
Preliminary Draft Plan

**Drainage, Erosion, and Sediment
Control Plan**

Walnut Creek Energy Park

City of Industry, California

(05-AFC-02)

Submitted to the:
California Energy Commission

Submitted by:
Walnut Creek Energy, LLC
A wholly owned subsidiary of



With Technical Assistance by:



Sacramento, California
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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 Walnut Creek Energy Park (WCEP) Project (05-AFC-02). The WCEP is a 500-megawatt (MW) natural gas-fired power plant located in the City of Industry, Los Angeles County, California. This preliminary draft DESCP, prepared in response to CEC Staff Data Request #74, 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, and will meet all local, state, and federal regulatory requirements associated with the protection of water quality and soil resources. In addition, this Drainage, Erosion, and Sediment Control Plan (DESCP) will ensure compliance with City of Industry City Code Section 17.03.060, Development Plan Standard (M), which states:

No surface storm waters from an improved industrial site shall flow onto adjacent parcels of land. Each parcel shall provide for the collection and discharge of surface runoff to an improved street, storm drain, or established watercourse independently of adjacent parcels.

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, final BMP map).

1.1 Drainage, Erosion, and Sediment Control Plan Elements

Staff Data Request #74 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 WCEP 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 DESCOP 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 DESCOP provides elevations, slope, location, and extent of proposed gradings.
- **Project Schedule** – The DESCOP 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 DESCOP 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 WCEP will be a nominal 500-MW peaking facility consisting of five GE Energy LMS100 natural gas-fired turbine-generators and associated equipment. The facility will be located at 911 Bixby Drive in the City of Industry (City), Los Angeles County, California, on an 11.48-acre parcel currently owned by the Industry Urban Development Agency (Development Agency). Figure 1 shows the regional location of the Project (all figures are located at the end of each section). Figure 2 shows the Project site and linear facilities locations. The parcel is entirely covered with a large warehouse building and asphalt paving and is currently in use as a commercial distribution warehouse. The Development Agency has planned this parcel for redevelopment and plans to demolish the existing structure in the near future. Edison Mission Energy has entered into a lease option agreement for the project site. The lease option will be assigned to and exercised by Walnut Creek Energy, LLC (WCE), who will take physical possession of the site from the Development Agency after this demolition has taken place.

The WCEP will be located in an area zoned for industrial uses. The project site is located within the boundaries of the La Puente Mexican land grant rancho and so it does not have a township, range, and section designation. The County Assessor's parcel designation is Los Angeles County 8242-013-901.

Figure 3 shows the project site plan and appurtenant facilities, including the electric transmission line, natural gas supply line, reclaimed water supply line, potable water supply line, and waste water disposal line. Three of these appurtenant facilities will connect to utility lines located on easements within the project parcel (natural gas, sanitary sewer, non-reclaimable waste water). Two others (reclaimed water and potable water) will connect to utility lines located within a few feet of the project boundary.

WCEP will connect to Southern California Edison's (SCE) electrical transmission system at the Walnut Substation, which is approximately 250 feet south of the project site (Figure 4). This connection will require 600 feet of 230-kilovolt (kV) transmission line and two transmission towers to be located adjacent to the substation within SCE's transmission corridor. Interconnection at this specific substation minimizes downstream impacts to 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 direct connection to a 12-inch-diameter reclaimed water pipeline at the corner of South Bixby Drive and East Chestnut Street, adjacent to the project entrance, through a 12-inch-diameter pipe extending approximately 30 feet from the project boundary into South Bixby Drive. The Rowland Water District will supply, on average, approximately 827 acre-feet per year (afy) of reclaimed water for the project from the San Jose Creek Wastewater Reclamation Plant.

The project will connect with Southern California Gas Company's (SoCal Gas') natural gas pipeline via a 14-inch-diameter connection to a 30-inch-diameter high-pressure pipeline that runs in a utility easement within the WCEP parcel.

Potable water for drinking and sanitary uses will be provided through a 30-foot-long, 4-inch-diameter connection to the Rowland Water District's 12-inch water main in South Bixby Drive, immediately adjacent to the project site.

Sanitary wastewater will be discharged to the Los Angeles County Sanitation District (LACSD) No. 21, Section 3, 48-inch trunk sewer line, which runs in a utility easement within the project site. Process wastewater will also be discharged to this sanitary sewer line through a 4-inch-diameter connecting pipe to the trunk sewer line. The sewer line is located within the utility easement adjacent to the railroad track and within the southern boundary 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 Walnut Creek Energy Park (filed November 15, 2005).

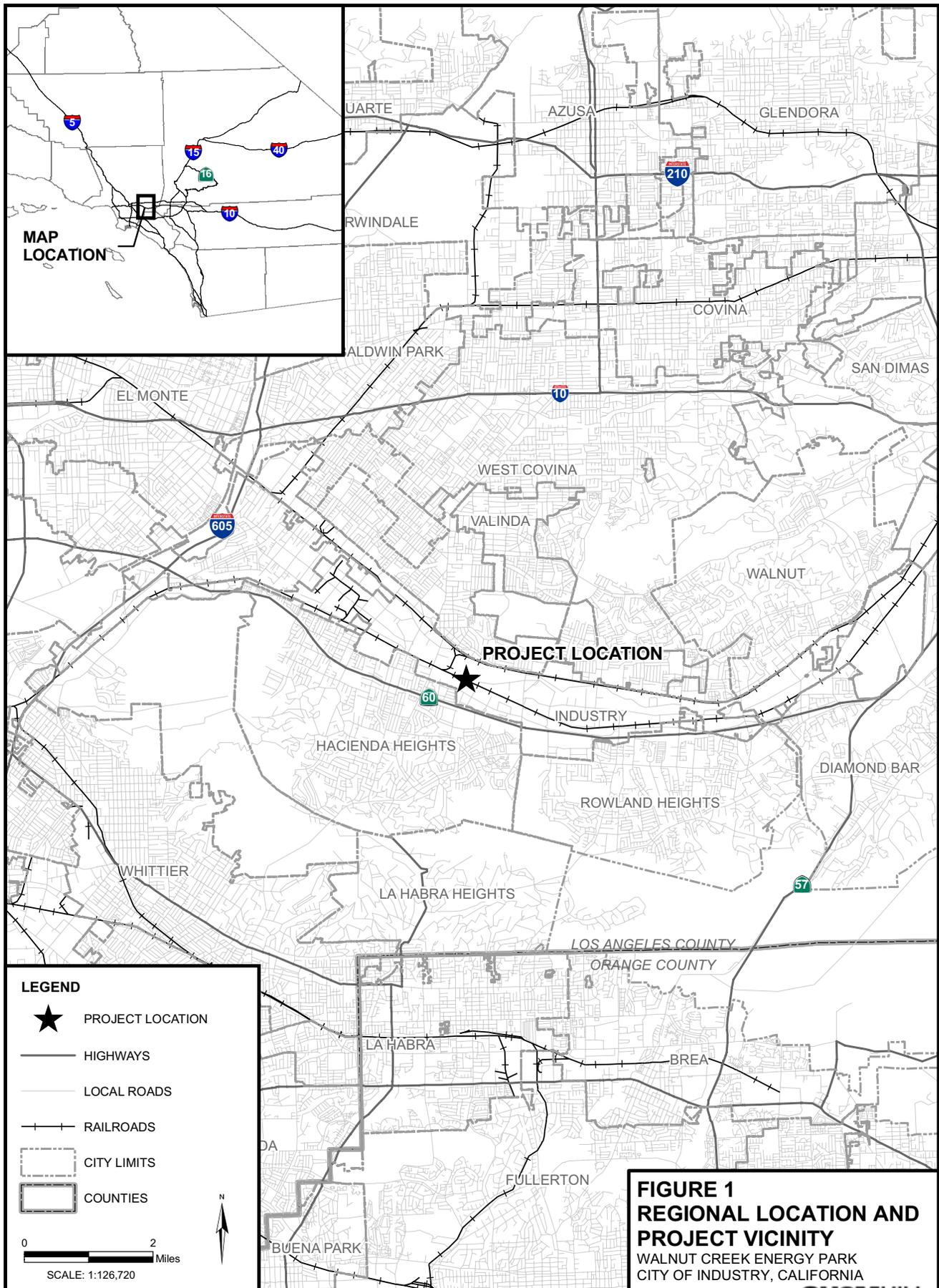
1.3 Watercourses and Critical Areas

The project is located within the San Gabriel River Watershed (SGRW). The San Gabriel River receives drainage from approximately 689 square miles. The main channel is approximately 58 miles long, and empties into the Pacific Ocean at the Los Angeles /Orange County border. Approximately 75 percent of the SGRW is urbanized, with the remaining portion lying in the Angeles National Forest. The major surface water feature in the project vicinity is San Jose Creek, which is an unlined channel located adjacent to the project site. San Jose Creek drains into the San Gabriel River approximately 5 miles downstream of the WCEP site. Figure 5 shows the regional water resources.

The WCEP site is located entirely within industrial development and includes a paved warehouse pad and warehouse surrounded by a large asphalt parking lot. The entire site is paved. There are no remaining natural features that provide significant habitat for plant or wildlife species. The closest natural habitat areas include the Puente Hills, approximately 4 miles south of the site, and the Angeles National Forest, approximately 20 miles north of the site. A regional and county park is located in the area of the Puente Hills. Other parks and habitat areas are shown on Figure 6.

1.4 Project Ownership

The WCEP will be owned by WCE, a wholly owned subsidiary of Edison Mission Energy.



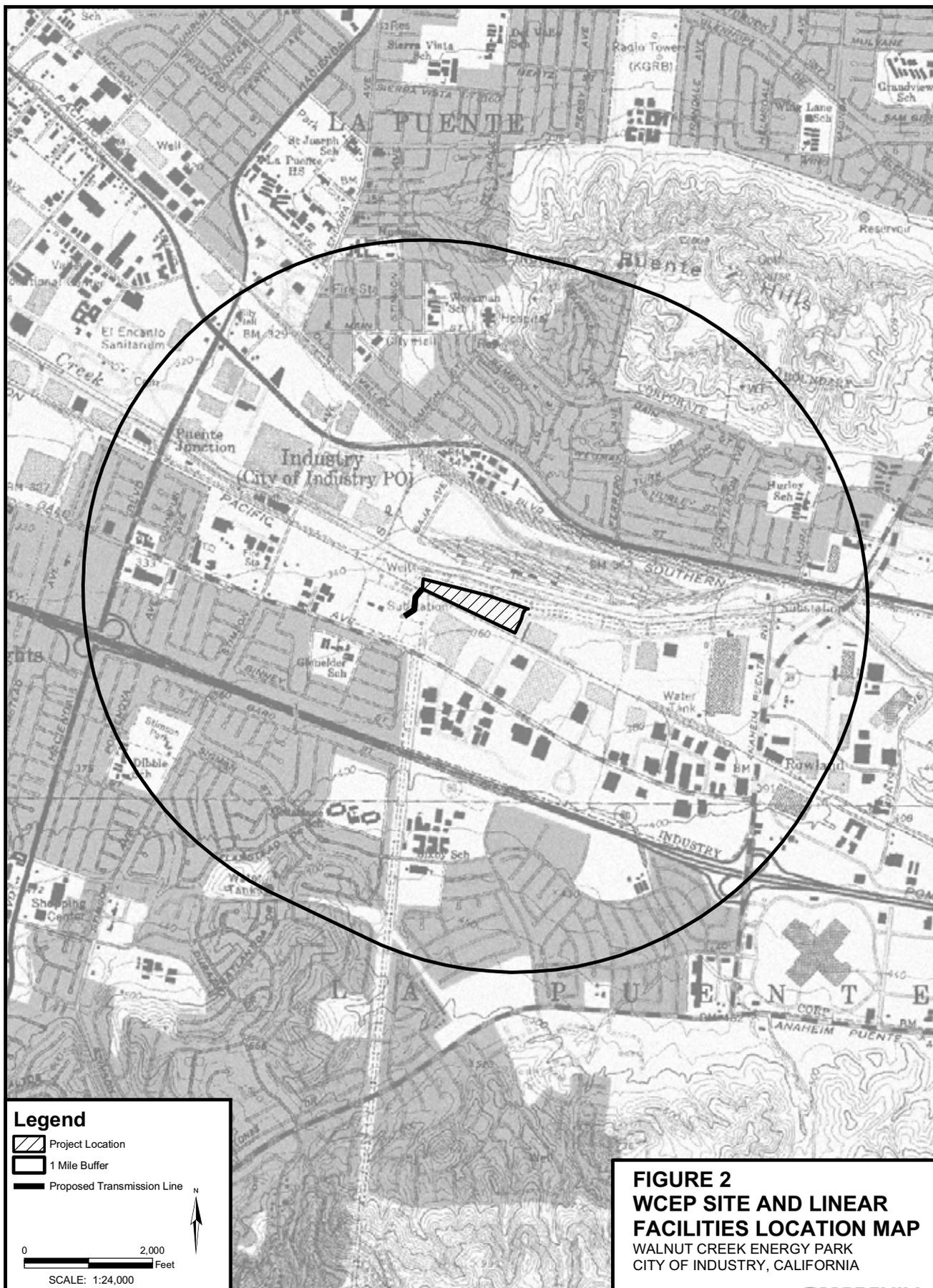


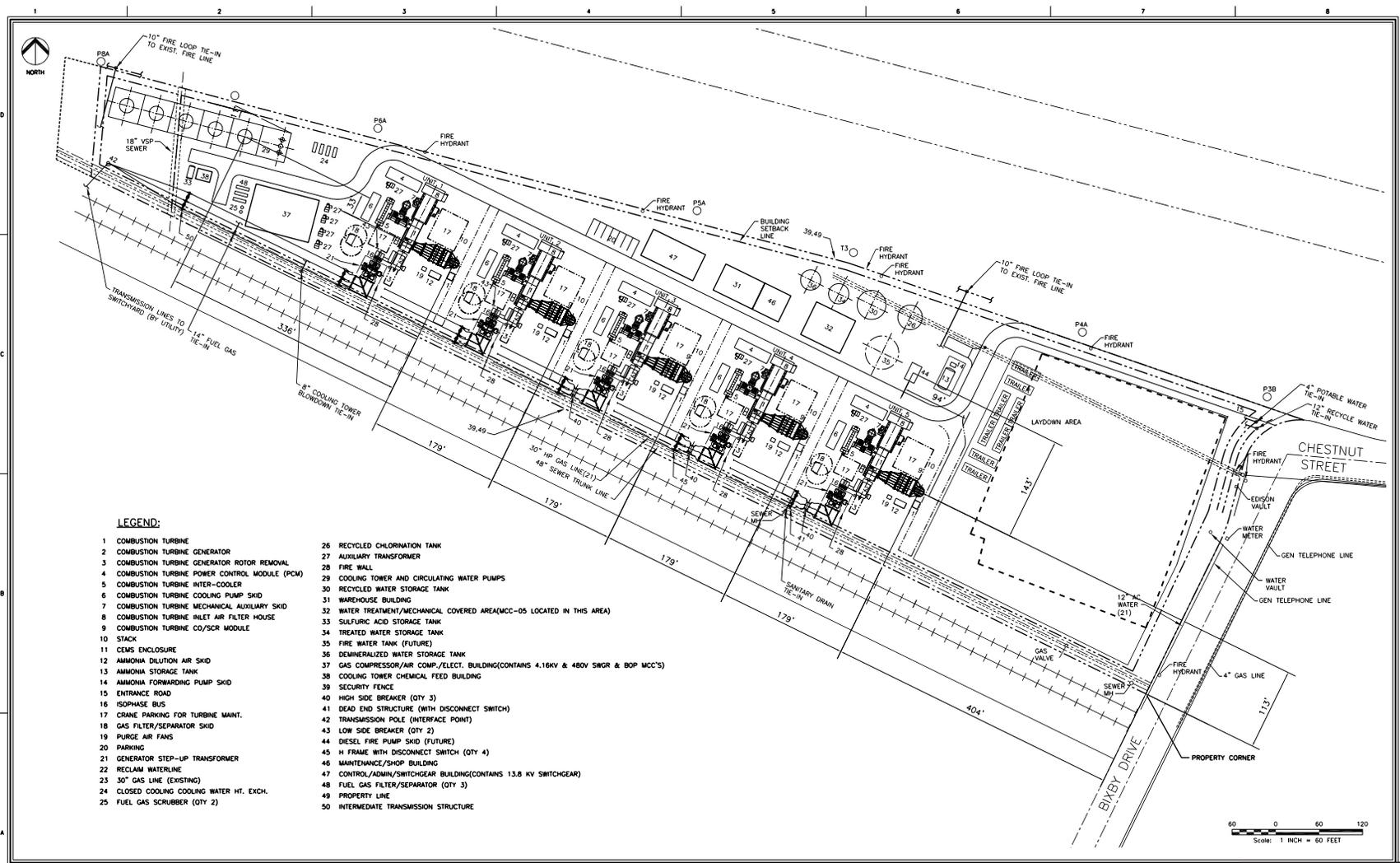
FIGURE 2
WCEP SITE AND LINEAR
FACILITIES LOCATION MAP
 WALNUT CREEK ENERGY PARK
 CITY OF INDUSTRY, CALIFORNIA

Legend

-  Project Location
-  1 Mile Buffer
-  Proposed Transmission Line

0 2,000
 Feet
 SCALE: 1:24,000

N



D	03-OCT-2005	FOR INFORMATION	JWC	DESIGNED BY J. CRAMFORD
C	01-SEP-2005	FOR INFORMATION	JWC	CHECKED BY
B	05-AUG-2005	FOR INFORMATION	JWC	DATE
A	25-JUL-2005	FOR COMMENT	JWC	DATE
NO	DATE	REASON	BY	CHK



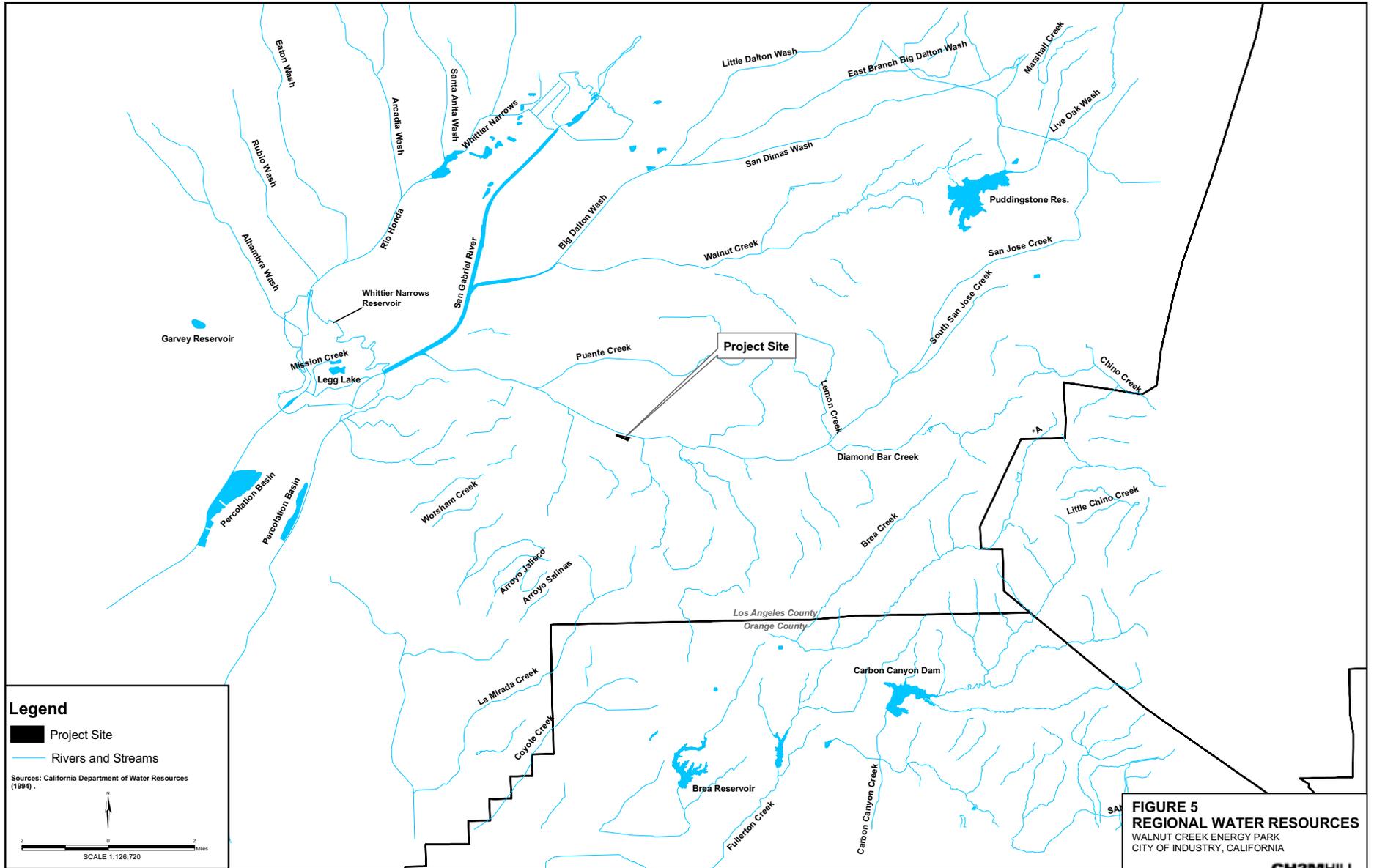
SHEET TITLE
WALNUT ARRANGEMENT
500MW-(5) LMS100'S
SIMPLE CYCLE



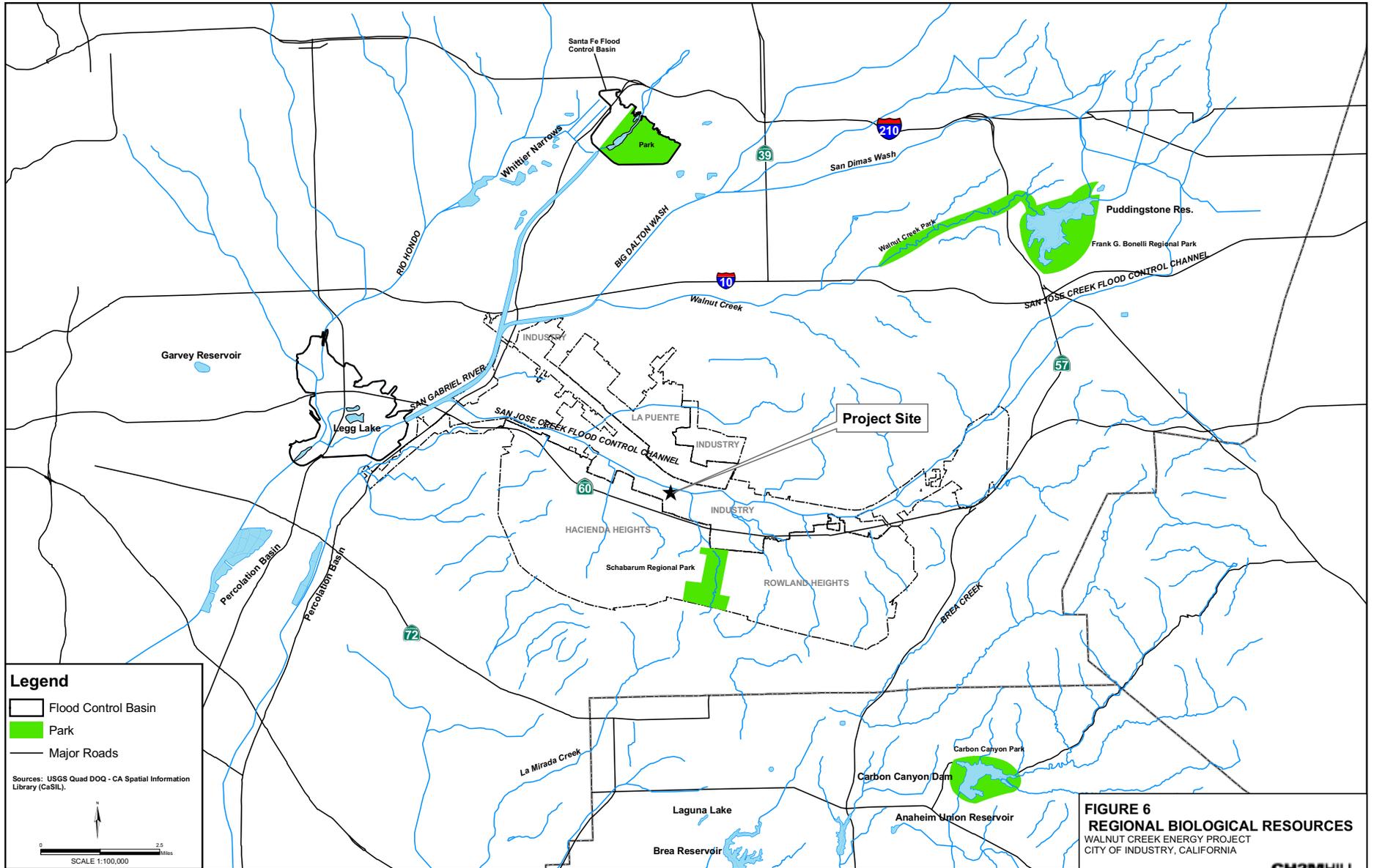
FIGURE 3
SITE PLAN
WALNUT CREEK ENERGY PARK
CITY OF INDUSTRY, CALIFORNIA







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SECTION 2

Drainage

The existing site is paved and site drainage currently flows to a drain located in the parking lot. The drain empties into the storm drainage system, which eventually drains to San Jose Creek. At completion of the WCEP, onsite drainage will be accomplished through gravity flow. Surface grading will direct storm water runoff to the storm water drains via overland flow at a minimum slope of 0.5 percent. The main plant complex area will be graded with moderate slopes for effective drainage. There will be two discharge points, one to the northeastern corner and one to the south of the property boundaries. Storm water management practices will follow the *California Storm Water Best Management Practice Handbook* (2003) and the *Caltrans Storm Water Quality Handbook* (2003). Appendix A contains pre- and post-construction drainage plans. Appendix B contains storm water calculations.

