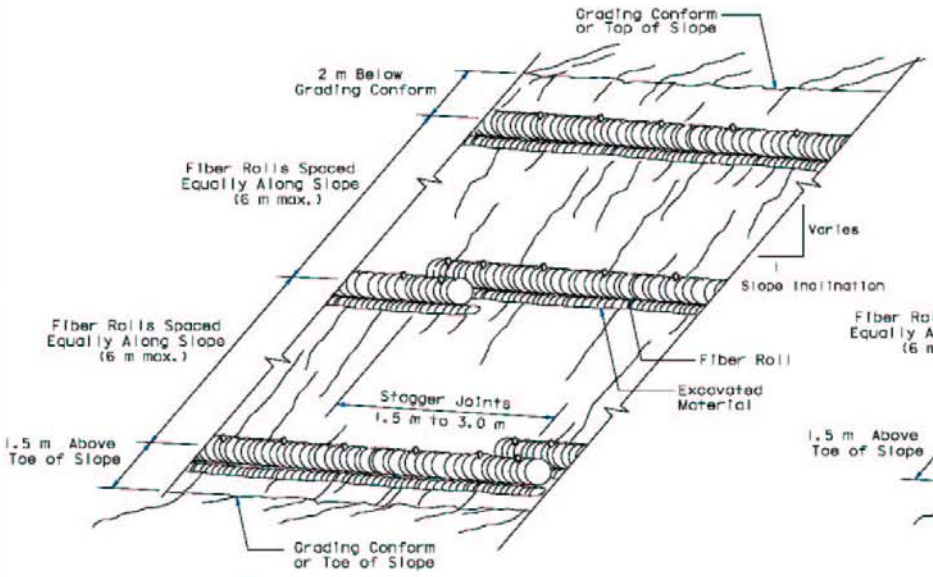


ELEVATION

NOTCH DETAIL

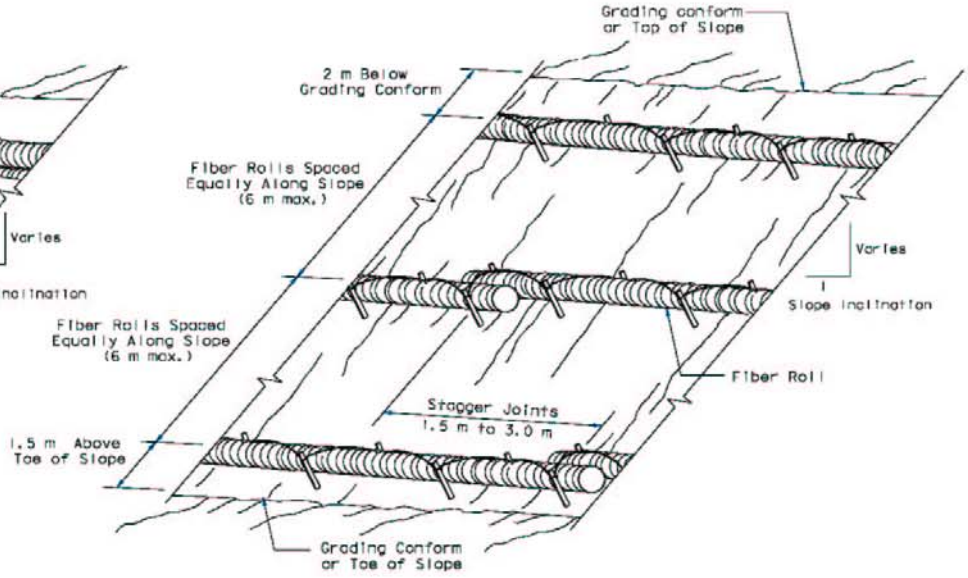
NOTE

1. Temporary fiber roll spacing varies depending upon slope inclination.



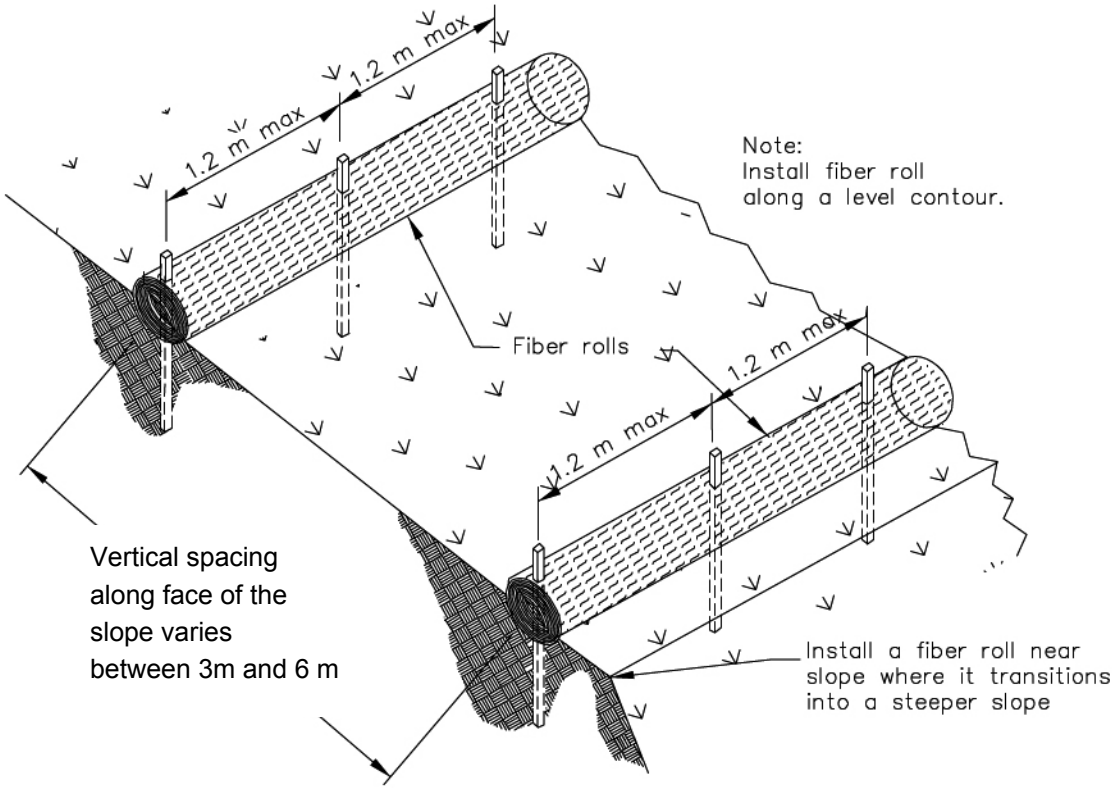
PERSPECTIVE

TEMPORARY FIBER ROLL (TYPE 1)



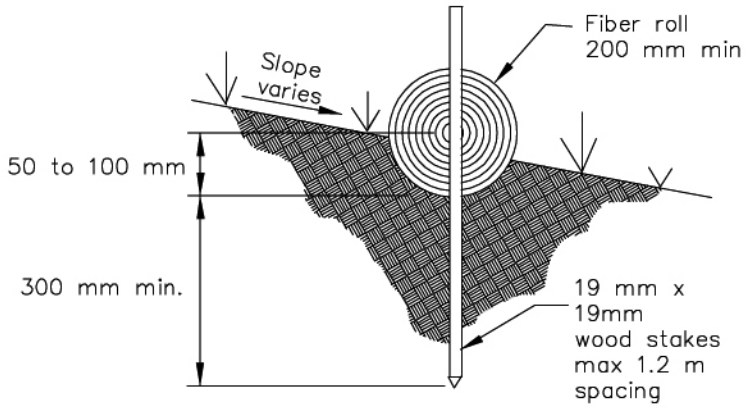
PERSPECTIVE

TEMPORARY FIBER ROLL (TYPE 2)



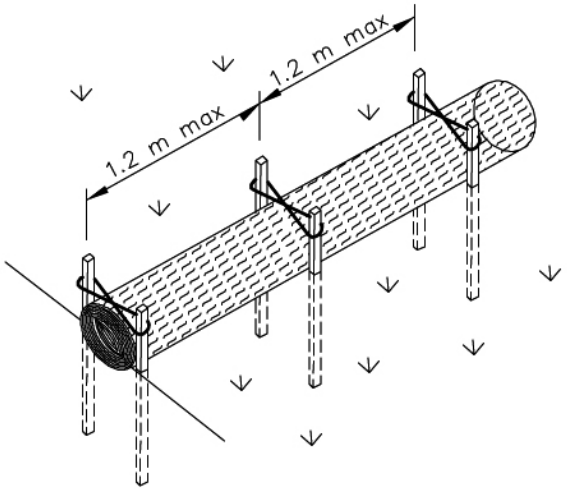
TYPICAL FIBER ROLL INSTALLATION

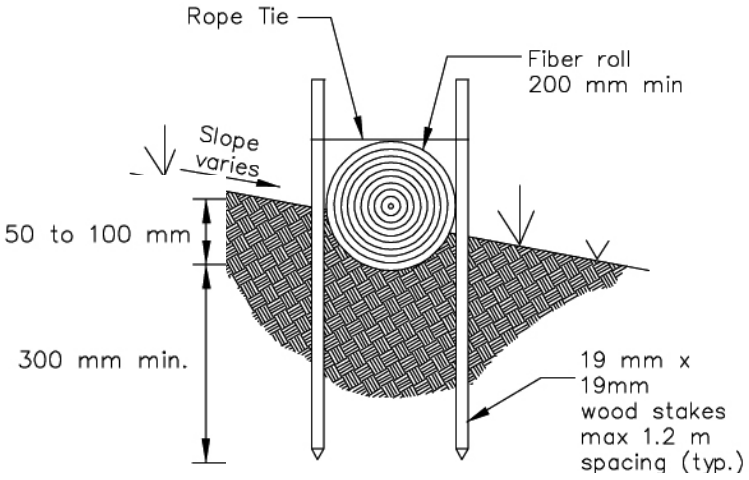
N.T.S.



ENTRENCHMENT DETAIL

N.T.S.



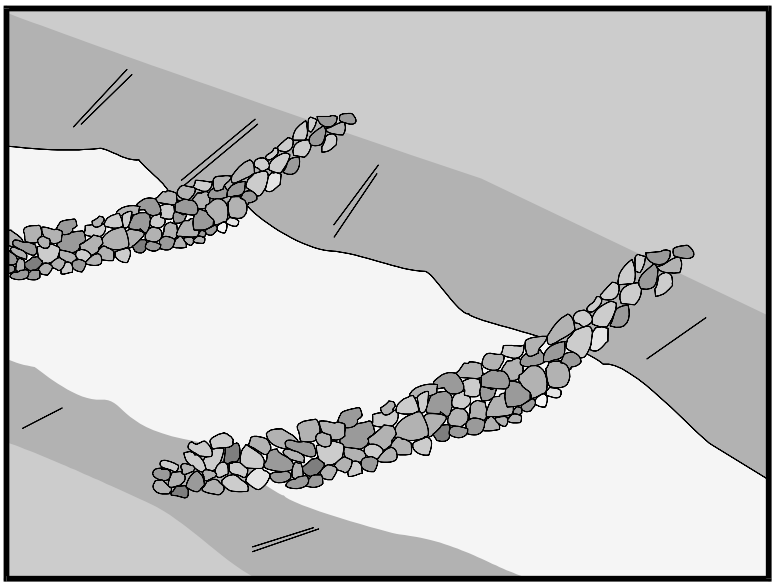


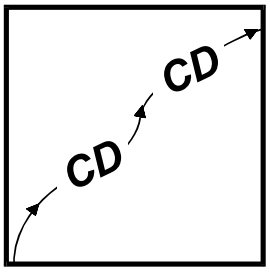
OPTIONAL ENTRENCHMENT DETAIL

N.T.S.

Check Dams

SC-4





Standard Symbol

BMP Objectives

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

Definition and Purpose

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, sandbags, 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 4 ha (10 ac) or less.
  - In steep channels where storm water runoff velocities exceed 1.5 m/s (4.9 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.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).

