State of California
Department of Transportation

Construction Site Best Management Practice (BMP) Field Manual and Troubleshooting Guide

CTSW-RT-02-007

January 2003

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PART I: INTRODUCTION

This document provides a toolbox for Caltrans field personnel to aid in proper implementation of water pollution control Best Management Practices (BMPs) on the construction site. The document is organized into the following parts:

- **Part I: Introduction** briefly presents (1) the principles of erosion and sediment control, (2) common storm water pollutants on the construction site, and (3) guidelines for implementing a proper monitoring and inspection program for the construction site, including the use of the Storm Water Pollution Prevention Plan (SWPPP) or Water Pollution Control Program (WPCP) to ensure an effective water pollution control program.
- **Part II: Project Operations and BMPs** identifies typical water pollution control challenges for specific construction operations and the BMPs that are available to meet those challenges.
- **Part III: BMP Implementation and Troubleshooting** provides guidance for installing, maintaining and troubleshooting selected BMPs from the *Caltrans Storm Water Quality Handbooks, Construction Site BMPs Manual*.

PRINCIPLES OF EROSION AND SEDIMENT CONTROL

The greatest water pollution threat from soil-disturbing activities is the introduction of sediment from the construction site into storm drain systems or natural receiving waters. Soil-disturbing activities such as clearing, grubbing, and earthwork increase the exposure of soils to wind, rain, and concentrated flows that cause erosion. A three-pronged approach is necessary to combat this storm water threat:

- Temporary soil stabilization practices reduce erosion associated with disturbed soil areas (DSAs).
- Temporary run-on control practices prevent storm water flows (sheet and concentrated) from contacting DSAs.
- Temporary sediment control practices reduce sediment caused by erosion from entering a storm drain system or receiving water.

Soil stabilization BMPs reduce the erosive impact of rain on exposed soil. Run-on control practices reduce the erosive impacts by preventing storm water flows from contacting DSAs. Sediment control BMPs remove sediment from storm water by ponding and settling, and/or filtering prior to discharge offsite. It is imperative that soil stabilization and sediment control BMPs are *implemented together* to reduce the discharge of sediment from the construction site.

The following conditions on construction sites contribute to erosion caused by storm water flows:

- Larger areas of impermeable structures and surfaces reduce natural infiltration resulting in increased storm water flow volume and velocity.
- Changes to surface flow patterns cause storm water flows to be more erosive.
- Concentration of flows to areas that are not naturally subjected to such runoff volume increases erosion.

Proper management of a construction project minimizes or prevents soil erosion and sediment discharges. Good construction management for soil conservation requires an understanding of the following basic principles:

Soil Erosion Control – The First Line of Defense

Soil stabilization is a key component in the control of erosion. By stabilizing DSAs with covers or binders, the exposed soils are less likely to erode from the effects of wind or rain.

Prevent Storm Water Flows from Contacting DSAs – The Second Line of Defense

Another key component in the control of erosion is the diversion of storm water flows around DSAs or the conveyance of flows through DSAs in a non-erosive manner.

Sediment Control – The Last Line of Defense

Storm water runoff may originate from active or inactive DSAs whether or not proper erosion and/or run-on controls have been implemented. Implementing proper sediment control BMPs can reduce sediment amounts in storm water discharges.

Combine Soil Erosion and Sediment Control – Effective Protection

An effective combination of soil erosion and sediment controls should be implemented to prevent sediment from leaving the site and/or entering a storm water drainage system or receiving water.

Soil stabilization and other erosion control BMPs are not 100 percent effective at preventing erosion. Soil erosion control BMPs must be supported by sediment control BMPs to capture sediment on the construction site.

Sediment control BMPs alone are not 100 percent effective primarily due to their capacity limits. To be effective for storm water protection, the amount of sediment must be reduced at the source using soil erosion control BMPs, and

then sediment control BMPs are used to further reduce the sediment that leaves the site or enters the storm drain system.

Inspection and Maintenance – Ensure Protection for the Duration of the Project

Inspection and maintenance are required for all BMPs (soil stabilization, run-on control, and sediment control) to maintain effectiveness for reducing or eliminating the amount of sediment that leaves a site.

COMMON POLLUTANTS ON THE CONSTRUCTION SITE

There are a number of potential storm water pollutants that are common to Caltrans construction sites. The soil-disturbing nature of construction activities and the use of a wide range of construction materials and equipment are the sources of contaminants with the potential to pollute storm water discharges.

Common construction activities that increase the potential for polluting storm water with sediment include:

- Clearing and grubbing operations
- Demolition of existing structures
- Grading operations
- Soil importing and stockpiling operations
- Clear water diversions
- Landscaping operations
- Excavation operations

Common construction materials with the potential to contribute pollutants, other than sediment, to storm water include the following:

- Vehicle fluids, including oil, grease, petroleum, and coolants
- Asphalt concrete (AC) and Portland cement concrete (PCC) materials and wastes
- Joint seal materials and concrete curing compounds
- Paints, solvents, and thinners

- Wood products
- Metals and plated products
- Fertilizers, herbicides, and pesticides

Construction-related waste must also be managed to prevent its introduction into storm water. Typical waste on construction sites includes:

- Used vehicle fluids and batteries
- Wastewater from vehicle cleaning operations
- Green waste from vegetation removal
- Non-storm water from dewatering operations
- Trash from materials packaging, employee lunch/meal breaks, etc.
- Contaminated soils
- Slurries from sawing and grinding operations
- Wastewater/waste from concrete washout operations
- Hazardous materials waste
- Sanitary waste

MONITORING AND INSPECTION PROGRAM

The Resident Engineer is responsible for ensuring that Caltrans personnel monitor the contractor's water pollution control practices and maintain compliance with the approved project SWPPP/WPCP. This includes reviewing the contractor's SWPPP/WPCP, reviewing written inspection reports, and conducting field inspections. Caltrans Structures personnel should also be aware of the water pollution control requirements and participate in the monitoring program.

Step 1: Do Your Homework

a. Review the *Storm Water Quality Handbooks: Construction Site BMPs Manual*.

Caltrans personnel with storm water responsibilities should familiarize themselves with BMP requirements. In particular, become familiar with (1) the rainy season dates for your geographical area, (2) the definitions of DSA, active DSA, and non-active DSA, and (3) the requirements for soil stabilization and sediment control BMPs for the season and specific Rainfall Area.

b. Review the Project Plans.

Review the Project Plans in the context of storm water pollution control. Visualize storm water run-on and runoff flow patterns when reviewing the plans. Review the general layout and existing drainage courses. Identify potential problem areas where storm water may run onto the site or discharge off site.

Identify the locations where structures are being constructed or modified. Be familiar with the right-of-way and easement limits. Determine the limits of clearing and grubbing activities. Identify the project phase or stage. Try to determine DSAs and Environmentally Sensitive Areas (ESAs). Is the next phase going to include soil-disturbing activities and is it scheduled within the rainy season? Do the DSAs have provisions in the plans for permanent erosion control? Determine if permanent erosion control can be placed when activity in the DSA is complete.

c. Review the Special Provisions

Review the Special Provisions for site-specific water pollution control requirements such as: (1) permits for the construction project, (2) limits on active DSAs, (3) rainy season dates and requirements, (4) minimum BMP requirements, (5) BMP maintenance and inspection requirements, and (6) final erosion control requirements. Final erosion control requirements include (1) required products, (2) application process, (3) application rate, (4) seeding window, and (5) planting requirements.

The Special Provisions also include a section on water pollution control permits or requirements imposed on the project by other agencies. Typical agencies include the California Department of Fish and Game, Army Corps of Engineers, local flood control agencies, and others. There may be special requirements for water bodies or ESAs that need special water pollution control consideration.

Review the Special Provisions bid items related to water pollution control. There may be lump sums or unit prices for water pollution control items including SWPPP/WPCP preparation, permanent erosion control, and temporary erosion and sediment controls.

Review the Special Requirements section of the Special Provisions for site-specific activities such as: (1) dewatering, (2) sampling and analysis, (3) BMP maintenance cost allocation between Caltrans and the contractor, and (4) sanctions against the contractor in the event of non-compliance with the water pollution control requirements.

d. Review the SWPPP/WPCP.

The SWPPP or WPCP for the project is the contractor's plan to ensure conformance with Caltrans' water pollution control requirements on the construction site. The SWPPP/WPCP contains details about the BMPs to be used on the site, their locations, implementation timeframes, and inspection and maintenance schedules.

The contractor must comply with the approved SWPPP/WPCP. If conditions change on the construction site that impact storm water pollution controls, the contractor must amend the SWPPP/WPCP.

In the SWPPP, Section 200 contains the approval signature and lists any amendments. Section 300 describes unique features of the construction site and contains the construction and water pollution control schedules. Section 500 identifies the BMPs selected for soil stabilization, sediment control, non-storm water controls, waste management, and materials disposal controls and references locations on the vicinity map and water pollution control drawings.

In a WPCP, Section 10 contains the approval signatures. Section 20 describes the unique features of the site and contains the schedule. Section 30 identifies the selected BMPs, the vicinity map and water pollution control drawings. Section 40 contains any WPCP amendments.

e. Review the Contractor's Schedule.

The accepted Baseline schedule as well as the monthly updates and three-week "look-ahead" schedules are important references to better anticipate which BMPs will be implemented or needed. A project schedule is required in both SWPPPs and WPCPs and must show how the rainy season relates to soil-disturbing and re-stabilization activities and must also show major activities sequenced with implementation of BMPs.

Step 2: Establish an Inspection Schedule

a. Prior to the rainy season, inspect the site to ensure that the contractor has the necessary materials to stabilize required DSAs and to implement the necessary sediment controls.

b. Year round, inspect the construction site prior to a forecast storm, after a rain event that causes runoff from the construction site, and at 24-hour intervals during an extended rain event.

c. Conduct inspections at other frequencies as required by the Special Provisions.

d. Work with the Project Storm Water Coordinator, the District Construction Storm Water Coordinator, and SWTF Inspectors during site inspections and to receive assistance when necessary.

Step 3: Conduct the Inspection

a. Use the most recent **Storm Water Quality Construction Site Inspection Checklist** to document the inspection. The checklist is provided in Attachment H of the *Caltrans Storm Water Quality Handbooks, SWPPP and WPCP Preparation Manual*. This is the same checklist used by the contractor for conducting inspections. Instructions for using the checklist are also provided in Attachment H.

b. Encourage the contractor to participate in the inspection. This provides the opportunity for verbal feedback and discussion.

c. If the project involves significant structures work, encourage the Structures representative or inspector to participate in the inspection. Take a copy of the most current and approved site plan(s) and SWPPP on the inspection for identification of site features and for taking notes at specific areas.

d. Fill out the Inspection Checklist and add findings in writing. Use clear and concise language and give specific locations where problems were observed.

e. Take photographs during the inspection to document the existing conditions. This is especially important if the contractor does not attend the inspection. When photos of problem areas are taken, try to follow up with photos showing corrections.

f. Inspect the entire site, including the perimeter, especially where there is potential for run-on or discharge from the site. Look for areas of potential concentrated flows and for adjacent water bodies or drainage facilities that may

be affected by discharges from the site. Start the inspection at the lowest point, or the area with the highest potential for discharge. Inspect all potential discharge points. The SWPPP/WPCP should identify discharge points, however, there may be areas with discharge potential that were not identified in the SWPPP/WPCP.

g. Inspect the contractor's yard(s), where required.

h. Look for changes in construction or site conditions that may require an amendment to the SWPPP/WPCP.

i. Inspect for proper implementation of non-storm water management BMPs and waste management and materials pollution control BMPs.

j. For inspections during the **rainy season**, evaluate active and non-active DSAs. (The Resident Engineer should periodically evaluate the classification of construction areas as active DSAs or non-active DSAs.) Determine the total area of DSA and compare it to the limit for DSAs in the Special Provisions. If the existing DSA exceeds the limit, identify areas that can be stabilized to reduce the amount. Active DSAs require protection prior to the onset of rain. Evaluate erosion and sediment control BMPs based on the requirements related to Rainfall Area, season and active/non-active status as defined in the SWPPP/WPCP and BMP Manual. Be sure to inspect the entire site during a rain event, especially when run-off from the site occurs. Confer with the District Construction Storm Water Coordinator as to the district's definition of a rain event and maintain weather reports in the SWPPP file.

k. During the **non-rainy season**, identify the active and non-active DSAs. Depending on the Rainfall Area, DSAs may continue to require erosion and sediment control BMPs during the non-rainy season.

l. For individual BMPs, note if the BMP is properly installed. Also note if the BMP is in need of repair or maintenance.

Step 4: Report Inspection Results

a. If the Resident Engineer did not attend the inspection, communicate the results to the Resident Engineer.

b. Ideally, observations should be discussed with the contractor during the inspection.

c. Missing BMPs and non-compliance issues must be communicated to the contractor. Refer to the contractor's SWPPP/WPCP for required BMPs.

Step 5: Follow-up with Corrective Measures

The contractor must install missing BMPs and correct improperly installed or damaged BMPs immediately or by a date and time as approved in writing by the Resident Engineer. In any event, corrections must be made prior to the next rain event.

PART II: PROJECT OPERATIONS AND BMPS

Table 1 identifies individual BMPs that are applicable to specific construction operations. The BMPs listed in the table are for general consideration during each phase of operations. The indicated BMPs may not be applicable to every construction operation, nor is every possible BMP listed for each construction operation. The Resident Engineer should determine the appropriateness of an individual BMP to a construction site.