Miscellaneous general plant drainage will include sample drainage, equipment leakage, and drainage from facility containment areas. Water from these areas will be collected in systems of floor drains, sumps, and pipes within the WCEP and discharged to an oil-water separator. The separator will be an underground or aboveground vault with baffles to collect oils and solids. Wastewater will be routed through the baffles, allowing oils to rise to the surface and solids to settle to the bottom. The vault will be pumped out periodically. Oils will be removed using oil absorbent pillows or other acceptable methods, and transported to an approved disposal facility. After passing through the oil-water separator, oil-free waste water will be recycled to the cooling tower basin.

Storm water falling outside of hazardous material containment areas (for example, on plant roads and other paved or gravel surfaced areas and landscaped areas) will be collected by the existing system of catch basins for discharge to the San Jose Creek flood control channel. Hazardous material containment areas (those areas with walls or dams built to contain spillage) will use an independent collection and treatment system.

The project linear facilities will be constructed within the rights-of-way associated with South Bixby Drive and East Chestnut Street (reclaimed and potable water) or the utility easement located within the project parcel and along its southern edge (high-pressure natural gas, and sanitary sewer trunk line). Drainage from these areas will be collected by the existing system of catch basins for discharge to the San Jose Creek flood control channel.

Clearing and Grading

3.1 Areas to be Cleared and Graded

The WCEP site is located entirely within an area of industrial development and is entirely covered in large warehouse buildings or paved. As such, no vegetation will need to be cleared. Approximately 1.89 acres of the 11.48-acre site will be used as a construction laydown area. The existing buildings and asphalt will be demolished and removed by the Urban Development Agency before the site is turned over to WCE for development of the WCEP. Active soil grading would occur over a 6-month period within the project site and laydown area. The soil in both of these areas would then be exposed for an additional 12-month construction period.

3.2 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.

3.3 Existing and Proposed Topography

The existing site is relatively flat. At completion of the WCEP, surface grading will direct storm water runoff to the storm water drains via overland flow at a minimum slope of 0.5 percent. The main plant complex area will be graded with moderate slopes for effective drainage. Appendix A contains drawings that show topography before and after construction.

3.4 Volumes of Cut and Fill

The grading of the site to design elevations will require the following: A cut volume of approximately 7,900 cubic yards and fill of approximately 7,100 cubic yards for a net fill of 800 cubic yards. All excess cut will be spread evenly around the site after construction. There will be no topsoil removed from the site.

3.4.1 Gas Pipeline

The trench excavated for the short pipeline tie-in will be entirely refilled. No surplus soil is expected.

3.4.2 Water Pipelines

The water pipeline connections are approximately 30 feet long. The trenches will be constructed and filled to satisfy local jurisdictional requirements.

SECTION 4

Project Schedule

The WCEP 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	Winter 2008
Commissioning	Spring 2008

SECTION 5

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 stormwater pollution prevention at the WCEP 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 ESCP will be reviewed by managers and construction contractors. While performing the work, the contractors may implement additional control measures if necessary.

5.1 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

5.1.1 Access Road, Entrance and Parking, and Laydown Areas

During construction, primary access to the WCEP site will be from a paved entrance via South Bixby Drive. The entrance will be maintained to limit sediment tracking and creation of dust. The parking and laydown areas will be stabilized with coarse gravel. 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 discharging into swales or ditches.

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)

5.1.2 WCEP 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 facilities will be constructed within the rights-of-way associated with South Bixby Drive and East Chestnut Street (reclaimed and potable water) or the adjacent utility easement to the south (high pressure natural gas, sanitary sewer). Temporary erosion control might include asphalt patching in the streets until permanent paving can be completed.

In addition, the WCEP will link to the power grid through the SCE Walnut Substation by a three-phase 230 kV solid dielectric aboveground transmission circuit. The proposed 230-kV route will exit south from WCEP and cross the Union Pacific Railroad track to a single conductor support tower to be located adjacent to the Walnut Substation in SCE's transmission corridor. This connection will require 600 feet of 230-kilovolt (kV) transmission line and two transmission towers to be located adjacent to the substation within SCE's transmission corridor. 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)

5.1.3 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)

5.1.4 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.

5.2 Other Controls

5.2.1 Material Handling and Storage

There will be a variety of chemicals stored and used during the construction and operation of WCEP. 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. 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. In case of a chemical spill or accidental release, personnel will be properly trained in the handling of these chemicals and instructed in the procedures to follow. 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)

5.2.2 Solid and Hazardous Waste Management

Solid nonhazardous waste, wastewater, and liquid and solid hazardous waste will be generated at the WCEP site during facility construction and operation. 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. Where practical, these wastes will be recycled. 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 Puente 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. Sanitary waste will be collected in portable, self-contained toilets. Storm water runoff will be managed in accordance with a storm water management permit, which will be obtained prior to the start of construction. Equipment washdown water will be contained at designated wash areas and will be disposed of offsite. Excavation dewatering water will be contained in portable tanks and sampled prior to disposal offsite. Water used for dust control and soil compaction during construction will not result in discharge.

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 be considered hazardous.

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)

5.2.2 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.

5.2.3 Groundwater/Dewatering Controls

The construction phase of WCEP will require no groundwater removal. Storm water is expected to result in only several days of dewatering during construction, and this will be in accordance with BMPs. With an unusual storm year, this could be as many as 5 to 10 days. Under a worst case storm scenario where all of the storm water would be collected in excavations, the water collected from a 10-year, 24-hour storm could be pumped out over 24 hours at a 50-gpm rate. For the WCEP project, this potential for site dewatering will only

occur over a single rain season. Therefore, the maximum daily dewatering discharge would be 72,000 gallons and, for the sake of providing a quantity, an extreme worst case annual maximum of 0.72 mg, based on the worst case daily amount for 10 days in a year.

If any contamination is detected via odors or visible sheens, the collected storm 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)

5.2.4 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)

5.2.5 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:

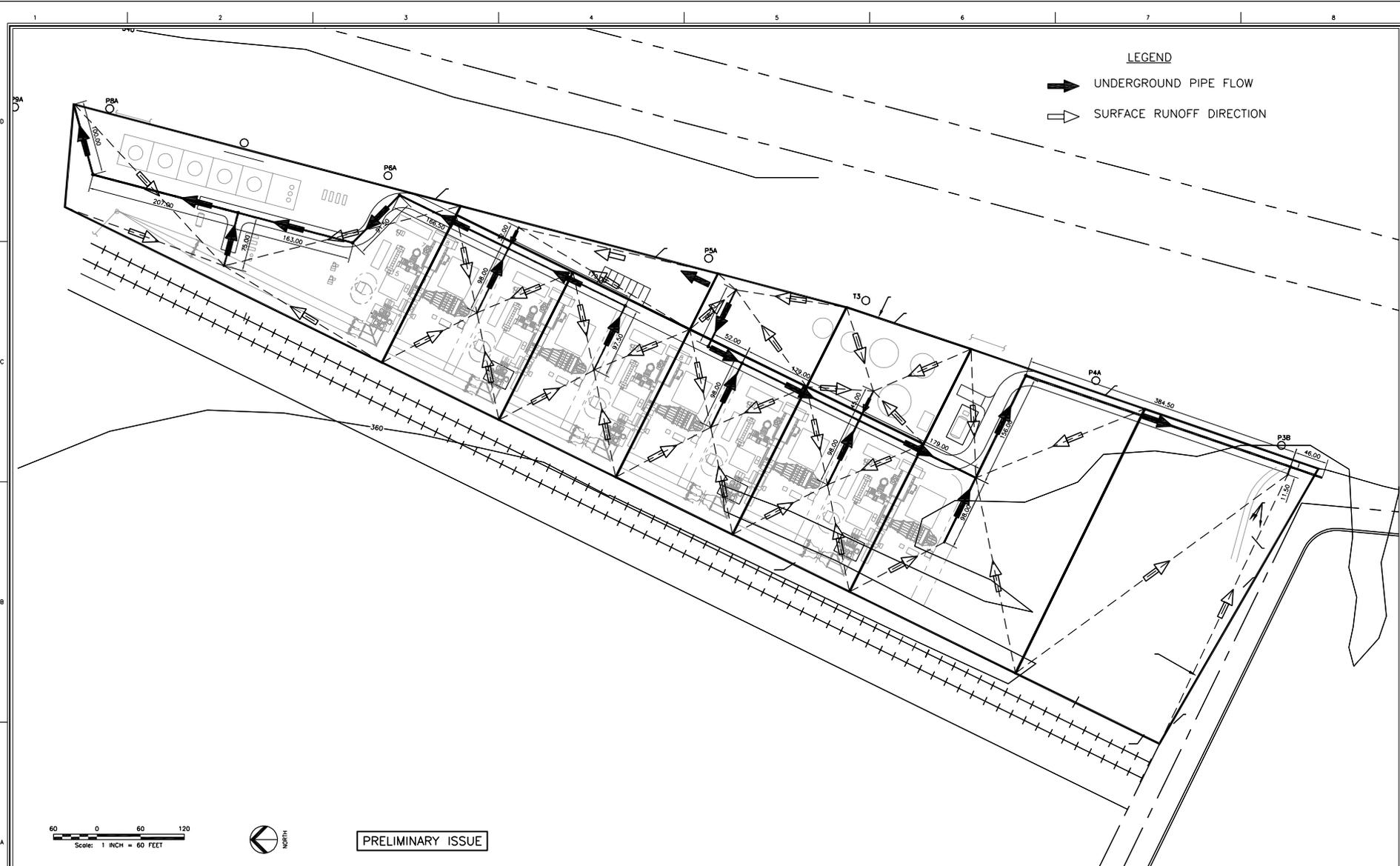
- Wind erosion control (WE-1)

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



LEGEND

- UNDERGROUND PIPE FLOW
- SURFACE RUNOFF DIRECTION



PRELIMINARY ISSUE

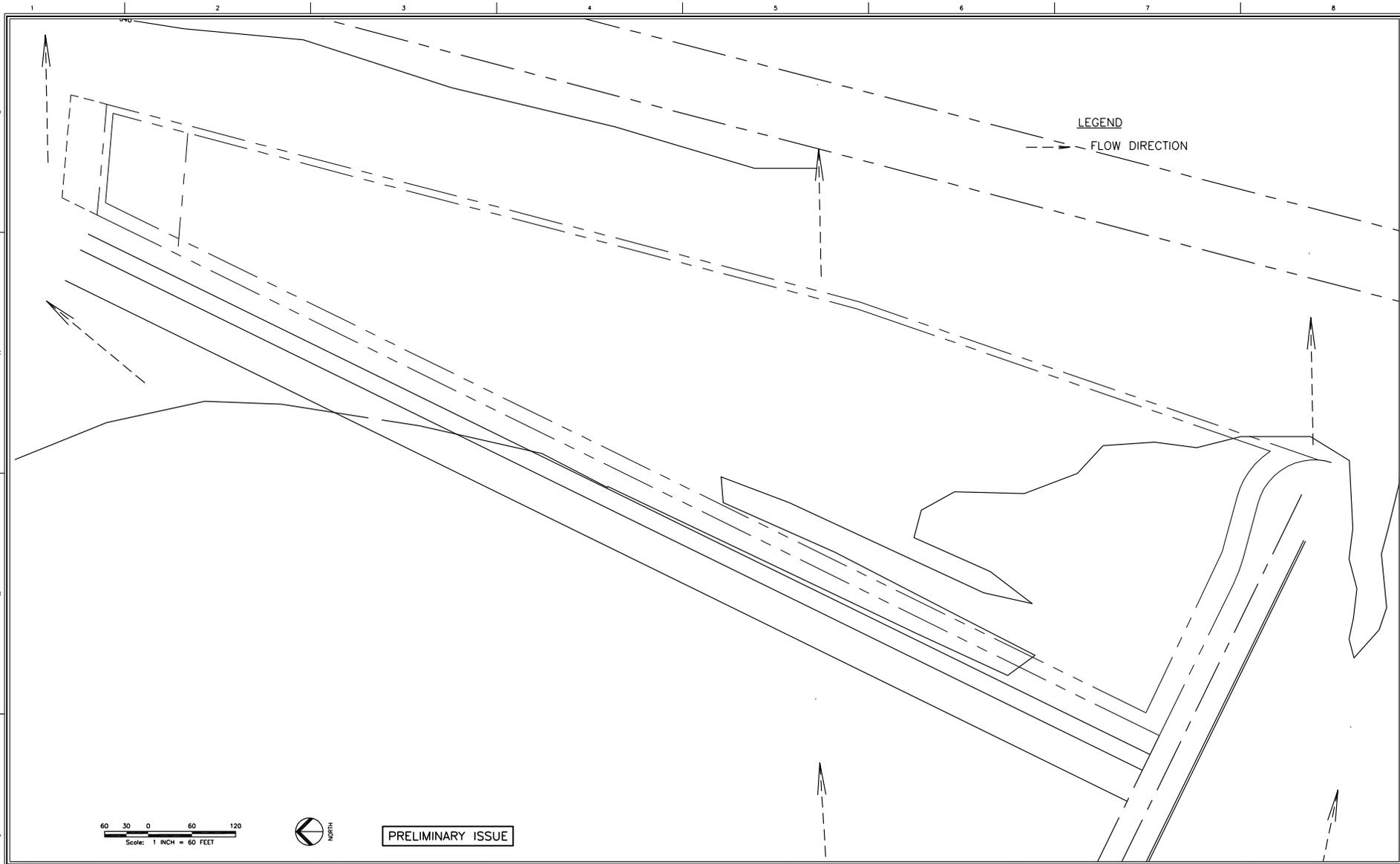
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CLIENT APPROVAL	
DATE	20-SEP-05
REVISION	PRELIMINARY ISSUE
BY	JGY
CHK	
APPR.	

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SHEET TITLE
 WALNUT
 STORM WATER
 DRAINAGE DIAGRAM



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



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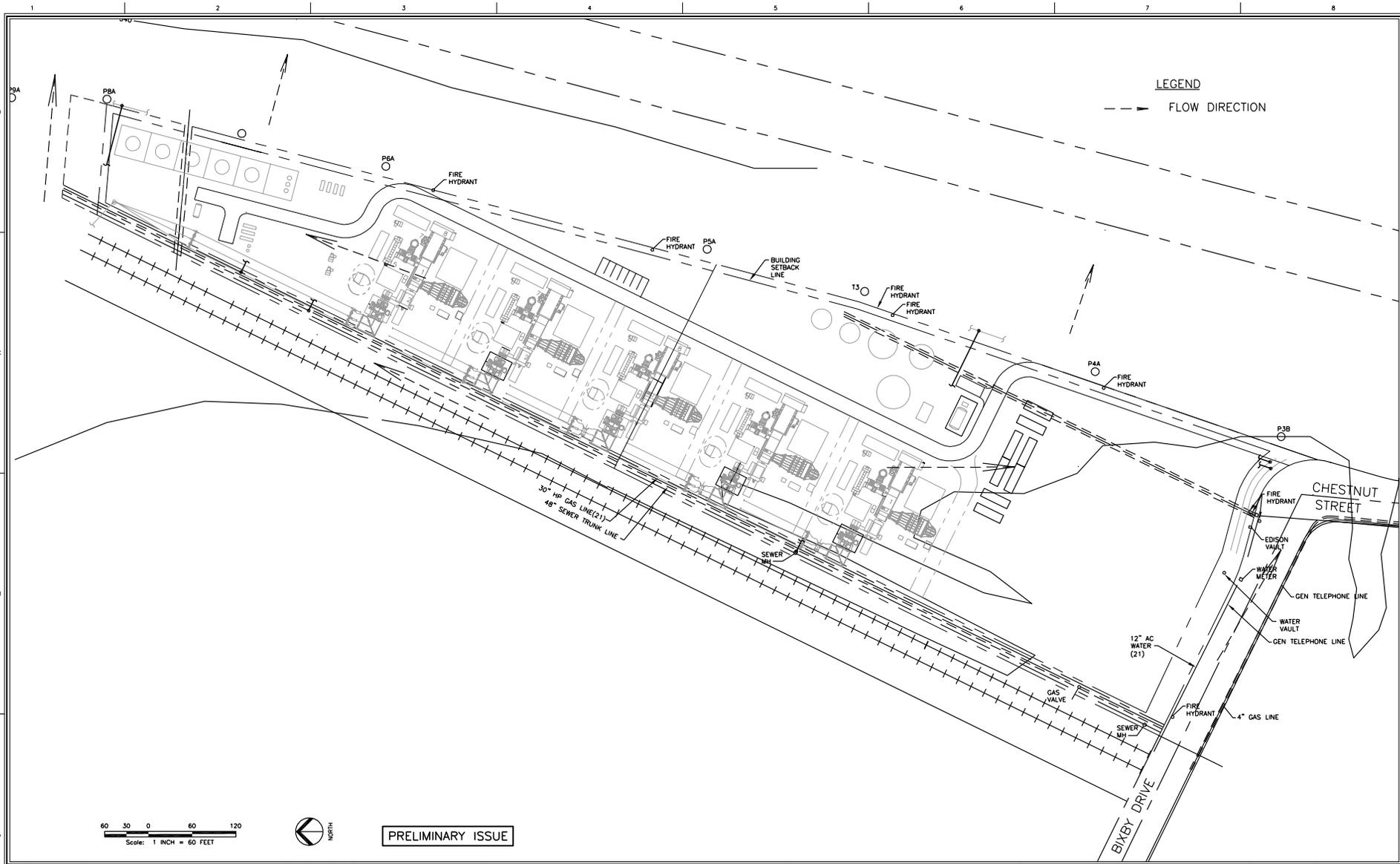
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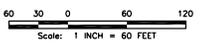
SHEET TITLE
 WALNUT
 PRE-CONSTRUCTION
 DRAINAGE PATTERNS

JOB NAME
 **EDISON**
 MISSION ENERGY

JOB NO.	023482.00	REV. NO.	A
FILENAME	CWALNUT.DWG	DWG. NO.	C-2
SCALE	1"=60'-0"		



LEGEND
 - - - - - FLOW DIRECTION



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SHEET TITLE
WALNUT
 POST-CONSTRUCTION
 DRAINAGE PATTERNS



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

APPENDIX B

Drainage Calculations



WALNUT SIMPLE CYCLE

STORM DRAIN CALCULATIONS

Lockwood Greene

Project number: 050-025482.00



Preliminary
(to be verified in final design)

Edison Mission Energy, Walnut, CA.

Storm drainage, Rational Method

Design Criteria:

Rainfall Intensity: 25 yr, 60 min Storm Event

Tc = 60 min

i = 60 in (Based on Figure 41, Isopluvial of 25 yr 24-hr precipitation for southern half of California, from NOAA Atlas 2, Volume XI)

$$Q = CiA$$

Units:

$$Q = \text{CFS}$$

C = see table 3. (Recommended Runoff Coefficient)

$$i = 6 \text{ in/hr}$$

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
Checked by
Date

JGY
DEM
09/20/05

DRAINAGE AREA	TYPE OF SURFACE	AREA	AREA	COEFFICIENT	I (25yr)	Q (25yr)	Q'(25yr) (cfs) INLET TOTAL	BRANCH TOTAL	Q CUM (cfs)	PIPE SIZE, SLOPE, & CAPACITY AT THE INLET
			(ACRES)	@	(in/hr)	(cfs)				
A1	ASPHALT	8,204.99	0.19	0.80	6.00	0.90				
	CONCRETE	16,686.18	0.38	0.90	6.00	2.07				
	EQUIPMENT	5,950.86	0.14	1.00	6.00	0.82				
	GRAVEL/GRASS	65,833.35	1.51	0.20	6.00	1.81	T2= 5.61			15" HDPE @ 0.75% Q = 6.06 cfs
A2	ASPHALT	1,882.59	0.04	0.80	6.00	0.21				
	CONCRETE	2,507.79	0.06	0.90	6.00	0.31				
	EQUIPMENT	0.00	0.00	1.00	6.00	0.00				
	GRAVEL/GRASS	13,416.52	0.31	0.20	6.00	0.37	T4= 0.89			12" HDPE @ 0.5% Q = 2.73 cfs
A3	ASPHALT	6,081.63	0.14	0.80	6.00	0.67				
	CONCRETE	2,620.42	0.06	0.90	6.00	0.32				
	EQUIPMENT	7,829.43	0.18	1.00	6.00	1.08				
	GRAVEL/GRASS	24,027.64	0.55	0.20	6.00	0.66	T5= 2.74			12" HDPE @ 0.75% Q = 3.34 cfs
A4	ASPHALT	6,081.63	0.14	0.80	6.00	0.67				
	CONCRETE	2,620.42	0.06	0.90	6.00	0.32				
	EQUIPMENT	7,829.43	0.18	1.00	6.00	1.08				
	GRAVEL/GRASS	24,027.64	0.55	0.20	6.00	0.66	T7= 2.74			12" HDPE @ 0.75% Q = 3.34 cfs
A5	ASPHALT	0.00	0.00	0.80	6.00	0.00				
	CONCRETE	4,692.21	0.11	0.90	6.00	0.58				
	EQUIPMENT	615.75	0.01	1.00	6.00	0.08				
	GRAVEL/GRASS	13,285.72	0.30	0.20	6.00	0.37	T8= 1.03			12" HDPE @ 0.5% Q = 2.73 cfs
A6	ASPHALT	6,081.63	0.14	0.80	6.00	0.67				
	CONCRETE	2,620.42	0.06	0.90	6.00	0.32				
	EQUIPMENT	7,829.43	0.18	1.00	6.00	1.08				
	GRAVEL/GRASS	24,027.64	0.55	0.20	6.00	0.66	T10= 2.74			15" HDPE @ 0.5% Q = 4.95 cfs
A7	ASPHALT	0.00	0.00	0.80	6.00	0.00				
	CONCRETE	3,000.00	0.07	0.90	6.00	0.37				
	EQUIPMENT	4,817.21	0.11	1.00	6.00	0.66				
	GRAVEL/GRASS	16,134.87	0.37	0.20	6.00	0.44	T12= 1.48			12" HDPE @ 0.5% Q = 2.73 cfs
A8	ASPHALT	6,081.63	0.14	0.80	6.00	0.67				
	CONCRETE	2,620.42	0.06	0.90	6.00	0.32				
	EQUIPMENT	7,829.43	0.18	1.00	6.00	1.08				
	GRAVEL/GRASS	24,027.64	0.55	0.20	6.00	0.66	T13= 2.74			15" HDPE @ 0.5% Q = 4.95 cfs
A9	ASPHALT	17,339.95	0.40	0.80	6.00	1.91				
	CONCRETE	1,863.65	0.04	0.90	6.00	0.23				
	EQUIPMENT	8,285.89	0.19	1.00	6.00	1.14				
	GRAVEL/GRASS	70,418.82	1.62	0.20	6.00	1.94	T16= 5.22			15" HDPE @ 0.75% Q = 6.06 cfs
A10	ASPHALT	0.00	0.00	0.80	6.00	0.00				
	CONCRETE	0.00	0.00	0.90	6.00	0.00				
	EQUIPMENT	0.00	0.00	1.00	6.00	0.00				
	GRAVEL/GRASS	98,461.69	2.26	0.20	6.00	2.71	T18 2.71			21" HDPE @ .75% Q = 14.87 cfs
TOTAL			11.84						T=19 15.92	12" HDPE @ 0.5% Q = 2.73 cfs 21" HDPE @ 1.0% Q = 17.17 cfs