Limitations

- Not to be used in live streams.
- Not appropriate in channels that drain areas greater than 4 ha (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

- Check dams shall be placed at a distance and height to allow small pools to form behind them. Install the first check dam approximately 5 meters (16 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 shall reach the toe of the upstream dam.
- High flows (typically a 2-year storm or larger) shall safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams shall be removed when grass has matured sufficiently to protect the ditch or swale.
- Rock shall be placed individually by hand or by mechanical methods (no dumping of rock) to achieve complete ditch or swale coverage.
- Fiber rolls may be used as check dams if approved by the RE or the Construction NPDES Coordinator. Refer to SC-5 "Fiber Rolls."
- Gravel bags may be used as check dams with the following specifications:

Materials

- ***Bag Material:*** Bags shall be either polypropylene, polyethylene or polyamide woven fabric, minimum unit weight 135 g/m2 (four ounces per square yard), mullen burst strength exceeding 2,070 kPa (300 psi) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.
- ***Bag Size:*** Each gravel-filled bag shall have a length of 450 mm (18 in), width of 300 mm (12 in), thickness of 75 mm (3 in), and mass of approximately 15 kg (33 lb). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the RE for approval prior to deployment.
- ***Fill Material:*** Fill material shall be between 10 mm and 20 mm (0.4 and 0.8 inch) in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured such that gravel does not escape. Gravel-filled bags shall be between 13 kg and 22 kg (28 and 48 lb) in mass. Fill material is subject to approval by the RE.

Installation

- Install along a level contour.
- Tightly abut bags and stack gravel bags using a pyramid approach.

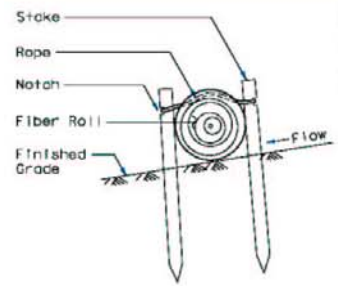
Gravel bags shall not be stacked any higher than 1 meter (3.2 ft).

– Upper rows of gravel bags shall overlap joints in lower rows.

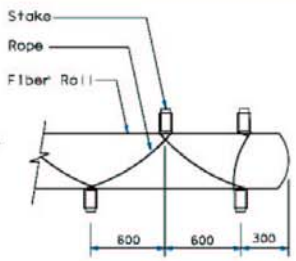
Maintenance and Inspection

- Inspect check dams after each significant rainfall event. Repair damage as needed or as required by the RE.
- 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 required by the RE.
- Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance with the Standard Specifications.

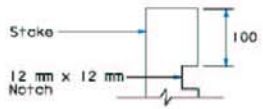
Check Dams



SECTION



PLAN



ELEVATION

NOTCH DETAIL

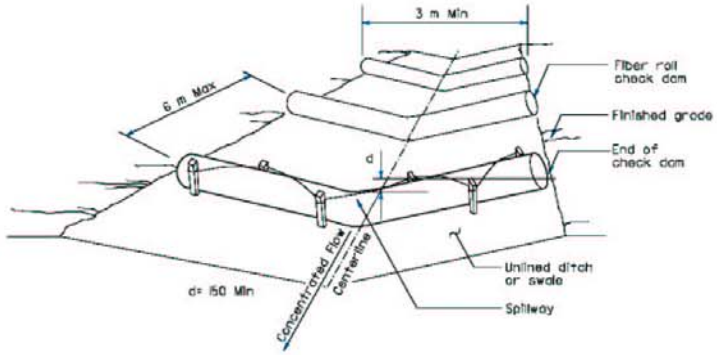
STAKING AND LASHING DETAIL

SECTION

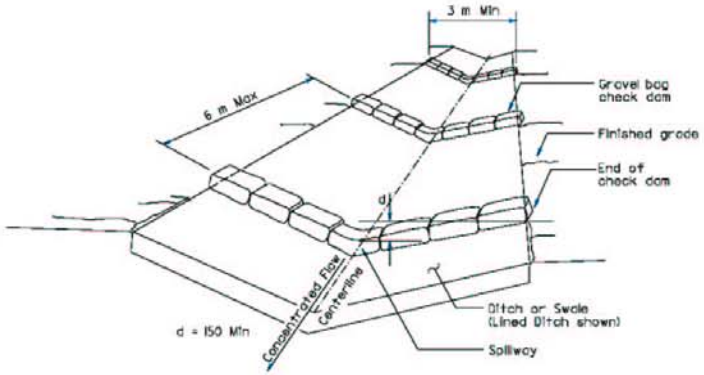
TEMPORARY CHECK DAM (TYPE 2)

NOTE

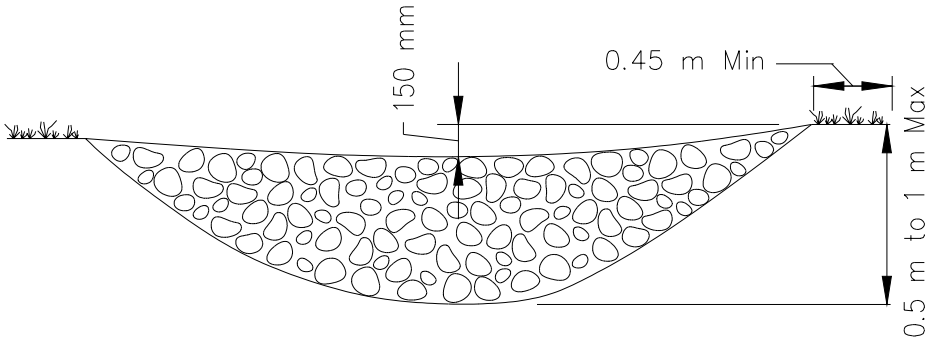
1. Spillway depth 'd' shall be maintained to prevent flanking of concentrated flow around the ends of check dam.



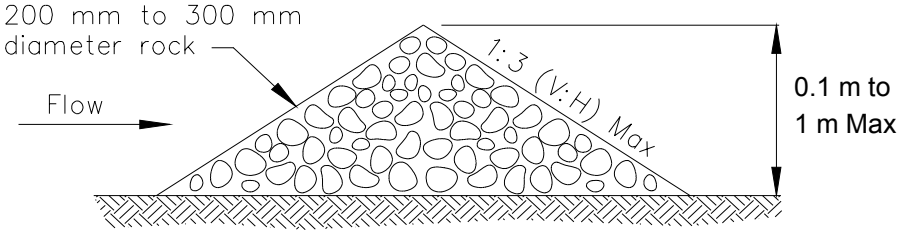
PERSPECTIVE
TEMPORARY CHECK DAM (TYPE 1)



PERSPECTIVE
TEMPORARY CHECK DAM (TYPE 2)



ELEVATION

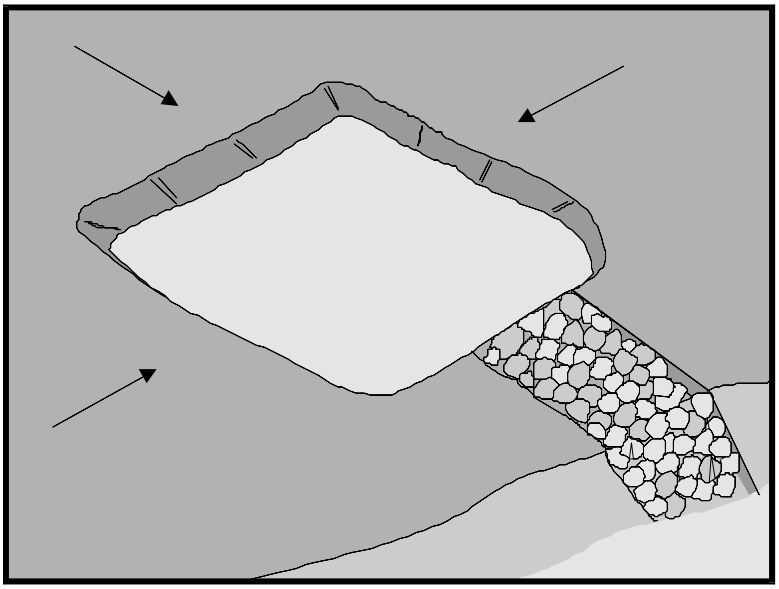


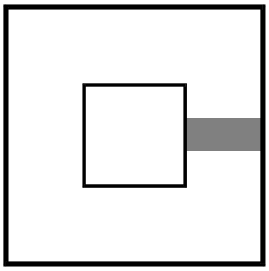
TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE

Sediment Trap

SC-3





Standard Symbol

BMP Objectives

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

Definition and Purpose

A sediment trap is a temporary 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 across a waterway or low drainage area.

Appropriate Applications

- Sediment traps may be used on construction projects where the drainage area is less than 2 ha (5 ac). Traps should be placed where sediment-laden storm water enters a storm drain or watercourse.
- This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the Resident Engineer (RE).
- As a supplemental control, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations

- Requires large surface areas to permit infiltration and settling of sediment.
- Not appropriate for drainage areas greater than 2 ha (5 ac).
- Only removes large and medium sized particles and requires upstream erosion control.
- Attractive and dangerous to children, requiring protective fencing.
- Not to be located in live streams.
- Size may be limited by availability of right-of-way.

Sediment Trap

SC-3

Standards and Specifications

- Construct sediment traps prior to rainy season and construction activities.
- Trap shall 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.
- Trap shall be sized to accommodate a settling zone and sediment storage zone with recommended minimum volumes of 130 m3/ha (67 yd3/ac) and 65 m3/ha (33 yd3/ac) of contributing drainage area, respectively, based on 12.7 mm (0.5 in) of runoff volume over a 24-hr period. Multiple traps and/or additional volume may be required to accommodate site specific rainfall and soil conditions.
- Traps with an impounding levee greater than 1.5 m (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 1000 cubic meters (35,300 cubic feet), shall be designed by a professional Civil Engineer registered with the state of California. The design must be submitted to the Resident Engineer (RE) for approval at least 7 days prior to the basin construction. The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
- Earthwork shall be in accordance with Standard Specifications Section 19 – "Earthwork". Contractor is specifically directed to Standard Specifications Sections 19-5 and 19-6 entitled, "Compaction" and "Embankment Construction," respectively.
- Areas under embankments, structural works, and sediment traps shall be cleared and stripped of vegetation in accordance with Standard Specifications Section 16 – "Clearing and Grubbing."
- Use rock or vegetation to protect the trap outlets against erosion.
- Fencing, in accordance with Standard Specifications Section 80 – "Fencing," shall be provided to prevent unauthorized entry.

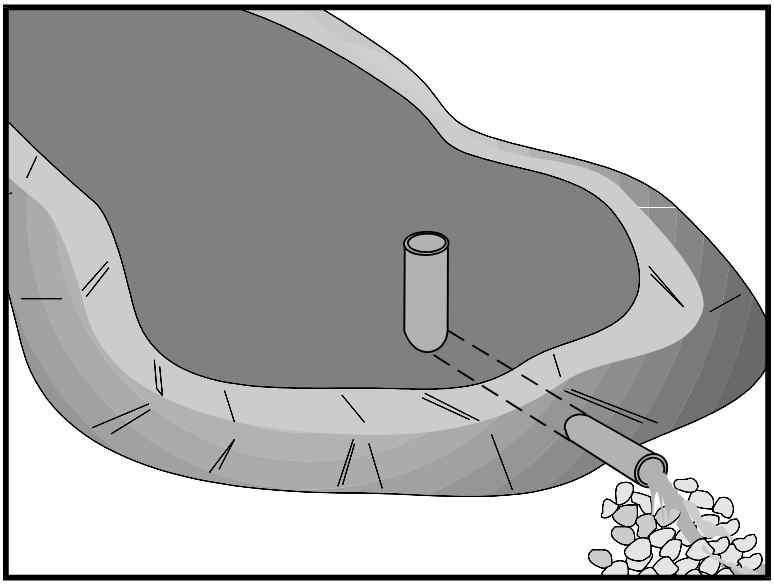
Maintenance and Inspection

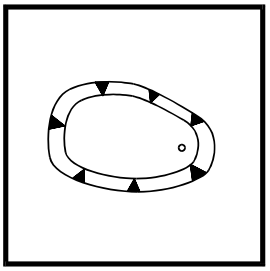
- Inspect sediment traps before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect sediment traps at least every 24 hours.
- If captured runoff has not completely infiltrated within 72 hours then the sediment trap must be dewatered.
- Inspect trap banks for embankment seepage and structural soundness.

- Inspect outlet structure and rock spillway for any damage or obstructions. Repair damage and remove obstructions as needed or as directed by the RE.
- Inspect outlet area for erosion and stabilize if required, or as directed by the RE.
- Remove accumulated sediment when the volume has reached one-third the original trap volume.
- Properly disposed of sediment and debris removed from the trap.
- Inspect fencing for damage and repair as needed or as directed by the RE.