Table 1 Storm Water BMPs for Construction Operations

Construction Operation	BMPs (See Part III for Details)	
Mobilization	SC-7	Street Sweeping and Vacuuming
	TC-1	Stabilized Construction Entrance/Exit
	TC-2	Stabilized Construction Roadway
	TC-3	Entrance/Outlet Tire Wash
	NS-6	Illicit Connection/ Illegal Discharge Detection and Reporting
	WM-1	Material Delivery and Storage
	WM-2	Material Use
	WM-4	Spill Prevention and Control
	WM-5	Solid Waste Management
	WM-6	Hazardous Waste Management
	WM-9	Sanitary/Septic Waste Management

Construction Operation	BMPs (See Part III for Details)	
Clearing/ Grubbing	SS-1	Scheduling
	SS-2	Preservation of Existing Vegetation
	SS-3	Hydraulic Mulch
	SS-4	Hydroseeding
	SS-5	Soil Binders
	SS-6	Straw Mulch
	SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats
	SS-8	Wood Mulching
	SS-9	Earth Dikes/Drainage Swales & Lined Ditches
	SS-10	Outlet Protection/Velocity Dissipation Devices
	SS-11	Slope Drains
	SC-1	Silt Fence
	SC-2	Desilting Basin
	SC-3	Sediment Trap
	SC-4	Check Dam
	SC-5	Fiber Rolls
	SC-6	Gravel Bag Berm
	SC-7	Street Sweeping and Vacuuming
	SC-8	Sandbag Barrier
	SC-9	Straw Bale Barrier
	SC-10	Storm Drain Inlet Protection
	WE-1	Wind Erosion Control
	NS-1	Water Conservation Practices
	NS-8	Vehicle and Equipment Cleaning
	NS-9	Vehicle and Equipment Fueling
	NS-10	Vehicle and Equipment Maintenance
	WM-3	Stockpile Management
	WM-5	Solid Waste Management
	WM-7	Contaminated Soil Management

Construction Operation	BMPs (See Part III for Details)	
Earthwork	SS-1	Scheduling
	SS-2	Preservation of Existing Vegetation
	SS-3	Hydraulic Mulch
	SS-4	Hydroseeding
	SS-5	Soil Binders
	SS-6	Straw Mulch
	SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats
	SS-8	Wood Mulching
	SS-9	Earth Dikes/Drainage Swales & Lined Ditches
	SS-10	Outlet Protection/Velocity Dissipation Devices
	SS-11	Slope Drains
	SC-1	Silt Fence
	SC-2	Desilting Basin
	SC-3	Sediment Trap
	SC-4	Check Dam
	SC-5	Fiber Rolls
	SC-6	Gravel Bag Berm
	SC-7	Street Sweeping and Vacuuming
	SC-8	Sandbag Barrier
	SC-9	Straw Bale Barrier
	SC-10	Storm Drain Inlet Protection
	TC-1	Stabilized Construction Entrance/Exit
	WE-1	Wind Erosion Control
	NS-4	Temporary Stream Crossing
	NS-8	Vehicle and Equipment Cleaning
	NS-9	Vehicle and Equipment Fueling
	NS-10	Vehicle and Equipment Maintenance
	WM-7	Contaminated Soil Management
PCC and AC Operations	SC-7	Street Sweeping and Vacuuming
	TC-1	Stabilized Construction Entrance/Exit
	NS-3	Paving and Grinding Operations
	WM-1	Material Delivery and Storage
	WM-2	Material Use
	WM-3	Stockpile Management
	WM-5	Solid Waste Management
	WM-8	Concrete Waste Management

Construction Operation	BMPs (See Part III for Details)	
Drainage Work	SC-2	Desilting Basin
	SC-3	Sediment Trap
	SC-4	Check Dam
	SC-10	Storm Drain Inlet Protection
	SS-9	Earth Dikes/Drainage Swales & Lined Ditches
	SS-10	Outlet Protection/Velocity Dissipation Devices
Dewatering Operations	NS-2	Dewatering Operations
Bridge Construction	NS-1	Water Conservation Practices
	NS-3	Paving and Grinding Operations
	NS-4	Temporary Stream Crossing
	NS-5	Clear Water Diversion
	NS-8	Vehicle and Equipment Cleaning
	NS-9	Vehicle and Equipment Fueling
	NS-10	Vehicle and Equipment Maintenance
	WM-1	Material Delivery and Storage
	WM-2	Material Use
	WM-3	Stockpile Management
	WM-4	Spill Prevention and Control
	WM-5	Solid Waste Management
	WM-6	Hazardous Waste Management
	WM-8	Concrete Waste Management
	WM-10	Liquid Waste Management
	NS-3	Paving and Grinding Operations
	NS-4	Temporary Stream Crossing
	NS-5	Clear Water Diversion
Roadway Construction	WM-1	Material Delivery and Storage
	WM-2	Material Use
	WM-3	Stockpile Management
	WM-5	Solid Waste Management
	WM-6	Hazardous Waste Management
	WM-8	Concrete Waste Management
	WM-10	Liquid Waste Management

Construction Operation	BMPs (See Part III for Details)	
Mobile Operations	SC-7	Street Sweeping and Vacuuming
	SC-10	Storm Drain Inlet Protection
	TC-1	Stabilized Construction Entrance/Exit
	NS-8	Vehicle and Equipment Cleaning
	NS-9	Vehicle and Equipment Fueling
	NS-10	Vehicle and Equipment Maintenance
	WM-1	Material Delivery and Storage
	WM-2	Material Use
	WM-3	Stockpile Management
	WM-5	Solid Waste Management
	WM-6	Hazardous Waste Management
	WM-8	Concrete Waste Management
Trenching Operations	SC-7	Street Sweeping and Vacuuming
	SC-10	Storm Drain Inlet Protection
	WM-3	Stockpile Management
Erosion Control, Highway Planting and Landscaping	SS-1	Scheduling
	SS-2	Preservation of Existing Vegetation
	SS-3	Hydraulic Mulch
	SS-4	Hydroseeding
	SS-5	Soil Binders
	SS-6	Straw Mulch
	SS-7	Geotextiles, Plastic Covers & Erosion Control Blankets/Mats
	SS-8	Wood Mulching
	SS-9	Earth Dikes/Drainage Swales & Lined Ditches
	SS-10	Outlet Protection/Velocity Dissipation Devices
	SC-1	Silt Fence
	SC-7	Street Sweeping and Vacuuming
	SC-8	Sandbag Barrier
	SC-9	Straw Bale Barrier
	SC-10	Storm Drain Inlet Protection
	WE-1	Wind Erosion Control
	NS-7	Potable Water/Irrigation
	NS-8	Vehicle and Equipment Cleaning
	WM-1	Material Delivery and Storage
	WM-2	Material Use

PART III: BMP IMPLEMENTATION AND TROUBLESHOOTING

TEMPORARY SOIL STABILIZATION

SS-2 PRESERVATION OF EXISTING VEGETATION

Preservation of existing vegetation involves the identification and protection of desired vegetation.

Applications

Delineate Environmentally Sensitive Areas (ESAs)
Delineate areas where no construction activities are planned
Delineate areas where construction activities will occur at a later date
Delineate areas outside the project right-of-way or boundary

Key Points

Key Point # 1 – Timing

Areas to be protected should be delineated prior to clearing and grubbing operations or other soil-disturbing activities. It is also appropriate for areas where no construction activity is planned or where activity is planned for a later date (Photo 1).

Key Point # 2 – Layout

Areas of existing vegetation that are scheduled for preservation should be clearly marked with a temporary fence (Photo 2). Minimize disturbance by locating temporary roadways, storage facilities, and parking areas away from preserved vegetation.

Photo 1

Photo 2

Key Point # 3 – Training

Instruct employees, workers, surveyors, and subcontractors to honor protective devices. Maintain any existing irrigation systems and vegetation.

Key Point # 4 –Tree Preservation

Keep equipment away from trees to prevent root and trunk damage. Trenching should be as far away from tree trunks as possible, typically outside the drip line. Trenches should be filled in as soon as possible to avoid root drying. Fill trenches carefully and tamp the soil to fill in air pockets. Never expose roots to the air.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Vehicles and equipment run into or over vegetation that is to be preserved.	Clearly mark areas of preservation, and instruct workers to honor those areas.
Existing vegetation dies from lack of watering.	Maintain existing irrigation systems and ensure that they function properly.
Preserved trees are damaged.	Keep equipment and vehicles away from trees to prevent trunk and root damage. Severely damaged trees should be attended to by an arborist.
ESAs or areas where construction is not to occur or can occur at a later date are not delineated for protection.	Verify vegetation that requires preservation. Stop work if necessary. Delineate area as needed.

SS-3 HYDRAULIC MULCH

Hydraulic mulch is a mixture of shredded wood fiber or hydraulic matrix, water, and a stabilizing emulsion or tackifier. Applied hydraulic mulch will help protect bare soil from water and wind erosion. Bonded Fiber Matrix (BFM) is another soil stabilizer alternative to hydraulic mulch.

Applications

Temporary protection for DSAs until permanent vegetation is established

Temporary protection for DSAs that will be re-disturbed following an extended period (1 to 3 months) of inactivity

Key Points

Key Point #1 – Application

Wood fiber mulches are mixed in a hydroseeder and applied as liquid slurry. Material is applied from a spray gun on a tower (Photo 1) or from a hose (Photo 2).

Photo 1

Photo 2

Key Point #2 – Hydraulic Matrix Vs. Hydraulic Mulch

A hydraulic matrix, as opposed to a basic wood fiber hydraulic mulch, consists of a wood fiber base layer and a paper fiber top layer mixed with a binding agent and applied as a liquid slurry. *Paper based hydraulic mulches alone shall not be used for temporary soil stabilization applications.*

Key Point #3 – Bonded Fiber Matrix

A bonded fiber matrix (BFM) consists of a continuous layer of elongated wood fiber strands mixed with a bonding agent. Again, the material is applied as a liquid slurry. Once dried, a high strength, porous, and erosion resistant mat is created (Photo 3).

Photo 3

Key Point #4 – Avoid Over Spraying

Do not over spray onto the traveled way, sidewalks, lined channels, etc. (Photo 4).

Key Point #5 – After Application

In addition, ensure that areas to be sprayed will remain inactive or undisturbed. This slope was disturbed after bonded fiber matrix was applied (Photo 5).

Photo 4

Photo 5

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Slope was improperly dressed before application.	Roughen embankment and fill areas first by rolling with crimping or punching type roller or by track walking.
Coverage is inadequate.	Follow recommended application rates. Count the number of bags of the product to ensure the correct amount of material is used.
Allowed inadequate drying time.	Allow at least 24 hours for the material to dry before a rain event. Follow manufacturer's recommendations. Reapply where necessary.
Portions of the mulch have been disturbed.	Keep workers and equipment off the mulched areas and repair areas that have been damaged.
Excess water flows across stabilized surface.	Use other BMPs to limit flow onto stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

SS-4 HYDROSEEDING

Hydroseeding typically consists of applying a mixture of fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment to temporarily protect exposed soils from erosion by water and wind.

Applications

Temporary protection for DSAs until permanent vegetation is established
Temporary protection for DSAs that will be re-disturbed following an extended period (6 to 12 months) of inactivity

Key Points

Key Point #1 – Hydroseeding Mixture Selection

Select a hydroseeding mixture by evaluating site conditions with respect to:

- Soil conditions and soil type.
- Site topography - steep slopes are difficult to protect with temporary seeding.
- Season and climate - seeding during summer or in arid areas may limit germination and plant establishment.
- Water availability - temporary or permanent irrigation may be needed for germination and plant establishment.
- Sensitive adjacent areas - seeding should be compatible with adjacent ESAs. If incompatible seeding is to be used, ensure that seeds are not sprayed or blown onto the sensitive area.
- The Landscape Architect or the Construction Storm Water Coordinator shall approve hydroseeding mixtures.

Key Point #2 – Temporary Measure

If permanent vegetation is to be applied in the seeded area, the temporary vegetation from the hydroseeding may need to be removed. For example, grasses that inhibit compaction of soil to the required density must be removed before permanent vegetation is applied.

Key Point #3 – Preparation and Application

Roughen areas to be hydroseeded by plowing or disking with furrows trending along the contours. Avoid over spraying onto sidewalks, lined drainage channels, roadways, or existing vegetation (Photo 1).

Key Point #4 – Inspection and Maintenance

All seeded areas should be inspected for failures. Reapply seed, fertilizer, mulch, and water as needed to maintain coverage and encourage plant establishment. After grasses are established, mowing may be required to reduce fire hazard (Photo 2).

Photo 1

Photo 2

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Slope was improperly dressed before application.	Roughen slopes. Furrow along the contour of areas to be seeded.
Coverage is inadequate.	Follow recommended application rates. Count the number of seed bags of the product to ensure the correct amount of material is being applied. Reapply to thin areas.
Seeds fails to germinate.	Apply straw mulch to keep seeds in place and to moderate soil moisture and temperature. In arid areas, temporary irrigation may be necessary.
Seeded slope fails.	Fill in rills and re-seed; fertilize and mulch slopes.
Seeding is washed off slope.	Allow at least 24 hours for the materials to dry before a rain event. Follow manufacturer's recommendations. Reapply where necessary.
Excessive water flows across stabilized surface.	Use other BMPs to limit flow on stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

SS-5 SOIL BINDERS

Soil binders are materials applied to the soil surface to temporarily reduce erosion of exposed soils on construction sites. Soil binders consist of applying and maintaining polymeric or lignin sulfonate soil stabilizers or emulsions.

Applications

Temporary protection for DSAs that will be re-disturbed following a period of inactivity

Depending on the type of soil binder, the period of effectiveness is three months to two years

Key Points

Key Point #1 – Product Selection

Select soil binders by evaluating the site with respect to:

- Soil types and surface materials
- Suitability to the situation
- Performance and longevity requirements

Key Point #2 – Preparation

Prepare soil before applying the binder so that the binder adheres to and penetrates the soil surface. The untreated surface must be roughened (Photo 1) and must contain sufficient moisture (Photo 2) for the binder to achieve uniform penetration.

Photo 1

Photo 2

Key Point #3 – Curing

Soil binders require a minimum curing time before becoming fully effective, therefore binders should not be applied during or immediately before rainfall.

Key Point #4 – Product Constituents

When selecting a product, consider the chemical components and review the Material Safety Data Sheet (MSDS). If the product has a potential for becoming a pollutant, consider using a different product.

Key Point #5 – Inspection and Maintenance

Inspect the areas of application after rainfall for signs of erosion (Photo 3).

Inspect high traffic areas daily and low traffic areas on a weekly basis. High traffic areas are those exposed to daily use (vehicle or foot traffic) by contractor, subcontractor, or other personnel. Low traffic areas are those available for use but not in a daily manner.

Reapply soil binder as necessary (Photo 4).

Photo 3

Photo 4

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Slope was improperly dressed before application.	Roughen embankment and fill areas by rolling with a crimping or punching type roller or track walking where rolling is impractical. Pre-wet the areas of application.
Coverage is inadequate.	Follow recommended application rates. Count the number of bags of the product to ensure the correct amount of material is implemented. Reapply to the areas.
Sprayed areas degrade or become ineffective.	Follow recommended application rates. Consider other or additional BMPs. Reapply binder as necessary.
Sprayed slope has spot failures.	Repair slopes and re-spray damaged areas.
Portions of the sprayed area have been disturbed.	Keep workers and equipment off sprayed areas. Repair and re-spray areas that have been damaged.
Binder fails to penetrate soil.	Roughen soil and pre-wet to manufacturer's recommendations. Reapply to areas where necessary.
Soil binder is washed off slope.	Allow at least 24 hours for the materials to dry before a rain event. Follow manufacturer's recommendations. Reapply as necessary.
Excessive water flows across stabilized surface.	Use other BMPs to limit flow onto stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

SS-6 STRAW MULCH

Straw mulch consists of placing a uniform layer of straw and incorporating it into the soil with a studded roller or anchoring it with a tackifier. Straw mulch is used as a temporary surface cover for soil stabilization on DSAs until soils can be prepared for re-vegetation. It is also used in combination with temporary and/or permanent seeding strategies to enhance plant establishment.

Applications

Temporary protection for DSAs (6 to 12 months)
Used in combination with temporary and/or permanent seeding to enhance plant establishment

Key Points

Key Point #1 – Application Rate

Straw mulch must be evenly distributed on the soil surface (Photo 1). Proper application rates should be followed so that mulch covers the soil in a uniform layer without any visible bare spots.

Key Point #2 – Application Methods

Straw mulch can be applied mechanically or by hand (Photo 2). Mechanical application involves a straw blower (Photo 3) and may require an access road or driving surface capable of supporting the equipment. When using a straw blower, schedule the application to avoid excessive windblown straw. Manual application is time and labor intensive and should be used only on small areas or where equipment access is not feasible.