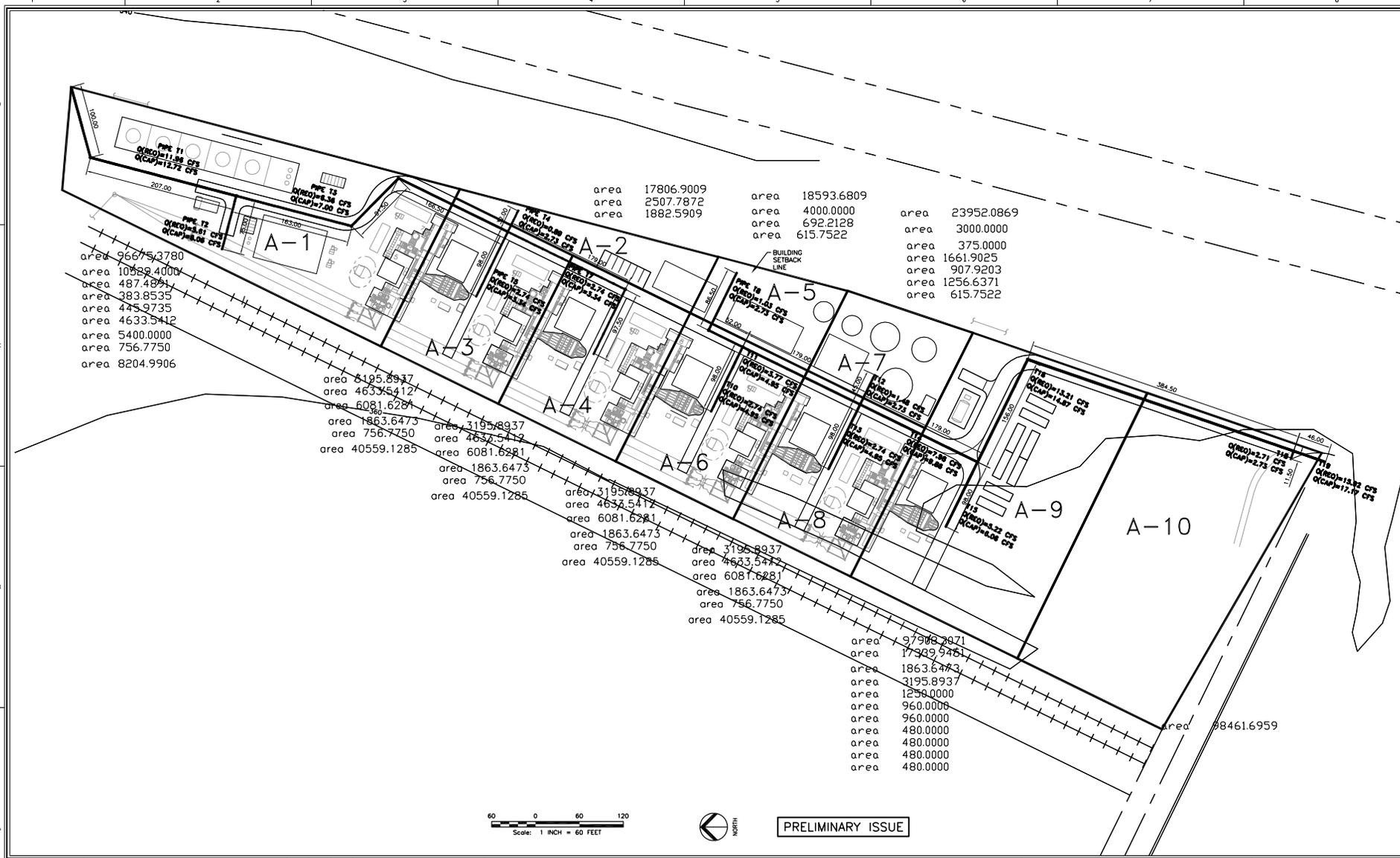
TABLE 4

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 = $(1.486 \times R^{2/3} \times A) / n$



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CH2MHILL
Lockwood Greene
 Atlanta, Georgia

SHEET TITLE
 WALNUT
 DRAINAGE AREAS



JOB NO.	023482.00	REV. NO.	A
FILENAME	CWALNUT.DWG	DWG. NO.	
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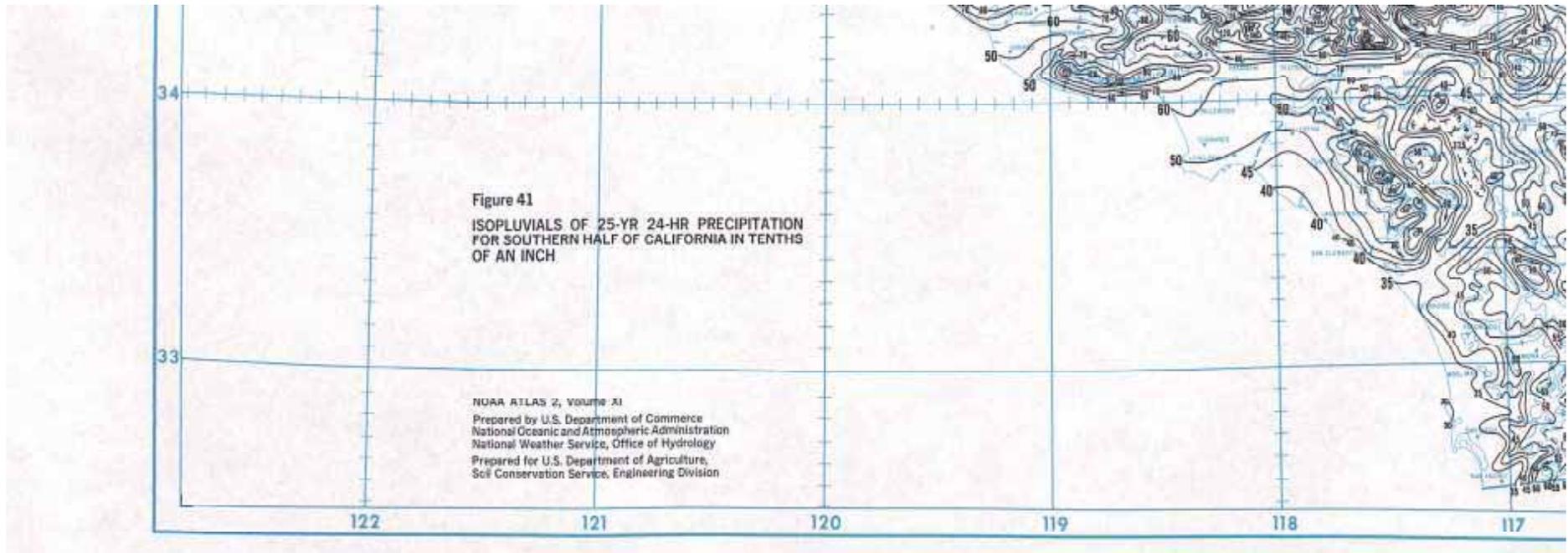


TABLE 3.4 Recommended Runoff Coefficients^a

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 selection 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

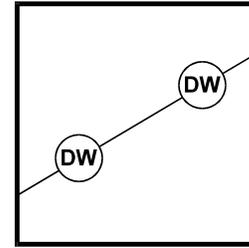
The coefficients in these two tabulations are applicable for storms of 5-to 10-yr frequencies. Less frequent, higher intensity storms will require the use of higher coefficients because infiltration and other losses have a proportionally smaller effect on runoff. The coefficients are based on the assumption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

APPENDIX C

Best Management Practices

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."

Standards and Specifications

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

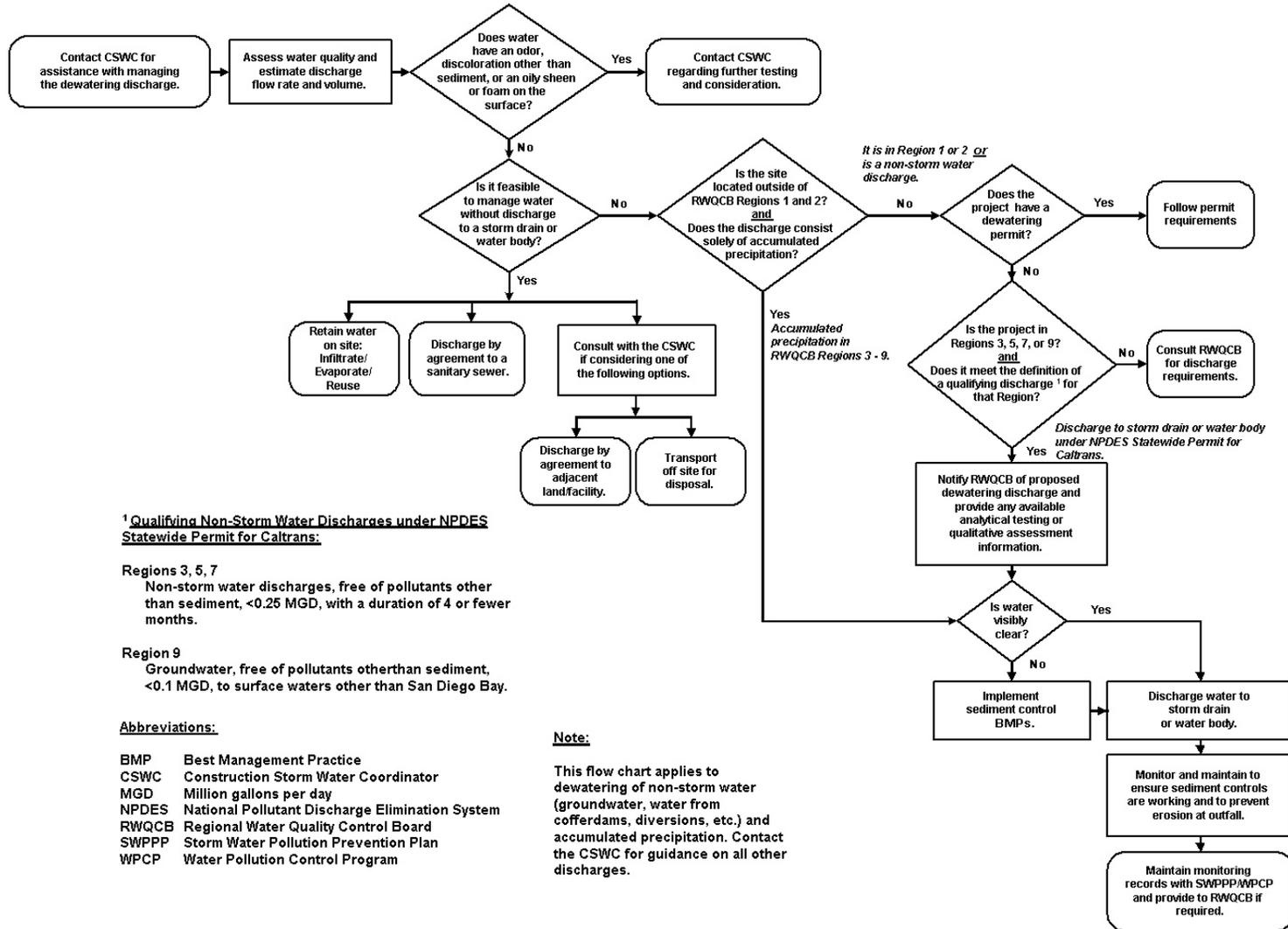
Dewatering Operations

NS-2

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



=

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.

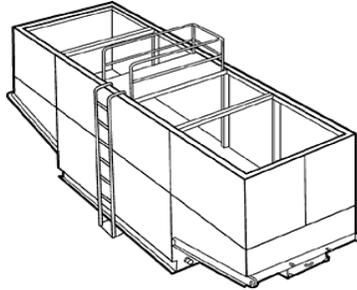
Implementation:

- 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.

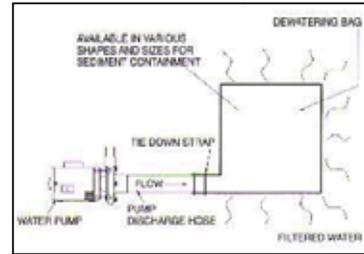
Implementation:

- 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

Dewatering Operations

NS-2

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 NPDES 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.



Dewatering Operations

NS-2

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 ^l
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



Dewatering Operations

NS-2

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM ^d	
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}				
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
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. [\[http://www.swrcb.ca.gov/rwqcb5/available_documents/index.html#anchor616381\]](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 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.



Dewatering Operations

NS-2

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.



Dewatering Operations

NS-2

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.



Dewatering Operations

NS-2

STORM WATER DEWATERING OPERATIONS BMP DISCHARGE MONITORING FORM ^a	
Colorado River Basin Region (RWQCB 7) For Surface Waters ^d	
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.



Dewatering Operations

NS-2

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 NPDES 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, surfactants, tastes and odors, and toxic substances.

^j Total dissolved solids (TDS), hardness, sodium (Na), chloride (Cl), total inorganic nitrogen (TIN), sulfate (SO₄) and chemical oxygen demand (COD) shall be analyzed for specific waterbodies as identified in the Basin Plan.



Dewatering Operations

NS-2

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	RECEIVING WATER
		Daily Maximum	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

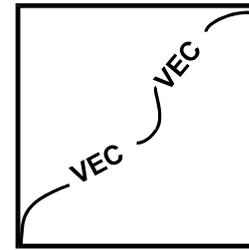
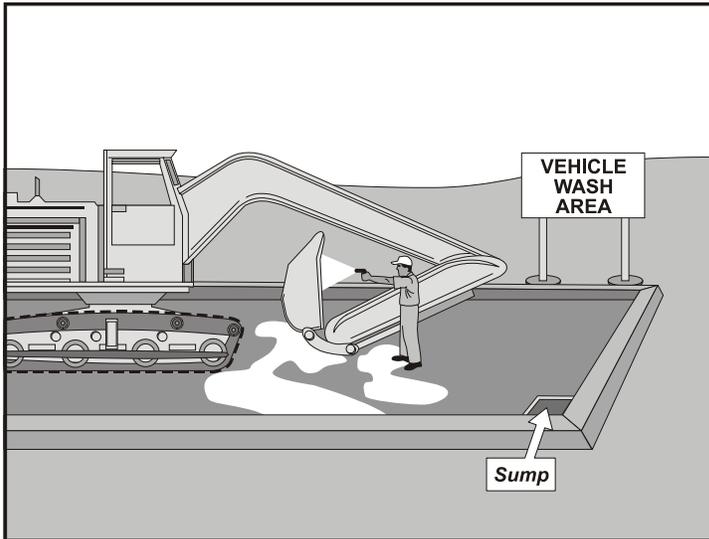
RWQCB - Regional Water Quality Control Board
-- - Not required
> - Greater Than

- 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.



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

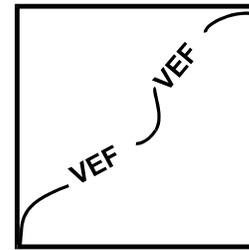
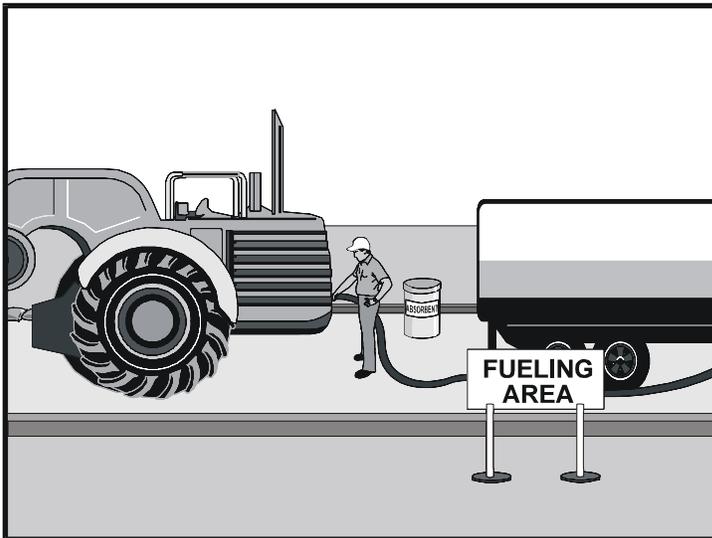


operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall have the following characteristics, and shall be arranged with the construction storm water coordinator:

- 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.



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.

Vehicle and Equipment Fueling

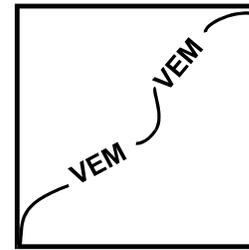
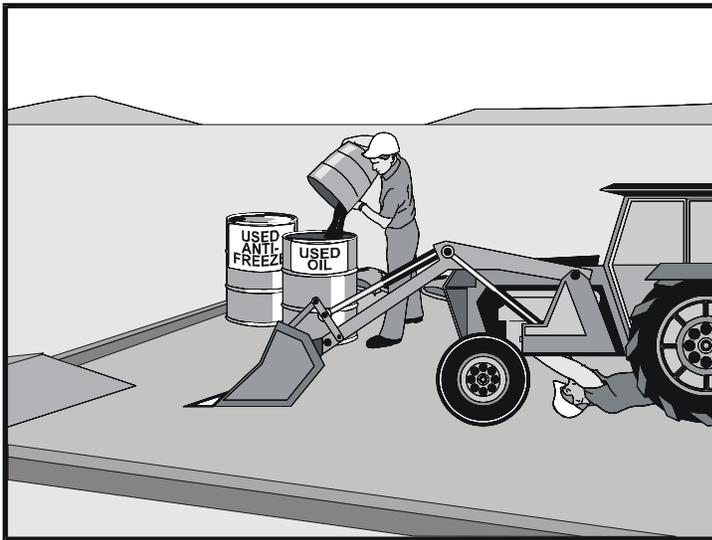
NS-9

- 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.





Standard Symbol

BMP Objectives

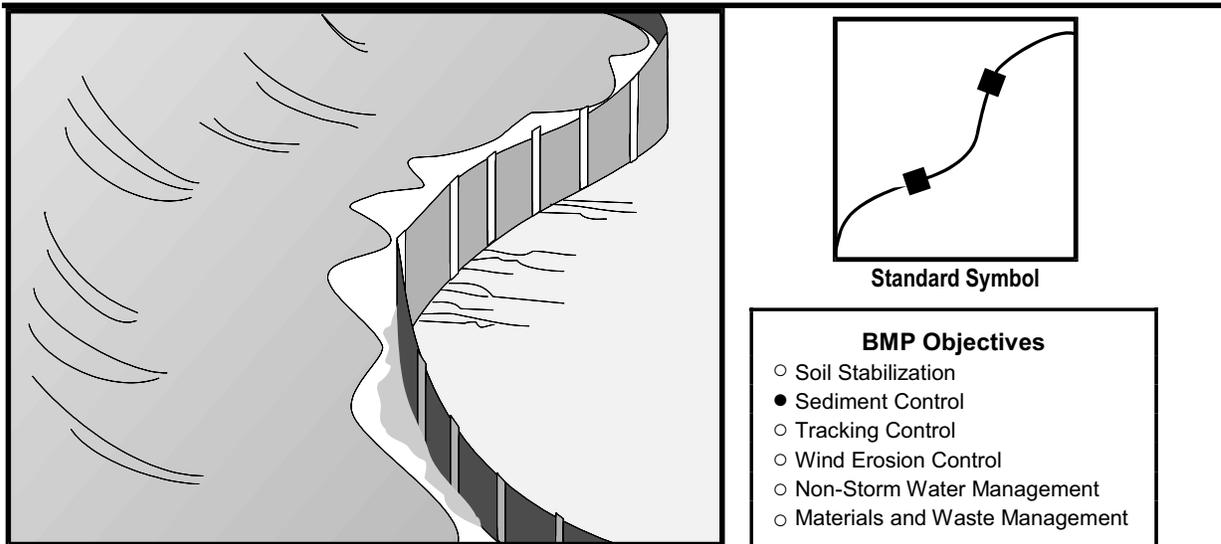
- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

- 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.



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.

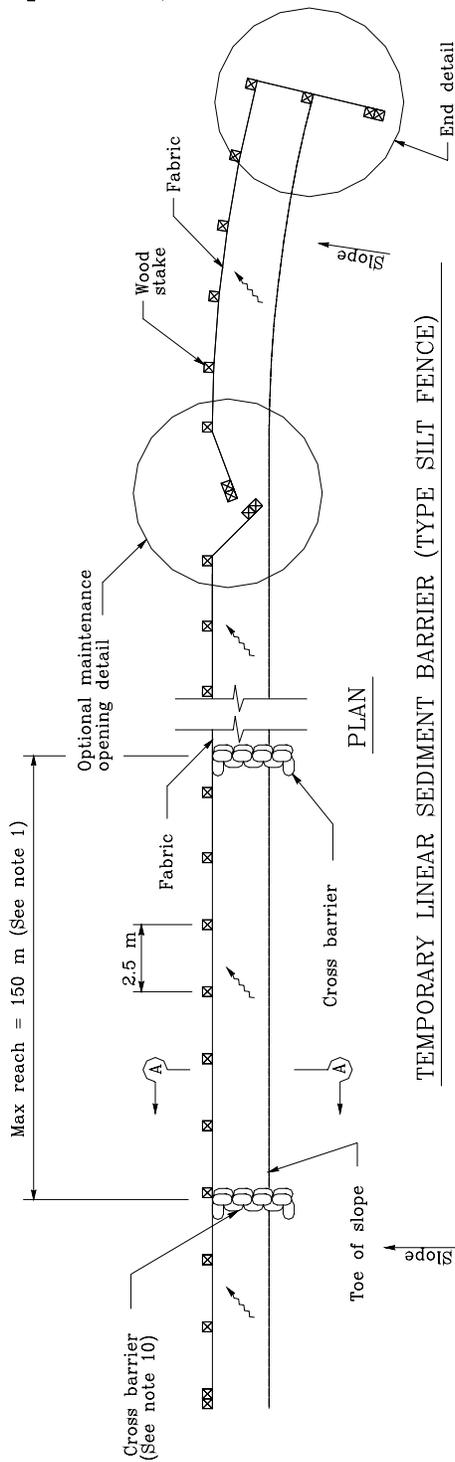
Maintenance and Inspection

- 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.

Silt Fence

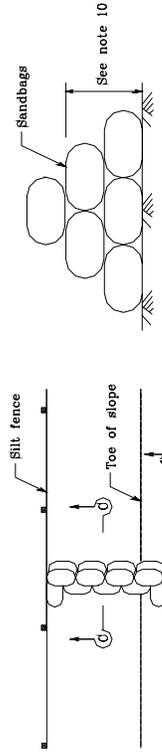
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TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SILT FENCE)

NOTES

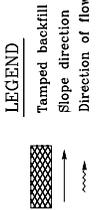
1. Construct the length of each reach so that the change in base elevation at the end of each reach does not exceed 1/3 the height of the linear barrier, in no case shall the reach length exceed 150m.
2. The last 2.5 m of fence shall be turned up slope.
3. Stake dimensions are nominal.
4. Dimension may 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.