Sediment/Desilting Basin

SC-2





Standard Symbol

BMP Objectives

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

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 and 2).

Appropriate Applications

Sediment basins shall be designed in accordance with Section A of the State of California NPDES General Permit for Storm Water Discharges Associated with Construction Activities (General Permit). If there is insufficient area to construct a sediment basin in accordance with the General Permit requirements, then the alternate desilting design standards specified herein may be used. This BMP may be implemented on a project-by-project basis with other BMPs when determined necessary and feasible by the RE.

Sediment/Desilting Basins shall be considered for use:

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

Limitations

- Alternative BMPs must be thoroughly investigated for erosion control before selecting temporary desilting basins.
- Requires large surface areas to permit settling of sediment.
- Not appropriate for drainage areas greater than 30 ha (75 ac).
- Not to be located in live streams

- For safety reasons, basins shall have protective fencing.
- Size may be limited by availability of right-of-way.

Standards and Specifications

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

Sediment Basin

- Sediment basins shall, at a minimum, be designed as follows:
  - Option 1: Pursuant to local ordinance for sediment basin design and maintenance, provided that the design efficiency is as protective or more protective of water quality than Option 3.

    OR

  - Option 2: Sediment basin(s), as measured from the bottom of the basin to the principal outlet, shall have at least a capacity equivalent to 102 cubic meters (3,600 cubic feet) of storage per 0.4 hectare (1 acre) draining into the sediment basin. The length of the basin shall be more than twice the width of the basin. The length is determined by measuring the distance between the inlet and the outlet; and the depth must not be less than 0.9 m (3 ft) nor greater than 1.5 m (5 ft) for safety reasons and for maximum efficiency.

    OR

  - Option 3: Sediment basin(s) shall be designed using the standard equation:

    $$As=1.2Q/Vs \qquad \text{(Eq. 1)}$$

    Where:

    As = Minimum surface area for trapping soil particles of a certain size

    Vs = Settling velocity of the design particle size chosen

    $Q = C\ I\ A$

    Where:

    Q = Discharge rate measured in cubic feet per second

    C = Runoff coefficient

    I = Precipitation intensity for the 10-year, 6-hour rain event

    A = Area draining into the sediment basin in acres

The design particle size shall be the smallest soil grain size determined by wet sieve analysis, or the fine silt sized (0.01mm) particle, and the *Vs* used shall be 100 percent of the calculated settling velocity.

The length is determined by measuring the distance between the inlet and the outlet; the length shall be more than twice the dimension as the width; the depth shall not be less than 0.9 m (3 ft) nor greater than 1.5 m (5 ft) for safety reasons and for maximum efficiency [0.6 m (2 ft) of sediment storage, 0.6 m (2 ft) of capacity). The basin(s) shall be located on the site where it can be maintained on a year-round basis and shall be maintained on a schedule to retain the 0.6 m (2 ft) of capacity.

OR

– Option 4: The use of an equivalent surface area design or equation, provided that the design efficiency is as protective or more protective of water quality than Option 3.

Desilting Basin

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

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

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

- Basins with an impounding levee greater than 1.5 m (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 1000 cubic meters (35,300 cubic feet), shall be designed by a professional Civil Engineer registered with the state of California. The design must be submitted to the Resident Engineer (RE) for approval at least 7 days prior to the basin construction. The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the basin outlet and bypass structures.

General Requirements

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

- Sediment/desilting basins, regardless of size and storage volume, shall include features to accommodate overflow or bypass flows that exceed the design storm event. The calculated basin volume and proposed location shall be submitted to

the RE for approval at least 3 days prior to the basin construction.

- Construct an emergency spillway to accommodate flows not carried by the principal spillway. Spillway shall consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.

- Spillway control section, which is a level portion of the spillway channel at the highest elevation in the channel, shall be a minimum of 6 m (20 ft) in length.

- A forebay, constructed upstream of the basin may be provided to remove debris and larger particles.

- Basin inlets shall be located to maximize travel distance to the basin outlet.

- Rock or vegetation shall be used to protect the basin inlet and slopes against erosion.

- The outflow from the basins shall be provided with outlet protection to prevent erosion and scouring of the embankment and channel. See BMP SS-10, "Outlet Protection/Velocity Dissipation Devices."

- Basin shall be located: (1) by excavating a suitable area or where a low embankment can be constructed across a swale, (2) where post-construction (permanent) detention basins will be constructed, (3) where failure would not cause loss of life or property damage, (4) where the basins can be maintained on a year-round basins to provide access for maintenance, including sediment removal and sediment stockpiling in a protected area, and to maintain the basin to provide the required capacity.

- Areas under embankments, structural works, and sediment/desilting basin must be cleared, stripped of vegetation in accordance with Standard Specifications Section 16 – "Clearing and Grubbing."

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

- Structure shall be placed on a firm, smooth foundation with the base securely anchored with concrete or other means to prevent floatation.

- Discharge from the basin shall be accomplished through a water quality outlet. An example is shown in Figure 3. The Principal outlet shall consist of a corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes and an anti-vortex device and trash rack attached to the top of the riser, to prevent floating debris from flowing out of the basin or obstructing the system. This principal structure shall be designed

to accommodate the inflow design storm.

- 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 72 hours (also referred to as "drawdown time"). (The 24-hour limit is specified to provide adequate settling time; the 72-hour limit is specified to mitigate vector control concerns.)

- 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:

$$a = \frac{2A(H-Ho)^{0.5}}{3600CT(2g)^{0.5}} = \frac{(7x10^{-5})A(H-Ho)^{0.5}}{CT} \qquad \text{(Eq. 2)}$$

  where:

  a = area of orifice (ft^2) (1 ft^2 =0.0929m^2)
  A = surface area of the basin at mid elevation (ft^2)
  C = orifice coefficient
  T = drawdown time of full basin (hrs)
  G = gravity (32.2 ft/s^2)
  H = elevation when the basin is full (ft)
  Ho = final elevation when basin is empty (ft)

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

$$a = \frac{(1.75x10^{-6})A(H-Ho)^{0.5}}{C} \qquad \text{(Eq. 3)}$$

  Flow Control Using Multiple Orifices (see Figure2):

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

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)

$h_{centroid\ of\ orifices}$ = 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

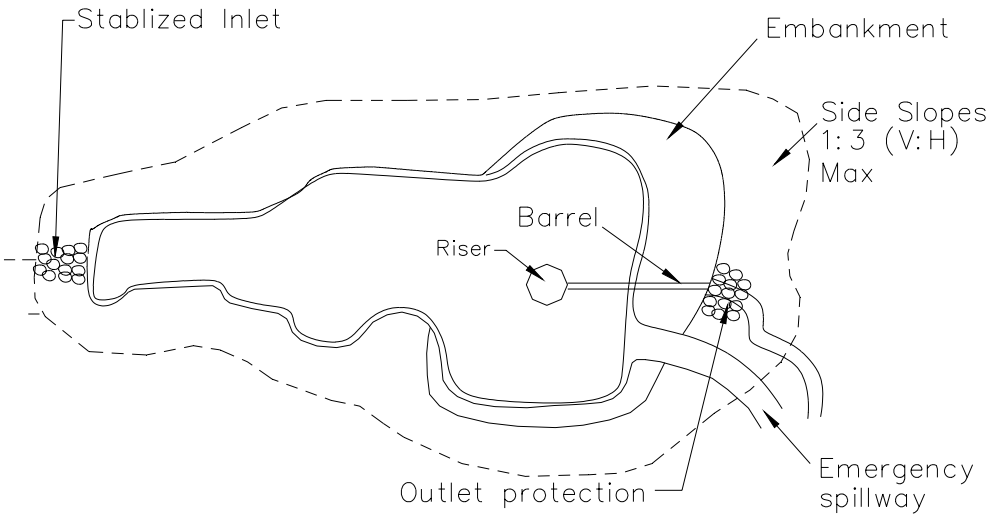
- The Contractor shall verify that the outlet is properly designed to handle the design and peak flows.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel), which extends through the embankment to toe of fill. Provide anti-seep collars on the barrel.
- Cleanout level shall be clearly marked on the riser pipe
- Avoid dewatering of groundwater to the sediment/desilting basin during the rainy season. Insignificant quantities of accumulated precipitation may be dewatered to the sediment/desilting basin unless precipitation is forecasted within 24 hours. Refer to NS-2 “Dewatering Operations.”
- Chain link fencing shall be provided around each sediment/desilting basin to prevent unauthorized entry to the basin or if safety is a concern. Fencing shall be in accordance with Standard Specifications Section 80 – “Fencing.”

Maintenance and Inspection

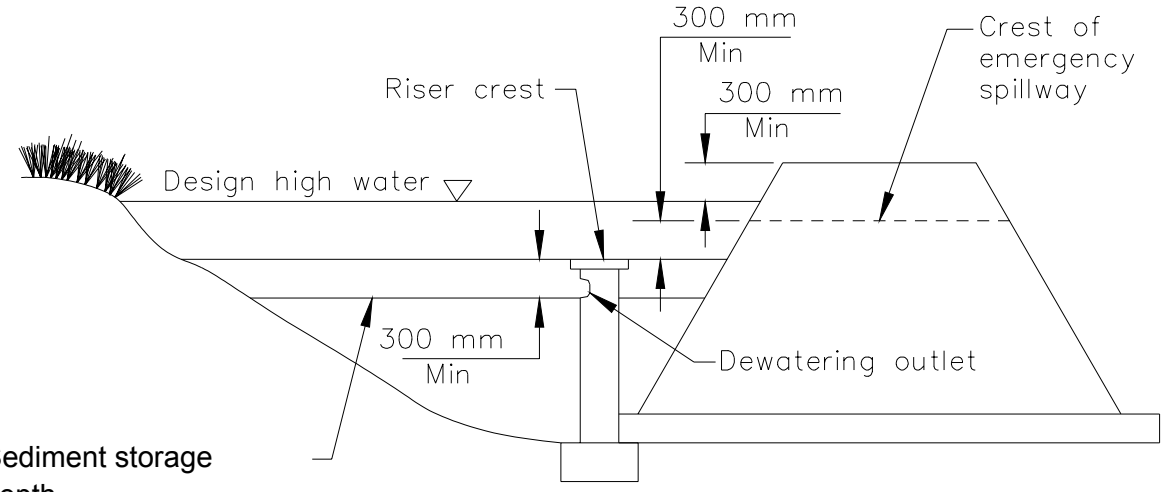
- Inspect sediment/desilting basins before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect at

least every 24 hours.

- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions. Repair damage and remove obstructions as needed, or as directed by the RE.
- Remove standing water from the basin within 72 hours after accumulation.
- Check inlet and outlet area for erosion and stabilize if required, or if directed by the RE.
- 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 as needed or as directed by the RE.

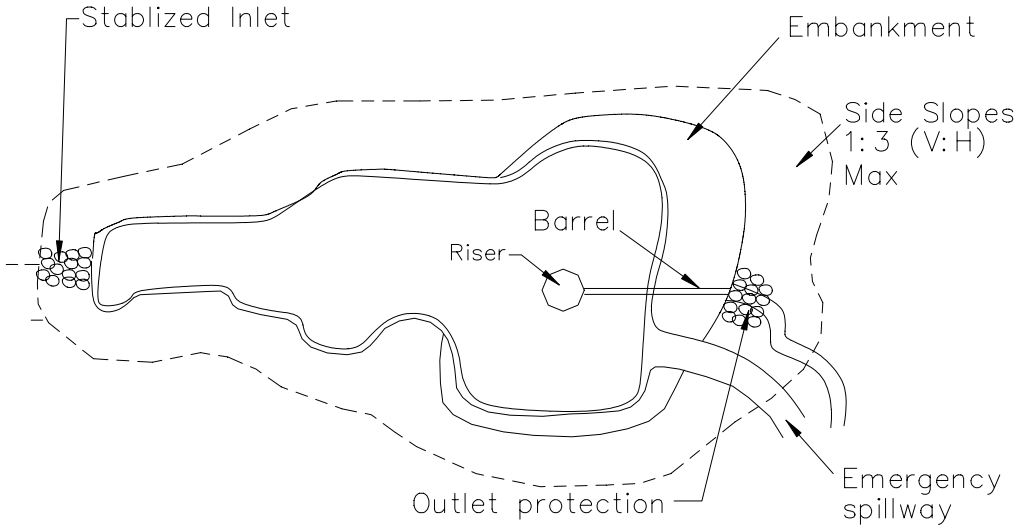


TOP VIEW



This outlet provides no drainage for permanent pool.