Photo 1

Photo 2

Key Point #3 – Anchoring

The preferred method for anchoring straw mulch in place is to use a tackifier. Other methods for anchoring the mulch include crimping (Photo 4), punching, or track walking. Crimping and punching are mechanical methods of anchoring the mulch to the soil. Track walking should be used only where rolling is impractical.

Key Point #4 – Inspection and Maintenance

Inspect straw mulches prior to and after rainstorms. Repair any damaged ground cover and re-mulch exposed areas of bare soil.

Photo 3

Photo 4

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Mulch blows away.	Anchor straw mulch in place by applying a tackifier, crimping, punching, or track walking. May need to use a different BMP.
Coverage is inadequate.	Follow recommended application rates. Count the number of bales per acre to ensure the correct amount of material is implemented. Reapply as necessary.
Excessive water flows across stabilized surface.	Use other BMPs to limit flow onto stabilized area and/or to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

SS-7 GEOTEXTILES, PLASTIC COVERS, EROSION CONTROL BLANKETS & MATS

This BMP involves the placement of geotextiles, plastic covers, and erosion control blankets and mats to stabilize DSAs and protect soil from erosion by wind or water. Typically these measures are used on slopes near ESAs, as a quick stopgap measure, and when DSAs are particularly difficult to stabilize.

Applications

Steep slopes that are generally steeper than 1:3 (V:H)
Slopes where the erosion potential is high
Disturbed areas where plants are slow to develop
Stockpiles
Slopes adjacent to water bodies in or near ESAs

Key Points

Key Point #1 – Product Selection

There are many types of erosion control blankets and mats available (Photo 1). Select a product appropriate for the application and site conditions. Selection criteria include: (1) effectiveness for reducing erosion, flow velocity, and runoff; (2) acceptability for environmental compatibility, institutional / regulatory requirements, and visual impact; (3) compatibility with native plants, moisture retention, temperature modification, and open space coverage; (4) durability, longevity, ease of installation; and (5) maintenance frequency.

Key Point #2 – Site Preparation

Site preparation is essential to ensure that blankets and mats perform as intended. Remove all rocks, clods, vegetation or other obstructions and re-grade to allow the blanket or mat to come into complete contact with the soil. Improper slope preparation prevents the blanket from fully contacting the soil, and allows water to flow under the blanket (Photo 2).

Photo 1

Photo 2

Key Point #3 – Slope Installation

Install the product starting from the top of the slope (Photo 3), anchored in a 150 mm by 150 mm (6 in by 6 in) trench that is backfilled and tamped firmly. Unroll the blankets down the slope, laying them loosely and stapling every 1 m (3 ft). Do not stretch blankets. Ensure that the blanket maintains direct contact with the soil. Overlap the edges of adjacent parallel rolls by 50 mm to 75 mm (2 in to 3 in).

Photo 3

Key Point #4 – Inspection and Maintenance

Inspect blanket and mat installations periodically and after significant rainstorms for signs of erosion or undermining. Repair or replace any failures immediately. If washout or breakage of material occurs, re-install material after repairing

damage to slope or channel. Maintain areas treated with temporary soil stabilization to provide adequate erosion control. Reapply or replace temporary erosion controls on exposed soils when visibly eroded or when there is a 10 percent or greater exposure of the previously treated area.

Preventive Measures and Troubleshooting Guide

Field Condition (**Geotextiles**):	Common solutions are:
Undercutting occurs along the top of the slope.	Dig a 150 mm by 150 mm (6 in by 6 in) trench along the top of the slope and anchor blanket into trench by back filling and tamping the soil.
Blankets separate along the seams.	Overlap adjacent blanket 50 mm to 75 mm (2 in to 3 in) and staple every 1 m (3 ft).
Blankets separate where the rolls are attached end to end.	Shingle the blanket so the top blanket covers the bottom blanket by 150 mm (6 in) and staple through the overlapped areas every 300 mm (12 in)
Blanket does not make complete contact with the soil surface.	Prepare the soil surface by removing, rocks, clods , sticks and vegetation, fill in rill and uneven areas
Excessive water flows across stabilized surface.	Use other BMPs to limit flow on stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

Field Condition (**Plastics**):	Common solutions are:
Undercutting occurs along the top of the slope.	Dig a trench along the top of the slope and anchor blanket into trench by back filling and tamping the soil.
Plastic sheeting separates along the seams.	Overlap edges of plastic sheeting by 300 mm to 600 mm (12 in to 24 in) and tape the entire length or weight down.
Plastic sheeting tears and separates.	Overlap plastic sheets by 300 mm to 600 mm (12 in to 24 in), tape edges together or weigh down. Maintain installation by replacing torn areas.
Plastic sheet is blown or displaced by winds.	Weigh down sheet to protect from wind. Maintain installation by replacing sheets in position.

Field Condition (**Blankets and Mats**):	Common solutions are:
Improper anchoring.	Dig trench along the top and bury the blankets. Use staples to anchor according to manufacturer's recommendations.
Undercutting due to inadequate preparation.	Prepare the soil surface. Remove rocks, clods and other obstructions. Fill in rills in uneven areas to promote good contact between mat and soil.
Excessive water flow across stabilized surface.	Use other BMPs to limit flow onto stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

SS-8 WOOD MULCHING

This BMP consists of applying a mixture of shredded wood mulch, bark, or compost to bare soil to reduce runoff, increase infiltration, and reduce erosion due to rainfall impact. Wood mulch provides temporary or short-term soil stabilization primarily for landscaping projects.

Applications

Temporary protection of DSAs pending establishment of permanent vegetative cover
As a permanent non-vegetative ground cover on slopes

Key Points

Key Point #1 – Product Selection

Select wood mulch products appropriate for the application and site conditions. Prior to placement, consult with the District Landscape Architect to ensure that the mulch is compatible with planned future projects.

Key Point #2 – Preparation

After existing vegetation has been removed, roughen embankment and fill areas by rolling with a punch type roller or track walking (Photo 1) before applying the wood mulch.

Photo 1

Key Point #3 – Mulch Depth

Mulch depth depends on the product selected such as green material or shredded wood (Photo 2). Distribute shredded wood mulch evenly (Photo 3) across the soil to a depth of 50 mm (2 in) to 75 mm (3 in). Mulch composed of recycled green waste should be applied to a maximum depth of 50 mm (2 in).

Key Point #4 – Inspection and Maintenance

Inspect and maintain mulch to ensure that it lasts long enough to achieve the erosion control objectives.

Photo 2

Photo 3

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Area was improperly dressed before application.	Remove existing vegetation and roughen embankment and fill areas by rolling with a punch type roller or by track walking.
Coverage is inadequate.	Follow recommended application rates. Inspect the areas to ensure that the mulch is applied to the correct depth.
Mulch is washed away.	Do not place mulch in concentrated flow areas. Reapply as necessary or use another BMP.
Excessive water flows across stabilized surface.	Use other BMPs to limit flow onto stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

SS-9 EARTH DIKES, DRAINAGE SWALES & DITCHES

Earth dikes, drainage swales, and lined ditches are structures that intercept, divert, and convey surface runoff around or through the project site in a non-erosive manner.

Applications

To convey surface runoff down sloping land
Along paved surfaces to intercept runoff
Along the top of slopes to divert surface flow from slopes
To divert and direct runoff towards stabilized drainage systems
Below steep grades where runoff begins to concentrate

Key Points

Key Point #1 – Sediment Control

It may be necessary to use other water pollution control practices such as check dams, plastic sheeting, or blankets to prevent scour and erosion in the swales, dikes, and ditches.

Key Point #2 – Flow Velocity

Select flow velocity for ditches, swales, and dikes based on careful evaluation of potential risk due to erosion, over topping, flow backup, washout, and drainage flow patterns for each project. In some cases the drainage swale may need to be constructed with asphalt concrete (Photo 1).

Photo 1

Key Point #3 – Location Selection

Care must be applied to correctly size and locate earth dikes, drainage swales, and lined ditches. Excessively steep, unlined dikes and swales may be subject to erosion and gully formation. Earth dikes, drainage swales and ditches are not suitable as sediment trapping devices.

Key Point #4 – Inspection and Maintenance

Inspect temporary measures prior to the rainy season, after rainfall events and regularly (approximately once every two weeks) during the rainy season. Inspect channels, embankments, and ditch beds for erosion, washout, and accumulation of sediment and debris. Repair or replace lost riprap, linings, or soil stabilization as needed.

Preventive Measures and Troubleshooting Guide

Field Condition (**Earth Dikes**):	Common solutions are:
Dikes wash out.	Compact the soil used to build the earthen dikes.
Area behind dikes erode.	Stabilize the area. Use other BMPs to stabilize the uphill side of the dike, such as SS-7.
Concentrated flow causes erosion.	Stabilize conveyances and/or use check dams, plastic, or blankets to control erosion.
Outlet erodes.	Stabilize outlets, replace lost riprap

Field Condition (**Drainage Swales and Ditches**):	Common solutions are:
Ditches and swales erode due to high velocity flows.	Line channels with permanent stabilization. Place riprap or line channel with blankets or plastics. Add velocity-reducing BMPs upstream, e.g. check dams.
Swales and ditches fill up with sediment.	Remove accumulated sediment from ditches and swales. Stabilize upstream contributing areas with a soil stabilizer.
Ditches and swales are overtaken by flows.	Determine the upstream contributing areas and size ditches and swales to handle anticipated flow velocities.
Conveyances erode.	Place check dams as necessary to reduce flow velocities. Stabilize conveyances with plastic and/or blankets.

SS-10 OUTLET PROTECTION/VELOCITY DISSIPATION DEVICES

This BMP requires the placement of rock, riprap, or other material at pipe outlets to reduce flow velocity of exiting storm water and thus prevent scouring.

Applications

Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conduits, or channels
Outlets located at the bottom of mild to steep slopes
Outlets subject to intense water flows
Outlets that carry continuous flows of water
Points where lined conveyances discharge to unlined conveyances

Key Points

Key Point #1 – Riprap Selection

The minimum riprap diameter is determined by the outlet diameter, discharge volume, and apron length. Outlets with slopes greater than 10% need additional protection. Flow rate and local climate may dictate whether loose rock (Photo 1) or grouted riprap is appropriate. High flows may wash loose rock away. Grouted riprap may break up in areas of freeze and thaw.

Key Point #2 – Unprotected Outlets

Flows from unprotected pipe outlets can result in severe erosion (Photo 2). Use a flared end section or riprap at the outlet to reduce flow velocity and erosive potential of concentrated flows.

Photo 1

Photo 2

Key Point #3 – Installation

Carefully place riprap to prevent damage to underlying filter fabric. Where large riprap is used, the underlying filter fabric may need to be protected with a rock blanket.

Key Point #4 – Inspection and Maintenance

Inspect temporary velocity dissipation devices prior to the rainy season, after rainfall events and regularly (approximately once every two weeks) during the rainy season. Inspect aprons for riprap displacement or damage to underlying fabric. Inspect for scour beneath the riprap and around the outlets, and repair as needed.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Riprap washes away.	Replace riprap with a larger diameter based on the pipe diameter and discharge velocity.
Apron is displaced.	Align apron with receiving water and keep it straight throughout its length. Repair fabric and replace riprap that has washed away.
Scour occurs around apron or riprap.	Repair damage to slopes or underlying filter fabric.
Outlet erodes.	Stabilize outlets; replace lost riprap; grout riprap.

SS-11 SLOPE DRAINS

A slope drain conveys water down a slope into a stabilized receiving water, trapping device, or stabilized area. Slope drains are used with lined ditches to convey surface flow away from slope areas to protect cut or fill slopes.

Applications

Where concentrated flows are directed over a slope

Key Points

Key Point #1 – Limitations

Severe erosion may result if a slope drain fails due to over topping or pipe separation.

Key Point #2 – Drainage Constraints

Limit the area draining to a slope drain to 4 ha (10 ac) per pipe. Large areas may require the use of a rock-lined channel or a series of pipes. The maximum slope gradient is generally limited to 1:2 (V:H), as the ability to dissipate water velocity from steeper slopes is difficult.

Key Point #3 – Installation

Install slope drains perpendicular to the slope contour (Photo 1). Compact the soil around and under the slope drain inlet, outlet, and along the length of the pipe. Protect the pipe inlet with filter fabric or flared end sections for pipes that are greater than 300 mm (12 in) in diameter. Ensure that pipe connections are watertight. Securely anchor and stabilize the pipe and appurtenances into the soil.

Photo 1

Key Point #4 – Velocity Dissipation

Protect outlet with riprap or velocity dissipation devices. For high-velocity discharges, reinforce riprap with concrete or reinforced concrete devices. It may be necessary to capture discharge and allow sediment to settle out.

Key Point #5 – Inspection and Maintenance

Inspect before and after each rain event and twice monthly until the tributary drainage area has been stabilized. Inspect outlets for erosion and downstream scour. In the event of scour, reduce the flows going into the channel unless other preventive measures can be implemented.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Pipe separates.	Reconnect pipe sections. Securely anchor and stabilize pipe into soil. Ensure that pipe connections are watertight.
Pipe outlet erodes.	Repair damage and stabilize outlet with a flared end section, riprap, or velocity dissipation device. If necessary, reduce flows being discharged.
Pipe becomes clogged.	Flush out pipe. Place a screen or grate at inlet to capture large particles.
Erosion occurs around inlet.	Stabilize area around inlet with filter fabric or flared end section. Re-grade around inlet to reduce the gradient angle.
Excessive sediment accumulates around inlet/outlet.	Remove accumulated sediment and stabilize upstream area.
Slope drain overtops.	Limit drainage area and flow velocity. Check pipe diameter to ensure that it is sized properly to accept flow. Add additional pipes to carry flows as necessary.

TEMPORARY SEDIMENT CONTROL

SC-1 SILT FENCE

Silt fence is a temporary linear barrier that captures sediment by ponding and filtering storm water runoff to allow sediment to settle out of the runoff water.

Application

Below the toe of slopes as required
Down slope of exposed soil areas
Around temporary stockpiles as required

Key Points

Key Point #1 – Installation

Install on a relatively level contour. This means the barrier should be installed as close as possible to a level horizontal plane near the toe of the slope (Photo 1). Turn the end of the barrier up the slope to prevent ponded water from escaping around the end (Photo 2).

Photo 1

Photo 2

Key Point #2 – Setback

A silt fence should be placed with a setback of at least 1 m (3 ft). Where a 1 m (3 ft) setback is not practicable due to site conditions, the fence may be constructed at the toe of slope but should be placed as far from the toe as practicable to increase the ponding area and allow sediment to settle out.

Key Point #3 – Key In

The bottom of the silt fence must be keyed in or water may flow underneath (Photo 3). A trench should be excavated along the proposed layout line of the fence. After the silt fence stakes have been driven into the trench, backfill over the fence fabric and compact (Photo 4).