CROSS BARRIER DETAIL

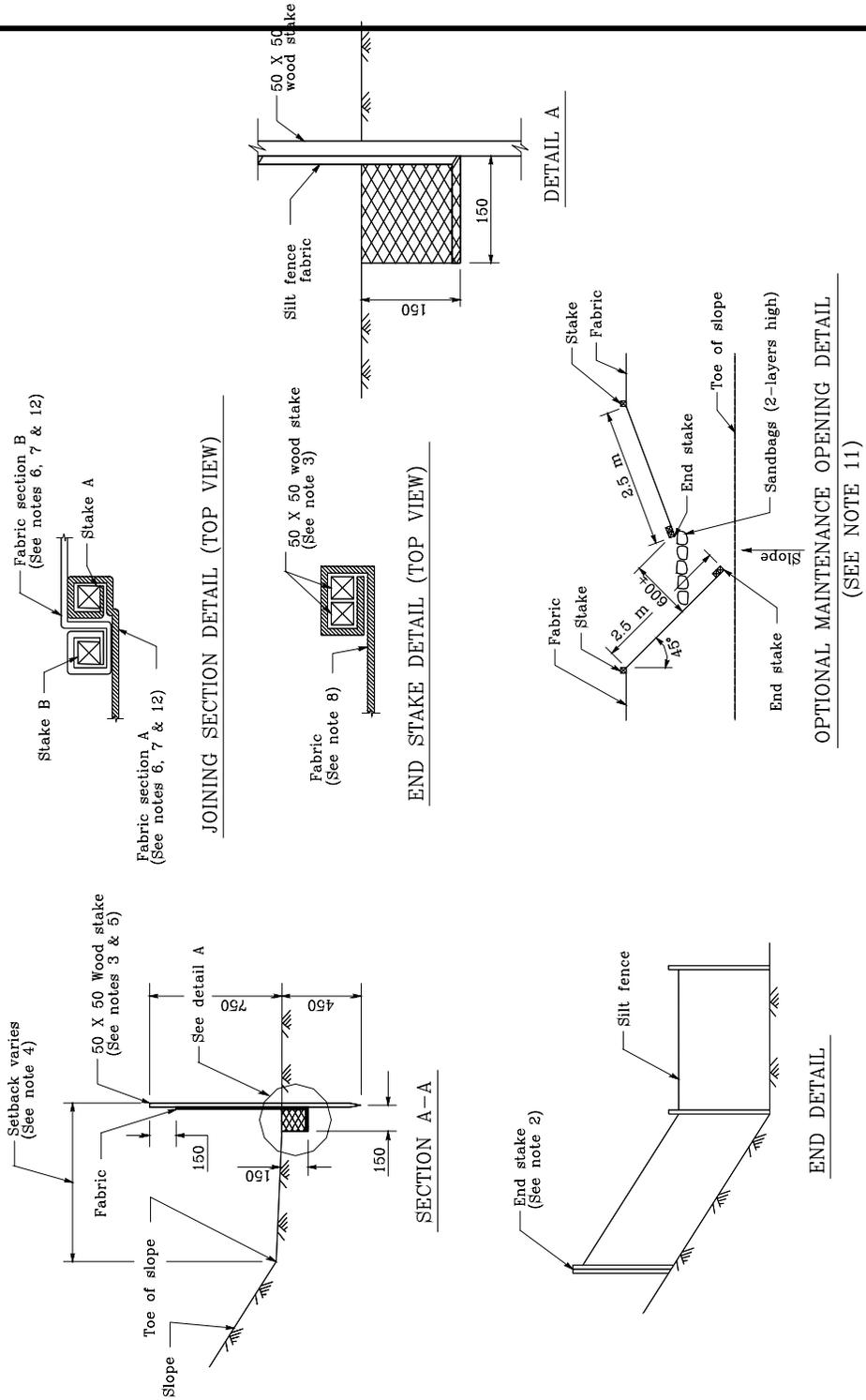
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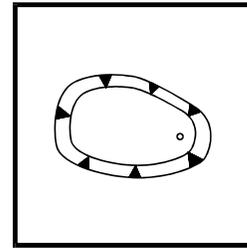
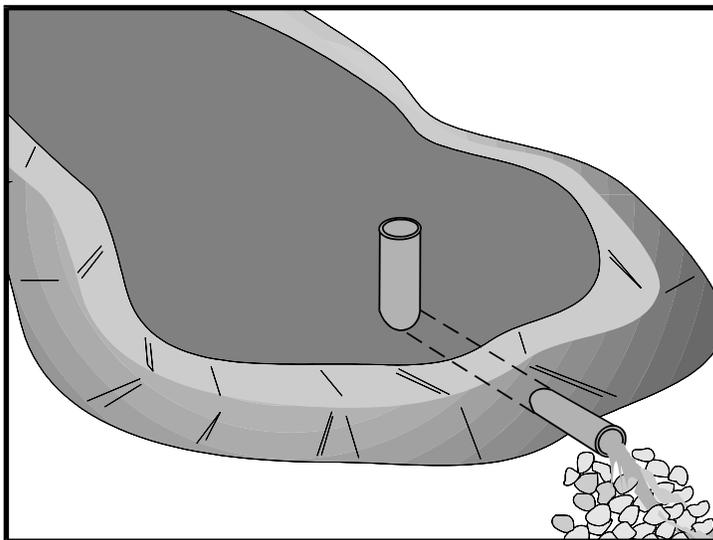
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE SILT FENCE)
NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN



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 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:

$$A_s = 1.2Q/V_s \quad (\text{Eq. 1})$$

Where:

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

V_s = 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 V_s 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:

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

where:

- a = area of orifice (ft²) (1 ft² = 0.0929m²)
- A = surface area of the basin at mid elevation (ft²)
- C = orifice coefficient
- T = drawdown time of full basin (hrs)
- G = gravity (32.2 ft/s²)
- H = elevation when the basin is full (ft)
- H_o = final elevation when basin is empty (ft)

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

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

Flow Control Using Multiple Orifices (see Figure2):

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

With terms as described above except:

a_t = total area of orifices

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

$h_{centroid\ of\ orifices}$ = 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

Sediment/Desilting Basin

SC-2

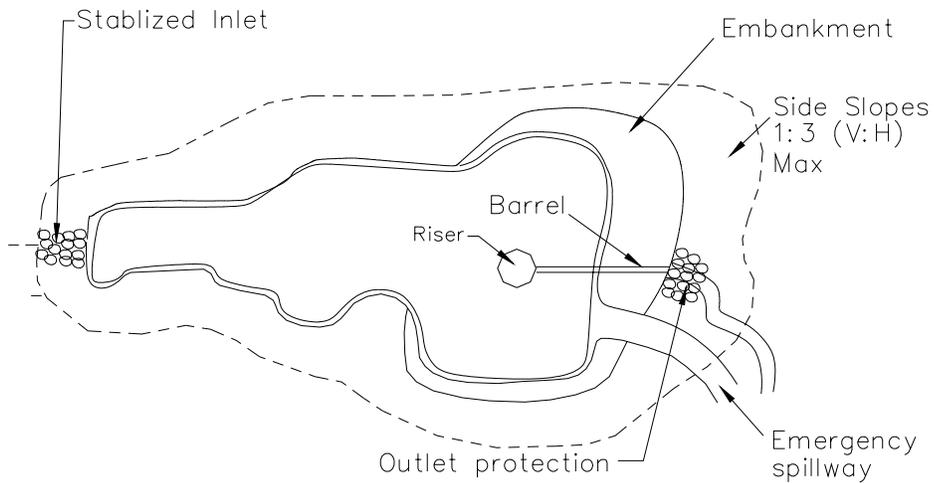
least every 24 hours.

- 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.

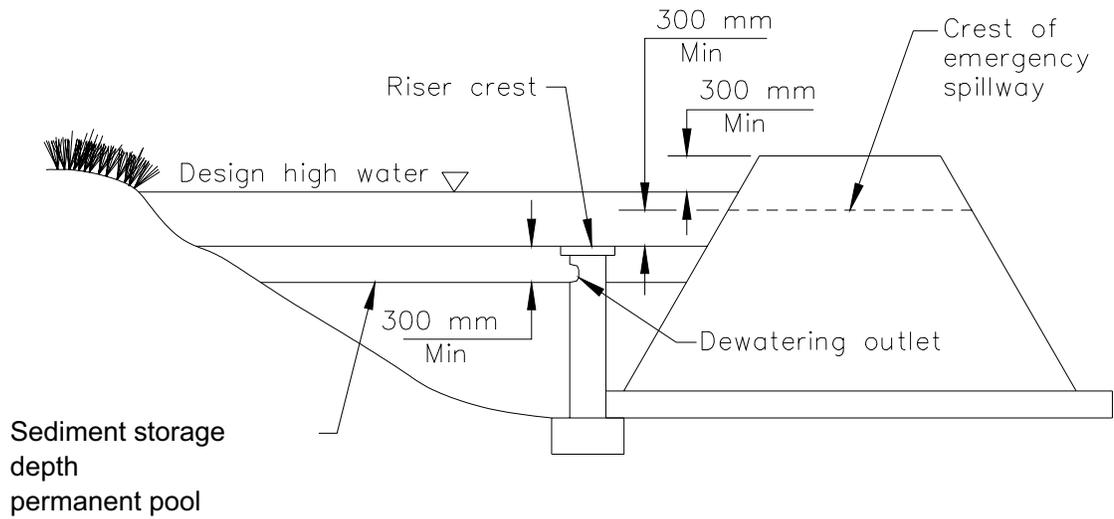


Sediment/Desilting Basin

SC-2



TOP VIEW



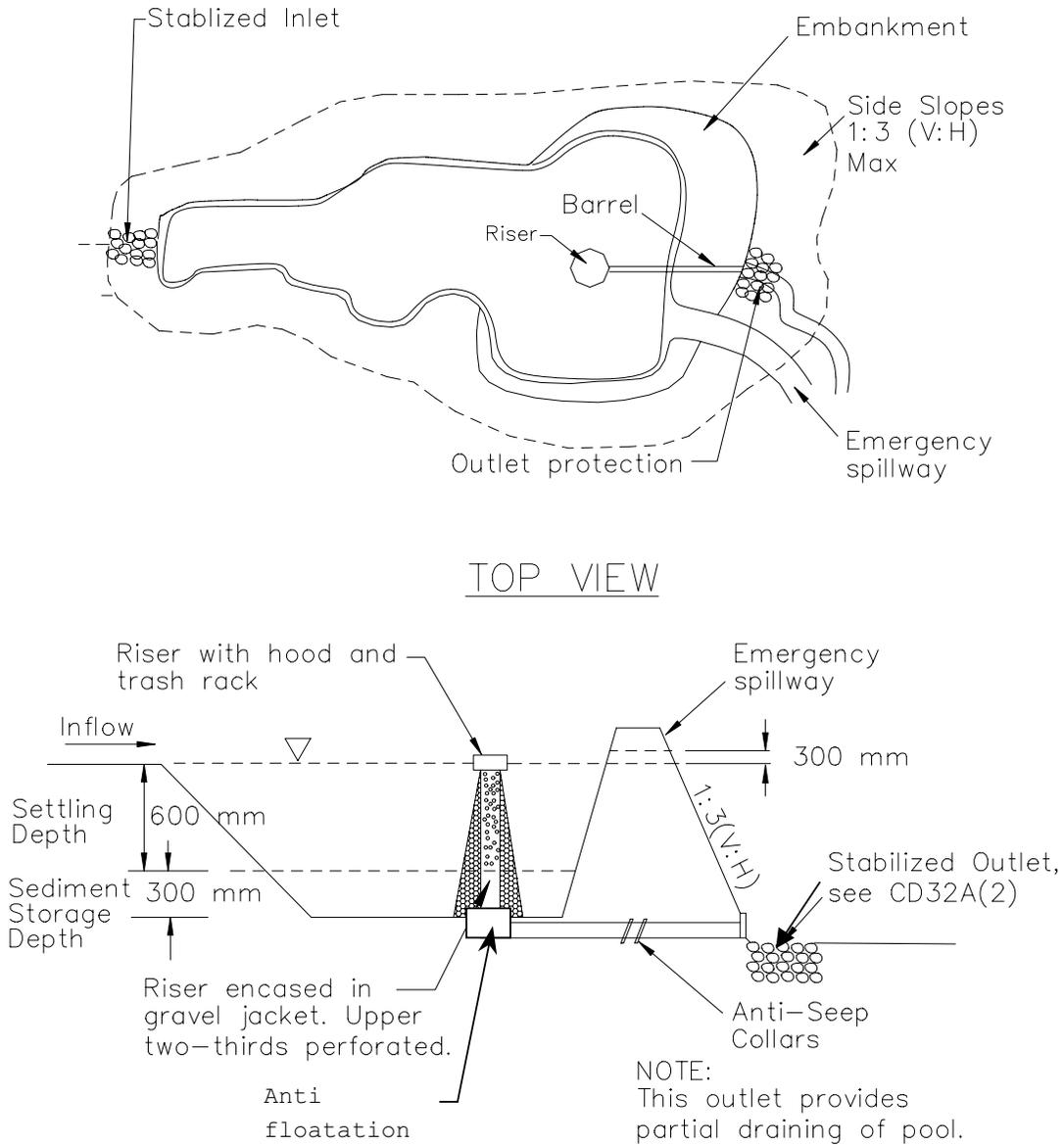
This outlet provides no drainage for permanent pool.

FIGURE 1: SINGLE ORIFICE DESIGN
NOT TO SCALE



Sediment/Desilting Basin

SC-2



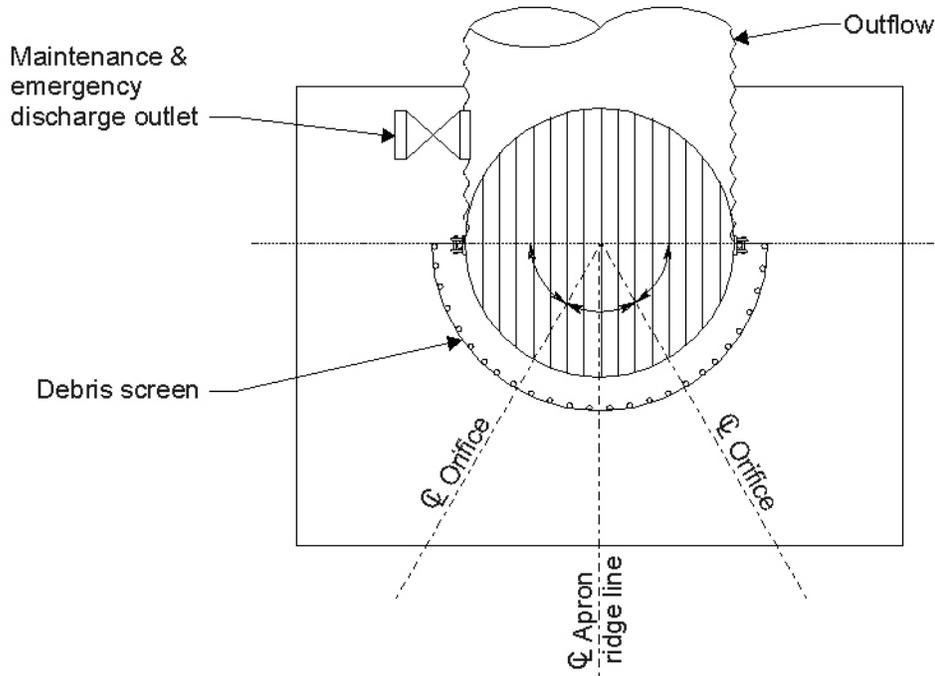
**FIGURE 2: MULTIPLE ORIFICE DESIGN
NOT TO SCALE**



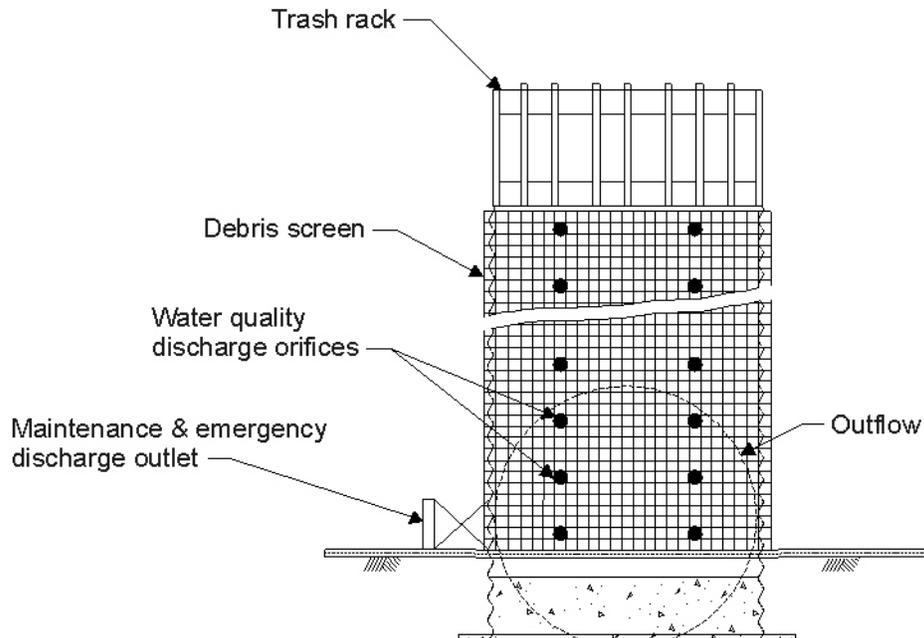
Sediment/Desilting Basin

SC-2

Plan



Profile

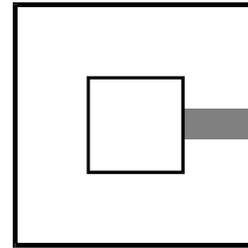
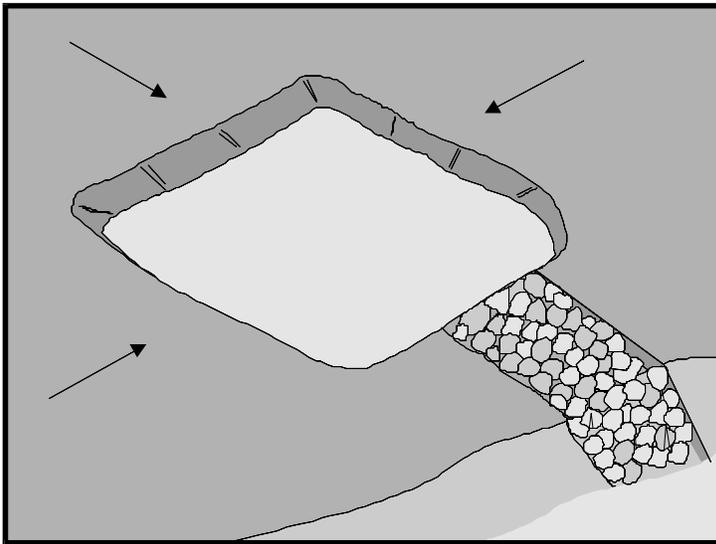


**FIGURE 3: MULTIPLE ORIFICE OUTLET RISER
NOT TO SCALE**



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.



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

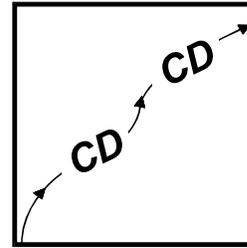
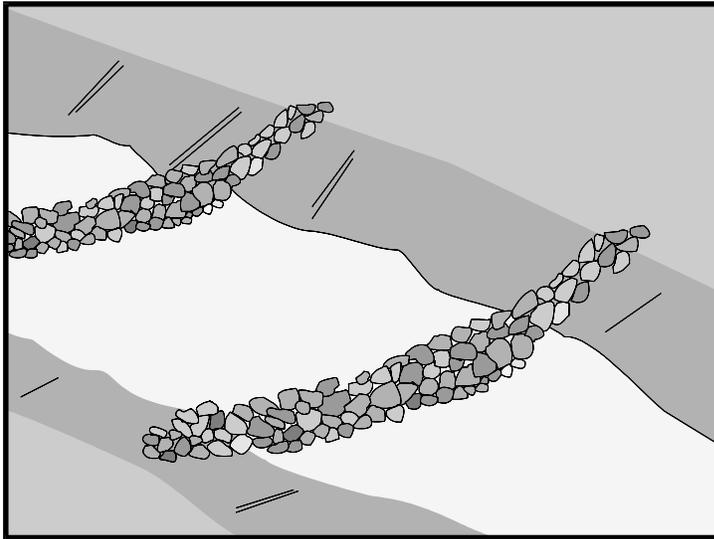
- Inspect sediment traps before and after rainfall events and weekly during the rest of the rainy season. During extended rainfall events, inspect sediment traps at least every 24 hours.
- If captured runoff has not completely infiltrated within 72 hours then the sediment trap must be dewatered.
- Inspect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

Sediment Trap

SC-3

- 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.





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.

Standards and Specifications

- Not to be constructed from straw bales or silt fence.
- 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.

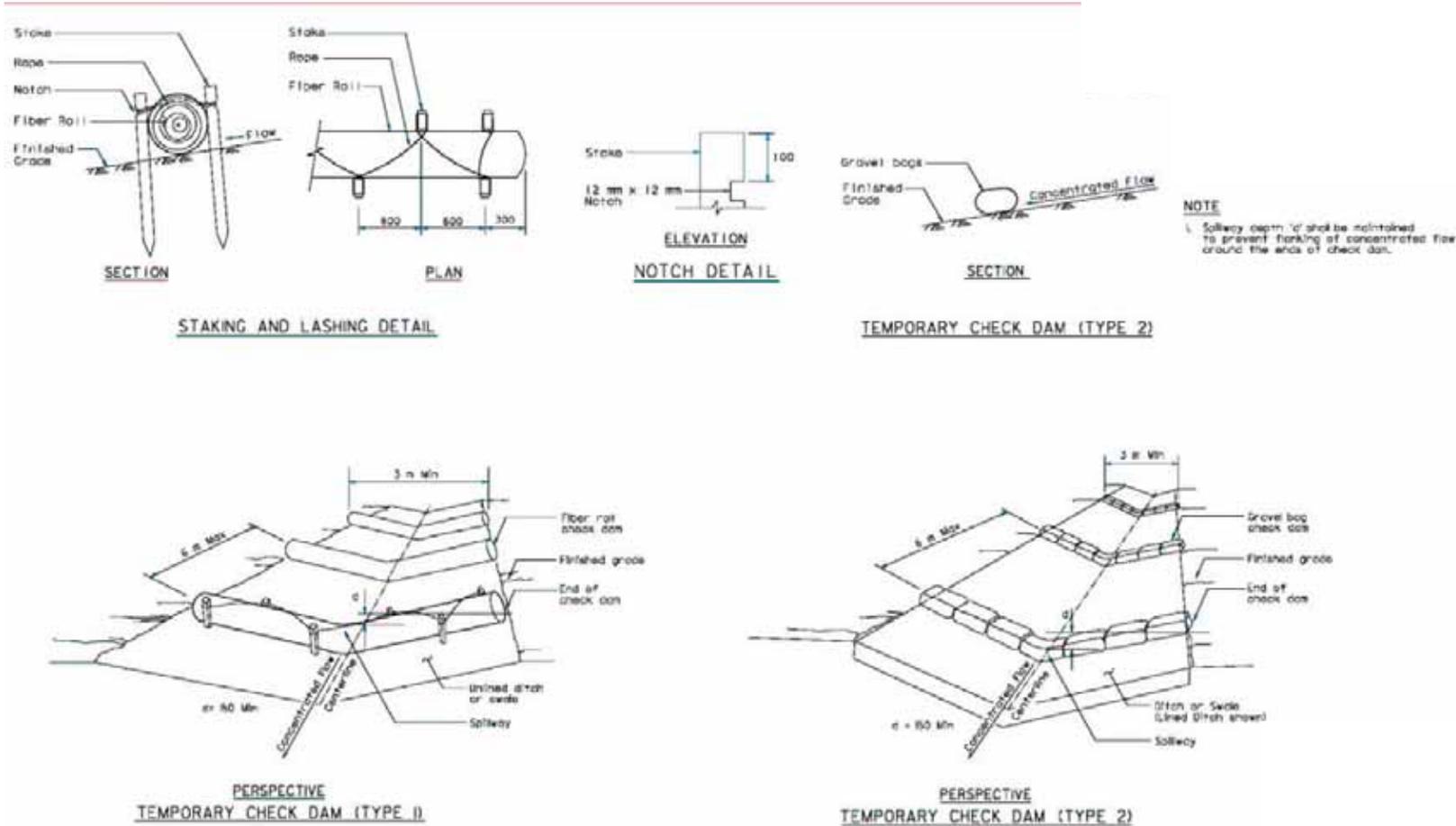
Installation

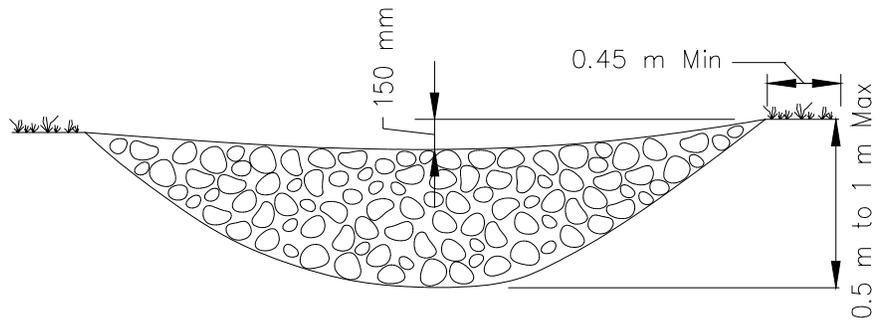
- Install along a level contour.
- Tightly abut bags and stack gravel bags using a pyramid approach.