FIGURE 1: SINGLE ORIFICE DESIGN
NOT TO SCALE



TOP VIEW

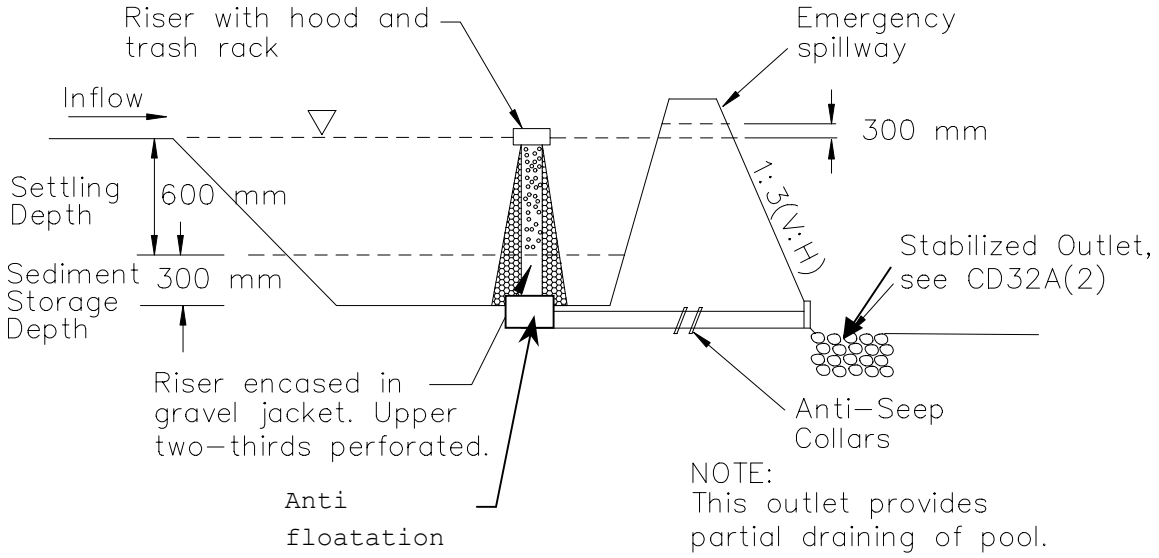


FIGURE 2: MULTIPLE ORIFICE DESIGN
NOT TO SCALE

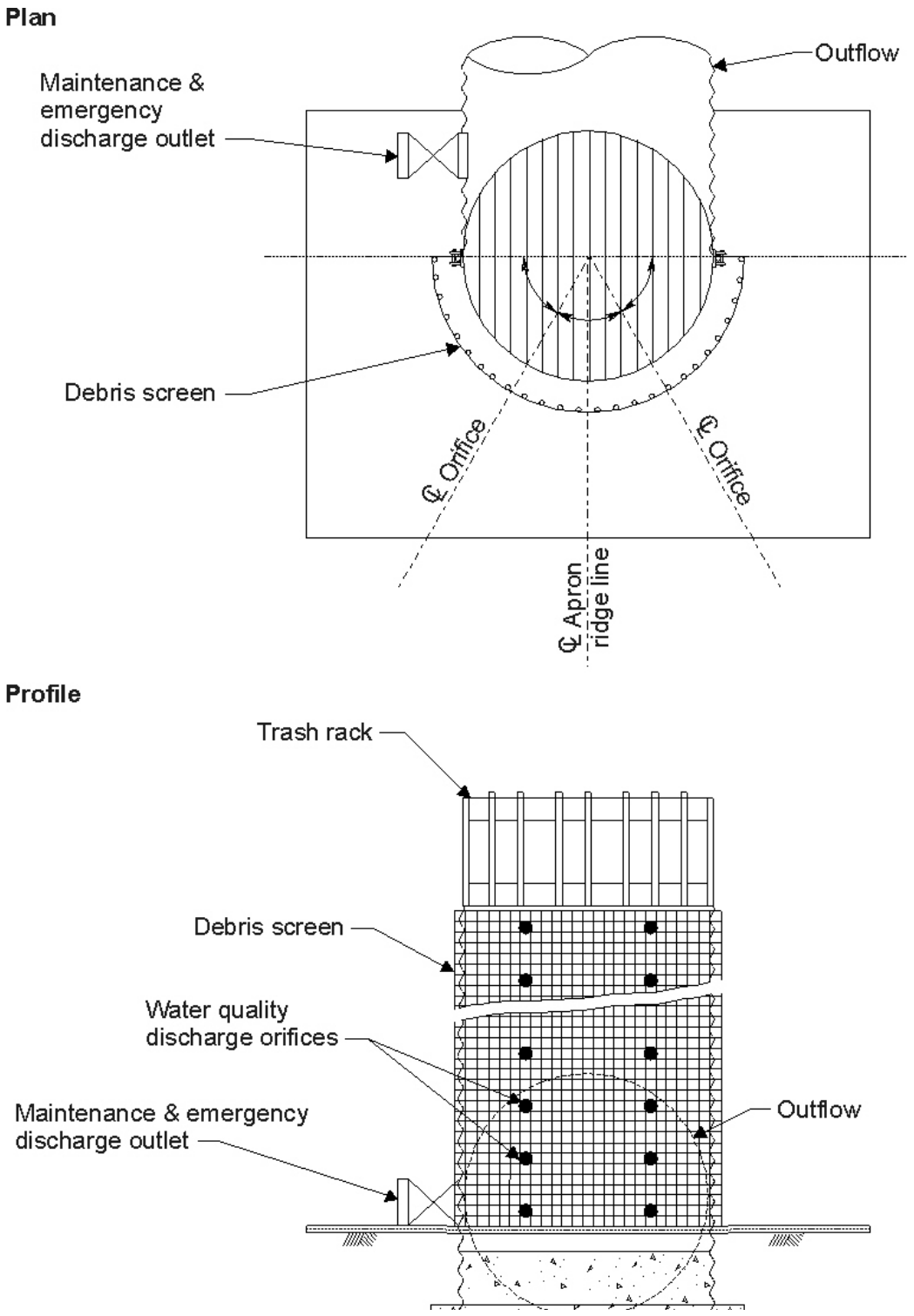
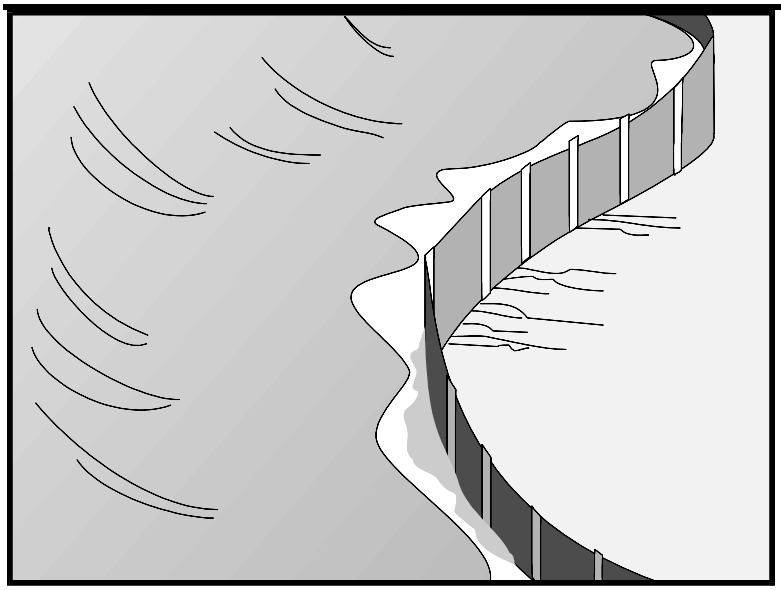
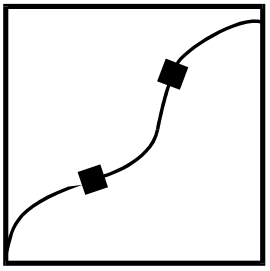


FIGURE 3: MULTIPLE ORIFICE OUTLET RISER
NOT TO SCALE

Silt Fence

SC-1





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

Silt fences are placed:

- Below the toe of exposed and erodible slopes.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along streams and channels.
- 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 1:4 (V:H).
- 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.

Standards and Specifications

Design and Layout

- The maximum length of slope draining to any point along the silt fence shall be 61 m (200 ft) or less.
- Slope of area draining to silt fence shall be less than 1:1 (V:H).
- Limit to locations suitable for temporary ponding or deposition of sediment.
- Fabric life span generally limited to between five and eight months. Longer periods may require fabric replacement.
- Silt fences shall not be used in concentrated flow areas.
- Lay out in accordance with Pages 5 and 6 of this BMP.
- For slopes steeper than 1:2 (V:H) and that contain a high number of rocks or large dirt clods that tend to dislodge, it may be necessary to install additional protection immediately adjacent to the bottom of the slope, prior to installing silt fence. Additional protection may be a chain link fence or a cable fence.
- For slopes adjacent to water bodies or Environmentally Sensitive Areas (ESAs), additional temporary soil stabilization BMPs shall be used.

Materials

- Silt fence fabric shall be woven polypropylene with a minimum width of 900 mm (36 inches) and a minimum tensile strength of 0.45-kN. The fabric shall conform to the requirements in ASTM designation D4632 and shall have an integral reinforcement layer. The reinforcement layer shall be a polypropylene, or equivalent, net provided by the manufacturer. The permittivity of the fabric shall be between 0.1 sec^{-1} and 0.15 sec^{-1} in conformance with the requirements in ASTM designation D4491. Contractor must submit certificate of compliance in accordance with Standard Specifications Section 6-1.07.
- Wood stakes shall be commercial quality lumber of the size and shape shown on the plans. Each stake shall be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable.
- Bar reinforcement may be used, and its size shall be equal to a number four (4) or greater. End protection shall be provided for any exposed bar reinforcement.
- Staples used to fasten the fence fabric to the stakes shall be not less than 45 mm (1.75 inches) long and shall be fabricated from 1.57 mm (0.06 inch) or heavier wire. The wire used to fasten the tops of the stakes together when

joining two sections of fence shall be 3.05 mm (0.12 inch) or heavier wire. Galvanizing of the fastening wire is not required.

Installation

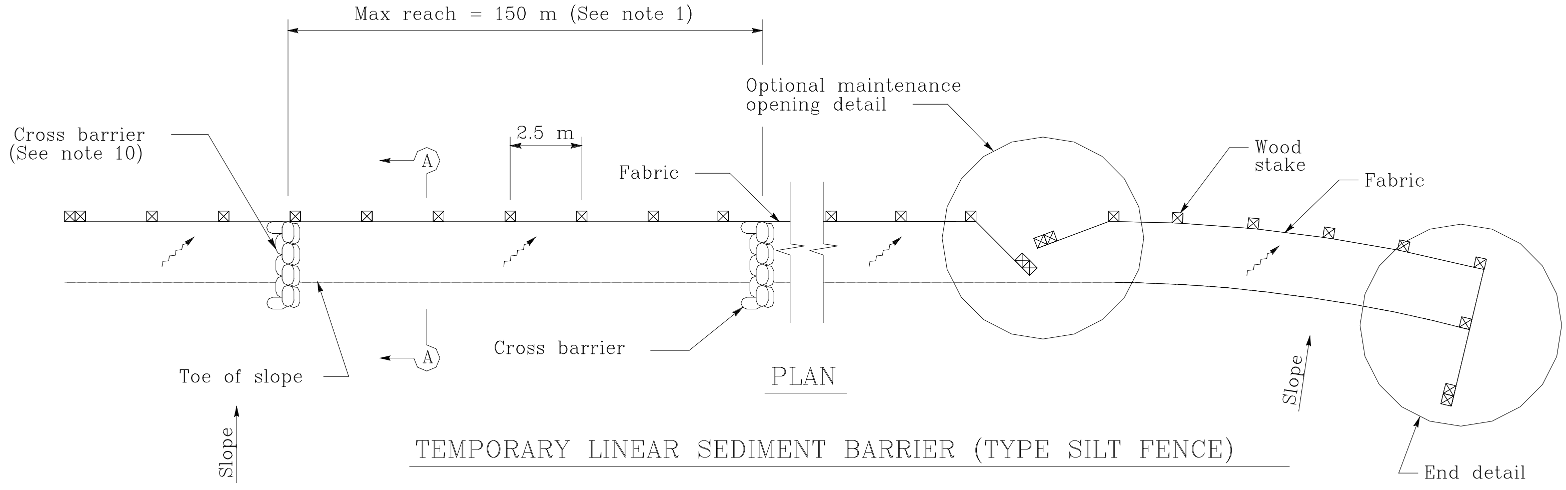
- Generally, silt fences shall be used in conjunction with soil stabilization source controls up slope to provide effective erosion and sediment control.
- Bottom of the silt fence shall be keyed-in a minimum of 150 mm (12 inches).
- Trenches shall not be excavated wider and deeper than necessary for proper installation of the temporary linear sediment barriers.
- Excavation of the trenches shall be performed immediately before installation of the temporary linear sediment barriers.
- Construct silt fences with a set-back of at least 1m (3 ft) from the toe of a slope. Where a silt fence is determined to be not practical due to specific site conditions, the silt fence may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practical.
- Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the barrier; in no case shall the reach exceed 150 meters (490 ft).
- Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
- Install in accordance with Pages 5 and 6 of this BMP.