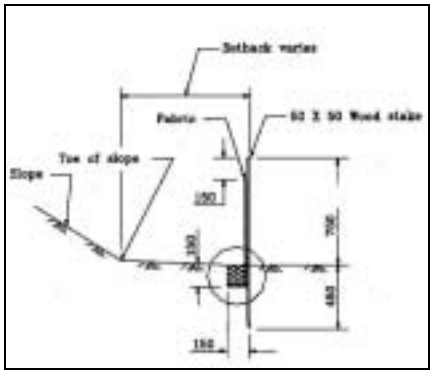

Photo 3

Photo 4

Key Point #4 – Cross Barriers

For silt fence installed on a level contour with long reaches, install cross barriers at a minimum of 150 m (500 ft) intervals. For silt fence not installed on a level contour, install cross barriers, at a minimum, where the change in elevation equals 1/3 the height of the silt fence.

Key Point #5 – Limitations

Do not install silt fence across intermittent or permanent streams, channels, or any location where concentrated flow is anticipated (Photos 5 and 6).

Photo 5

Photo 6

Key Point #6 – Inspection and Maintenance

Perform inspection before and after rain events, every 24 hours during extended rain events, and weekly throughout the rainy season. Should silt fence fabric tear (Photo 7) or decompose, replace immediately. Remove sediment deposits (Photo 8) when the sediment accumulation reaches 1/3 of the barrier height.

Photo 7

Photo 8

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
There is excessive sediment accumulation.	Remove sediment. Apply Hydraulic Mulch (SS-3) or Straw Mulch (SS-6) or other BMP upstream to reduce sediment in runoff.
Bottom of fence is not properly keyed in.	Trench, place fabric, and backfill.
Length of slope draining to silt fence is too long.	Shorten slope length using Fiber Rolls (SC-5) or equivalent. Slope shall be 61 m (200 ft) or less.
Storage capacity is inadequate due to sediment buildup.	Remove accumulated sediment when it reaches 1/3 the height of the barrier.
There is a lack of sufficient ponding area.	Fence should be installed with at least a 1m setback from the toe of slope where possible. Divert flow at top of slope.
Erosion occurs around barrier ends.	Turn ends of barriers into the up-slope area.
Silt fence is not installed along level enough contour.	Reinstall silt fence so that change in elevation does not exceed 1/3 the height of the linear barrier along the reach. Install cross barriers.
Slope draining to fence is too steep. Slope shall be less than 1:1 (V:H).	Shorten slope length using Fiber Rolls (SC-5) or equivalent. Increase setback of silt fence from the toe of slope.
Fence is installed in concentrated flow area.	Replace fence with proper BMP such as Check Dams (SC-4), if appropriate.
Cross barriers not installed or installed incorrectly.	Place cross barriers on the receiving side of the barrier at a maximum separation of 150 m. Cross barrier should be a minimum of 1/3 and a maximum of ½ the height of the linear barrier.
Stakes are too far apart.	Add stakes a maximum of 2.5 m apart.
Concentrated flows cause erosion to occur behind silt fence.	Place cross barrier check dams behind the barrier.

SC-2 DESILTING BASIN

A desilting basin is a temporary basin formed by excavation and/or construction of an embankment so that storm water runoff is temporarily detained, allowing sediment to settle out before the water is discharged.

Applications

Where storm water can enter a drainage system or receiving water from a construction area
At outlets of DSAs between 2 and 4 ha (5 and 10 ac) in size

Key Points

Key Point #1 – Capacity

Desilting basins shall be designed to have a capacity of 100 m^3 of storage for every 1 ha (55 yd^3 per acre) of contributory area. Basin storage capacity is measured from the top of the basin to the principal outlet. Basins must be designed to drain within 72 hours following storm events. Basins with levees greater than 1.5 m (5 ft) in height or with an impounding capacity of 1000 m^3 (1300 yd^3) or greater shall be designed by a professional Civil Engineer registered with the state of California.

Key Point #2 – Configuration

The basin inlet shall be located to maximize travel distance to the basin outlet. The outlet structure should be placed as far away from the inlet structure as possible to maximize travel distance and allow suspended sediment to settle out.

Key Point #3 – Basin Dimensions

The length of the basin shall be more than twice the width of the basin. Basin depth must not be less than one 1 m (3 ft) or greater than 1.5 m (5 ft). Check the approved SWPPP for actual dimensions.

Key Point #4 –- Limitations

Basins generally require excavation of large surface areas so that sediment will settle out efficiently. The availability of right-of-way may limit basin size or deployment on construction sites. Basins may not be located in live streams. Basins may require protective fencing to ensure safety.

Key Point #5 – Inspection and Maintenance

Inspect basins before and after rainfall events, weekly during the rainy season, and at 24 hours intervals during extended storm events. Check inlet and outlet structures and spillways for signs of erosion, damage, or obstructions. Examine basin banks for seepage and structural soundness. Remove accumulated sediment when the basin storage capacity is 1/3 full.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Outlet pipe is clogged with debris.	Clean outlet pipe. Wrap outlet pipe with filter fabric or install fencing or trash rack around pipe to hold back larger debris particles.
Spillway erodes due to high velocity flows.	Stabilize outlet with riprap or line spillway with plastic sheeting or geotextile blankets.
Slope sides erode.	Stabilize slopes with rock, vegetation, or equivalent method.
There is excessive accumulated sediment buildup.	Remove sediment to retain holding capacity.
The upstream drainage area is too large.	Ensure that the basin is designed to accommodate the inflow for the designed storm. Limit contributing drainage area or expand basin. Ensure drainage area does not exceed 4 ha (10 ac). If the drainage area does exceed this limit, use other or additional BMPs.

SC-3 SEDIMENT TRAP

A sediment trap is a temporary basin formed by excavation or by construction of an earthen embankment across a waterway or low drainage area and has a controlled release structure.

Applications

Permissible where contributing area is less than 2 ha (5 ac)
Sites where storm water can enter a storm drain or receiving water from a construction area
As a supplemental control for reducing sediment before it enters a drainage system or receiving water

Key Points

Key Point #1 – Location

Traps should be excavated in a suitable area or by constructing a low embankment across a swale where failure would not pose a risk to life or property. Traps should provide access for maintenance, including sediment removal.

Key Point #2 – Configuration

The trap inlet shall be located as far away from the trap outlet to maximize travel distance and allow suspended sediment to settle out (Photo 1).

Photo 1

Key Point #3 –-Dimensions

The length of the trap shall be more than three times the width (Photo 2). Traps with levees greater than 1.5 m (5 ft) in height or with a storage capacity greater than 1000 m^3 (1300 yd^3) shall be designed by a professional Civil Engineer registered with the state of California. Check the approved SWPPP for actual dimensions.

Photo 2

Key Point #4 – Limitations

Traps generally require excavation of large surface areas to permit settling of sediment. The availability of right-of-way may limit their size or deployment on construction sites. Sediment traps should be limited to drainage areas of 2 ha (5 ac) or less. Traps may not be located in live streams. Traps may require protective fencing to ensure safety.

Key Point #5 – Inspection and Maintenance

Traps should be inspected before and after rainfall events, weekly during the rainy season, and at 24-hour intervals during extended storm events. Check inlet and outlet structures and spillways for signs of erosion, damage, or obstructions. Examine trap banks for seepage and structural soundness. Remove accumulated sediment when the trap storage capacity is 1/3 full.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Outlet pipe is clogged with debris.	Clean out pipe. Wrap outlet pipe with filter fabric or install fencing or trash rack around pipe to hold back larger debris particles.
Spillway erodes due to high velocity flows.	Stabilize outlet with riprap or line spillway with plastic sheeting or geotextile blankets.
Slope sides erode.	Stabilize slopes with rock, vegetation or equivalent method.
Accumulated sediment has built up.	Remove sediment to recover holding capacity.
Drainage area is too large.	Ensure that the trap is designed to accommodate the inflow for the designed storm. Limit drainage contributing area. Consider other or additional BMPs.

SC-4 CHECK DAM

A check dam is a small structure constructed of rock or gravel bags placed across a natural or man-made channel or drainage ditch. Check dams reduce scour and channel erosion by reducing flow velocity and encouraging sediment to settle out.

Applications

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 (5 ft/s)
In drainage ditches or channels in which grass linings are being established
In temporary ditches where a short-term service does not warrant establishment of erosion resistant linings
In combination with other BMPs such as sediment basins and traps

Key Points

Key Point #1 – Installation

Install check dams 5 m (16 ft) from the outfall device and at regular intervals along the channel based on the erosion characteristics and slope degree of the drainage swale (Photo 1). Swales that are very steep or have a high potential of eroding require check dams placed closer together.

Photo 1

Key Point #2 – Dimensions

Check dams should be placed at a height and distance as to allow small pools to form behind them but allow high velocity flows

(typically a 2-year storm or larger) to safely flow over them without an increase in upstream flooding or damage to the check dam. Check dams should be constructed to pond runoff flows so that the backwater from the downstream check dam reaches the toe of the upstream dam (Photo 2).

Photo 2

Key Point #3 – Limitations

Check dams should not be placed in live streams or in channels that are already grass-lined unless erosion is expected, as existing vegetation may be damaged. Check dams are not appropriate in channels that drain areas greater than 4 ha (10 ac).

Key Point #4 – Inspection and Maintenance

Check dams require extensive maintenance after storm events or high velocity flows to repair damage (Photo 3). Remove sediment when it reaches 1/3 the check dam height.

Photo 3

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Too much sediment has accumulated.	Remove accumulated sediment to recover holding capacity.
There is insufficient ponding area.	Space check dams farther apart. Increase height of dam.
The check dam is higher than the drainage channel.	Lower check dam so that it is 150 mm (6 in) lower than the channel side.
Check dams wash away.	Ensure that the drainage area is 4 ha (10 ac) or less. Replace check dams. Consider adding more dams upstream.
Wrong type of materials is used to construct barrier .	Use heavier materials such as larger rocks. Do not use straw bales or silt fence.

SC-5 FIBER ROLLS

A fiber roll consists of straw, flax, or similar material that is rolled and bound into a tight tubular cylinder and placed at regular intervals on a slope face. Fiber rolls intercept runoff, reduce runoff flow velocity, and release the runoff as sheet flow. Fiber rolls are also used as a filter to remove sediment from runoff.

Applications

Along the top, face, and at grade breaks of exposed and erodible slopes

Key Points

Key Point #1 – Installation

Proper fiber roll installation is crucial to ensure effectiveness and performance. Fiber rolls should be placed on a level contour in a shallow trench with a maximum depth of 50 mm to 100 mm (2 in to 4 in). The fiber roll should be staked at each end and at regular intervals along its length with a maximum distance of 1.2 m (4 ft) between stakes. If more than one fiber roll is placed in a row, the ends of the adjoining rolls should be tightly abutted together and not overlapped (Photo 1).

Photo 1

Key Point #2 – Vertical Spacing

When used to create storm water benches on a slope, the vertical spacing of the fiber rolls rows is determined by the inclination and length of the slope (Photo 2). For slopes 1:2 (V:H) and steeper and 15 m (50 ft) and greater, fiber rolls shall be placed at

intervals no greater than 7.5 m (25 ft). For slopes between 1:20 (V:H) and 1:2 (V:H) and 30 m (100 ft) and greater, fiber rolls shall be placed at intervals no greater than 15 m (50 ft).

Photo 2

Key Point #3 – Sediment Control

Fiber rolls are acceptable for use as sediment control and may be used in conjunction with other soil stabilization methods (soil binders, mulches, etc.) (Photo 3) and/or other sediment controls.

Photo 3

Key Point #4 – Removal

Fiber rolls are typically left in place. If they are removed, dispose of the accumulated sediment and fill in trenches, holes, or depressions to blend in with adjacent ground contours.

Key Point #5 – Inspection and Maintenance

Inspect fiber rolls prior to and after rain events, and at least daily during prolonged rainfall. Maintenance includes replacing slumping rolls, removing accumulated sediment, and filling in rills. If fiber rolls split, tear (Photo 4), unravel, or become ineffective, replace them immediately.

Photo 4

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Runoff flows under the fiber roll or daylight shows under fiber roll.	Trench-in rolls to a depth of 100 mm (4 in) and stake. Place compacted soil along the uphill side of the fiber roll.
Runoff flows along fiber roll and discharges around ends.	Make sure rolls are placed on a level contour and turn ends of fiber rolls up-slope.
Runoff flows between fiber rolls.	Ensure that fiber rolls are butted tightly together and staked.
There is excessive sediment accumulation.	Remove accumulated sediment. Apply soil stabilization measures to contributing areas.
Length of slope draining to fiber roll is too long.	Place fiber rolls at shorter intervals. The steeper the slope, the closer together the fiber rolls should be placed.

SC-6 GRAVEL BAG BERM

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 runoff velocity, release runoff as sheet flow, and provide some sediment removal.

Applications

Along the top, face, and at grade breaks of exposed and erodible slopes

Key Points

Key Point #1 – Installation

Proper gravel bag berm installation is crucial to ensure its effectiveness and performance. Gravel bag berms should be placed on a level contour along the slope (Photo 1). Gravel bags should be tightly abutted together and not overlapped (Photo 2).

Photo 1

Photo 2

Key Point #2 – Bag Design

Bags should be made of a woven polypropylene, polyethylene or polyamide fabric, or burlap material. When full, a bag should be 450 mm (1.5 ft) long, 300 mm (1 ft) wide, and 75 mm (3 in) thick, with a mass of approximately 15 kg (35 lb). Bag dimensions are standardized but may vary based on locally available materials. Alternative bag sizes shall be submitted to the Resident Engineer for approval prior to deployment. Fill material shall be 13 mm to 25 mm (1/2 in to 1 in) class 2 aggregate base that is clean and free from clay and undesirable materials.

Key Point #3 – Sediment Control

Although gravel bag berms remove some sediment, they should not be used in place of linear sediment barriers.

Key Point #4 – Limitations

Gravel bags are sensitive to ultraviolet light resulting in a limited durability that may make them unsuitable for long-term projects. Gravel bag berms are labor intensive. Installation, removal, and maintenance costs should be evaluated when considering this BMP.

Key Point #5 – Inspection and Maintenance

Inspect gravel bag berms weekly and prior to and after rainfall events during the rainy season. Repair or replace broken or ripped bags, and reshape as necessary. Remove accumulated sediment when it reaches 1/3 the height of the berm. Repair washouts and rills as needed.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Runoff flows under the bags.	Ensure that bags are placed completely on the soil surface and not overlapped. Butt the bag ends together tightly. Repair rills and washouts.
Runoff flows around ends of bag rows.	Make sure that bags are placed on a level contour. Turn up ends of each row.
Runoff flows between bags.	Ensure that gravel bags are butted tightly together.
There is excessive sediment accumulation.	Remove accumulated sediment. Apply soil stabilization measures to contributing areas
Length of slope draining to gravel bag berm is too long.	Place berm at shorter intervals. The steeper the slope, the closer together the berms should be placed.

SC-7 STREET SWEEPING AND VACUUMING

Street sweeping and vacuuming are practices to remove tracked sediment from public roads in order to prevent sediment and dirt from entering storm drains or receiving waters. Areas of concern include ingress and egress points, portions of roadway within the project limits adjacent to a freeway or other public road, and any other paved surface within project limits that is to remain after construction is complete.

Applications

Where sediment is tracked onto public or private roadways from the project site

Key Points

Key Point #1 – Sweepers

Sweepers should have vacuum or other mechanical attachments for collecting dirt and sediment (Photo 1). Adjust brooms regularly to maximize efficiency of sweeping operations. Never use kick brooms or sweeper attachments for the implementation of this BMP.