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

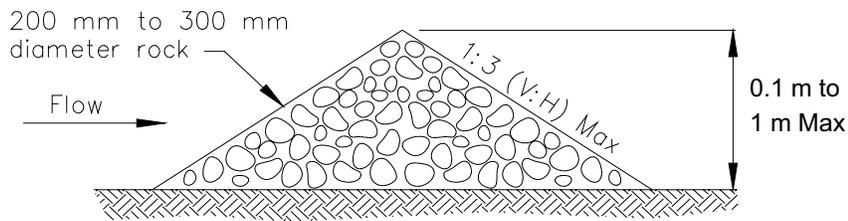
- Maintenance and Inspection
- Upper rows of gravel bags shall overlap joints in lower rows.
 - Inspect check dams after each significant rainfall event. Repair damage as needed or as required by the RE.
 - Remove sediment when depth reaches one-third of the check dam height.
 - Remove accumulated sediment 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



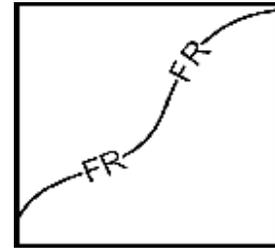


ELEVATION



TYPICAL ROCK CHECK DAM SECTION

ROCK CHECK DAM
NOT TO SCALE



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

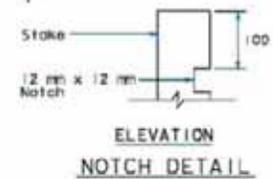
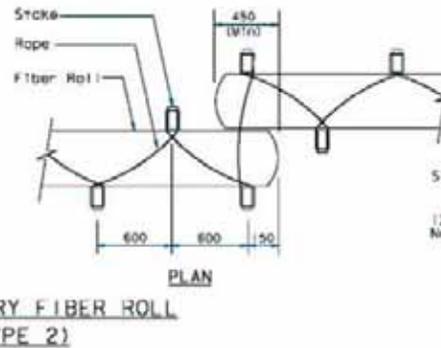
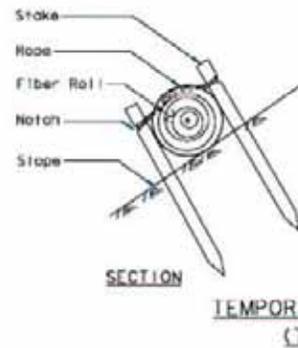
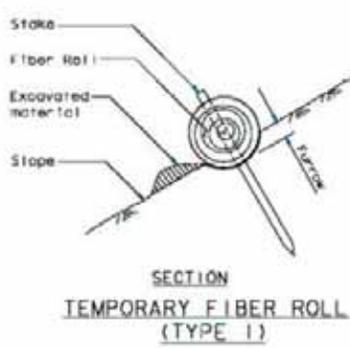
- Fiber rolls are typically left in place.
- If fiber rolls are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Maintenance and Inspection

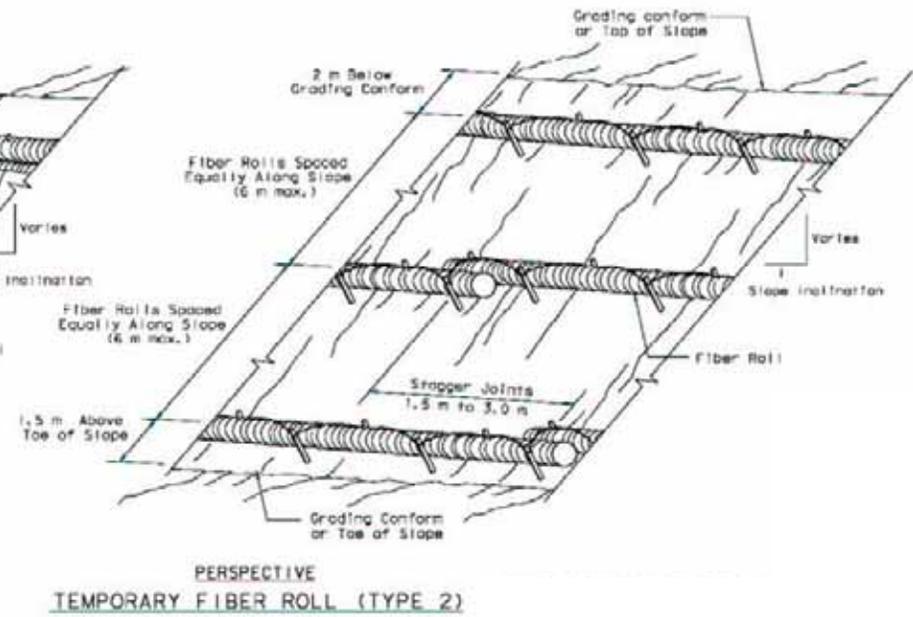
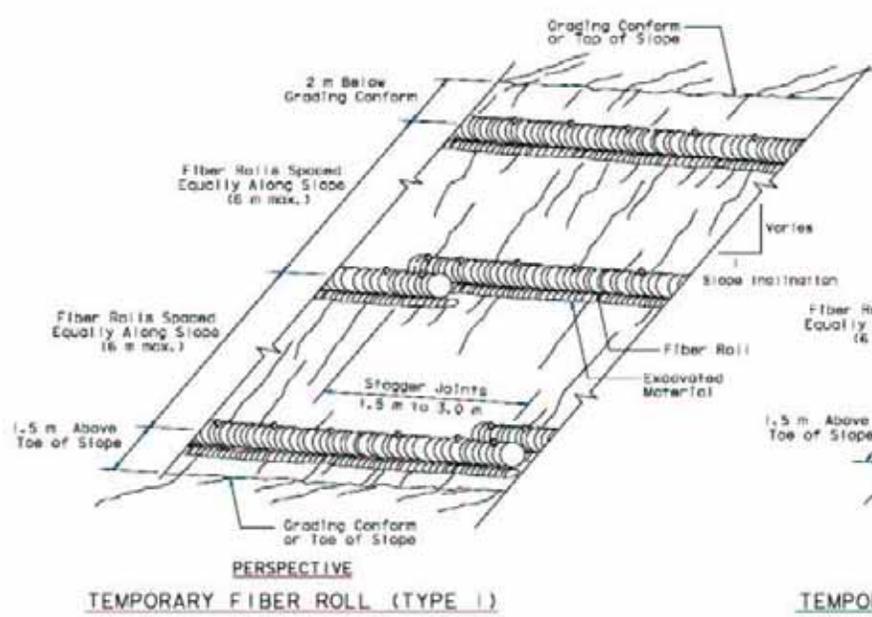
- Repair or replace split, torn, unraveling, or slumping fiber rolls.
- Inspect fiber rolls when rain is forecast. Perform maintenance as needed or as required by the RE.
- Inspect fiber rolls following rainfall events and at least daily during prolonged rainfall. Perform maintenance as needed or as 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.

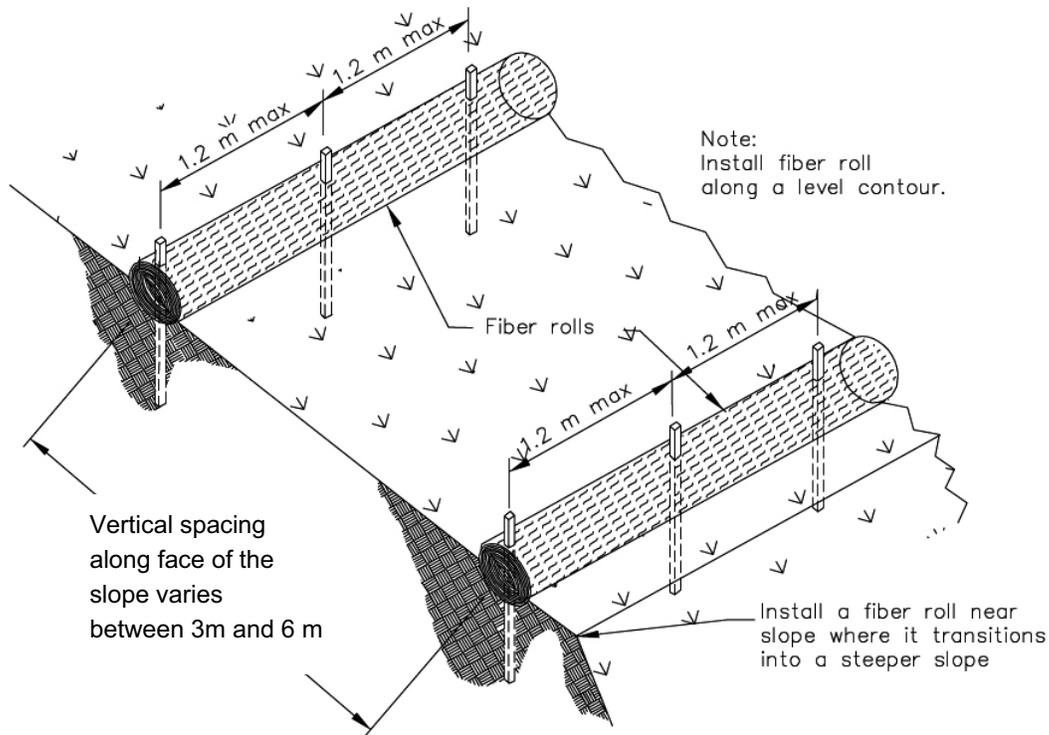
Fiber Rolls

SC-5

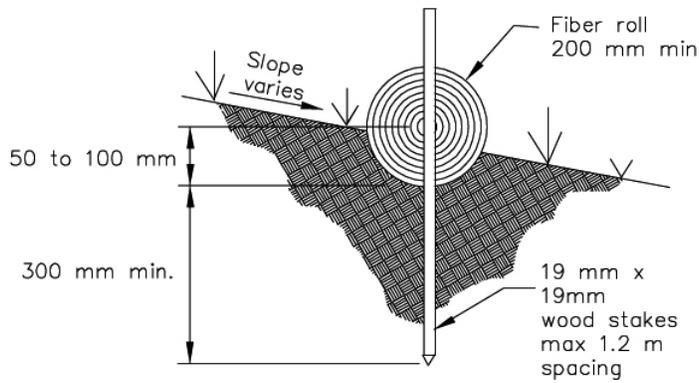


NOTE
1. Temporary fiber roll spacing varies depending upon slope inclination.

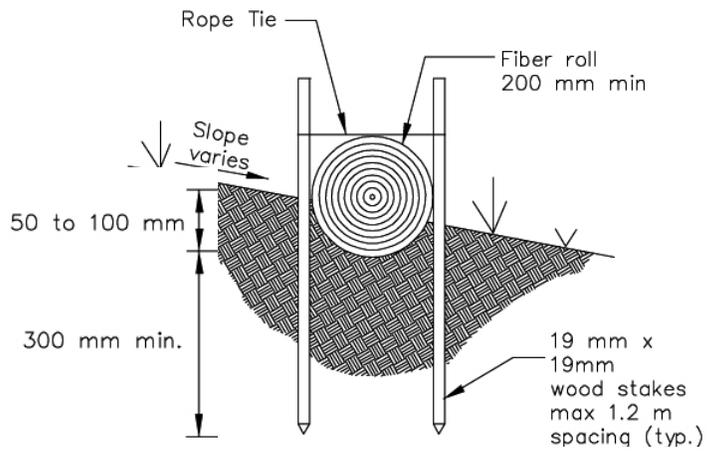
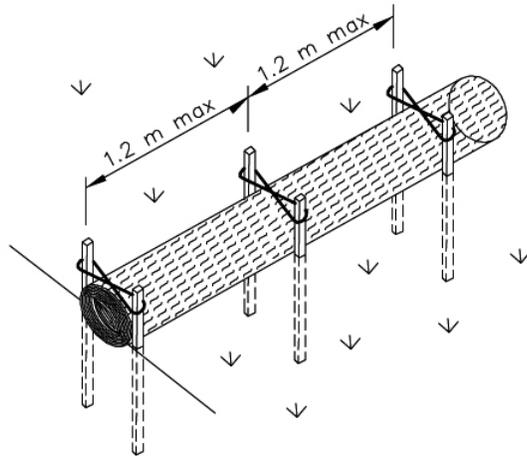




TYPICAL FIBER ROLL INSTALLATION
N.T.S.

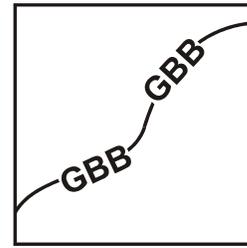
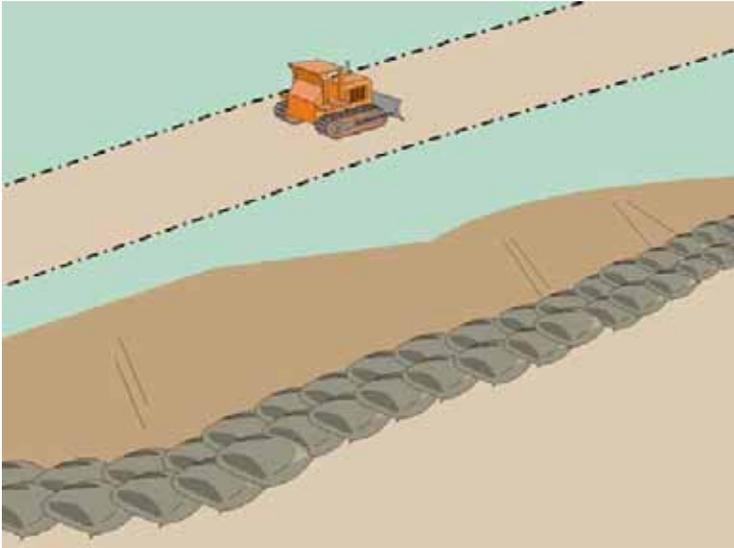


ENTRENCHMENT DETAIL
N.T.S.



OPTIONAL ENTRENCHMENT DETAIL

N.T.S.



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

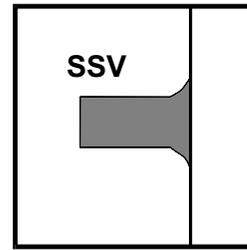
- **Bag Material:** Bags shall be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight 135 g/m² (four ounces per square yard), mullen burst strength exceeding 2,070 kPa (300 psi) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 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.



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

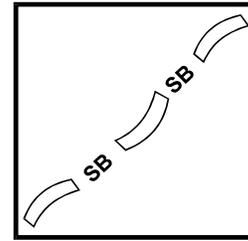
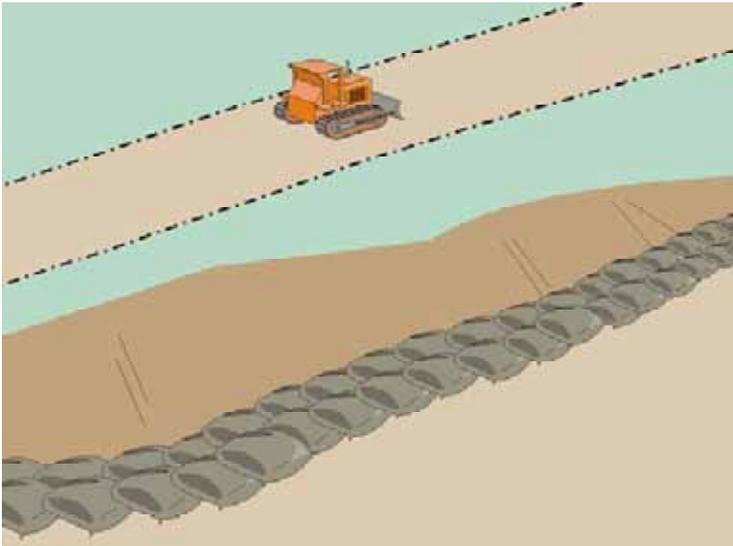
- Kick brooms or sweeper attachments shall not be used.
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking shall be swept and/or vacuumed daily.
- If not mixed with debris or trash, consider incorporating the removed sediment back into the project.

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 .

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).



- 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.

Sandbag Barrier

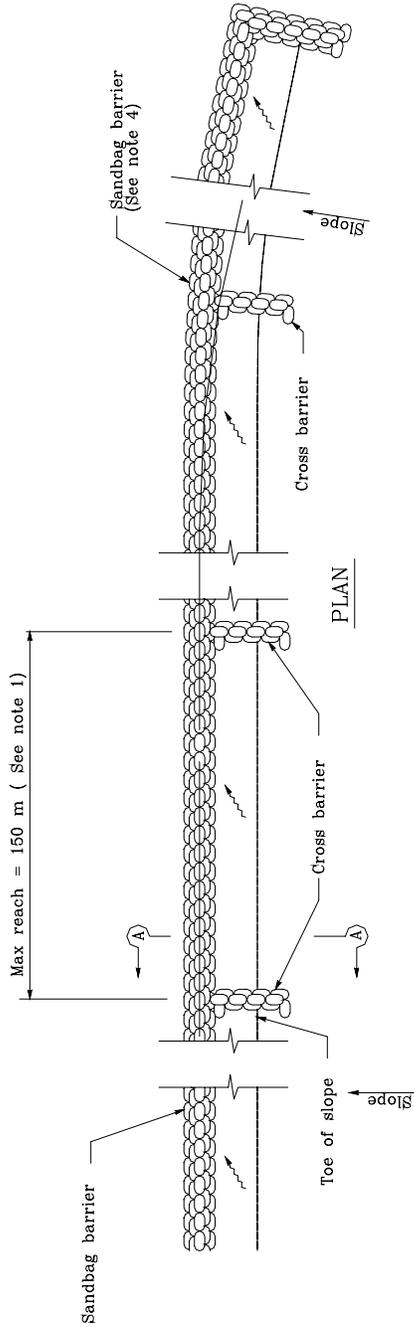
SC-8

- 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.



Sandbag Barrier

SC-8



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

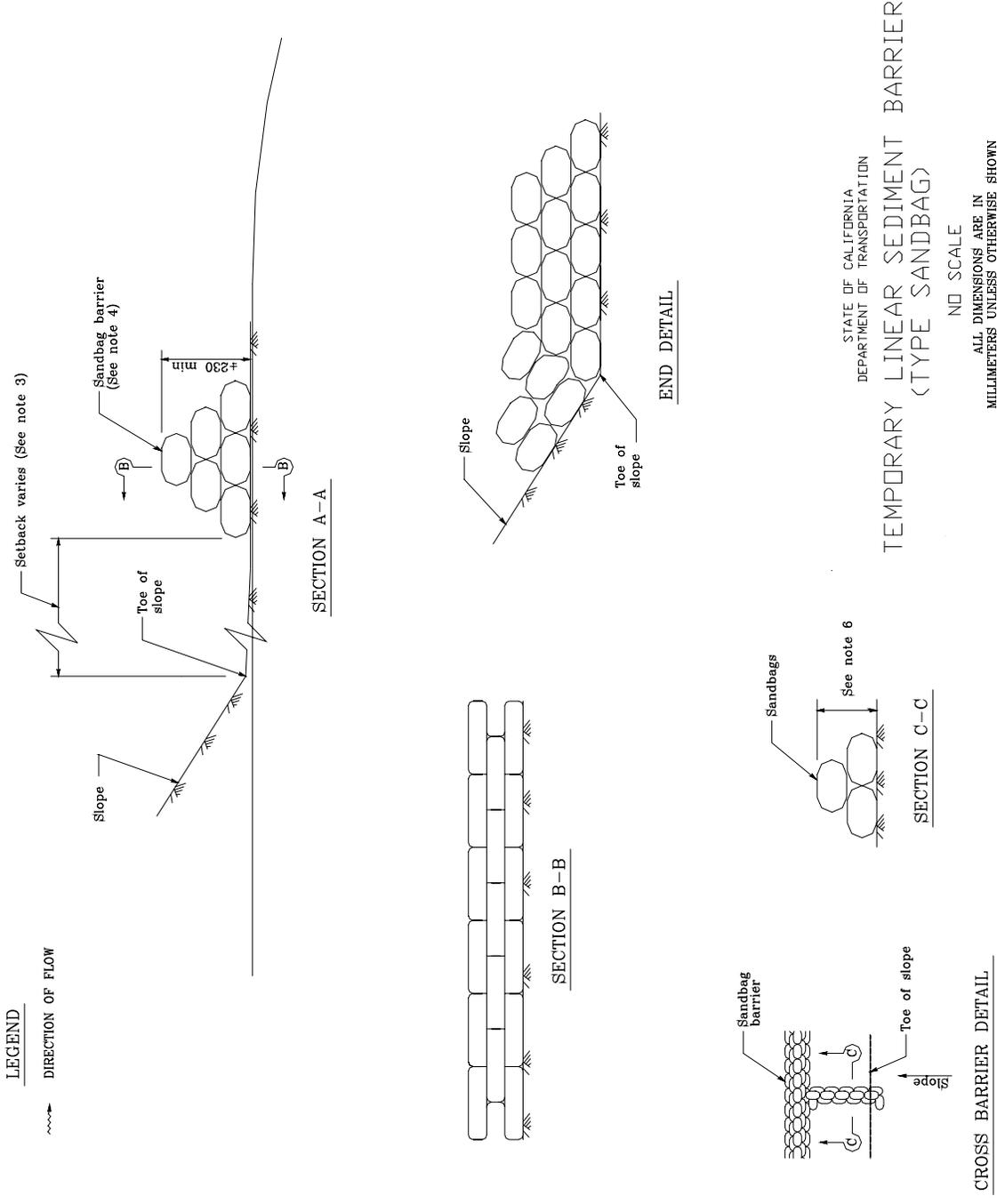
NOTES

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.



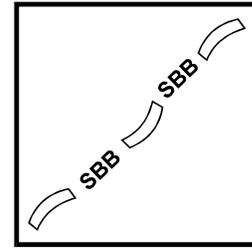
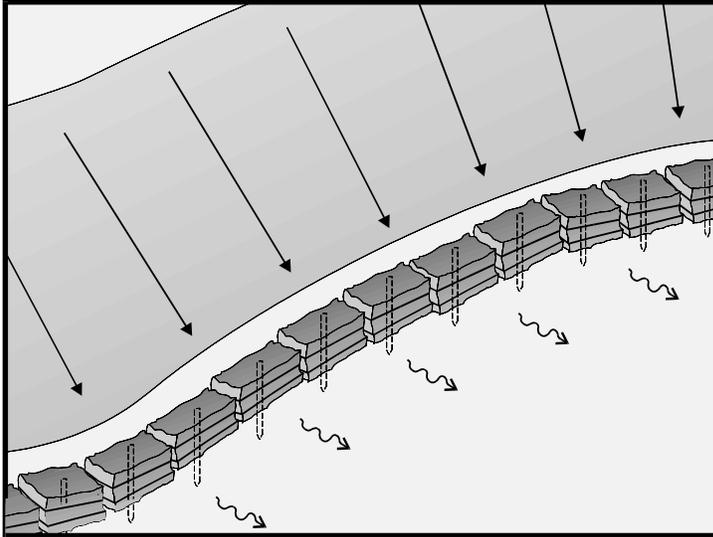
Sandbag Barrier

SC-8



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.)

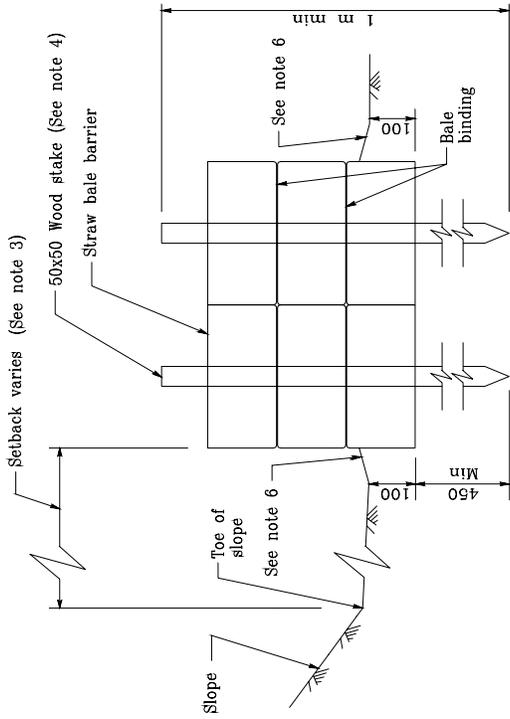
- Slopes of 2:100 (V:H) (2%) or flatter are preferred. If the slope exceeds 1:10 (V:H) (10%), the length of slope upstream of the barrier must be less than 15 m (50 ft).
- Install straw bale barriers along a level contour, with the last straw bale turned up slope.
- Straw bales must be installed in a 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

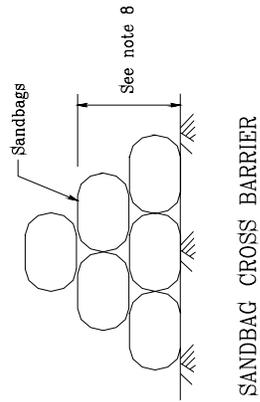
- Inspect straw bale barriers before and after each rainfall event, and weekly throughout the rainy season.
- Inspect straw bale barriers for sediment accumulations and remove sediment when depth reaches one-third the barrier height. Removed sediment shall be incorporated in the project at locations 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.