Maintenance and Inspection

- Repair undercut silt fences.
- Repair or replace split, torn, slumping, or weathered fabric.
- Inspect silt fence when rain is forecast. Perform necessary maintenance, or maintenance required by the Resident Engineer (RE).
- Inspect silt fence following rainfall events. Perform maintenance as necessary, or as required by the RE.
- Maintain silt fences to provide an adequate sediment holding capacity. Sediment shall be removed when the sediment accumulation reaches one-third (1/3) of the barrier height. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the right-of-way in conformance with the Standard Specifications.
- Silt fences that are damaged and become unsuitable for the intended purpose, as determined by the RE, shall be removed from the site of work, disposed of outside the highway right-of-way in conformance with the Standard Specifications, and replaced with new silt fence barriers.

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

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



PLAN

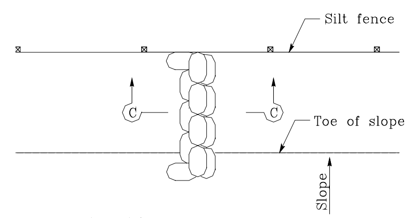
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SILT FENCE)

NOTES

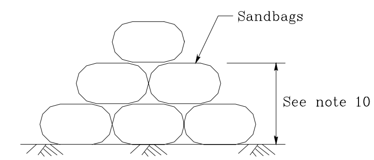
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 150m.
2. The last 2.5 m of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may vary to fit field condition.
5. Stakes shall be spaced at 2.5 m maximum and shall be positioned on downstream side of fence.
6. Stakes to overlap and fence fabric to fold around each stake one full turn. Secure fabric to stake with 4 staples.
7. Stakes shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the stakes shall be secured with wire.
8. For end stake, fence fabric shall be folded around two stakes one full turn and secured with 4 staples.
9. Minimum 4 staples per stake. Dimensions shown are typical.
10. Cross barriers shall be a minimum of 1/3 and a maximum of 1/2 the height of the linear barrier.
11. Maintenance openings shall be constructed in a manner to ensure sediment remains behind silt fence.
12. Joining sections shall not be placed at sump locations.
13. Sandbag rows and layers shall be offset to eliminate gaps.

LEGEND

Tamped backfill
Slope direction
Direction of flow



CROSS BARRIER DETAIL



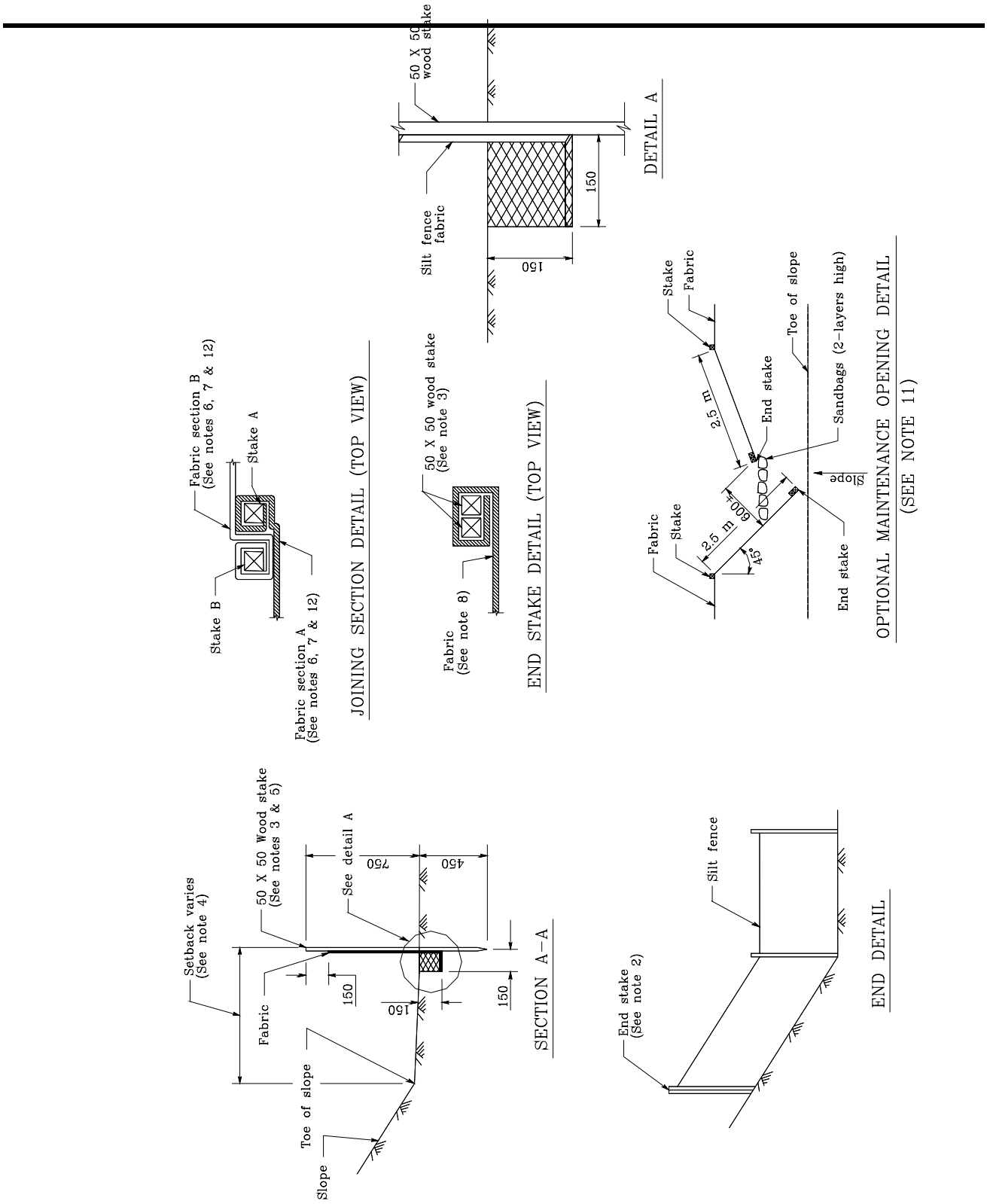
SECTION C-C

STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

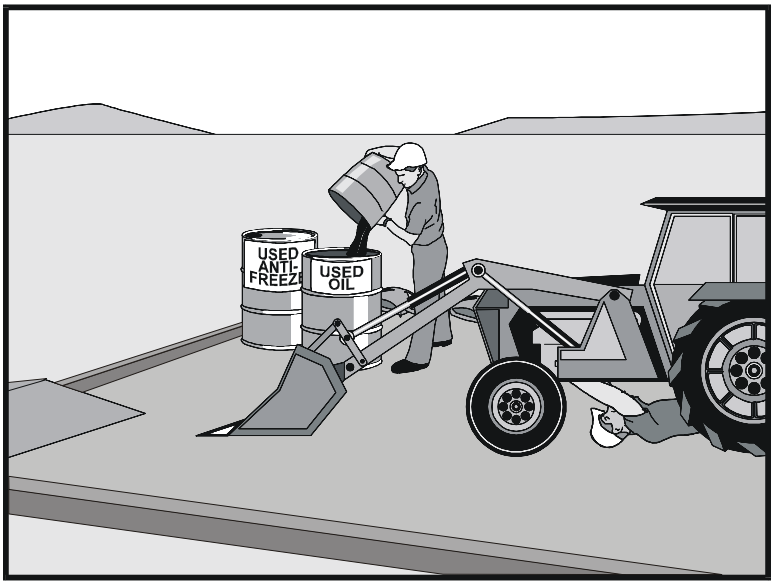
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SILT FENCE)

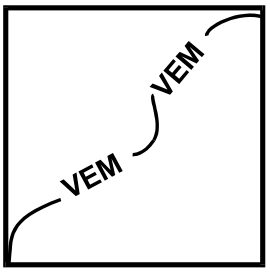
NO SCALE

ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN


50 X 50 wood stake
Silt fence fabric
150
150
DETAIL A
Fabric section B (See notes 6, 7 & 12)
Stake A
Stake B
Fabric section A (See notes 6, 7 & 12)
JOINING SECTION DETAIL (TOP VIEW)
50 X 50 wood stake (See note 3)
Fabric (See note 8)
END STAKE DETAIL (TOP VIEW)
Stake
Fabric
2.5 m
End stake
Toe of slope
Sandbags (2-layers high)
Slope
600
2.5 m
45°
Fabric
Stake
End stake
OPTIONAL MAINTENANCE OPENING DETAIL
(SEE NOTE 11)
Setback varies (See note 4)
50 X 50 Wood stake (See notes 3 & 5)
See detail A
750
450
150
150
150
Fabric
Toe of slope
Slope
SECTION A-A
Silt fence
End stake (See note 2)
END DETAIL

Vehicle and Equipment Maintenance NS-10





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

Limitations

- None identified.

Standards and Specifications

- Drip pans or absorbent pads shall be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- All maintenance areas are required to have spill kits and/or use other spill protection devices.
- Dedicated maintenance areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m (50 ft) from downstream drainage facilities and watercourses.
- Drip Pans or plastic sheeting shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.
- Absorbent spill clean-up materials shall be available in maintenance areas and shall be disposed of properly after use. Substances used to coat asphalt transport trucks and asphalt-spreading equipment shall be non-toxic.
- Use off-site maintenance facilities whenever practical.

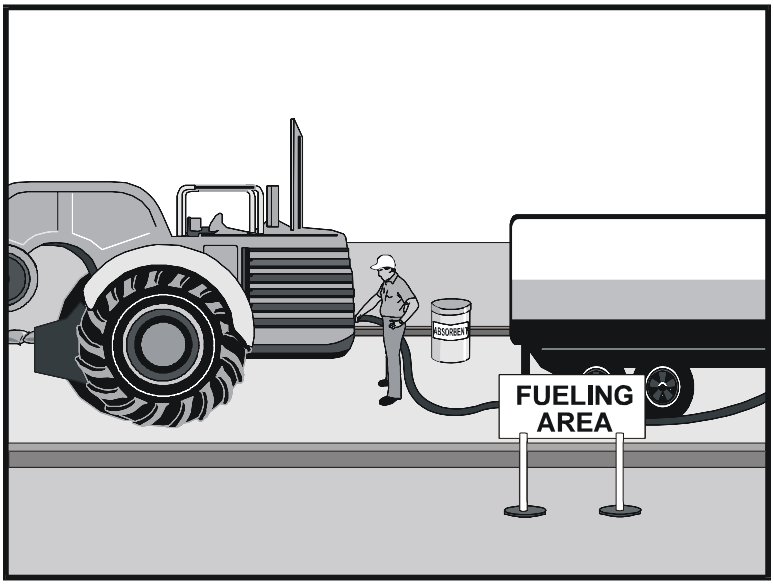
- For long-term projects, consider constructing roofs or using portable tents over maintenance areas.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not dump fuels and lubricants onto the ground.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose or recycle used batteries.
- Do not bury used tires.
- Repair of fluid and oil leaks immediately.
- Provide spill containment dikes or secondary containment around stored oil and chemical drums.

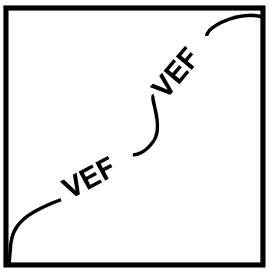
Maintenance and Inspection

- Maintain waste fluid containers in leak proof condition.
- Vehicle and equipment maintenance areas shall be inspected regularly.
- Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately or the problem vehicle(s) or equipment shall be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

Vehicle and Equipment Fueling

NS-9





Standard Symbol

BMP Objectives

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

Definition and Purpose

Vehicle and equipment fueling procedures and practices are designed to minimize or eliminate the discharge of fuel spills and leaks into storm drain systems or to watercourses.