Key Point #2 – Inspection

Inspect project ingress and egress points and roadways daily for signs of tracked sediment (Photo 2).

Photo 1

Photo 2

Key Point #3 – Sweeping Waste Disposal

After sweeping is finished, properly dispose of sweeper waste. Sweeper waste that includes trash and debris should be disposed of at an approved dumpsite. For collected sediment that is free of

trash and debris, consider incorporating the sediment back into the project's earthwork operations.

Key Point #4 – Site Entrances and Exit

Designate a limited number of centralized ingress/egress locations for the site and instruct construction personnel to use only those locations for entering/exiting the project (see TC-1).

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Sediment tracking is excessive.	Install a stabilized construction entrance/exit at egress point.
Sweeper is not picking up sediment.	Adjust sweeper brooms to maximize efficiency of sweeping operations.
Sweeping causes excessive dust.	Use a sweeper with a vacuum attachment. Use sweeper with water spray device to reduce dust. Never use kick brooms or sweeper attachments.
Sediment is being tracked from many areas of the job site.	Limit egress and ingress locations and instruct personnel to use designated centralized entrance/outlet locations.

SC-8 SANDBAG BARRIER

A sandbag barrier is a temporary linear sediment barrier constructed of stacked sandbags. This type of barrier is designed to intercept and slow storm water sheet flow runoff. Sandbag barriers allow sediment in runoff to settle before the water leaves the construction site. Sandbag barriers can also be used to divert and detain moderately concentrated flows associated with ditches, swales, and storm drain inlets.

Applications

Along the perimeter of a site
Below the toe of slopes as required
Down slope of exposed soil areas
Around temporary stockpiles as required
Parallel to a roadway to keep sediment from paved areas
To divert or direct flow

Key Points

Key Point #1 – Installation

When used as a linear sediment barrier for slopes, sandbags should be placed along a level contour with the end of each row turned up-slope to prevent flow around the ends. Due to the limited sediment holding capacity behind the bags, they should be used in conjunction with other erosion source controls such as soil binders, covers, and/or mulches to provide effective control.

Key Point #2 – Setback

A sandbag barrier should be placed with a setback of at least 1 m (3 ft). Where a 1 m (3 ft) setback is not practicable due to site conditions, the barrier may be constructed at the toe of slope but should be placed as far from the toe as practicable to increase the ponding area and allow sediment to settle out.

Key Point #3 – Configuration

Sandbags should be stacked in a pyramid formation (Photo 1). To do this, the base of the barrier should be the widest, with the width decreasing with each higher row. The joints between bags should be staggered for each row.

Photo 1

Key Point #4 – Cross Barriers

For sandbag barriers not on a level contour and for longer reaches, install cross barriers at a minimum of 150 m (500 ft) intervals to prevent concentrated flow.

Key Point #5 – Limitations

Sandbag materials are sensitive to ultraviolet light resulting in a limited durability that may make them unsuitable for long-term projects. Sandbag barriers are labor intensive. Installation, removal, and maintenance costs should be evaluated when considering this BMP.

Key Point #6 – Inspection and Maintenance

Inspect sandbag barriers weekly and prior to and after rainfall events during the rainy season. Repair or replace broken or ripped bags, and reshape as necessary. Remove accumulated sediment when it reaches 1/3 the barrier height. Repair washouts and rills as needed. When no longer needed, remove the barrier and accumulated sediment then clean, re-grade, and stabilize the area.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
There is excessive sediment accumulation.	Remove sediment. Apply Hydraulic Mulch (SS-3) or Straw Mulch (SS-6) or other soil stabilization BMP upstream to reduce sediment in runoff.
Concentrated flows causes erosion to occur behind barriers.	Place cross barrier check dams behind the barrier.
Length of slope draining to sandbag barrier is too long. Slope shall be 61 m (200 ft) or less.	Shorten slope length using Fiber Rolls (SC-5) or equivalent.
Storage capacity is inadequate due to sediment buildup.	Remove accumulated sediment when it reaches 1/3 the barrier height.
There is insufficient ponding area.	Sandbag barrier should be installed with at least a 1 m (3 ft) setback from the toe of slope where possible. Divert flow at top of slope.
Erosion occurs around barrier ends.	Turn ends of barriers into the up-slope area.
Sandbag barrier is not installed along level enough contour.	Reinstall barrier so that change in elevation does not exceed 1/3 the barrier height along its reach or install cross barriers.
Slope draining to barrier is too steep. Slope shall be less than 1:1 (V:H).	Shorten slope length using Fiber Rolls (SC-5) or equivalent. Increase setback of sandbag barrier from the toe of slope.
Incorrect sandbag material, size or fill material is being used.	Require the contractor to use the specified bag material, size, and fill material.

Field Condition:	Common solutions are:
Sandbags rupture or degrade.	Replace bags. Clean up and remove any spilled material.
Cross barriers are not installed or are installed incorrectly.	Place cross barriers on the receiving side of the barrier at a maximum separation of 150 m (500 ft). Cross barrier should be a minimum of 1/2 and a maximum of 2/3 the barrier height.

SC-9 STRAW BALE BARRIER

A straw bale barrier is a temporary linear sediment barrier constructed of straw bales. This type of barrier is designed to intercept and slow storm water runoff. Straw bale barriers allow sediment in runoff to settle before water leaves the construction site.

Applications

Along the perimeter of a site
Below the toe of slopes as required
Down slope of exposed soil areas
Around temporary stockpiles as required

Key Points

Key Point #1 – Installation

When used as a linear sediment barrier for slopes, straw bales should be placed along a level contour with the end of each row turned up-slope to prevent flow around the ends. Bales should be installed in a shallow trench with ends tightly abutted together.

Key Point #2 – Setback

Straw bales placed at the toe of slopes should be set back at least 1 m (3 ft) from the toe. Where a 1 m (3 ft) setback is not practicable due to site conditions, the barrier may be constructed at the toe of the slope but should be placed as far from the toe as practicable to increase the ponding area and allow sediment to settle out.

Key Point #3 – Configuration

Straw bales should be placed in two rows back to back with a half-bale offset to cover the butted ends of the bales.

Key Point #4 – Cross Barriers

For straw bale barriers not on a level contour and for longer reaches, install cross barriers at a minimum of 150 m (500 ft) intervals to prevent concentrated flow.

Key Point #5 – Application Limitations

Straw bale barriers should not be used in areas subject to highly concentrated flows (Photo 1) such as channels or live streams as they may be easily overtaken or washed away. Straw bale barriers should not be used on paved surfaces, in lined ditches, or for drain inlet protection. Consider using sandbag barriers instead.

Photo 1

Key Point #6 – Durability Limitations

Straw bales fall apart when removed or degrade when left in place for extended periods. They can be labor intensive to install, remove, and maintain.

Key Point #7 – Inspection and Maintenance

Inspect straw bale barriers weekly and prior to and after rainfall events during the rainy season. Repair or replace broken or damaged bales as necessary. Remove accumulated sediment when it reaches 1/3 the barrier height. Repair washouts or other damage as needed or required. When no longer needed, remove barrier and accumulated sediment then clean, re-grade, and stabilize the area.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
There is excessive sediment accumulation.	Remove sediment. Apply Hydraulic Mulch (SS-3) or Straw Mulch (SS-6) or other BMP upstream to reduce sediment in runoff.
Concentrated flows causes erosion to occur behind barriers	Place cross barrier check dams behind the barrier. Make sure the barrier is along a level contour. Ensure that stakes are angled toward adjacent bales so that they are held down together.
Bottom of barrier is not properly keyed in.	Trench and replace bales and backfill.
Length of slope draining to barrier is too long. Slope shall be 30 m (100 ft) or less.	Shorten slope length using Fiber Rolls (SC-5) or equivalent.
Storage capacity is inadequate due to sediment buildup.	Remove accumulated sediment when it reaches 1/3 the height of the barrier.
There is insufficient ponding area.	Barrier should be installed with at least a 1 m (3 ft) setback from the toe of slope where possible. Divert flow at top of slope.
Erosion occurs around barrier ends.	Turn ends of barriers into the up-slope area.
Bale binding degrades and breaks.	Replace degraded bales. Place bales so that the bindings are parallel to the ground.
Barrier is not installed along level enough contour.	Reinstall barrier so that change in elevation does not exceed 1/3 the barrier height along its reach or install cross barriers.

Field Condition:	Common solutions are:
Slope draining to straw bale barrier is too steep. Slope shall be less than 1:10 (V:H).	Shorten slope length to 15 m (30 ft) or less using Fiber Rolls (SC-5) or equivalent. Increase setback of barrier from the toe of slope.
Straw bale barrier is installed in concentrated flow area.	Replace straw bale barrier with proper BMP such as Check Dams (SC-4), if appropriate.
Cross barriers are not installed or are installed incorrectly.	Place cross barriers on the receiving side of the barrier at a maximum separation of 150 m (500 ft). Cross barrier should be a minimum of 1/2 and a maximum of 2/3 the barrier height.

SC-10 STORM DRAIN INLET PROTECTION

Storm drain inlet protection is a practice to reduce sediment from storm water runoff discharging from the construction site prior to entering the storm drain system. Effective storm drain inlet protection allows sediment to settle out of water or filters sediment from the water before it enters the drain inlet. Storm drain inlet protection is the last line of sediment control defense prior to storm water leaving the construction site.

Applications

Where storm water surface runoff can enter a drain inlet
Where disturbed drainage areas have not yet been permanently stabilized
Where ponding will not encroach into traffic
Where the drainage area is 4 ha (10 ac) or less

Key Points

Key Point #1 – Identify Drain Inlets

Identify existing and/or planned storm drain inlets that have the potential to receive storm water runoff and discharge from the construction site. For those drain inlets that are to be protected, determine the most effective method to use. Consider drain inlet protection for active inlets that are downstream of DSAs.

Key Point #2 – Sandbag Barriers

A sandbag barrier (Photo 1) is the most common type of protection due to the flexibility of its use. Sandbag barriers are constructed by placing the bags around the inlet to create a holding area that allows suspended sediment to settle.

Photo 1

Key Point #3 – Filter Fence

A filter fabric fence (Photo 2) is effective in open areas where sheet flows are low and are not expected to exceed 0.14 m^3/s (0.5 cfs). Filter fabric fences are installed similarly to silt fences but are constructed to surround the inlet to create an enclosure. Use plastic sheeting or geotextile blankets to stabilize any DSAs within the enclosure to prevent sediment within the enclosed area from entering the inlet.

Photo 2

Key Point #4 – Sediment Traps

Excavated drop inlet sediment traps are typically used where relatively heavy flows are expected and overflow capacity is needed. A drain inlet sediment trap is constructed by excavating the soils surrounding the inlet to create a temporary trap that detains flows and allows suspended sediments to settle before storm water is discharged from the site.

Key Point #5 – Inspection

Inspect all inlet protection devices before and after storm events, at 24 hour intervals during extended storms, and weekly during the rest of the rainy season. Check storm drain inlet after several storms to determine if sediment is bypassing inlet protection devices.

Key Point #6 – Maintenance

Maintenance is critical to ensure that drain inlet protection remains functional. Remove accumulated sediment when it reaches 1/3 the barrier height or 1/3 the holding capacity. For barriers, replace broken or torn bags. For fences, repair/replace fencing material and re-stake fences that are damaged.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Excessive sediment is entering the inlet.	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that the barriers around the inlet are installed correctly. Sandbags need to be tightly abutted. Filter fence needs to be keyed in so that water goes through filter fabric and not under it. Ensure that disturbed soil inside the protective device is prevented from entering drain by covering with plastic.
Material from broken bags is entering inlet.	Clean out inlet. Remove broken bags and replace as necessary.
Ponded water causes a traffic concern.	Use alternative BMPs upstream. Remove drain inlet protection if necessary.

WIND EROSION CONTROL

WE-1 WIND EROSION CONTROL

Wind erosion control consists of applying water or other dust palliatives to prevent or alleviate dust nuisance. Dust control shall be applied in accordance with Caltrans standard practices.

Applications

On all exposed soils that are subject to wind erosion

Key Points

Key Point #1 – Dust Control Operation

Care should be taken when applying water (Photo 1) or palliative to prevent the washing of sediment offsite or into storm drains or receiving waters. Do not apply so much that runoff occurs.

Photo 1

Key Point #2 – Stockpile and Small Area Management

Cover small stockpiles or small DSAs as an alternative to applying water or dust palliative.

Key Point #3 – Palliative Application Rates

When applying palliatives or binders as a wind erosion control, refer to the manufacturer's recommendations for guidance.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Excessive dust leaves the site.	Increase frequency of water application. Consider using a palliative or binder on inactive areas.
Vehicles kick up dust.	Water more frequently. Limit vehicle speeds. Stabilize the roadway.
Watering for dust control causes erosion	Reduce water pressure on the water truck. Check watering equipment to ensure that it has a positive shutoff. Water less frequently.
Sprayed areas are ineffective at limiting dust.	Re-spray areas and ensure that the application rate is proper.

TRACKING CONTROL

TC-1 STABILIZED CONSTRUCTION ENTRANCE/EXIT

Stabilized construction access is a defined point of entrance/exit to a construction site that is stabilized to reduce the tracking of sediment (mud and dirt) onto public roads by construction vehicles. Stabilized construction entrances are an effective method for reducing tracking of sediment from the construction site.

Applications

As a preventive method instead of a treatment method (e.g., sweeping or dust control)
Where dirt or mud can be tracked onto public roads
Adjacent to water bodies
Where poor soils are encountered

Key Points

Key Point #1 – Design

Site conditions may dictate the design and need for access points. Design a stabilized construction entrance/exit to support the heaviest vehicles and equipment that will use it (Photo 1). The access point should be at least 15 m (50 ft) in length or four times the circumference of the largest construction vehicle tire, whichever is greater (Photo 2). Designate access points and require all employees, subcontractors, and others to use them.

Photo 1

Photo 2

Key Point #2 – Grading

Grade construction entrance/exit points to prevent runoff from leaving the construction site. Route runoff from entrances/exits through a sediment-trapping device before discharge.

Key Point #3 – Aggregate Characteristics

Stabilize the roadway with aggregate, AC, or PCC, depending on expected usage and site conditions. When access points are constructed from aggregate, aggregate should be 75 mm (3 in) to 150 mm (6 in) in diameter and at least 300 mm (1 ft) in depth. Place aggregate over a geotextile fabric.

Key Point #4 – Alternative Stabilization Methods

Alternative stabilization methods such as manufactured steel plates (Photo 3) or steel pipes/gratings require written approval of the Resident Engineer. The use of cold mix asphalt or AC grindings is not allowed.

Key Point #5 – Inspection and Maintenance

Inspect and maintain stabilized construction entrance/exit points. Routinely check for damage and effectiveness (Photos 4 and 5). Remove accumulated sediment (Photo 6) and/or replace stabilization material as needed.