Straw Bale Barrier

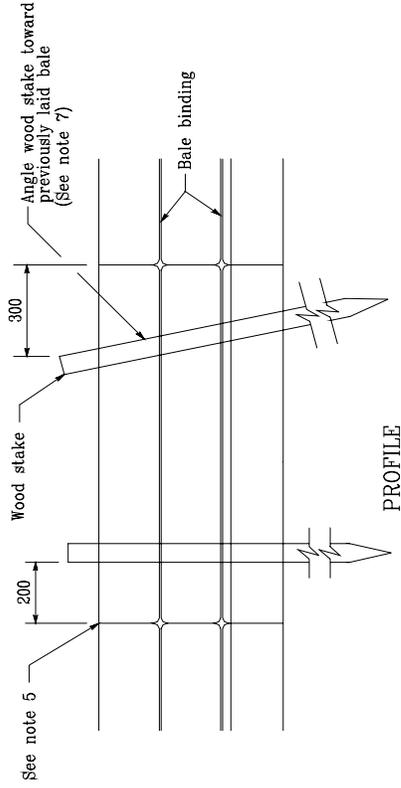
SC-9



SECTION B-B



SANDBAG CROSS BARRIER



STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION
TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE STRAW BALE)
NO SCALE
ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN

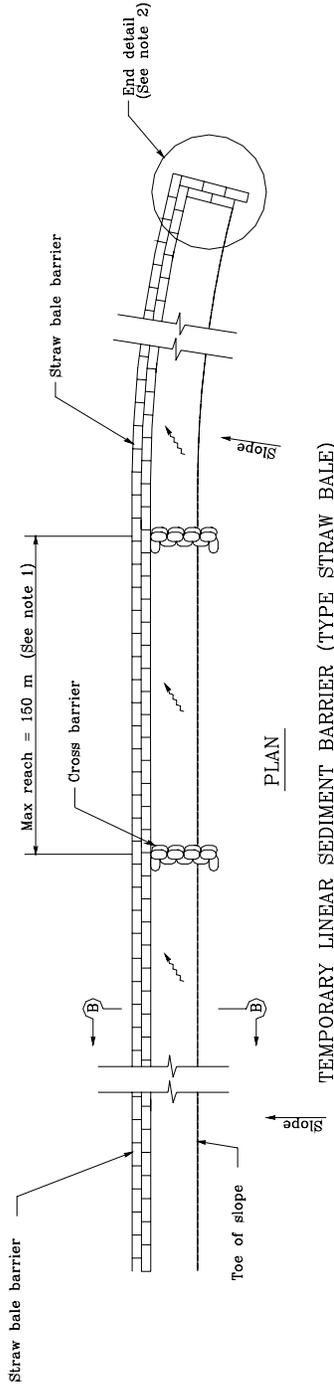
LEGEND

DIRECTION OF FLOW



Straw Bale Barrier

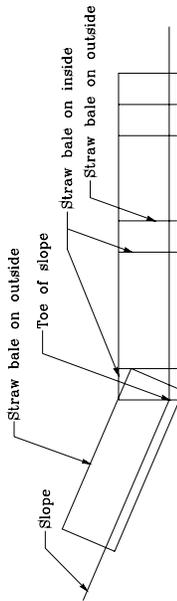
SC-9



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 linear barrier. In no case shall the reach length exceed 150 m.
- 2. End of barrier shall be turned up slope.
- 3. Dimension may vary to fit field conditions.

- 4. Place
- 5. Tamp
- 6. Cross
- 7. ndba



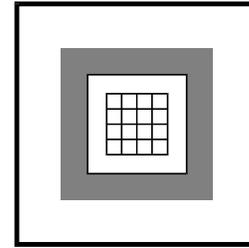
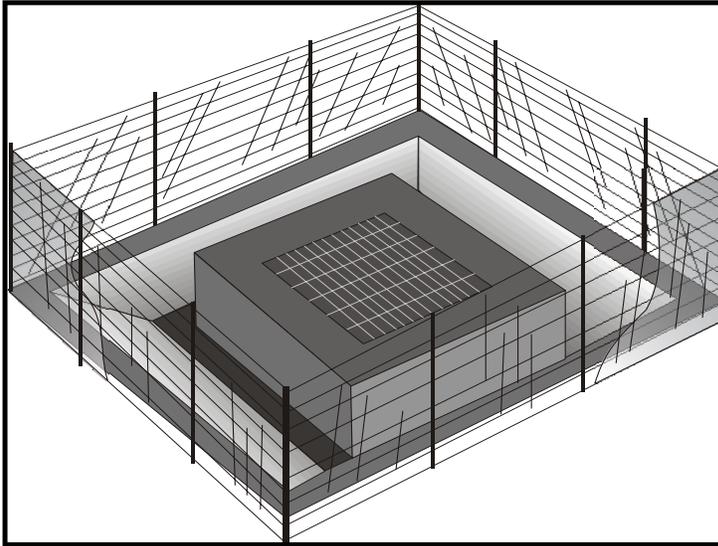
STATE OF CALIFORNIA
DEPARTMENT OF TRANSPORTATION

TEMPORARY LINEAR SEDIMENT BARRIER
(TYPE STRAW BALE)

NO SCALE

ALL DIMENSIONS ARE IN
MILLIMETERS UNLESS OTHERWISE SHOWN





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.

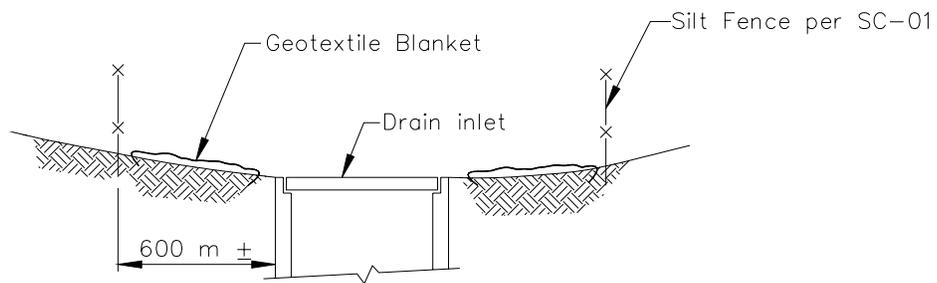
■ ***Type 3 - Gravel Bag Barrier***

- This method may be used for drain inlets surrounded by AC or paved surfaces.
- Inspect bags for holes, gashes, and snags.

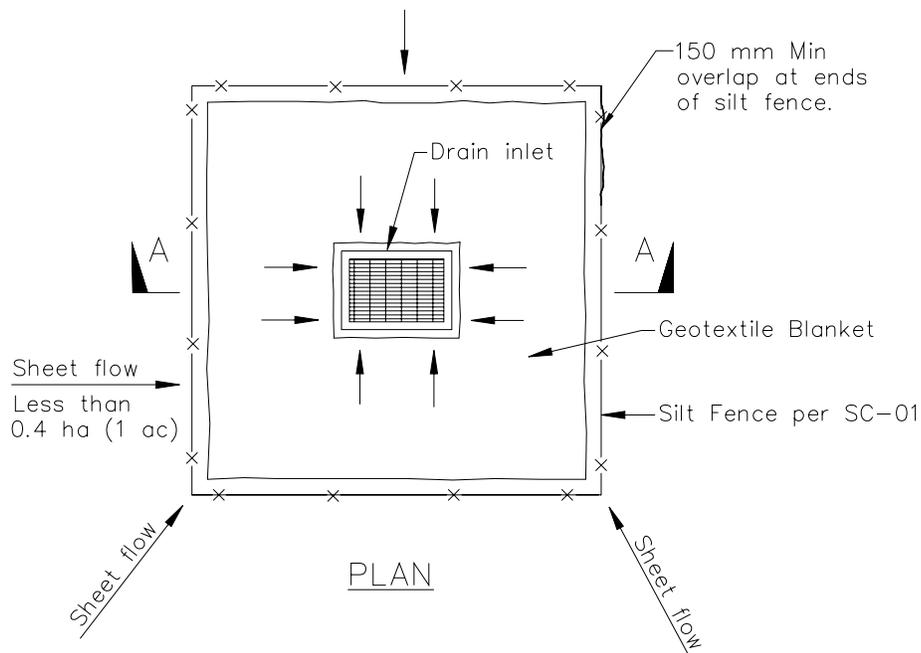
- Check gravel bags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way in conformance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

Storm Drain Inlet Protection

SC-10



SECTION A-A



PLAN

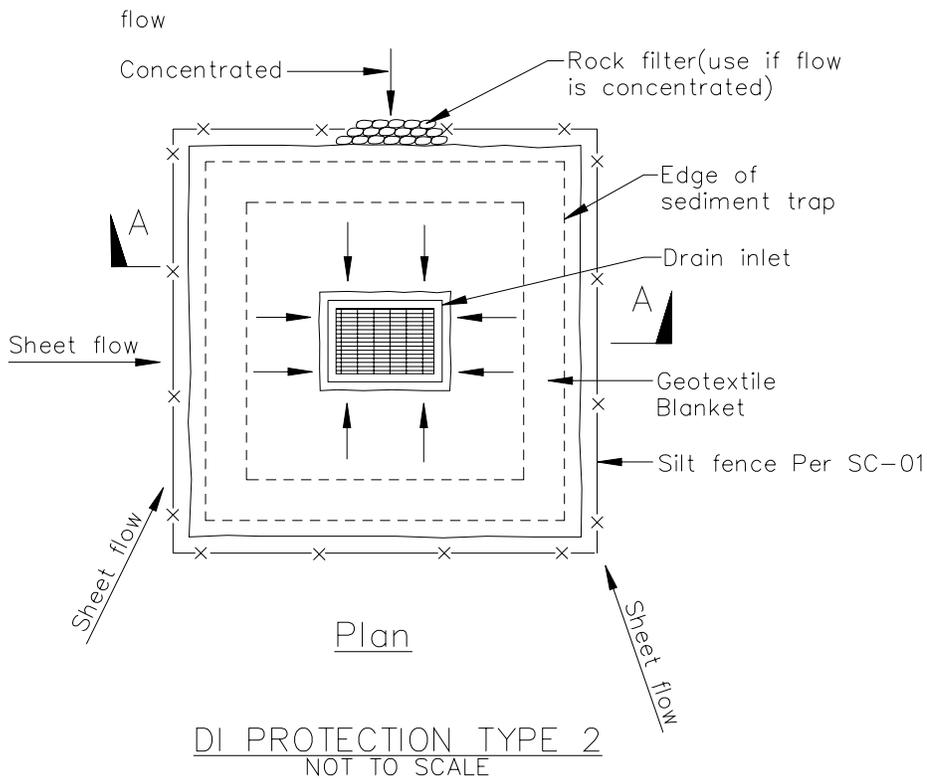
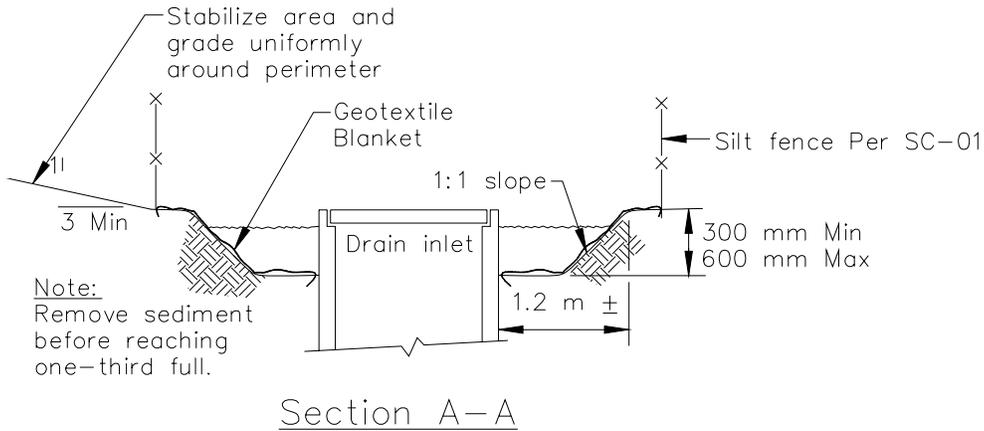
DI PROTECTION TYPE 1
NOT TO SCALE

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.

Storm Drain Inlet Protection

SC-10



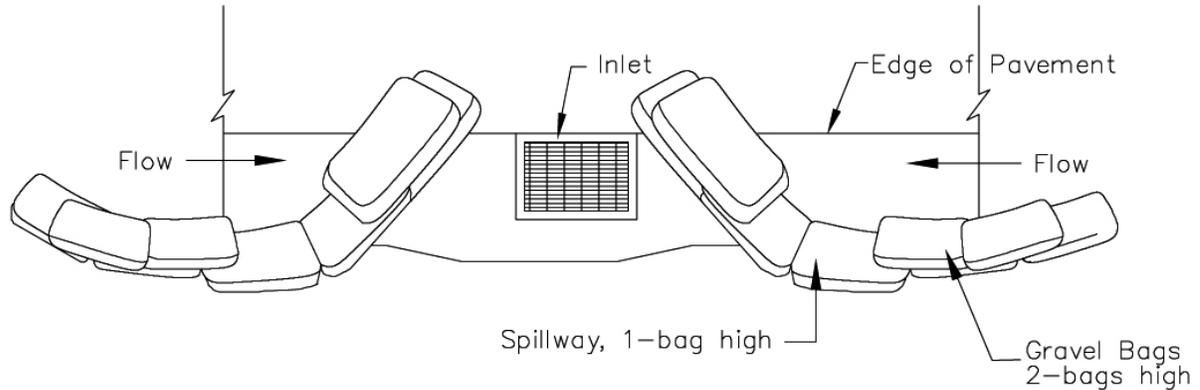
Notes

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.

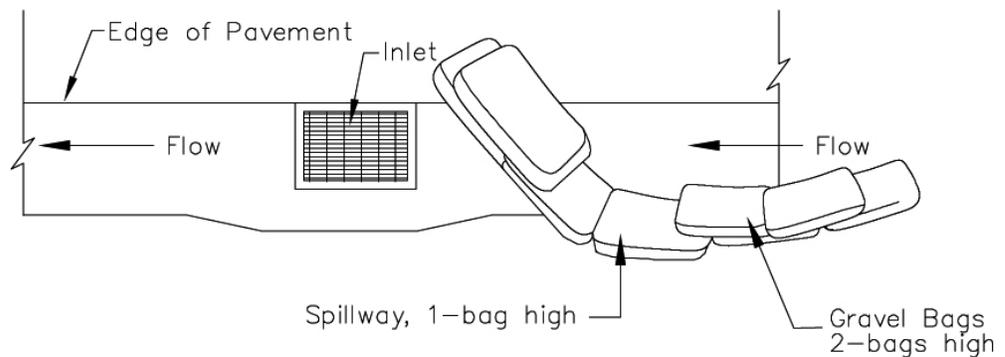


Storm Drain Inlet Protection

SC-10



TYPICAL PROTECTION FOR INLET WITH OPPOSING FLOW DIRECTIONS

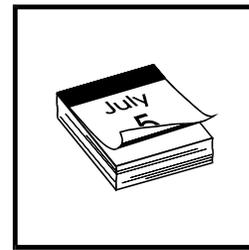


TYPICAL PROTECTION FOR INLET WITH SINGLE FLOW DIRECTION

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.





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.

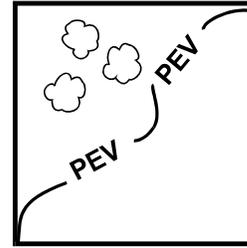
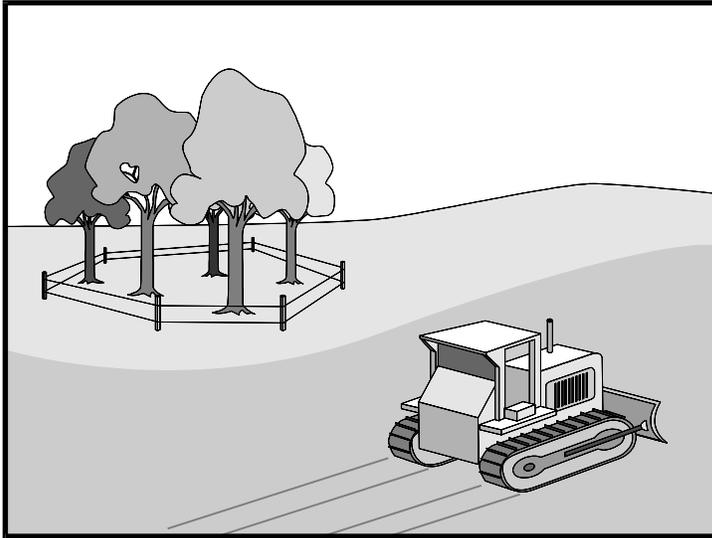
- Standards and Specifications**
- Developing a schedule and planning the project are the very first steps in an effective storm water program. The schedule shall clearly show how the rainy season relates to soil-disturbing and re-stabilization activities. The construction schedule shall be incorporated 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.

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).



Preservation of Existing Vegetation

SS-2

- 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



Preservation of Existing Vegetation

SS-2

otherwise required by the contract documents.

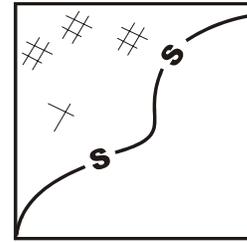
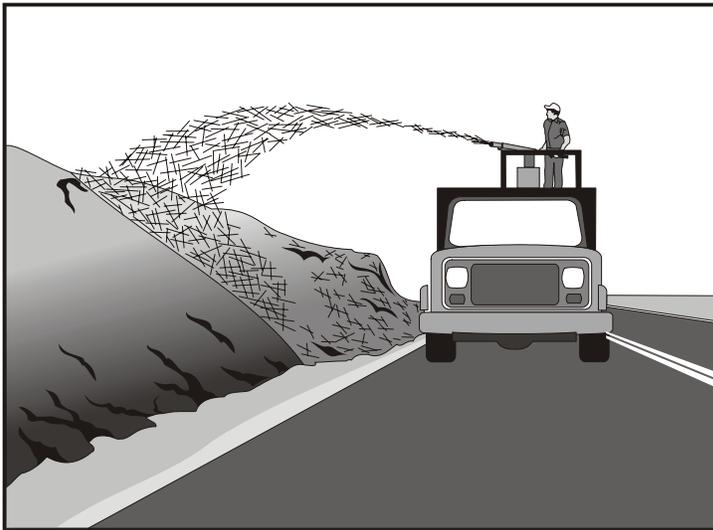
- After all other work is complete, fences and barriers shall be removed last. This is because protected trees may be destroyed by carelessness during the final cleanup and landscaping.

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.





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.

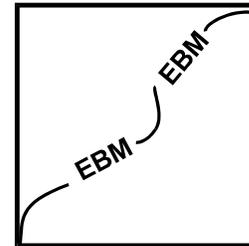
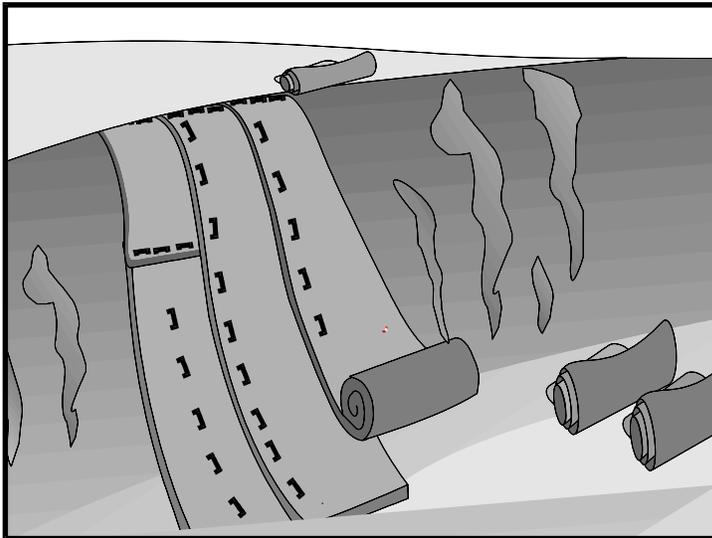
- On slopes with soils, which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw can be “punched” into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a “crimper.”
- 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.

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).

Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

SS-7

- 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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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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/m² (12 lb/ft²), ±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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- **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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- 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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- 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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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- 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.



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

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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.

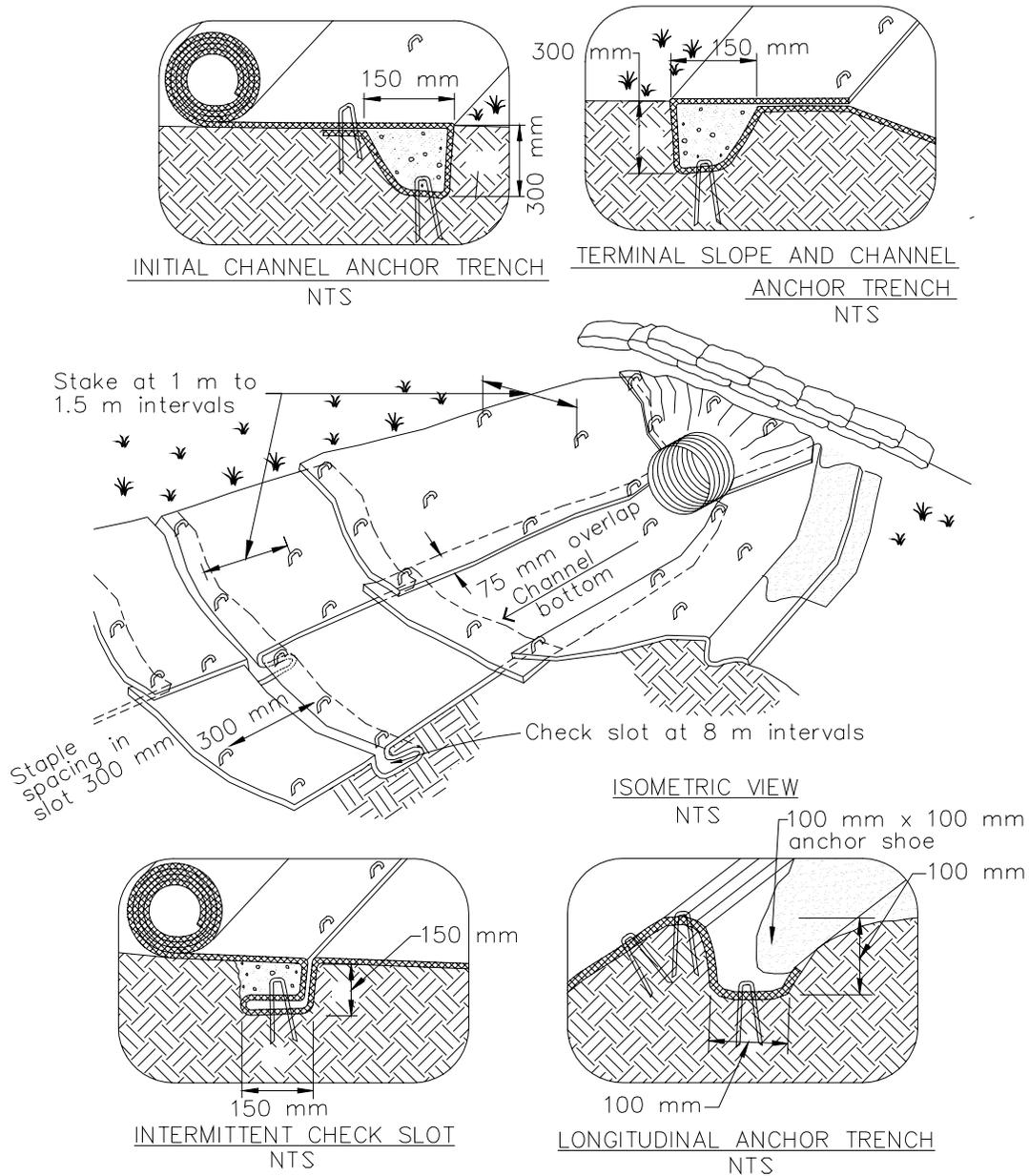
- All blankets and mats shall be inspected periodically after installation.
- Installation shall be inspected after significant rain storms to check for erosion and undermining. Any failures shall be repaired immediately.
- If washout or breakage occurs, re-install the material after repairing the damage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



Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

SS-7

Typical Installation Detail

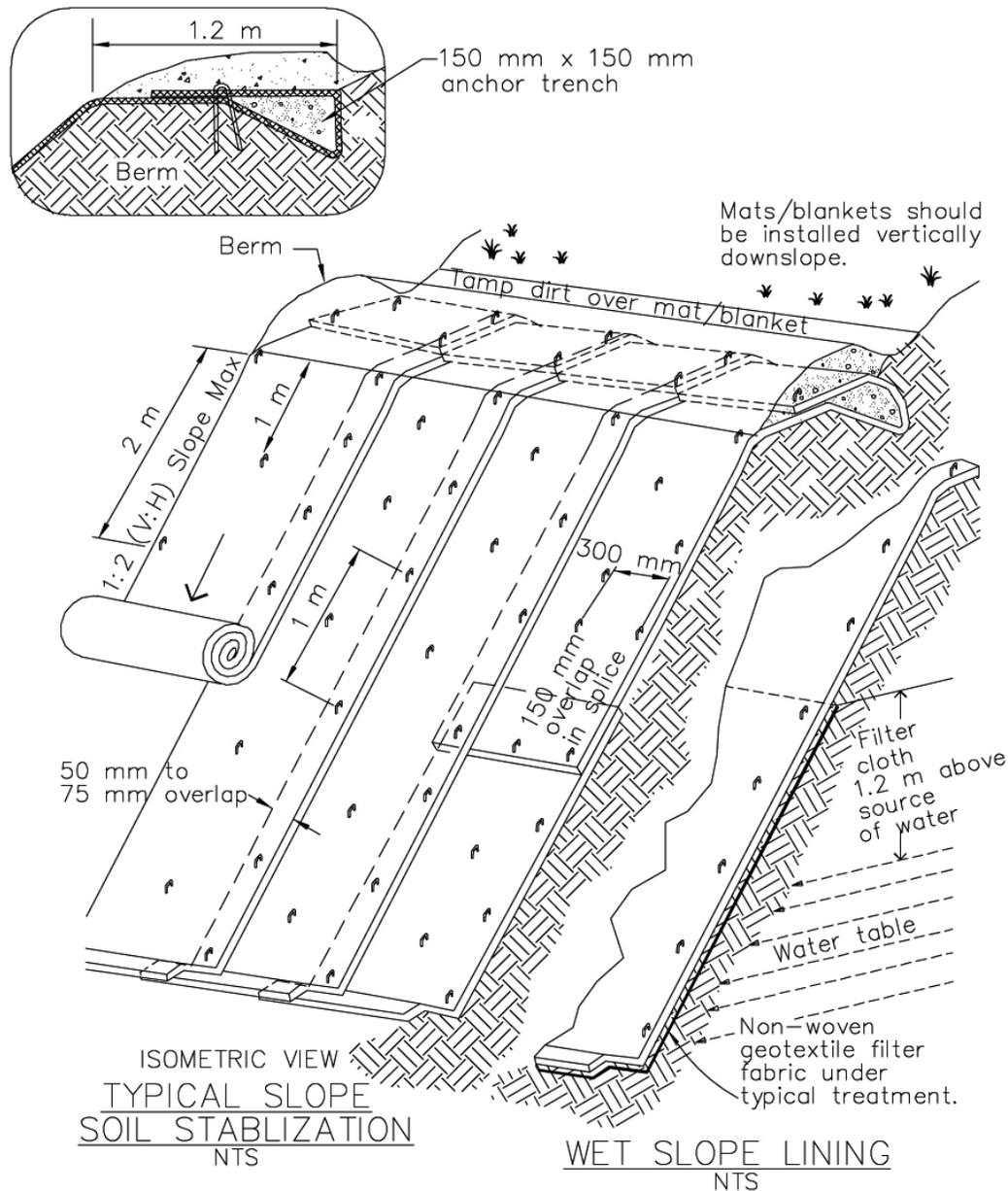


- NOTES:
1. Check slots to be constructed per manufacturers specifications.
 2. Staking or stapling layout per manufacturers specifications.
 3. Install per manufacturer's recommendations

Geotextiles, Mats, Plastic Covers and Erosion Control Blankets

SS-7

Typical Installation Detail



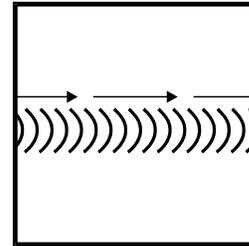
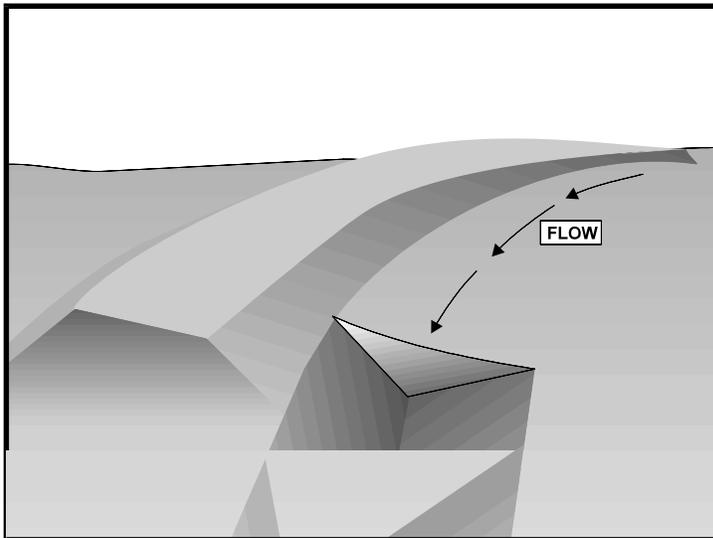
NOTES:

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



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

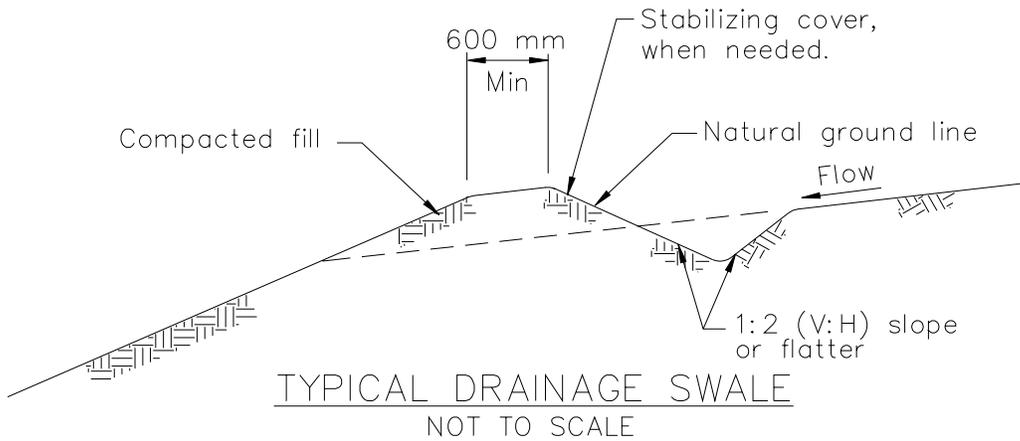
SS-9

- 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.



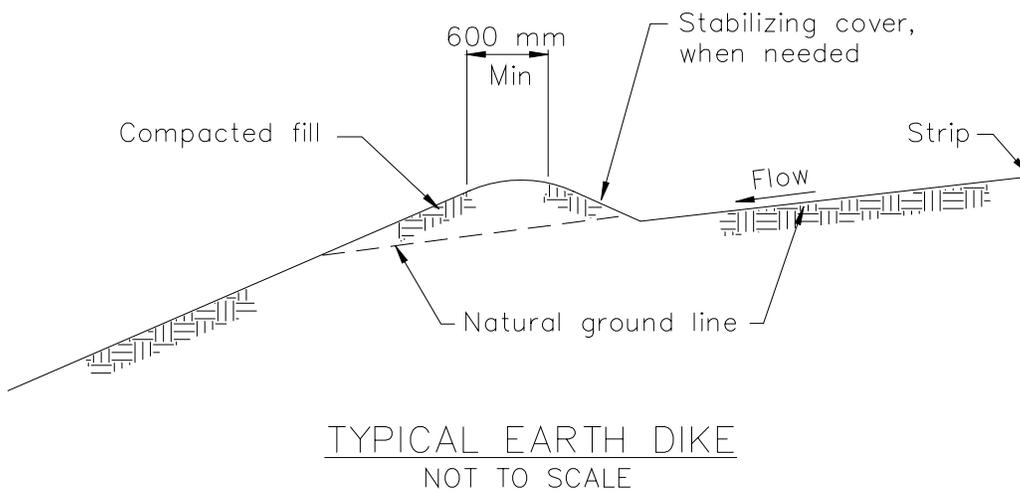
Earth Dikes/Drainage Swales and Lined Ditches

SS-9



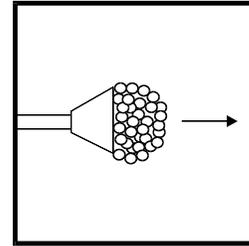
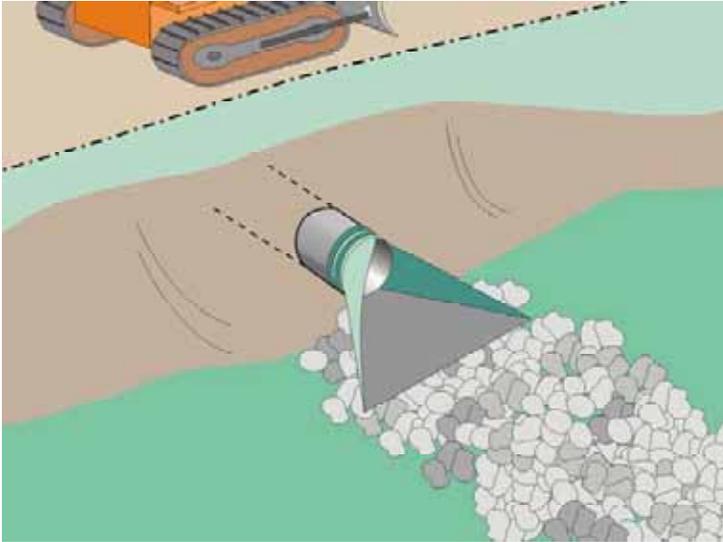
NOTES:

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



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

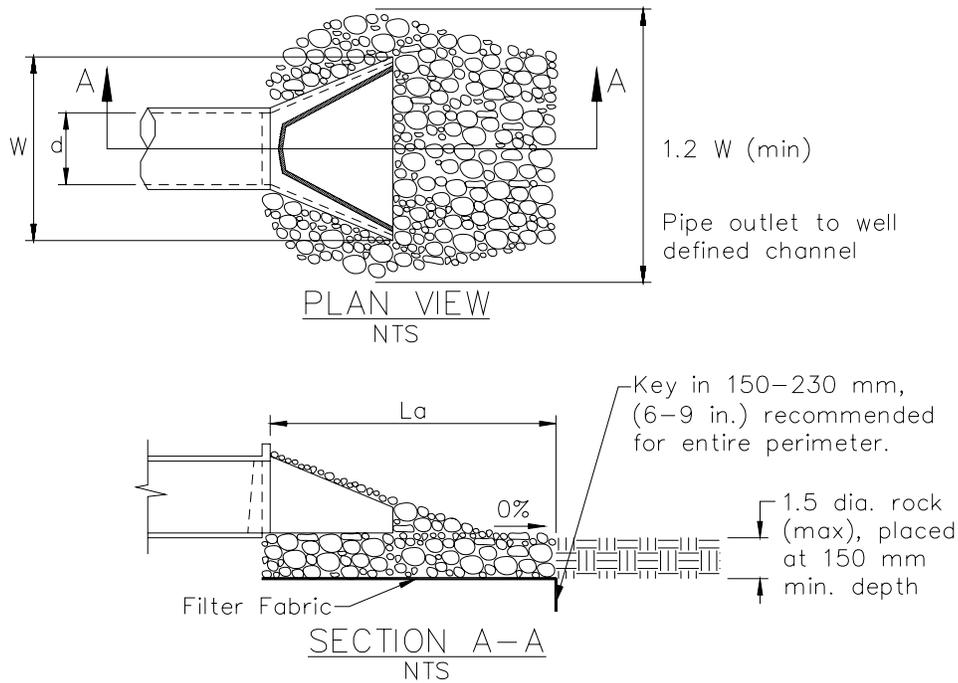
SS-10

- 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

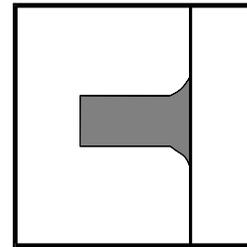
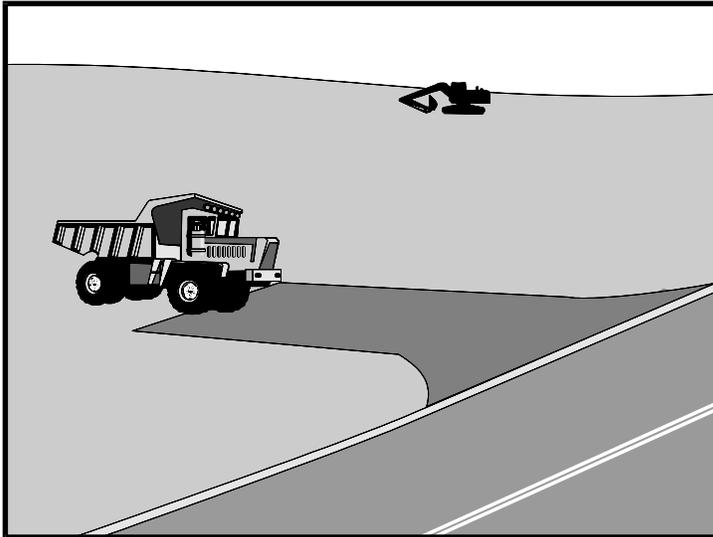
For larger or higher flows, consult a Registered Civil Engineer

Source: USDA – SCS



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.



Stabilized Construction Entrance/Exit

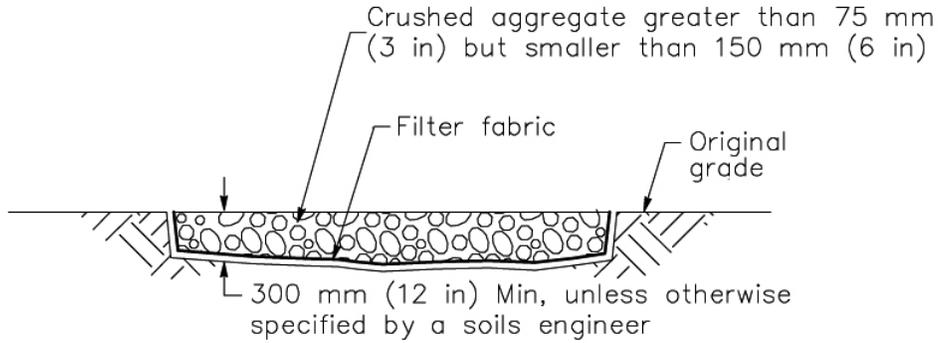
TC-1

- 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.

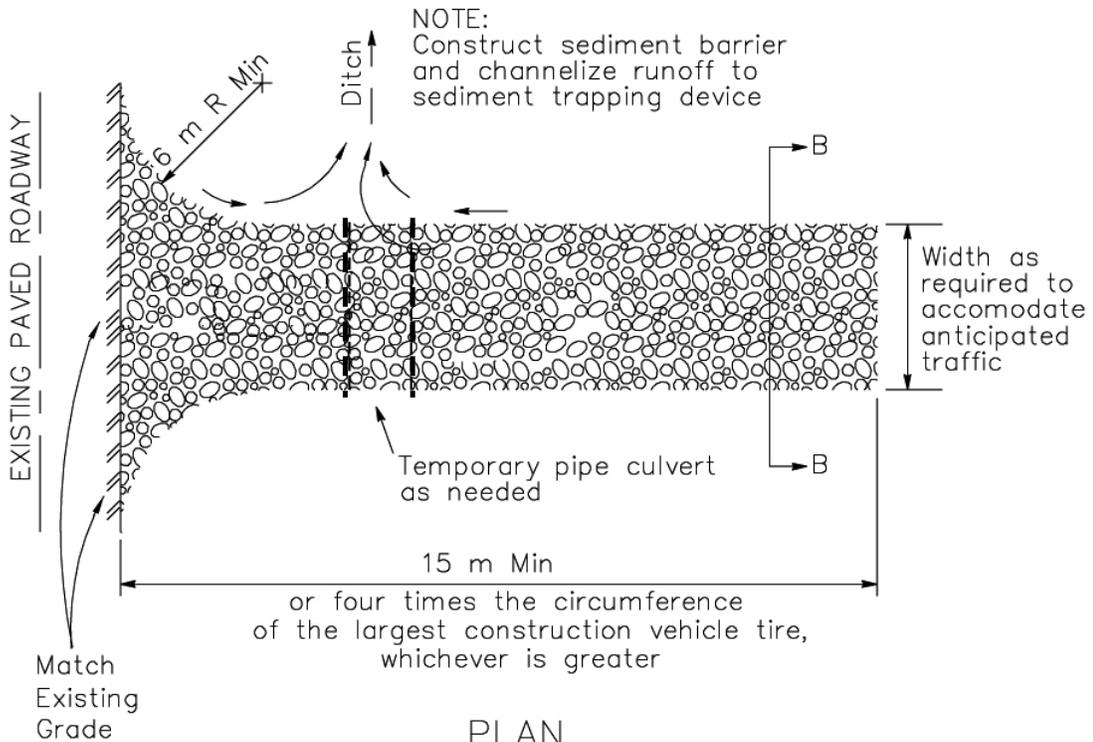


Stabilized Construction Entrance/Exit

TC-1



SECTION B-B
NTS

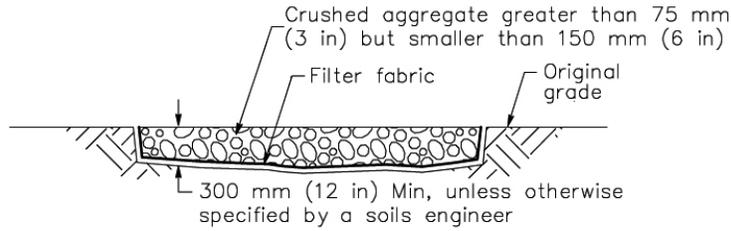


Stabilized Construction Entrance/Exit (Type 1)

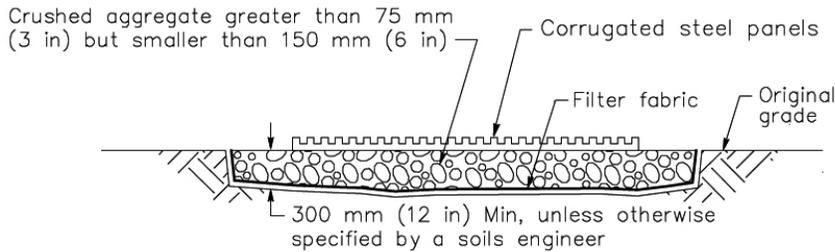


Stabilized Construction Entrance/Exit

TC-1

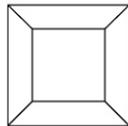


SECTION B-B
NTS

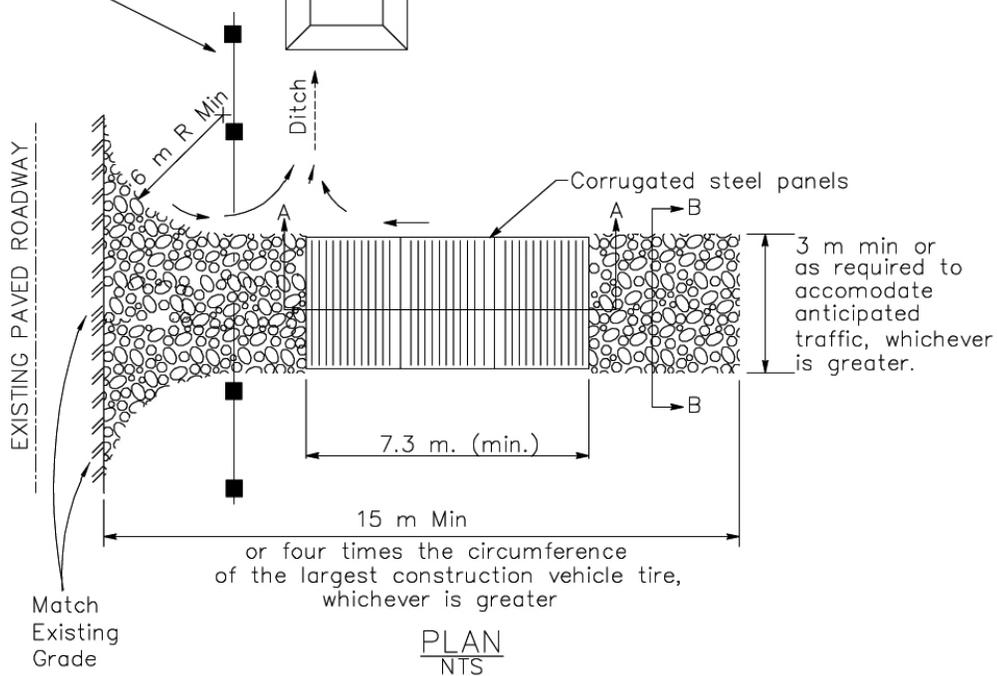


SECTION A-A
NOT TO SCALE

NOTE:
Construct sediment barrier and channelize runoff to sediment trapping device

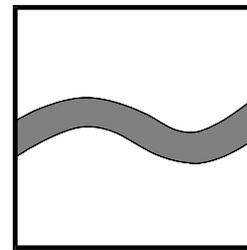
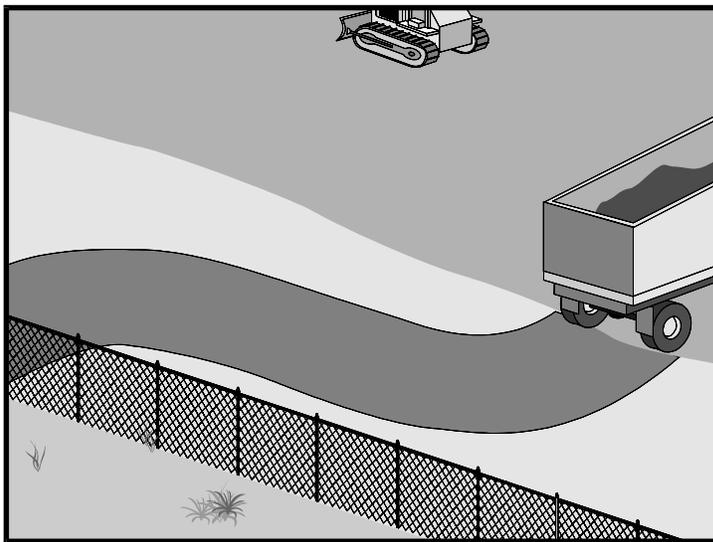


Sediment trapping device



Stabilized Construction Entrance/Exit (Type 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.

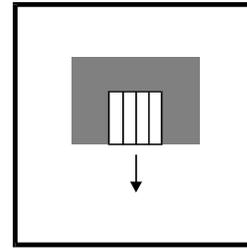
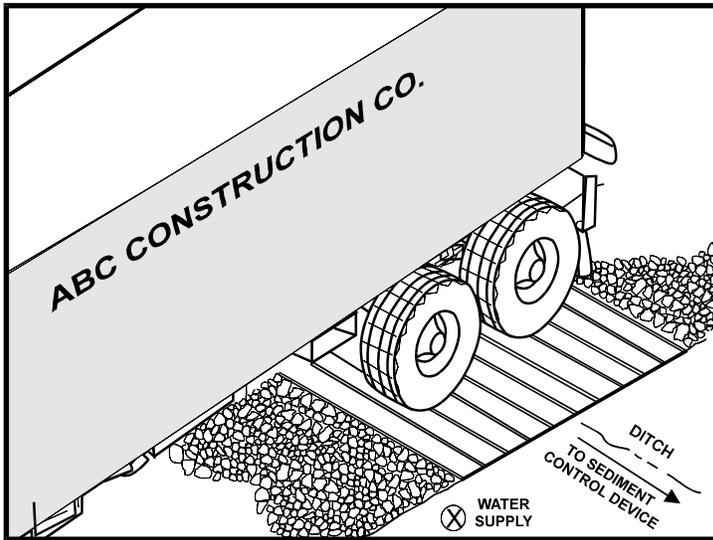
Appropriate Applications

- 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.

- 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.



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.