Appropriate Applications

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

Limitations

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

Standards and Specifications

- When fueling must occur onsite, the contractor shall select and designate an area to be used, subject to approval of the Resident Engineer (RE).
- Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and shall be disposed of properly after use.
- Drip pans or absorbent pads shall be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.
- Dedicated fueling areas shall be protected from storm water run-on and runoff, and shall be located at least 15 m (50 ft) from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips. Fueling operations shall not be left unattended.
- Protect fueling areas with berms and/or dikes to prevent run-on, runoff, and to contain spills.

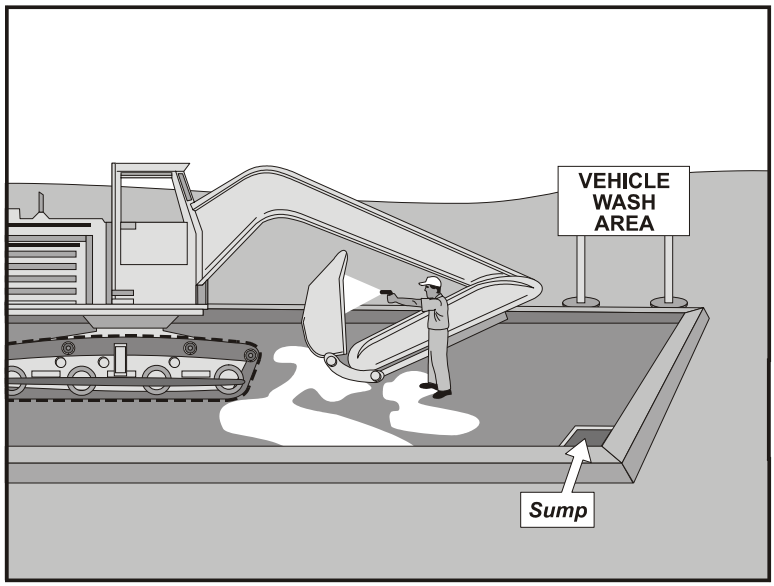
- Use vapor recovery nozzles to help control drips as well as air pollution where required by Air Quality Management Districts (AQMD). Ensure the nozzle is secured upright when not in use.
- Fuel tanks shall not be "topped-off."
- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.
- Absorbent spill clean-up materials shall be available in fueling and maintenance areas and used on small spills instead of hosing down or burying techniques. The spent absorbent material shall be removed promptly and disposed of properly.
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks. Refer to WM-1, "Material Delivery and Storage."
- Mobile fueling of construction equipment throughout the site shall be minimized. Whenever practical, equipment shall be transported to the designated fueling area.

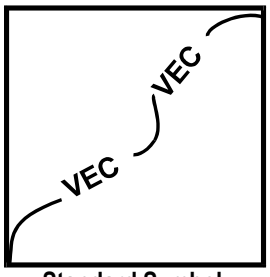
Maintenance and Inspection

- Fueling areas and storage tanks shall be inspected regularly.
- Keep an ample supply of spill cleanup material on the site.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

Vehicle and Equipment Cleaning

NS-8





Standard Symbol

BMP Objectives

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

Definition and Purpose

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

Appropriate Applications

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

Limitations

- None.

Standards and Specifications

- On-site vehicle and equipment washing is discouraged.
- Cleaning of vehicles and equipment with soap, solvents or steam shall not occur on the project site unless the Resident Engineer (RE) has been notified in advance and the resulting wastes are fully contained and disposed of outside the highway right-of-way in conformance with the provisions in the Standard Specifications Section 7-1.13. Resulting wastes and by-products shall not be discharged or buried within the highway right-of-way, and must be captured and recycled or disposed according to the requirements of WM-10, "Liquid Waste Management" or WM-6, "Hazardous Waste Management," depending on the waste characteristics. Minimize use of solvents. The use of diesel for vehicle and equipment cleaning is prohibited.
- Vehicle and equipment wash water shall be contained for percolation or evaporative drying away from storm drain inlets or watercourses and shall not be discharged within the highway right-of-way. Apply sediment control BMPs if applicable.
- All vehicles/equipment that regularly enter and leave the construction site must be cleaned off-site.
- When vehicle/equipment washing/cleaning must occur onsite, and the

operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall have the following characteristics, and shall be arranged with the construction storm water coordinator:

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

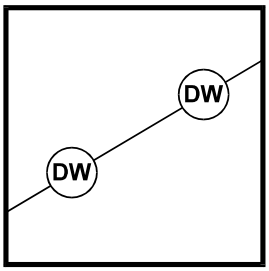
- When cleaning vehicles/equipment with water:
  - Use as little water as possible. High pressure sprayers may use less water than a hose, and shall be considered.
  - Use positive shutoff valve to minimize water usage.
  - Facility wash racks shall discharge to a sanitary sewer, recycle system or other approved discharge system and shall not discharge to the storm drainage system or watercourses.

Maintenance and Inspection

- The control measure shall be inspected at a minimum of once a week.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed or as directed by the RE.

Dewatering Operations

NS-2



Standard Symbol

BMP Objectives

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

Definition and Purpose

Dewatering Operations are practices that manage the discharge of pollutants when non-storm water and accumulated precipitation (storm water) must be removed from a work location so that construction work may be accomplished.

Appropriate Applications

- These practices are implemented for discharges of non-storm water and storm water (accumulated rain water) from construction sites. Non-storm water 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 (storm water) from depressed areas at a construction site.
- Storm water mixed with non-storm water should be managed as non-storm water.

Limitations

- Dewatering operations for non-storm water will require, and must comply with, applicable local permits, project-specific permits, and regulations.
- Site conditions will dictate design and use of dewatering operations.
- A dewatering plan shall be submitted as part of the SWPPP/WPCP detailing the location of dewatering activities, equipment, and discharge point.
- The controls discussed in this best management practice (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 Resident Engineer (RE) and comply with Standard Specifications Section 5-1.116, "Differing Site Conditions."

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

Standards and Specifications

- Dewatering shall be conducted in accordance with the Field Guide to Construction Site Dewatering, October 2001, CTSW-RT-01-010.
- Dewatering for accumulated precipitation (storm water) shall follow this BMP and use treatment measures specified herein.
- The RWQCB may require a separate NPDES permit prior to the dewatering discharge of non-storm water. These permits will have specific testing, monitoring, and discharge requirements and can take significant time to obtain.
- Except in RWQCB Regions 1 and 2, the discharge of accumulated precipitation (storm water) to a water body or storm drain is subject to the requirements of Caltrans NPDES permit. Sediment control and other appropriate BMPs (e.g., outlet protection/energy dissipation) must be employed when this water is discharged.
- RWQCB Regions 1 and 2 require notification and approval prior to any discharge of water from construction sites.
- In RWQCB Regions 3, 5, 7, and 9 non-storm water dewatering for discharges meeting certain conditions are allowed under an RWQCB general dewatering NPDES Permit. Notification and approval from the RWQCB is required prior to conducting these operations. This includes storm water that is mixed with groundwater or other non-storm water sources. Once the discharge is allowed, appropriate BMPs must be implemented to ensure that the discharge complies with all permit requirements. Conditions for potential discharge under an RWQCB general dewatering NPDES Permit include:
  - Regions 3, 5, 7: Non-storm water discharges, free of pollutants other than sediment, <0.25 MGD, with a duration of 4 or fewer months.
  - Region 9: Groundwater, free of pollutants other than sediment, <0.10 MGD, to surface waters other than San Diego Bay.
- The flow chart shown on Page 4 shall be utilized to guide dewatering operations.
- The RE will coordinate monitoring and permit compliance.
- 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 discharges must not cause erosion at the discharge point.

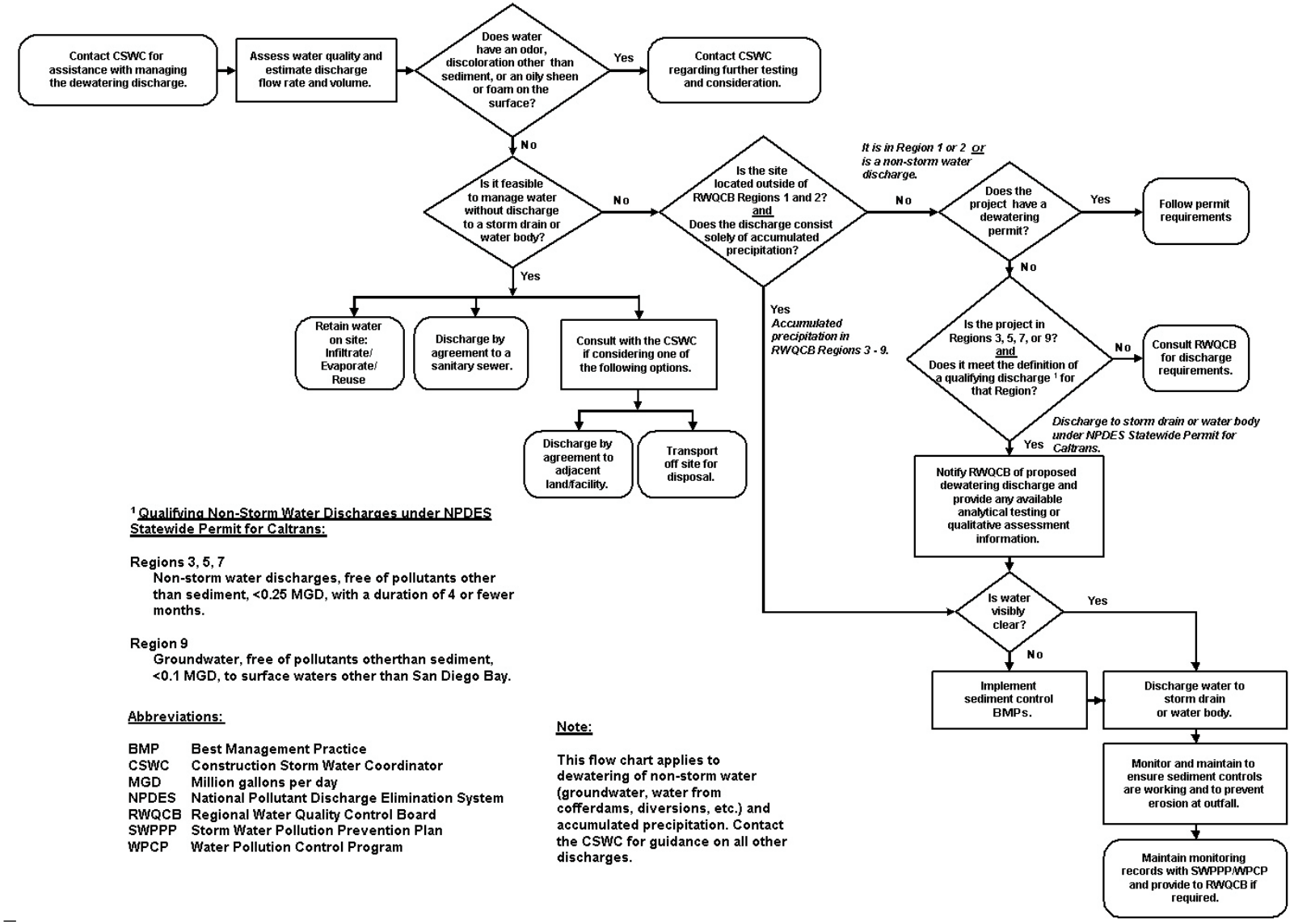
- Dewatering records shall be maintained for a period of 3 years.

Maintenance and Inspection

- Inspect all BMPs implemented to comply with permit requirements frequently and repair or replace to ensure the BMPs function as designed.
- Conduct water quality monitoring pursuant to the "Storm Water Dewatering Operations BMP Discharge Monitoring Forms".
- Accumulated sediment removed during the maintenance of a dewatering device may be incorporated in the project at locations designated by the RE or disposed of outside the right-of-way in conformance with the Standard Specifications.
- Accumulated sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations and as approved by the RE.

Dewatering Operations

NS-2



[1] Qualifying Non-Storm Water Discharges under NPDES Statewide Permit for Caltrans:

Regions 3, 5, 7
Non-storm water discharges, free of pollutants other than sediment, <0.25 MGD, with a duration of 4 or fewer months.