Photo 3

Photo 4

Photo 5

Photo 6

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Access points require constant maintenance.	Select proper stabilization material or consider alternate methods for longevity, performance and site conditions.
Stabilization material (aggregate) is tracked onto roadway.	Limit larger vehicles from construction exit or use larger diameter material.
Aggregate material is being incorporated into soil.	Use geotextile fabric under base material.
Excessive sediment is tracked onto roadway.	Increase length of stabilized exit. Regularly maintain access area to remove sediment buildup.
Sediment-laden water is leaving the construction site.	Properly grade access point to prevent runoff from leaving site. Route runoff through a sediment-trapping device.
Sediment is being tracked from numerous locations.	Limit access points and require their use. Stabilize designated access points.

TC-2 STABILIZED CONSTRUCTION ROADWAY

A stabilized construction roadway is a temporary access road that connects existing public roads to remote construction areas. For storm water protection, it should be designed to control dust and erosion created by vehicular traffic.

Applications

Where displacement of soil occurs because of vehicular traffic during wet weather
Where dust control is a problem during dry weather
Adjacent to water bodies
Where poor soils are encountered

Key Points

Key Point #1 – Design

Site conditions may dictate the design and need for stabilized construction roadways. Design the roadway to support the heaviest vehicles and equipment that will use it. Grade the roadway to prevent runoff from leaving the construction site. This may require the construction of a drainage ditch to collect and convey runoff.

Key Point #2 – Stabilization Materials

Stabilize the roadway with aggregate, AC, or concrete, depending on expected usage and site conditions. Aggregate diameter should be between 75 mm (3 in) and 150 mm (6 in) and at least 300 mm (1 ft) in depth. Place aggregate over a geotextile fabric. The use of cold mix asphalt or AC grindings is not allowed.

Key Point #3 – Inspection and Maintenance

Inspect and maintain the stabilized construction roadway routinely. Re-grade the roadway as necessary. Check for damage and repair as necessary or as directed by the Resident Engineer.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Runoff leaves the site via the roadway.	Properly grade roadway so that runoff is kept on site. Install a drainage ditch along roadway to convey flows.
Roadway degrades or breaks up.	Re-grade roadway using material that will support the heaviest vehicles that will use the road. Stabilize roadway with AC, concrete base, aggregate, or equivalent.
Vehicles kick up dust.	Re-stabilize the roadway.

NON-STORM WATER MANAGEMENT

NS-1 WATER CONSERVATION

Water conservation involves the use of practices that reduce the amount of water used for a given activity. If less water is used, the potential for erosion decreases and the transport of construction-related pollutants offsite is less likely.

Applications

On all projects where water is used during the course of construction

Key Points

Key Point #1 – Watering Equipment

Watering equipment should be kept in good working order (Photo 1). Repair leaky watering equipment promptly.

Photo 1

Key Point #2 – Equipment Washing

Discourage the washing of vehicles and equipment on the construction site. Workers should never wash their personal vehicles on site. Vehicles and equipment that regularly leave the construction site should be washed offsite.

Key Point #3 –Paved Areas

Paved areas should be swept and vacuumed rather than washed off. Always protect storm drain inlets or receiving waters from sediment or other pollutants susceptible to non-storm water run-off. When possible, direct runoff water to areas where it can percolate into the ground.

Key Point #4 – Dust Control

When watering for dust control, ensure that watering operations do not cause erosion.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Water tank leaks from the outlet valve.	Repair the positive shutoff valve.
Watering equipment overflows during filling creating muddy and rutted areas.	Do not overfill. Use other BMPs to stabilize the roadway around the filling area e.g. Stabilized Construction Roadway (TC-2).
Paved areas are being washed with water.	Sweep and vacuum paved areas per Street Sweeping and Vacuuming BMP (SC-7).
Watering for dust control causes erosion.	Apply soil stabilization or dust palliative to slopes and reduce water frequency.

NS-2 DEWATERING OPERATIONS

This BMP is intended to prevent the discharge of pollutants from construction site dewatering operations associated with storm water (accumulated rain) and non-storm water (groundwater, water from a diversion or cofferdam, etc.). Dewatering effluent that is discharged from the construction site to a storm drain or receiving water is subject to the requirements of the applicable National Pollutant Discharge Elimination System (NPDES) permit. Refer to the *Caltrans Field Guide to Construction Site Dewatering* for detailed guidance for management of dewatering operations. The District Construction Storm Water Coordinator is also available for assistance.

Applications

On all projects where the discharge of water is to occur by mechanical means

Key Points

Key Point #1 – Management Alternatives

If possible, the contractor should consider managing dewatering without discharge to a storm drain or receiving water. Options include: (1) retaining the water on site for construction use or allowing water to evaporate/infiltrate, (2) discharging to the sanitary sewer with permission from the local agency; (3) discharging to an adjacent land or facility with permission of the owner, and (4) having the effluent transported and disposed of offsite using a Transportation, Storage & Disposal (TSD) contractor. If one of these management options is used, the water is not discharged to a storm drain or receiving water, and the operation is not subject to an NPDES permit.

Key Point #2 – Notify CSWC

If on-site management of the dewatering operation is not the selected option, contact the Construction Storm Water Coordinator (CSWC) before the dewatering operation commences.

Key Point #3 – Dewatering Under the Caltrans General NPDES Permit

In many areas of the state, uncontaminated storm water and minor discharges of non-storm water can be discharged to a storm drain or receiving water under the Caltrans General NPDES Permit. If the effluent is not visibly clear, it must be treated to remove sediment prior to discharge (Photo 1). All records related to the dewatering operation must be maintained with the project SWPPP and provided to the Regional Water Quality Control Board (RWQCB) upon request. Note that in RWQCB Region 1 and 2, no type of dewatering discharge to a storm drain or receiving water is authorized under the Caltrans NPDES Permit – a separate Regional dewatering permit is required.

Key Point # 4 – Dewatering Under a Regional Dewatering Permit

For all dewatering discharges in RWQCB Regions 1 and 2 (North Coast and San Francisco Bay areas), and for many discharges of non-storm water dewatering (Photo 2) in all other Regions, the RWQCB must approve a discharge to a storm drain or receiving water. The RWQCB may require the contractor to apply to discharge under a separate Regional dewatering permit or under a site-specific dewatering permit. Regional dewatering permits generally require the contractor to monitor (test) the dewatering effluent, to maintain monitoring records, and to submit reports to the RWQCB about the operation. Discuss dewatering requirements with the District Construction Storm Water Coordinator.

Photo 1

Photo 2

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Discharge of treated water causes erosion.	Install outlet protection or velocity dissipation device (SS-10).
Treatment unit fills with sediment.	Remove sediment when unit reaches 1/3 its capacity to preserve settling efficiency.
Dewatering discharge flow is higher than expected.	Alter the treatment unit to handle increased flow. Notify the RWQCB and District Construction Storm Water Coordinator of the increased flow before resuming dewatering operation.
Water spread on the construction site is not infiltrating fast enough and is entering the storm drain system or receiving water.	Stop dewatering. Install a sediment treatment system and test discharge as necessary.

NS-3 PAVING AND GRINDING OPERATIONS

Paving and Grinding Operations include the handling of materials and wastes and the use of equipment associated with pavement preparation, paving, grinding, removal, surfacing, resurfacing, thermoplastic striping, and placing pavement markers.

Application

During pavement grinding and removal
During PCC paving
During AC paving and resurfacing
During placement of thermoplastic striping and pavement markers

Key Points

Key Point #1 – Asphalt Concrete (AC)

Remove or dispose of grindings and wastes as work progresses. Place AC pieces in embankments above the water table and cover with plastic until they are removed from the site. Remove wastes from the site immediately.

Key Point #2 – AC Equipment

Coat AC equipment with non-toxic non-foaming products. Clean equipment (Photo1) offsite whenever possible. When paving equipment is kept onsite, place paving equipment on plastic sheeting to capture drips or leaks (Photo 2). Dispose of hardened AC properly.

Photo 1

Photo 2

Key Point #3 – Wastes

Do not allow wastes, such as AC pieces, PCC grinding residue/slurry (Photo 3), sand/gravel, exposed aggregate concrete residue, or dig-out materials into storm drains or receiving waters. Sweep, vacuum, and collect such wastes and recycle or dispose of properly.

Photo 3

Key Point #4 – Seal Coats

Do not apply seal coat, tack coat, slurry seal, or fog seal if rain is predicted during the application or curing period. Do not conduct digout operations in the rain. During application of seal coat, tack coat, slurry seal, or fog seal, cover drainage inlets and manhole covers with filter fabrics. Do not apply these materials in the rain.

Key Point #5 – Thermoplastic Striping

Verify that equipment shut-off valves function properly to avoid thermoplastic leakage. Do not pre-heat, transfer, or load thermoplastic near storm drains or receiving waters. When filling the pre-heater, leave 150 mm (6 in) of space at the top of the container to prevent spills when the equipment is moved. Clean truck beds daily and recycle thermoplastic material when possible.

Key Point #6 – Raised/Recessed Pavement Markers

Do not transfer or load bituminous materials near storm drains or receiving waters. Verify that all pressure is released before filling melting tank. When filling the melting tank, leave 150 mm (6 in) of space at the top of the container to prevent spills when the equipment is moved.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Paving equipment leaks while parked.	Clean up spilled or leaked material. Place drip pans, plastic sheeting or absorbent materials under parked equipment when not in use.
Loose gravel and sand deposit on roadway from paving operations.	Sweep streets when practical. Minimize washing. If washing is necessary, protect inlets and receiving waters during operations.
Water residue from grinding and saw cutting operations enters inlet.	Clean inlet and recover as much material as possible. Use a vacuum attachment to capture concrete slurry residue. Block inlet. Notify the District Construction Storm Water Coordinator about the potential for a non-compliant incident.
Seal coat, tack coat, and fog seal wash off streets.	Allow for proper curing time before rain events. Do not apply before or during predicted rainfall. Protect drain inlets.
Operators use diesel fuel to clean equipment.	Use only non-toxic substances to coat and clean paving and transport equipment.
Seal coat, tack coat, and fog seal enter inlets.	Clean inlets and collect as much material as possible. Cover inlets with filter fabric. Notify the District Construction Storm Water Coordinator about the potential for a non-compliant incident.

NS-4 TEMPORARY STREAM CROSSING

A temporary stream crossing is a structure placed across a waterway that allows construction traffic to cross without contacting the water. Typical types include culvert crossings, ford crossings, and bridge crossings. Temporary stream crossings prevent streambed erosion and downstream sedimentation due to construction traffic.

Applications

Where appropriate permits have been secured
Where construction equipment or vehicles must cross a waterway (ephemeral or perennial)

Key Points

Key Point #1 – Permits

Verify that applicable permits have been obtained before the stream crossing is installed. Required permits may include RWQCB 401 Certification, U.S. Army Corps of Engineers 404 Permit, and/or Department of Fish and Game 1601 Agreement. Verify that applicable pre-installation water sampling/testing has been completed before, and possibly during, installation.

Key Point #2 – Design

Verify that the structure design has been prepared under the direction of and approval of a registered civil and/or structural engineer. The structure should not constrict waterway flow such that backups or washouts occur during flood events. Culverts are acceptable for perennial or intermittent streams and can accommodate heavy equipment loads. Fords are the least expensive but are acceptable only for dry washes/ephemeral streams during the dry season. Bridges (Photo 1) are the most expensive but are appropriate for high velocity/steep gradient streams or where restrictions in the waterway channel are not allowed.

Photo 1

Key Point #3 – Installation

Construct crossings during the dry season. Stabilize adjacent construction roadways, work areas, and streambeds to prevent erosion. Minimize disturbance or removal of adjacent vegetation. If riparian vegetation is disturbed for construction of the stream crossing, the vegetation should be cut no lower than ground level and covered with a layer of clean river cobble.

Key Point #4 –- Use

Vehicles are not to be operated, stored, fueled, or maintained in wet or dry portions of a waterway without authorization of the Resident Engineer or as authorized by the Fish and Game Permit. Drip pans must be placed under all vehicles/equipment on temporary stream crossing structures that remain idle for more than one hour. Being in such close proximity to a watercourse, this BMP, and others implemented with it, must be installed correctly and maintained to prevent any discharge. Any incident of discharge requires submittal of a Notice of Non-Compliance.

Key Point #5 – Inspection and Maintenance

Inspect temporary stream crossings weekly and after significant rain events for water flow blockage, sediment buildup, trapped debris, structural damage, riprap displacement, or streambed erosion. Verify that sediment buildup is removed regularly and that riprap/aggregate is replaced as needed to prevent erosion and maintain stability of adjacent areas.

Key Point #6 – Removal

Ensure that temporary stream crossings are removed promptly when no longer needed. Remove river cobble from disturbed riparian vegetation to ensure rapid re-growth.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Slopes of temporary earthen crossing erodes.	Place rock layer on slope sides. Stabilize roadway at crossing.
Sediment and debris block culvert inlet.	Remove sediment and debris as necessary to keep pipe open.
Pipe outlet causes erosion.	Stabilize outlet with riprap or flared end section.
Overtopping occurs.	Incorrect design. Redesign crossing and obtain approval (stamp) of registered civil and/or structural engineer.

NS-5 CLEAR WATER DIVERSION

A clear water diversion is a system of structures that intercepts surface water from a running stream or waterway upstream of a project, transports it around the construction site, and discharges it downstream of the site, with minimal water quality impacts. Typical structures used for clear water diversions include diversion ditches, berms, dikes, slope drains, coffer dams, pipes, and drainage and interceptor swales.

Applications

Where appropriate permits have been secured
Where work must be performed in an active drainage system, a running stream, or a water body

Key Points

Key Point #1 – Permits

Verify that applicable permits have been obtained before the diversion is installed. Required permits may include RWQCB 401 Certification, U.S. Army Corps of Engineers 404 Permit, Department of Fish and Game 1601 Agreement, and/or Federal Emergency Management Agency requirements. If required by a permit, verify that applicable pre-installation water sampling/testing has been completed before, and possibly during, installation.

Key Point #2 – During Design

The structure should not constrict waterway flow such that backups or washouts occur due to fluctuations in water depth or flow volume. Materials used to construct diversion structures must be free of potential pollutants such as soil, silt, sand, clay, grease, or oil. At all times during construction, operation, maintenance, and removal, sufficient water flow/volume must be diverted to maintain downstream aquatic life (Photo 1).

Photo 1

Key Point #3 – During Construction

When possible, construct diversion structures during periods of low or no stream flow. Minimize disturbance and removal of adjacent vegetation. If riparian vegetation is disturbed for construction of the diversion, the vegetation should be cut no lower than ground level and covered with a layer of clean river cobble. The exterior of vehicles and equipment in wet areas of the diversion construction site should be free of petroleum residues and sealed so as to prevent leakage of fuels and oils into the water body if submerged. Only the bucket of an excavator/backhoe may operate in a water body. The main body of the equipment is not to enter the water portions of the water body except to cross the stream to access the work site.

Key Point #4 – Operation

Barriers should be installed to prevent muddy water from flowing from adjacent construction activity to the stream. Drip pans must be placed under all stationary equipment and vehicles located over water diversions that remain idle for more than one hour. Being in such close proximity to a watercourse, this BMP, and others implemented with it, must be installed correctly and maintained to prevent any discharge. Any incident of discharge requires submittal of a Notice of Non-Compliance.