Entrance/Outlet Tire Wash

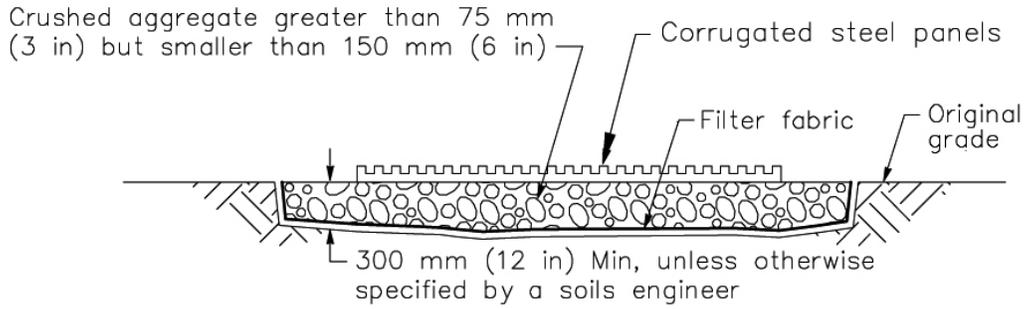
TC-3

- 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.

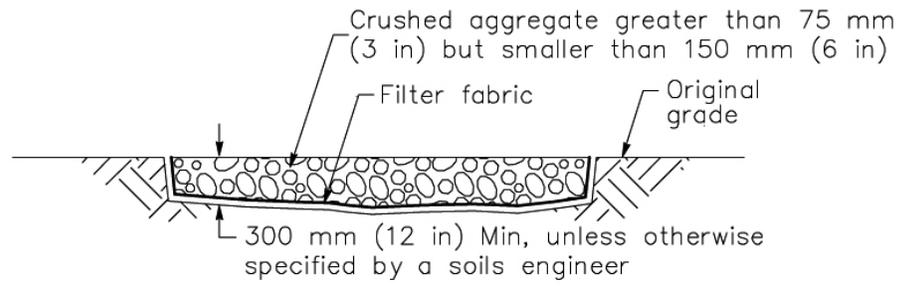


Entrance/Outlet Tire Wash

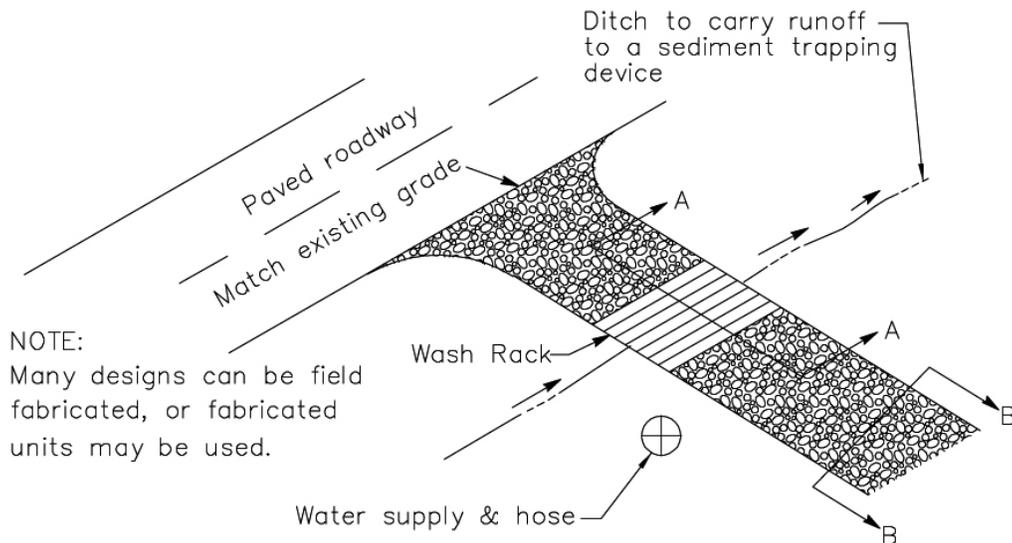
TC-3



SECTION A-A
NOT TO SCALE

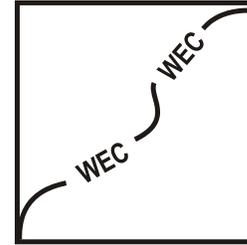
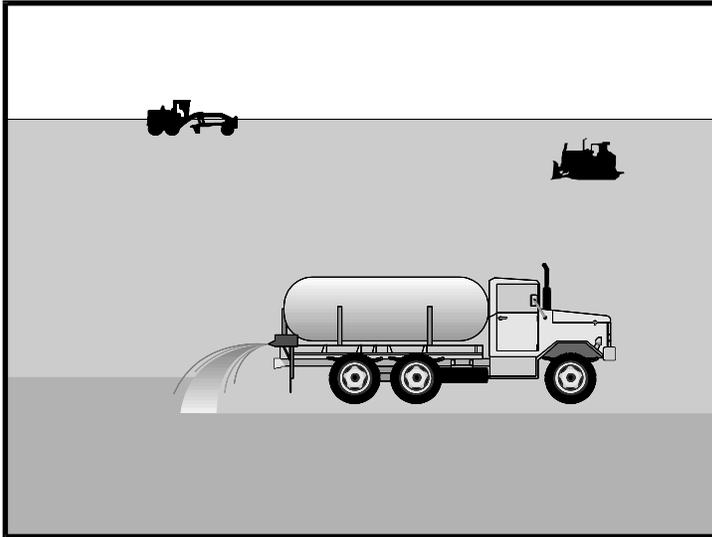


SECTION B-B
NTS



TYPICAL TIRE WASH
NOT TO SCALE





Standard Symbol

BMP Objectives

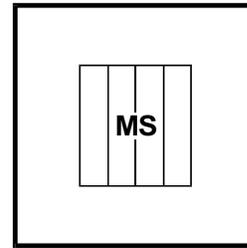
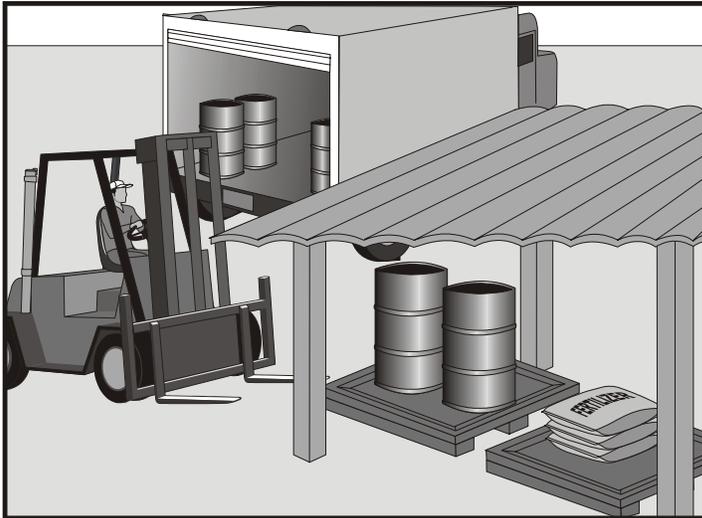
- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

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.



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

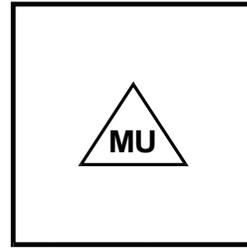
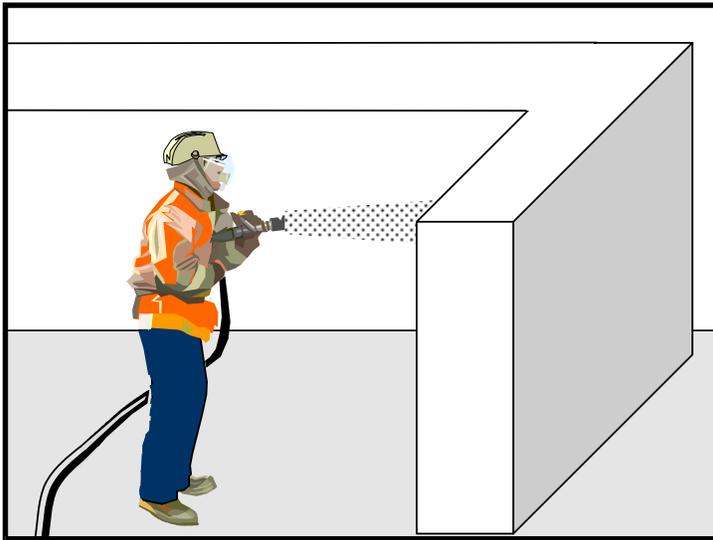
- Contain and clean up any spill immediately.
- If significant residual materials remain on the ground after construction is complete, properly remove and dispose any hazardous materials or contaminated soil.
- See BMP WM-4, “Spill Prevention and Control”, for spills of chemicals and/or hazardous materials.

Material Delivery and Storage

WM-1

- 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.





Standard Symbol

BMP Objectives

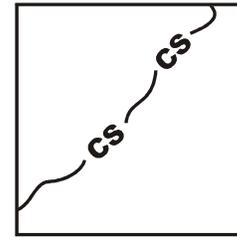
- Soil Stabilization
- Sediment Control
- Tracking Control
- Wind Erosion Control
- Non-Storm Water Management
- Materials and Waste Management

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.

- 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.



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:

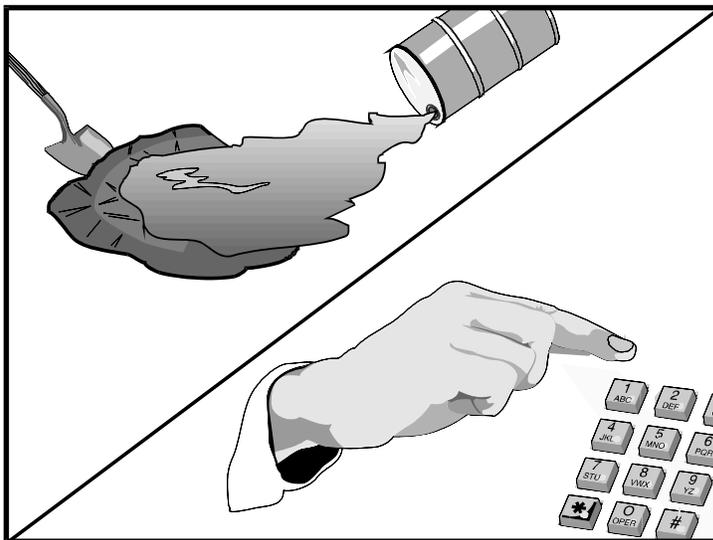
- All stockpiles shall be covered, stabilized, or protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of “cold mix” shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpile Management

WM-3

- 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.





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.

Spill Prevention and Control

WM-4

- 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

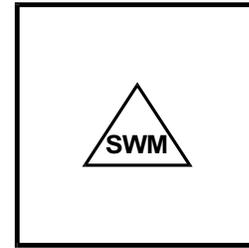
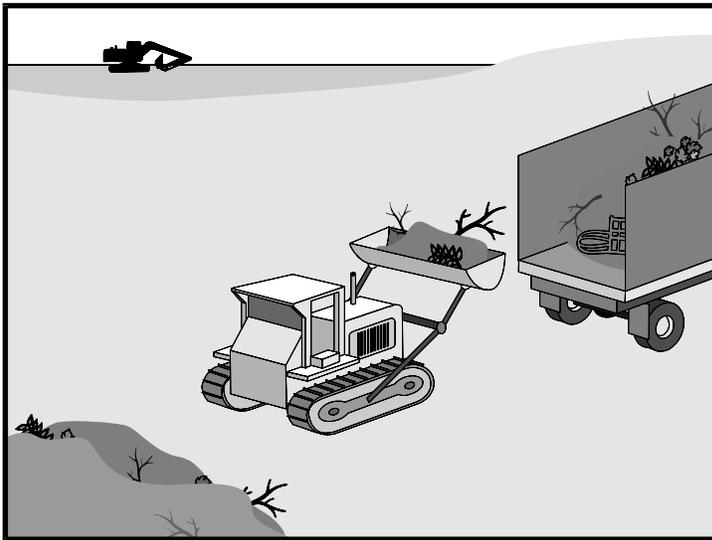
- Minor spills typically involve small quantities of oil, gasoline, paint, etc., which can be controlled by the first responder at the discovery of the spill.
- Use absorbent materials on small spills rather than hosing down or burying the spill.
- Remove the absorbent materials promptly and dispose 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.



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.

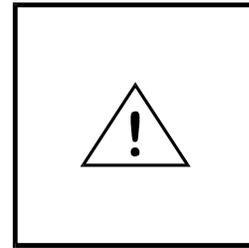
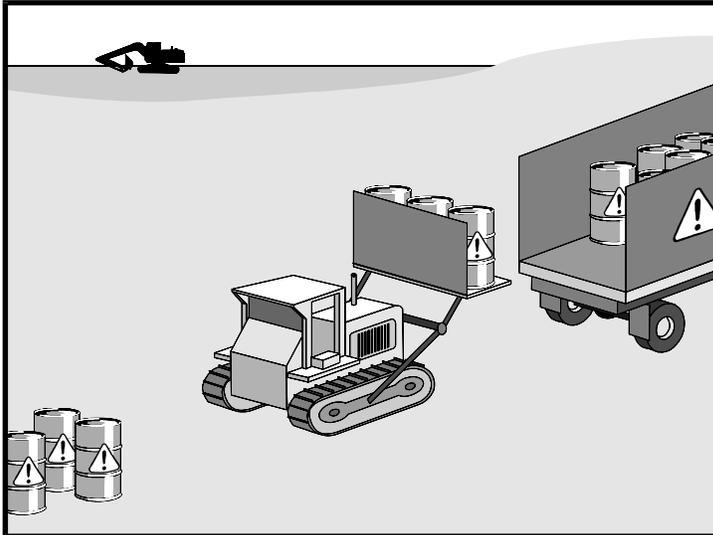
- Construction material visible to the public shall be stored or stacked in an orderly manner to the satisfaction of the RE.
- Storm water run-on shall be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures 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.

Solid Waste Management

WM-5

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





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.

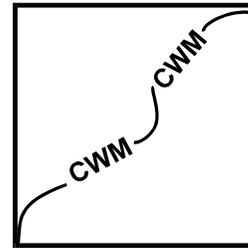
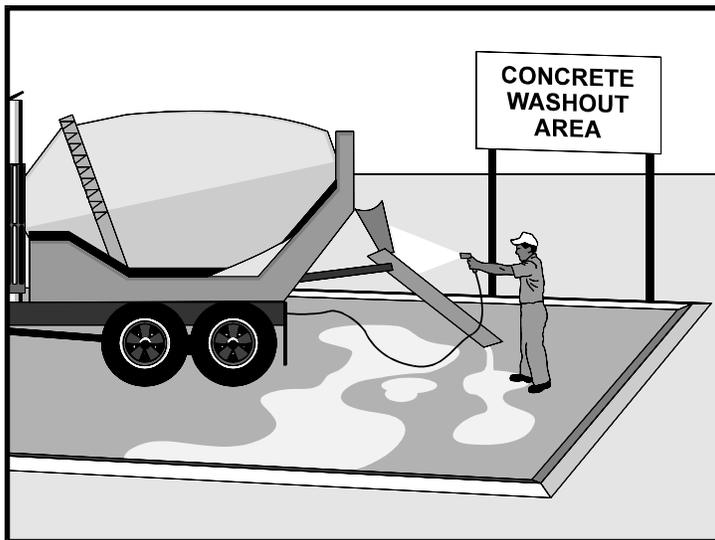
- Temporary containment facility shall be impervious to the materials stored there for a minimum contact time of 72 hours.
 - Temporary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks accumulated rainwater and spills shall be placed 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.



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.

Concrete Waste Management

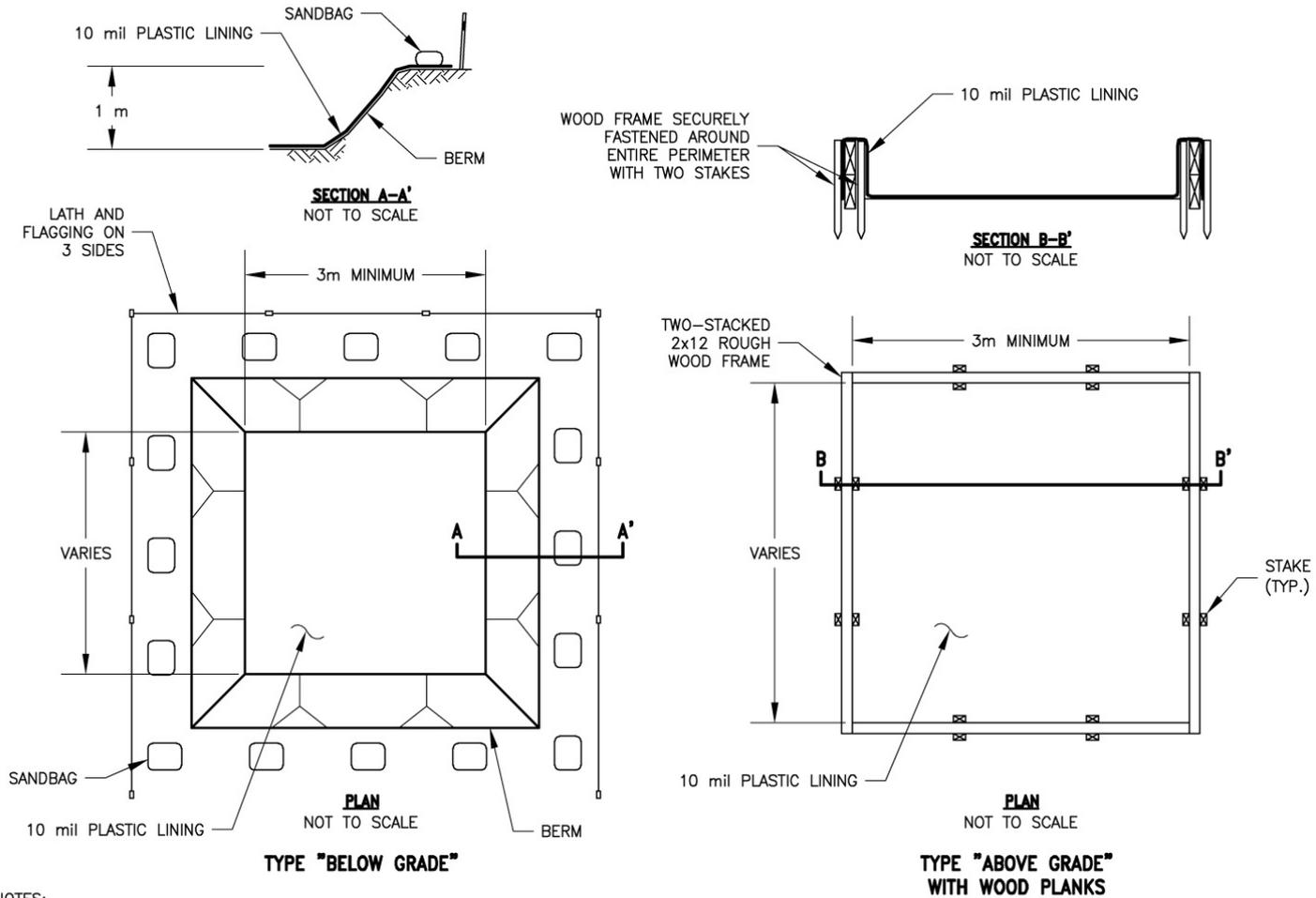
WM-8

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



Concrete Waste Management

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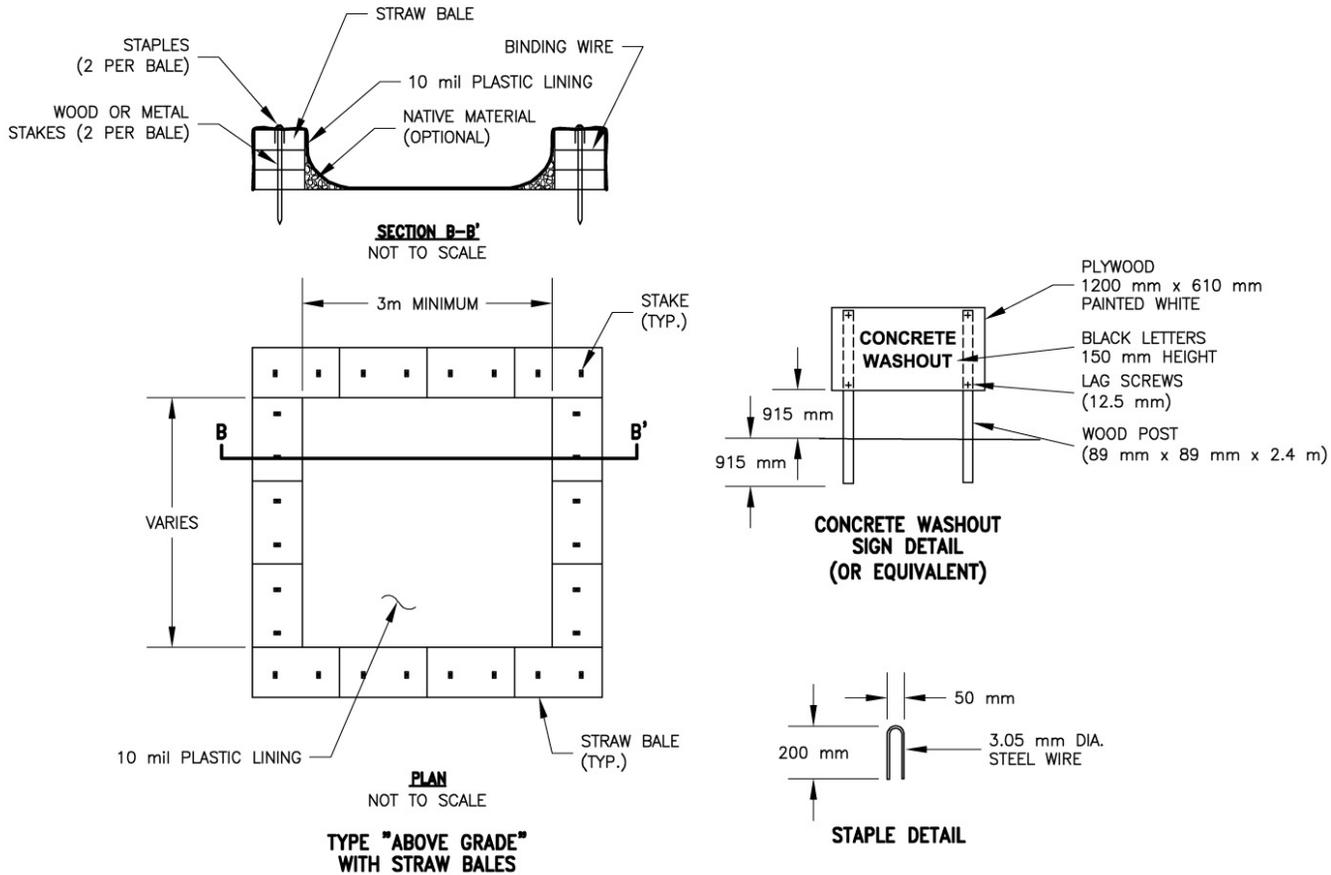


NOTES:

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.



Concrete Waste Management

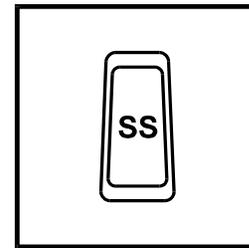
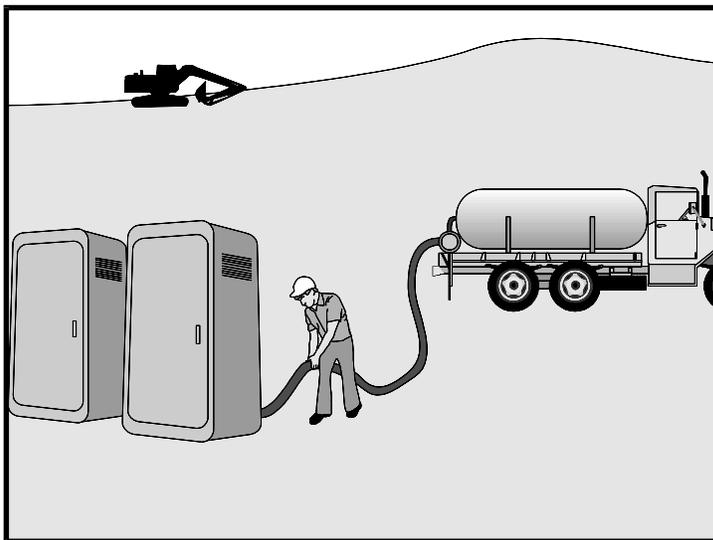


NOTES:

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 FACILITY.

CALTRANS/FIG4-14.DWG SAC 8-14-02





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.

Sanitary/Septic Waste Management

WM-9

- 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.