Region 9
Groundwater, free of pollutants otherthan sediment, <0.1 MGD, to surface waters other than San Diego Bay.

Abbreviations:

BMP	Best Management Practice
CSWC	Construction Storm Water Coordinator
MGD	Million gallons per day
NPDES	National Pollutant Discharge Elimination System
RWQCB	Regional Water Quality Control Board
SWPPP	Storm Water Pollution Prevention Plan
WPCP	Water Pollution Control Program

Note:

This flow chart applies to dewatering of non-storm water (groundwater, water from cofferdams, diversions, etc.) and accumulated precipitation. Contact the CSWC for guidance on all other discharges.

=

Sediment Treatment

A variety of methods can be used to treat water during dewatering operations from the construction site. Several devices are presented in this section that provide options to achieve sediment removal. The size of particles present in the sediment and 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.

Category 1: Constructed Settling Technologies

The devices discussed in this category are to be used exclusively for dewatering operations only.

Sediment/Desilting Basin (SC-2)

Description:

A desilting basin is a temporary basin with a controlled release structure that is formed by excavation and/or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Temporary desilting basins must be fenced if safety is a concern.
- Outlet protection is required to prevent erosion at the outfall location.

Maintenance:

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Sediment Trap (SC-3)

Description:

A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging.

Appropriate Applications:

- Effective for the removal of large and medium sized particles (sand and gravel) and some metals that settle out with the sediment.

Implementation:

- Excavation and construction of related facilities is required.
- Trap inlets shall be located to maximize the travel distance to the trap outlet.
- Use rock or vegetation to protect the trap outlets against erosion.

Maintenance:

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by one-third.

Category 2: Mobile Settling Technologies

The devices discussed in this category are typical of tanks that can be used for sediment treatment of dewatering operations. A variety of vendors are available who supply these tanks.

Weir Tank

Description:

A weir tank separates water and waste by using weirs. The configuration of the weirs (over and under weirs) maximizes the residence time in the tank and determines the waste to be removed from the water, such as oil, grease, and sediments.

Appropriate Applications:

- The tank removes trash, some settleable solids (gravel, sand, and silt), some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

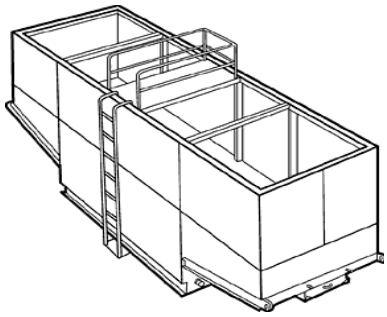
Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors shall be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Schematic Diagrams:



Weir Tanks

Dewatering Tank

Description:

A dewatering tank removes debris and sediment. Flow enters the tank through the top, passes through a fabric filter, and is discharged through the bottom of the tank. The filter separates the solids from the liquids.

Appropriate Applications:

- The tank removes trash, gravel, sand, and silt, some visible oil and grease, and some metals (removed with sediment). To achieve high levels of flow, multiple tanks can be used in parallel. If additional treatment is desired, the tanks can be placed in series or as pre-treatment for other methods.

Implementation:

- Tanks are delivered to the site by the vendor, who can provide assistance with set-up and operation.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Vendors shall be consulted to appropriately size tank.

Maintenance:

- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Schematic Diagrams:

Dewatering Tanks

Category 3: Basic Filtration Technologies

Gravity Bag Filter

Description:

A gravity bag filter, also referred to as a dewatering bag, is a square or rectangular bag made of non-woven geotextile fabric that collects sand, silt, and fines.

Appropriate Applications:

- Effective for the removal of sediments (gravel, sand, and silt). Some metals are removed with the sediment.

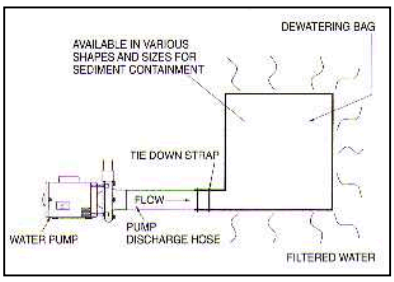
Implementation:

- Water is pumped into one side of the bag and seeps through the bottom and sides of the bag.
- A secondary barrier, such as a rock filter bed or straw/hay bale barrier, is placed beneath and beyond the edges of the bag to capture sediments that escape the bag.

Maintenance:

- Inspection of the flow conditions, bag condition, bag capacity, and the secondary barrier is required.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.
- The bag is disposed off-site, or on-site as directed by the RE.

Schematic Diagrams:



Gravity Bag Filter

Category 4: Advanced Filtration Technologies

Sand Media Particulate Filter

Description:

Water is treated by passing it through canisters filled with sand media. Generally, sand filters provide a final level of treatment. They are often used as a secondary or higher level of treatment after a significant amount of sediment and other pollutants have been removed.

Appropriate Applications:

- Effective for the removal of trash, gravel, sand, and silt and some metals, as well as the reduction of biochemical oxygen demand (BOD) and turbidity.
- Sand filters can be used for standalone treatment or in conjunction with bag and cartridge filtration if further treatment is required.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filters require monthly service to monitor and maintain the sand media.

Schematic Diagrams:

Sand Media Particulate Filters

Pressurized Bag Filter

Description:

A pressurized bag filter is a unit composed of single filter bags made from polyester felt material. The water filters through the unit and is discharged through a header, allowing for the discharge of flow in series to an additional treatment unit. Vendors provide pressurized bag filters in a variety of configurations. Some units include a combination of bag filters and cartridge filters for enhanced contaminant removal.

Appropriate Applications:

- Effective for the removal of sediment (sand and silt) and some metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Oil absorbent bags are available for hydrocarbon removal.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance with installation and operation.

Maintenance:

- The filter bags require replacement when the pressure differential exceeds the manufacturer's recommendation.

Schematic Diagrams:

Pressurized Bag Filter

Cartridge Filter

Description:

Cartridge filters provide a high degree of pollutant removal by utilizing a number of individual cartridges as part of a larger filtering unit. They are often used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed. Units come with various cartridge configurations (for use in series with pressurized bag filters) or with a larger single cartridge filtration unit (with multiple filters within).

Appropriate Applications:

- Effective for the removal of sediment (sand, silt, and some clays) and metals, as well as the reduction of BOD, turbidity, and hydrocarbons. Hydrocarbons can effectively be removed with special resin cartridges.
- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.

Implementation:

- The filters require delivery to the site and initial set up. The vendor can provide assistance.

Maintenance:

- The cartridges require replacement when the pressure differential exceeds the manufacturer's recommendation.

Schematic Designs:

Cartridge Filter

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM [a]

Central Coast Region (RWQCB 3)
For Inland Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
Dissolved Oxygen	mg/L			
pH	unitless			
Turbidity	JTUs			

DISCHARGE LIMITATIONS [g, h, i]

Constituent	Units	EFFLUENT	RECEIVING WATER
		Daily Maximum	Daily Maximum
Dissolved Oxygen	mg/L	--	5.0 [j]
pH	unitless	--	Between 7.0 - 8.5 [j]
Turbidity	JTUs	--	20% (Where Ambient is 0 - 50 JTUs)
			10 (Where Ambient is 50 - 100 JTUs)
			10% (Where Ambient is > 100 JTUs)

NOTES:

Ambient - Upstream sample result (i.e.. R-1)
BMP - Best Management Practice
JTUs - Jackson turbidity units
mg/L - Milligrams per liter
RWQCB - Regional Water Quality Control Board
SAR - Sodium absorption ratio
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDE permit or Waste Discharge Requirements.

b All inland surface waters, enclosed bays, and estuaries. **Based on the 1994 RWQCB 3 Basin Plan.** [http://www.swrcb.ca.gov/rwqcb3/BasinPlan/Index.htm]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e Dissolved oxygen, pH, and turbidity are required to be analyzed throughout the basin.
The following constituents shall be sampled if suspected to present in the discharge: ammonia for toxicity, MBAS, PCBs, phenols, and phthalate esters are required to be analyzed throughout the basin, however, bacteria, boron, chemical color, temperature, and total dissolved solids shall be analyzed if the project lies in an area designated for a specific beneficial use, as noted in the Basin Plan.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface waters.

h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan.

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Biostimulatory substances, floating material, oil and grease, pesticides, sediment, settleable materials, suspended materials, and tastes and odors.

j In addition, dissolved oxygen and pH have specific beneficial uses discharge limitations. See basin plan for specific limitations.

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM [a]

Los Angeles Region (RWQCB 4)
Los Angeles and Ventura Counties
For Inland Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
pH	unitless			
Turbidity	NTUs			
TDS [j]	mg/L			

DISCHARGE LIMITATIONS [g, h, k, i]

Constituent	Units	EFFLUENT	RECEIVING WATER
		Daily Maximum	Daily Maximum
pH	unitless	--	Between 6.5 - 8.5 [j]
Turbidity	NTUs	--	20% (Where Ambient is 0 - 50 NTUs)
			10% (Where Ambient is > 50 NTUs)
TDS	mg/L	--	See Table 3-8 in Basin Plan

NOTES:

Ambient - Upstream sample result (ie. R-1)
BMP - Best Management Practice
mg/L - Milligrams per liter
NTUs - Nephelometric turbidity units
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDES permit or Waste Discharge Requirements.

b All inland surface waters, enclosed bays, and estuaries, including wetlands. **Based on the 1995 RWQCB 4 Basin Plan.** [http://www.swrcb.ca.gov/rwqcb4/html/meetings/tmdl/Basin_plan/basin_plan_doc.html]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e pH, and turbidity are required to be analyzed throughout the basin, however, ammonia, bacteria/coliform, boron, chemical constituents, chloride, dissolved oxygen, methylene blue activated substances, nitrogen, pesticides, polychlorinated biphenyls, radioactive substances, sodium absorption ratio, sulfate, temperature, and total dissolved solids shall be analyzed if the project lies in an area designated for a specific beneficial use, as noted in the Basin Plan.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface waters

h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan.

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Bioaccumulation, biochemical oxygen demand, biostimulatory substances, color, exotic vegetation, floating material, oil and grease, solid/suspended/settleable materials, tastes and odors, and toxicity.

j In addition, ambient pH levels shall not be changed more than 0.2 units for inland surface waters, and 0.5 for bays or estuaries from natural conditions.

k See Table 3-8 in Basin Plan for applicable watershed

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM [a]

Central Valley Region (RWQCB 5)
Sacramento River Basin and The San Joaquin River Basin
For Inland Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No.	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]				
		Results		
		Effluent	Receiving Water [f]	
Constituents	Units		Upstream (R-1)	Downstream (R-2)
pH	unitless			
Turbidity	NTUs			

DISCHARGE LIMITATIONS [g, h, i]			
		EFFLUENT	RECEIVING WATER
Constituent	Units	Daily Maximum	Daily Maximum
pH	unitless	--	Between 6.5 - 8.5
Turbidity	NTUs	--	1 NTU increase (Where Ambient is 0 - 5 NTUs)
			20% increase (Where Ambient is 5 - 50 NTUs)
			10 NTU increase (Where Ambient is 50 - 100 NTUs)
			10% increase (Where Ambient is > 100 NTUs)

NOTES:

Ambient - Upstream sample result (i.e.. R-1)
BMP - Best Management Practice
NTUs - Nephelometric turbidity units
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDES permit or Waste Discharge Requirements.

b All surface waters in the Sacramento and San Joaquin River Basins, including the Delta.**Based on the 1998 RWQCB 5a/5b Basin Plan.** [http://www.swrcb.ca.gov/rwqcb5/available_documents/index.html#anchor616381]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e Turbidity and pH are required to be analyzed throughout the basin, however, bacteria, chemical constituents, dissolved oxygen, pesticides, radioactivity, salinity, and temperature shall be analyzed if the project lies in an area designated for a specific beneficial use or along a specific waterbody, as noted in the Basin Plan.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface water

h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plar

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Biostimulatory substances, color, floating material, oil and grease, sediment, settleable material, suspended material, tastes and odors, and toxicity.