Key Point #5 – Inspection and Maintenance

Inspect diversion structures weekly and after significant rain events for damaged linings, sediment buildup, trapped debris, or

reduced slope protection. Ensure that debris is removed and linings are repaired promptly.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Vehicles and equipment parked over water bodies leak fluids.	Place drip pans under all vehicles and equipment that are placed on structures over water bodies that will be idle for more than one hour.
Erosion occurs along diversion path.	Protect diversion from erosion. Use rock, gravel, pipe or other BMP to protect diverted waterway.

NS-7 POTABLE WATER/IRRIGATION

Non-storm water discharges that originate from onsite and offsite sources must be properly managed to reduce the potential for pollutants being discharged from the construction site. Sources of these non-storm waters include broken water lines, landscape irrigation, lawn watering, water line flushing, and fire hydrant flushing.

Applications

All projects susceptible to the above-listed and other non-storm water discharges from the construction site

Key Points

Key Point #1 – Divert Flows

Where possible, direct potable/irrigation water originating from offsite sources around the construction site or through the site in a way that minimizes contact with construction activities.

Key Point #2 – Onsite Irrigation

Inspect irrigated areas on the construction site for excessive watering (Photo 1). Adjust watering schedules to ensure landscaping receives adequate water but minimizes associated runoff. Promptly shut off water to broken lines, sprinklers, or valves and repair as needed.

Photo 1

Key Point #3 – Water Conservation

Reuse water from line flushing for landscape irrigation.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Irrigation line breaks and causes erosion.	Shut off water to broken lines. Protect downstream drain inlets or receiving waters by implementing sediment control BMPs. Repair or replace lines and repair erosion.
Water from irrigation operations causes runoff or erosion.	Adjust watering schedule and times. Turn off sprinklers when they are no longer necessary to maintain vegetation. Ensure that the irrigation system is operating correctly by verifying that sprinklers are directed appropriately and are not broken or leaking.
Discharge from line flushing causes erosion.	Discharge water into a stabilized area or temporary sediment trap. Reuse water when practical.

NS-8 VEHICLE AND EQUIPMENT CLEANING

Wash water from vehicle and equipment cleaning is not to be discharged from construction sites because the rinse water may contain contaminates such as sediment, petroleum/lubricant residues, soaps, or solvents that could enter storm drain systems or receiving waters.

Applications

All construction sites

Key Points

Key Point #1 – Offsite Cleaning

Equipment/vehicle cleaning should be conducted offsite. All vehicles that regularly enter and leave the construction site must be cleaned offsite.

Key Point #2 – Onsite Cleaning

For equipment that must be cleaned on site, the Resident Engineer must be notified in advance. All waste from onsite cleaning operations must be fully contained and disposed of outside the highway right-of-way.

Key Point #3 – Wash Area Requirements

The vehicle wash area must be properly identified by sign (Photo 1) and located away from storm drain inlets, drainage facilities, and watercourses. It must be paved with concrete (Photo 2) or asphalt and have a berm to contain runoff and prevent run-on. It must be equipped with a sump for the collection and disposal of wash water.

Photo 1

Photo 2

Key Point #4 – Water Conservation

Use as little water as possible and use a positive shut-off valve to conserve on water usage.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Workers clean personal vehicles on site.	Personal vehicles and work trucks and/or equipment that regularly leave the site shall be cleaned offsite.
Wash water leaves the site.	Contain wash water in a bermed area and dispose of water outside the right-of-way.
Washing occurs on a pervious surface.	Contain water in a concrete or paved bermed area. Place a sump in the wash area and transfer wash water to sanitary sewer system or temporary sediment trap. Never discharge wash water to storm drains or receiving waters.
Vehicle fluids are spilled onto the washrack.	Clean up spilled material and dispose of properly. Contain contaminated water and dispose of properly. Do not allow spilled material to flow to storm drain system.

NS-9 VEHICLE AND EQUIPMENT FUELING

Potential fuel spills and leaks from vehicle/equipment fueling operations must be prevented from entering storm drain systems or receiving waters.

Applications

All construction sites

Key Points

Key Point #1 – Fuel Offsite

All vehicles and equipment that regularly enter and leave the construction site should be fueled offsite.

Key Point #2 – Fueling Area Location

Designated fueling areas are selected by the contractor and approved by the Resident Engineer. The fueling area should be on level grade and must be at least 15 m (50 ft) downstream of storm drain facilities or receiving waters. The fueling area should be protected by a berm or dike to prevent storm water run-on and to prevent storm water from leaving the fueling area (Photo 1).

Photo 1

Key Point #3 – Spill Response

Absorbent spill clean-up materials and spill kits must be available in fueling areas and on fueling trucks. Spills should be cleaned up immediately. Absorbent materials should be used on small spills. All used absorbent materials must be disposed of properly.

Key Point #4 – Leak Containment

Drip pans or absorbent pads must be placed under vehicles/equipment if being fueled in areas other than a dedicated fueling area with an impermeable surface (Photo 2).

Photo 2

Key Point #5 – Fueling Guidelines

Fueling operations are not to be left unattended. Fuel tanks are not to be topped off. Mobile fueling trucks must also follow BMP guidelines.

Key Point #6 – Fuel Nozzles

Fuel nozzles are to be equipped with automatic shut-off to control drips. Where required by Air Quality Management Districts, vapor recovery nozzles shall be used.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Vehicles and equipment leak fuel.	Do not top off vehicle fuel tanks. Repair immediately or remove problem vehicles or equipment from the project site.
Fueling tanks are not stored in temporary containment facilities.	Place fuel tanks in bermed temporary containment facility.
Fuel spills on ground.	Use absorbent material to clean up spill and dispose of used clean-up materials properly. Never hose down or bury spills. If fuel spills on soil, clean up contaminated soil and dispose of properly.

NS-10 VEHICLE AND EQUIPMENT MAINTENANCE

Petroleum products, lubricants, solvents, and other pollutants related to vehicle/equipment maintenance must be prevented from entering storm drain systems or receiving waters.

Applications

All construction sites

Key Points

Key Point #1 – Offsite Storage and Maintenance

All vehicles and equipment that regularly enter and leave the construction site should be maintained offsite.

Key Point #2 – Maintenance Area Design

Designated vehicle maintenance areas must be at least 15 m (50 ft) downstream of storm drain facilities or receiving waters. For long-term projects, a portable tent or cover over the maintenance area is recommended.

Key Point #3 – Maintenance Operations

For maintenance involving fluids, place drip pans or absorbent pads under the vehicle unless the work is being done in a dedicated maintenance area constructed over an impermeable surface.

Key Point #4 – Spill Prevention/Cleanup

All fluid and oil leaks must be cleaned up immediately. The maintenance area must be equipped with appropriate absorbent spill clean-up materials (Photo 1).

Photo 1

Key Point #5 – Waste Disposal

All used absorbents must be disposed of properly. Waste fluids must be placed in appropriate leak-free containers with secondary containment. All used maintenance materials should be disposed of properly off the construction site. Used fluids, tires, batteries, etc. are not to be dumped or buried on the construction site.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Used batteries are stored on the ground.	Remove batteries from site or place them in a temporary containment facility.
Used oil, filters, and vehicle fluids are stored onsite.	Place used materials in a temporary containment facility and schedule regular pickups to dispose of these materials.
Vehicles and equipment leak fluids onto the ground.	Clean up spills on pavement with absorbent. Clean up contaminated soil. Dispose of clean-up waste properly. Place drip pans or absorbent materials under parked vehicles and equipment. Repair equipment and vehicles immediately or remove from the project site.
Absorbent spill clean-up materials are not kept onsite.	Instruct contractor to keep an ample supply of absorbent clean-up materials on site at all times during maintenance operations.
Run-on flows onto the maintenance area.	Construct a berm, dike, or temporary diversion structure around maintenance facility.

NS-11 PILE DRIVING OPERATIONS

Proper control and use of equipment, materials, and waste products from pile driving operations will reduce the discharge of potential pollutants to the storm drain system or watercourse.

Applications

All construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving operations take place.

Key Points

Key Point #1 – Be Prepared

Use drip pans or absorbent pads at all times. However, the equipment should be as leak-free as possible. Have spill kits and clean-up materials available at all pile driving locations. Implement other BMPs as applicable. Always comply with all applicable permits.

Key Point #2 – Equipment Use

Park equipment over plastic sheeting or equivalent. Plastic sheeting is not a substitute for drop pans or absorbent pads. Use less hazardous products, e.g. vegetable oil, when practicable.

Key Point #3 – Equipment Storage

Store pile driving equipment away from flowlines, drainage courses, and inlets. Protect hammers and other hydraulic attachments from run-on by placing them on plywood. Cover them with plastic when rain is forecast.

Key Point #4 – Inspection and Maintenance

Inspect entire pile driving areas and equipment (Photo 1) for leaks and spills on a daily basis. Inspect equipment routinely for damage and repair equipment as needed.

Photo 1

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Used oil, filters, and fluids are stored onsite.	Place used materials in a temporary containment facility and schedule regular pickups to dispose of these materials.
Equipment leaks fluids onto the ground.	Clean up spills on pavement with absorbent. Clean up contaminated soil. Dispose of clean-up waste properly. Place drip pans or absorbent materials under parked equipment. Repair equipment immediately or remove from the project site.
Absorbent spill clean-up materials are not kept onsite.	Instruct contractor to keep an ample supply of absorbent clean-up materials on site at all times during pile driving operations.

NS-12 CONCRETE CURING

Following proper procedures in the use of cure, chemical or water, during construction of concrete structures will minimize pollution through run-off.

Applications

All construction sites where concrete structures are subject to curing requirements.

Key Points

Key Point #1 – Use of Chemical Cure

Protect drain inlets prior to application of cure. Use proper storage and handling techniques at all times and have spill kits available at the location of curing. .Avoid over-spraying cure, allowing it to become airborne.

Key Point #2 – Use of Water Cure

Ensure cure water does not flow to inlets or watercourses but rather to collection areas for infiltration or other means of removal approved by the RE and in accordance with all applicable permits.

Key Point #3 – Inspection and Maintenance

Ensure that cure is stored (Photo 1), handled, and used properly. Ensure that the Contractor keeps cure containers leak-free and spray nozzles clean.

Photo 1

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Cure containers are not in secondary containment.	Place materials in a temporary containment facility and store in permanent secondary containment when no longer in use.
Chemical cure is becoming airborne.	Ensure that the cure is applied close to the concrete surface to minimize cure becoming airborne.
Absorbent spill clean-up materials are not kept onsite.	Instruct contractor to keep an ample supply of absorbent clean-up materials on site at all times.
Temporary diversion devices that collect cure water needs maintenance.	Ensure the contractor is aware of the situation. If maintenance is not done, inform the RE.

NS-13 MATERIAL AND EQUIPMENT USE ON WATER

Following proper procedures in the use, storage, and disposal of materials and equipment on barges, boats, docks, temporary construction pads, or similar location will minimize or eliminate the discharge of potential pollutants to a watercourse.

Applications

All sites where materials and equipment are used on barges (Photo 1), boats, docks, and other platforms over or adjacent to a watercourse.

Photo 1

Key Points

Key Point #1 – Be Prepared

Use drip pans and absorbent materials under equipment and vehicles expected to be idle more than one hour. Ensure that an adequate supply of spill clean-up materials is available. Identify types of spill control measures to be employed, including the storage of necessary clean-up materials and equipment.

Key Point #2 – Be Aware

Ensure NS-10 is implemented. If repairs cannot be made, remove the equipment from over the water. Ensure compliance with all other permits associated with the project.

Key Point #3 – Secure the Area

Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris form leaving the barge,

platform, dock, etc. Secure all materials to prevent discharge to the watercourse via wind.

Key Point #4 – Inspection and Maintenance

Ensure timely and proper removal of accumulated waste. Inspect equipment for leaks and spills on a daily basis and ensure necessary repairs are done. Ensure proper procedures of storage and use of materials and equipment are being followed. Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the watercourse.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
A discharge to the watercourse occurs.	Report the discharge to the RE immediately. Clean up the discharge as much as possible. Determine the cause and secure the area.
A spill occurs without discharging into the watercourse.	Deploy spill clean up kits and supplies.
Vehicles and equipment parked over water bodies leak fluids.	Place drip pans under all vehicles and equipment that are placed on structures over water bodies that will be idle for more than one hour.

NS-14 CONCRETE FINISHING

Following proper procedures in performing concrete finishing methods will minimize the impact of potential pollutants on runoff.

Applications

All sites where concrete finishing operations are performed.

Key Points

Key Point #1 – Containment

Ensure containment of all waste materials from high-pressure water blasting, sandblasting, grinding, etc. Without containment or water suppression of particles, these operations can become problems (Photo 1).

Photo 1

Key Point #2 – Disposal

Refer to NS-2, "Dewatering" and the Dewatering Manual for options. Ensure disposal method is approved by the RE and is in compliance with applicable permits in advance of disposal.

Key Point #3 – Secure the Area

Protect all inlets that may be affected by any concrete finishing work. Direct any water, through non-erodible methods, to collection areas for infiltration or other disposal means.

Key Point #4 – Inspection and Maintenance

Inspect containment structures prior to use, during use, and prior to rainfall. If any repairs are required, ensure these are done in a timely manner and especially before a rain event. After use or at the end of the shift, ensure containment structures and general work area are clean and the wastes are disposed of properly.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Concrete finishing waste materials are not contained or cleaned up.	Ensure the Contractor knows he must contain all finishing wastes and remove them from the project in a timely manner.
Inlets are not protected.	Ensure all inlets that may be affected are protected during concrete finishing.
Containment structure is inadequate.	Ensure the Contractor is aware of the situation and makes any necessary repairs or maintenance immediately.

NS-15 STRUCTURE DEMOLITION/REMOVAL OVER OR ADJACENT TO WATER

Following proper procedures during structure demolition or removal operations will protect watercourses from debris and wastes associated with these operations.

Applications

All construction projects with full or partial structure demolition or removal, e.g bridge widenings, concrete channel removal, etc.

Key Points

Key Point #1 – Containment

Use attachments on construction equipment to catch debris or use covers or platforms to collect debris and prevent it from falling into the watercourse. Debris catching devices must be emptied regularly and the debris stored away from the watercourse and protected until removal.

Photo 1

Key Point #2 – Disposal

Dispose of accumulated debris in a timely manner and at an approved disposal site. For hazardous waste disposal, refer to WM-6.

Key Point #3 – Inspection and Maintenance

Inspect equipment and any debris catching devices on a daily basis. Ensure any stockpiles are protected and disposed of

properly. Any discharge must be reported to the RE immediately.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
A discharge to the watercourse occurs.	Report the discharge to the RE immediately. Clean up the discharge as much as possible. Determine the cause and secure the area.
A spill occurs without discharging into the watercourse.	Deploy spill clean up kits and supplies.
Vehicles and equipment parked over water bodies leak fluids.	Place drip pans under all vehicles and equipment that are placed on structures over water bodies that will be idle for more than one hour.
Debris falls into the watercourse.	Remove as much as possible with the available means, e.g. floating booms.
Inlets are not protected.	Ensure all inlets that may be affected are protected during concrete finishing.
Containment structure is inadequate.	Ensure the Contractor is aware of the situation and makes any necessary repairs, maintenance, or modification immediately.