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM[a]

Central Valley Region (RWQCB 5)
Tulare Lake Basin
For Inland Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
pH	unitless			
Turbidity	NTUs			
Dissolved Oxygen	mg/L			
Electrical Conductivity	umho/cm			

DISCHARGE LIMITATIONS [g, h, i]

Constituent	Units	EFFLUENT	RECEIVING WATER
		Daily Maximum	Daily Maximum
pH	unitless	--	Between 6.5 - 8.3 0.3 unit change for background
Turbidity	NTUs	--	1 (Where Ambient is 0 - 5 NTUs) 20% (Where Ambient is 5 - 50 NTUs) 10 (Where Ambient is 50 - 100 NTUs) 10% (Where Ambient is > 100 NTUs)
Dissolved Oxygen	mg/L		See Table III-1 in Basin Plan
Electrical Conductivity	umho/cm		See Table III-2 in Basin Plan

NOTES:

Ambient - Upstream sample result (i.e.. R-1)
BMP - Best Management Practice
cm - Centimeter
mg/L - Milligrams per liter
NTUs - Nephelometric turbidity units
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDES permit or Waste Discharge Requirements.

b **Based on the 1995 RWQCB 5c Basin Plan.** [http://www.swrcb.ca.gov/rwqcb5/available_documents/index.html#anchor616381]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e Bacteria, chemical constituents, pesticides, radioactivity, salinity, and temperature shall be analyzed for a specific beneficial use as noted in the Basin Plan. Ammonia is suspected at elevated levels.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface water

h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Biostimulatory substances, color, floating material, oil and grease, sediment, settleable material, suspended material, tastes and odors, and toxicity.

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM [a]

Lahontan Region (RWQCB 6)
For Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
pH	unitless			
Turbidity	NTUs			

DISCHARGE LIMITATIONS [g, h, i]

Constituent	Units	EFFLUENT	RECEIVING WATER
		Daily Maximum	Daily Maximum
pH	unitless	--	Between 6.5 - 8.5 [j]
Turbidity	NTUs	--	10% of Ambient [j]

NOTES:

Ambient - Upstream sample result (i.e.. R-1)
BMP - Best Management Practice
NTUs - Nephelometric turbidity units
mg/L - Milligrams per liter
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDES permit or Waste Discharge Requirements.

b All surface waters including wetlands. **Based on the 1994 RWQCB 6 Basin Plan.** [http://www.swrcb.ca.gov/rwqcb6/BPlan/BPlan_Index.htm]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e pH and turbidity are required to be analyzed throughout the basin, however, adjusted sodium adsorption ration, algal growth potential, biological indicators, biostimulatory substances, boron, chemical constituents, chlorophyll-a, clarity, color, dissolved inorganic nitrogen, dissolved orthophosphate, dissolved oxygen, electrical conductivity, fluoride, iron, nitrogen as nitrate, pesticides, plankton counts, radioactivity, sodium adsorption ratio, soluble reactive iron, soluble reactive phosphorous, species composition, sulfate, suspended sediment, tastes & odors, temperatures, total dissolved solids, total alkalinity as carbonate, total kjeldahl nitrogen, total nitrogen, total phosphorous, total reactive iron, toxicity, transparency, un-ionized ammonia shall be analyzed if the project lies in an area designated for a specific beneficial use, as noted in the Basin Plan. Bacteria/Coliform if high levels are suspected. Residual chlorine if suspected to be present.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface waters

h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan.

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Floating material, nondegradation of aquatic communities and populations, oil and grease, sediment, settleable materials, and suspended materials.

j In addition, bacteria/coliform, pH, total residual chlorine, and turbidity have specific beneficial uses and/or location specific discharge limitations. See basin plan for specific limitations.

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM[a]

Colorado River Basin Region (RWQCB 7)
For Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No.	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
pH	unitless			
TDS [f]	mg/L			

DISCHARGE LIMITATIONS [g, h, i]

Constituent	Units	EFFLUENT	RECEIVING WATER
		Daily Maximum	Daily Maximum
pH	unitless	--	Between 6.0 - 9.0
TDS [g]	mg/L	--	See Basin Plan

NOTES:

BMP - Best Management Practice

RWQCB - Regional Water Quality Control Board

-- - Not required

> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDES permit or Waste Discharge Requirements.

b **Based on the 2002 RWQCB 7 Water Quality Plan.**
[http://www.swrcb.ca.gov/rwqcb7/documents/RB7Plan.pdf]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e Bacteria, biochemical oxygen demand, chemical constituents, chemical oxygen demand, dissolved oxygen, radioactivity, and selenium shall be analyzed for specific beneficial uses as noted in the Basin Plan.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g Total Dissolved Solids (TDS) has specific location discharge limitations. See basin plan for specific limitations.

h If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface waters

i All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan.

j Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Biostimulatory substances, color, floating material, herbicides, oil and grease, pesticides, sediment, settleable and suspended solids, tainting substances, tastes and odors, temperature, toxicity, and turbidity.

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM [a]

Santa Ana Region (RWQCB 8)
For Inland Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
pH	unitless			
Turbidity	NTUs			
TDS	mg/L			

DISCHARGE LIMITATIONS [g, h, i, j]

Constituent	Units	EFFLUENT	RECEIVING WATER
		Daily Maximum	Daily Maximum
pH	unitless	--	Between 7.0 - 8.6 (bays and estuaries)
		--	Between 6.5 - 8.5 (inland surface waters)
Turbidity	NTUs	--	20% (Where Ambient is 0 - 50 NTUs)
			10 NTUs (Where Ambient is 50 - 100 NTUs)
			10% (Where Ambient is > 100 NTUs)
TDS	mg/L	--	See Table 4-1 in Basin Plan

NOTES:

Ambient - Upstream sample result (i.e.. R-1)
BMP - Best Management Practice
NTUs - Nephelometric turbidity units
mg/L - Milligrams per liter
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDE permit or Waste Discharge Requirements.

b All inland surface waters including streams, rivers, lakes, and wetlands. **Based on the 1995 RWQCB 8 Basin Plan.** [http://www.swrcb.ca.gov/rwqcb8/pdf/R8BPlan.pdf]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e Bacteria/coliform, dissolved oxygen, fluoride, methylene blue-activated substances (MBAS), metals, nitrate, radioactivity, temperature, and un-ionized ammonia shall be analyzed for a specific beneficial use, as noted in the Basin Plan. Boron, Residual Chlorine, Hardness, sodium, chloride, total inorganic nitrogen, sulfate, and chemical oxygen demand if present at elevated levels.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface waters.

h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan.

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses of the following: Algae, color, floatables, oil and grease, suspended & settleable solids, sulfides, sulfides, surfactants, tastes and odors, and toxic substances.

j Total dissolved solids (TDS), hardness, sodium (Na), chloride (Cl), total inorganic nitrogen (TIN), sulfate (SO_4) and chemical oxygen demand (COD) shall be analyzed for specific waterbodies as identified in the Basin Plan.

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM [a]

San Diego Region (RWQCB 9)
For Inland Surface Waters [b]

GENERAL INFORMATION	
Project Name	
Contract No	
Contractor	
Sampler's Name	
Sampler's Signature	
Date Discharge Began	
Date of Sampling	

WATER SAMPLE LOG [c, d, e]

Constituents	Units	Results		
		Effluent	Receiving Water [f]	
			Upstream (R-1)	Downstream (R-2)
pH	unitless			
Turbidity	NTUs			
TDS	mg/L			
Dissolved Oxygen	mg/L			
Color				

DISCHARGE LIMITATIONS [g, h, i]

Constituent	Units	EFFLUENT Daily Maximum	RECEIVING WATER Daily Maximum
pH	unitless	--	Between 6.5 - 8.5
Turbidity	NTUs	--	20% (Where Ambient is 0 - 50 NTUs) 10 NTUs (Where Ambient is 50 - 100 NTUs) 10% (Where Ambient is > 100 NTUs) 0.2 NTUs (ocean waters)
TDS	mg/L		See Table 3-2 in Basin Plan
Dissolved Oxygen	mg/L		5.0 mg/l in inland surface waters 6.0 mg/l in waters with designated COLD beneficial uses
Color		--	See Table 3-2 in Basin Plan

NOTES:

Ambient - Upstream sample result (i.e.. R-1)
BMP - Best Management Practice
NTUs - Nephelometric turbidity units
mg/L - Milligrams per liter
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

a This form shall be used only for dewatering of storm water/accumulated precipitation. Dewatering non-storm water shall monitor constituents required in the applicable NPDES permit or Waste Discharge Requirements.

b All inland surface waters, enclosed bays, and estuaries and coastal lagoons. **Based on the 1994 RWQCB 9 Basin Plan.** [http://www.swrcb.ca.gov/rwqcb9/programs/basinplan.html]

c Collect monthly samples. The first sample shall be collected at the start of the discharge and the last sample shall be collected at the completion of the discharge. Use the same sample collection criteria for discharges less than one month in duration for a total of two samples per discharge event.

d Each constituent will be analyzed in the effluent and the two receiving water samples.

e Bacteria, E. Coli & enterococci, biostimulatory substances, dissolved oxygen, inorganic chemicals, organic chemicals, pesticides, phenolic compounds, radioactivity, tastes & odors, temperatures, and trihalomethanes shall be analyzed for specific beneficial use, as noted in the Basin Plan.
Un-ionized Ammonia, chloride, sulfate, sodium, iron, manganese, MBAS, boron, and fluoride if suspected at elevated levels.

f R-1 shall be collected 100 feet upstream from the closest point of discharge. R-2 shall be collected 100 feet downstream from the closest point of discharge.

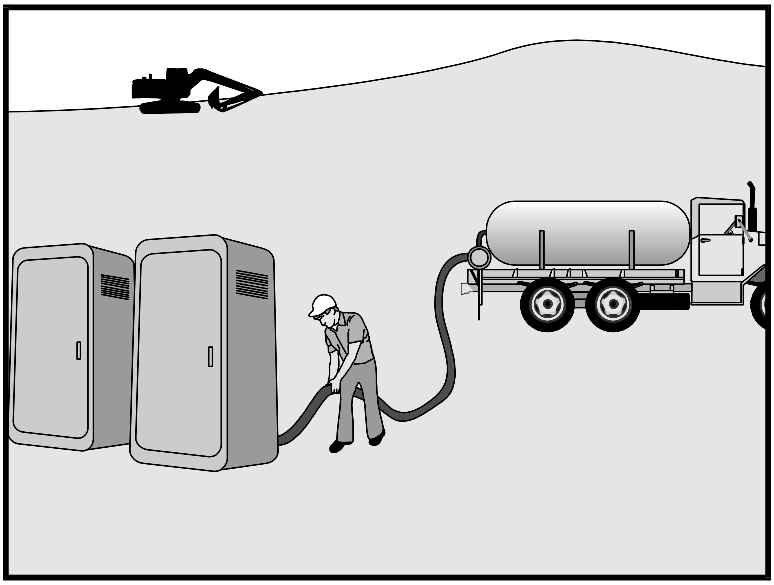
g If the results from receiving water sample exceed any of the discharge limits then discontinue dewatering activities to surface waters.

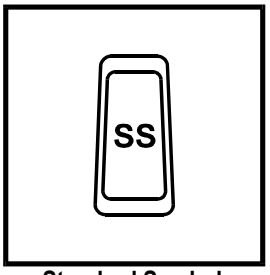
h All discharge limitations are listed in the Water Quality Objectives Section of the Basin Plan.

i Water shall not contain concentrations that cause nuisance or adversely affect beneficial uses as required in the Basin Plan.

Sanitary/Septic Waste Management

WM-9





Standard Symbol

BMP Objectives

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

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses.

Appropriate Applications

Sanitary/septic waste management practices are implemented on all construction sites that use temporary or portable sanitary/septic waste systems.

Limitations

- None identified.

Standards and Specifications

Education

- Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures.
- Educate employees, subcontractors, and suppliers of potential dangers to humans and the environment from sanitary/septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary/septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Storage and Disposal Procedures

- Temporary sanitary facilities shall be located away from drainage facilities, watercourses, and from traffic circulation. When subjected to high winds or risk.

- Wastewater shall not be discharged or buried within the highway right-of-way.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, shall comply with the local health agency, city, county, and sewer district requirements.
- If using an on site disposal system, such as a septic system, comply with local health agency requirements.
- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.
- Ensure that sanitary/septic facilities are maintained in good working order by a licensed service.
- Use only reputable, licensed sanitary/septic waste haulers.

Maintenance and Inspection

- The Contractor's Water Pollution Control Manager (WPCM) shall monitor onsite sanitary/septic waste storage and disposal procedures at least weekly.

APPENDIX D

Project Schedule

Detailed project construction schedule to be provided in a future draft after final construction design is completed.