NS-16 TEMPORARY BATCH PLANTS

Proper control and use of equipment, materials, and waste products from temporary batch plant facilities will reduce the potential of pollutant discharges to storm drain systems and/or watercourses, reduce air emissions, and mitigate noise impacts.

Applications

Construction projects where temporary batch plant facilities are used. Batch plants may be on or off site.

Key Points

Key Point #1 – Planning

A Notice of Intent (NOI) must be submitted to the SWRCB for construction and operation of a temporary batch plant. Consideration for minimizing nuisance noise and impacts to air and water quality should be observed during construction and operation. Appropriate BMPs must be implemented within the boundaries of the batch plant in accordance with the approved SWPPP.

Key Point #2 – Layout and Design

Batch plants should be located at least 300 ft away from any recreational area, school, residence, or other structure not associated with the construction project. AC or PCC berms should be constructed around plant equipment to facilitate proper containment and cleanup. Runoff should be directed to a collection area or baker tank.

Key Point #3 – Operational Procedures

Designate a concrete washout area in accordance with WM-8. All operations should be conducted so as to have no visible emissions including fabric or cartridge type filters for dry material transfers, dust-tight service hatches on silos and auxiliary bulk storage trailers, wet suppression systems at all transfer points, and covered conveyors and transporting vehicles. All plant roads shall be stabilized, watered, treated, or paved so as to control dust and tracking. All entrances and exits shall likewise be stabilized.

Key Point #4 – Materials Storage and Disposal

Refer to WM-1, "Material Delivery and Storage" as well as WM-2, "Material Use" for proper handling procedures and secondary containment requirements. All stockpiles within the batch plant boundaries shall be in accordance with WM-3, "Stockpile Management." Refer to WM-4, 5, 8, and 10 for further discussion of handling and disposal of wastes.

Key Point #5 – Inspection and Maintenance

Inspect batch plant equipment, components, and BMPs daily during construction and operation.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Cement transfer to silos produces excessive dust.	Check fabric or filter at transfer point and repair if necessary.

NS-17 STREAMBANK STABILIZATION

Proper planning and procedures for work in and around streams and channels can reduce the potential for discharge of sediment and other pollutants and minimize the impacts of construction activities on watercourses and habitat.

Applications

Construction projects that disturb or occur within stream channels and associated riparian areas.

Key Points

Key Point #1 – Planning

Planning should consider scheduling, avoidance of in-stream construction, minimizing disturbance area and construction time, using pre-disturbed areas, selecting crossing location, and selecting equipment.

Key Point #2 – Associated BMP Selection for Streambanks

Preservation of existing vegetation (SS-2) in a streambank provides water quality protection, streambank stabilization, and riparian habitat. Hydraulic mulch (SS-3), hydroseeding (SS-4), soil binders (SS-5), straw mulch (SS-6), or a combination may be used on disturbed streambanks to provide temporary soil stabilization. Be sure to review the limitations of each so that a selection of the most appropriate one for the given conditions may be made. Also consider possible use of other soil stabilization and sediment control BMPs provided the application is appropriate and the limitations are not applicable.

Key Point #3 – In-stream Sediment Control

The primary goal while working in a stream is minimizing turbidity. There are three general ways to achieve this: construct a water diversion away from the work area, implement a water barrier around the work area, or employ practices that minimize sediment suspension.

Key Point #4 – Inspection and Maintenance

Inspect BMPs and equipment daily and ensure necessary repairs for both are done in a timely manner. If a piece of equipment leaks, remove it from the stream immediately for repairs.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Equipment in stream leaks fluids.	Remove it immediately for repairs.
Erosion occurs along the streambank.	Use appropriate BMP to stabilize streambank or repair/replace current materials as necessary.

WASTE MANAGEMENT AND MATERIALS POLLUTION CONTROL

WM-1 MATERIAL DELIVERY AND STORAGE

Materials associated with construction activities must be delivered and stored using practices that prevent these materials from polluting receiving waters. Typical materials include PCC components, petroleum products, pesticides, herbicides, fertilizers, detergents, plasters, acids, lime, glues, adhesives, paints, and solvents.

Applications

All construction sites with applicable material storage

Key Points

Key Point #1 – Storage Areas

Store materials indoors in existing structures when available. Temporary storage sheds must meet building and fire code requirements and should be located away from vehicle traffic. Storage instructions should be posted (Photo 1), and employees should be trained in proper storage and delivery procedures.

Key Point #2 – Hazardous Materials

Do not store hazardous materials directly on the ground. Store liquid chemicals in drums and bags on pallets under cover and in secondary containment. Store materials in original containers with their original product labels (Photo 2).

Photo 1

Photo2

Key Point #3 – MSDS

The contractor must provide the Resident Engineer with the Material Safety Data Sheets (MSDS) for all materials stored on the site.

Key Point #4 – Liquid Materials and Petroleum Products

Do not store incompatible materials in the same temporary storage facility. Allow sufficient space between stored containers to allow for spill cleanup and emergency response access.

Key Point #5 – Containment

Temporary containment facilities for storage must be of sufficient volume 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. (Photo 3). Accumulated rainwater or spills should be removed from containment areas promptly.

Photo 3

Key Point #6 – Bagged/Boxed Materials

Store materials delivered in bags and boxes on pallets. Cover bagged/boxed materials on non-working days and prior to rain events to protect materials from wind and precipitation.

Key Point #7 – Spill Cleanup

Contain and clean up spills immediately in accordance with BMPs detailed in Spill Prevention and Control (WM-4).

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Hazardous materials are not stored in temporary containment devices.	Place hazardous materials in an appropriate temporary containment facility.
Hazardous substances are not labeled.	Re-label items with an original label or remove substances from the site.
Hazardous chemicals, drums, or bagged materials are stored directly on the ground.	Place material on a pallet and when possible, under cover and in temporary containment.
Temporary containment facilities have standing water in them.	Pump out standing water into a containment device and dispose of properly. The water should be tested for possible pollutants and disposed of properly.
Materials are stored outside.	Place materials on a raised platform and cover as needed to provide run-on and runoff control.
Incompatible materials such as chlorine and ammonia are stored together.	Place incompatible materials in separate temporary storage facilities.
Temporary containment facilities are not covered.	When practicable, cover containment facilities at all times. At a minimum, cover containment facilities on non-working days and prior to rain events.
There are no spill clean-up materials onsite.	Instruct contractor to purchase an ample supply of clean-up materials for materials being stored onsite and keep them close to the temporary storage areas.

WM-2 MATERIAL USE

Materials associated with construction activities must be used in accordance with practices that prevent them from polluting receiving waters. Typical materials include AC, PCC, PCC compounds, petroleum products, pesticides, herbicides, fertilizers, detergents, plasters, acids, lime, glues, adhesives, paints, solvents, and curing compounds.

Applications

All construction sites with applicable material uses

Key Points

Key Point #1 – MSDS

The contractor must provide the Resident Engineer with the Material Safety Data Sheets (MSDS) for all materials used on the site.

Key Point #2 – Paint Materials

Mix paint indoors or in a containment area. Allow time for drying before rain events. Never clean brushes or rinse equipment so waste water enters street, gutter, storm drain, or receiving water. Items used with water-based paint can be cleaned, discharging rinse water to a sanitary sewer. When dry, empty latex paint cans, brushes, etc. can be disposed of with other construction debris. Filter used paint thinner/solvents and reuse. Paint thinners and solvents that cannot be recycled must be disposed of as hazardous waste.

Key Point #3 – Landscaping-Related Products

The contractor must complete a “Report of Chemical Spray Form” when spraying herbicides and pesticides. Products must be applied by a licensed applicator. Do not over-apply fertilizers or pesticides and follow product usage recommendations. Apply in small amounts, allowing time for product to work in or dry before rain events.

Key Point #4 – Spill Cleanup

Maintain spill clean-up materials near areas that products will be used.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Improper disposal of waste water from washing paint brushes occurs.	When practicable, wash paint brushes in a drain that is connected to a sanitary sewer system or into a concrete washout pit or temporary sediment trap.
Paint mixing occurs onsite.	Mix paints indoors or in a containment area.
Disposal of latex paint occurs onsite.	Collect all excess paint. Paint cans, brushes, rags, absorbent materials, and rags, when thoroughly dry, may be disposed of with other construction debris.
Paint thinner or solvent is spilled during use.	Clean up spills on pavement with absorbent. Spills on soil should be cleaned up by removing contaminated soil and disposing of properly.

WM-3 STOCKPILE MANAGEMENT

Construction stockpiles of materials such as soil, PCC, AC, PCC/AC rubble, aggregate base, aggregate sub-base, and asphalt based cold-mix have the potential to pollute receiving waters if not protected from contact with storm water.

Applications

All construction sites with applicable stockpiles

Key Points

Key Point #1 – General Guidelines

Stockpile protection is a year-round requirement. Install temporary barriers around stockpile perimeters to prevent contact with storm water when required. Temporary barriers can be berms, dikes, silt fences (Photo 1), straw bales, or sandbag barriers. All active stockpiles are to be protected by linear sediment barriers prior to rain events.

Key Point #2 – Soil Stockpiles

During the rainy season, cover inactive soil stockpiles (Photo 2) or protect them with soil stabilization at all times (Photo 3). During the non-rainy season, cover inactive soil stockpiles or protect them with linear barriers prior to rain events.

Photo 1

Photo 2

Key Point #3 – Paving Material Stockpiles

During the rainy season, cover inactive stockpiles of PCC, AC, AC/PCC rubble, and aggregate base and sub-base, and protect with a temporary perimeter barrier at all times. During the non-

rainy season, cover inactive stockpiles or protect with a linear barrier prior to rain events.

Key Point #4 – Asphalt Based Cold-Mix Stockpiles

Place active and inactive cold-mix stockpiles on plastic and cover with plastic prior to rain events (Photo 4). The key is to prevent contact between rainfall and run-on with the stockpiles.

Photo 3

Photo 4

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Soil stockpile erodes.	Cover stockpile with plastic sheeting or spray with a soil stabilizer. Protect with a temporary perimeter sediment barrier around the stockpile.
Stockpile is in flow line.	Remove stockpile from drainage path or protect with a berm, dike, or temporary diversion device.
Storm water run-on impacts the stockpile.	Protect the stockpile by using temporary perimeter sediment barriers such as berms, dikes, silt fencing, or sandbags.
Wind causes erosion and or blowing dust.	Cover stockpile or spray with a soil stabilizer. Use a water application to suppress dust.
Cold-mix stockpile is on the bare ground.	Remove stockpile and place on plastic or comparable material.
Cold-mix is stored in curb drainage way.	Remove stockpile from flow line.

WM-4 SPILL PREVENTION AND CONTROL

Spill prevention and prompt appropriate spill response reduces the potential for polluting receiving waters with spilled contaminants. Spills of concern include chemicals and hazardous wastes such as soil stabilizers/binders, dust palliatives, herbicides, growth inhibitors, fertilizers, de-icing products, fuels, lubricants, paints, and solvents.

Applications

All construction sites where chemicals or hazardous materials are stored or used

Key Points

Key Point #1 – Spill Types

Be prepared for spills. Locate and clearly label spill kits and used absorbent containers (Photo 1). Respond to all spills immediately upon discovery. The appropriate spill response is determined by the quantity and/or composition of spilled substance, as follows:

- A “minor spill” involves a small quantity of oil, gas, paint, etc. that can be controlled by the first responder upon discovery of the spill.
- A “semi-significant spill” can be controlled by the first responder with the aid of other personnel and may require cessation of all other activity.
- A “significant/hazardous spill” is a spill that cannot be controlled by personnel in the immediate vicinity.

Photo 1

Key Point #2 – Minor Spill Response

- Contain the spill.
- Recover the spilled material.
- Clean the spill area. Use absorbent materials. Do not hose down the area.
- Dispose of clean-up materials appropriately.

Key Point #3 – Semi-Significant Spill Response

- On impermeable surfaces, surround the spill with absorbent material to contain it. Clean spill using absorbent material.
- On dirt areas, construct an earthen dike to contain the spill. Dig up contaminated soil and dispose of properly.
- If spill occurs during rain, cover spill area to prevent contaminating storm runoff.

Key Point #4 – Significant/Hazardous Spill Response

- Contractor notifies the RE immediately.
- Contractor calls 911 and appropriate county officials.
- Contractor notifies the Governor's Office of Emergency Services Warning Center (805) 852-7550.
- For spills meeting federal quantities, the contractor notifies the National Response Center (800) 424-8802.
- All verbal notification must be followed up by written reports.
- Contractor obtains services of spill contractor or a HazMat team immediately. Contractor staff is not to attempt cleanup until qualified assistance has arrived onsite.

Key Point #5 – Education

Train employees regarding the appropriate response for spills for the materials they use. Incorporate spill response procedures into regular safety meetings.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Material spills occur on a permeable surface.	Contain spread of spill with an earthen dike. Dig up and properly dispose of contaminated soil.
Material spills occur on an impermeable surface.	Use dry absorbent materials to encircle and contain the spill. Place clean-up materials in a drum and dispose of properly.
The spill exceeds the capacity of spill cleanup materials on site.	Contain spill. Obtain enough spill clean-up materials to completely clean up the spill. Contact Caltrans Maintenance. Store additional spill clean-up materials as necessary.
Spilled material encroaches onto travel way.	Contact Caltrans Maintenance. Use additional spill clean-up materials as necessary and replenish these materials in adequate quantity for future use.

WM-5 SOLID WASTE MANAGEMENT

Solid construction wastes must be collected, stored, and disposed of using practices that minimize contact with storm water. Solid wastes include such items as used brick, mortar, timber, steel, vegetation/landscaping waste, empty material containers, and litter.

Applications

All construction sites

Key Points

Key Point #1 – Waste Storage Areas

Solid waste storage areas should be located in an area with little potential for flooding and at least 15 m (50 ft) from drainage facilities and receiving waters. Use berms, dikes, or temporary diversion structures to protect stockpiled waste materials from contacting storm water. During foul weather, waste should be stored in watertight dumpsters or securely covered. Salvage or recycle waste as appropriate.

Key Point #2 – Litter Control

Provide adequate trash receptacles in the yard, field trailer areas, and where workers gather for breaks and meals (Photo 1). Do not place litter receptacles near drainage inlets or receiving waters. All litter within the construction site is to be collected weekly, regardless of the litter's origin. Litter is to be removed from the site by trash hauling contractors.

Photo 1

Key Point #3 – Dumpsters

Provide an adequate number of watertight dumpsters to collect the anticipated volume of construction waste. Plan for additional dumpsters and dumpster pickups during demolition phases. Do not place dumpsters near drainage inlets or receiving waters. Full dumpsters are to be removed from the site and disposed of outside the highway right-of-way. Washing out dumpsters on the project site is prohibited.

Key Point #4 – Litter and Debris

Do not let litter interfere with the functioning of the storm drain system. Ensure that litter and debris are removed regularly from drainage grates and ditch lines (Photo 2).

Photo 2

Key Point #5 – Hazardous Wastes

Separate potentially hazardous waste from non-hazardous waste. Do not dispose of toxic liquid wastes in dumpsters designated for construction wastes. Dispose of hazardous wastes in accordance with WM-6.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Runoff runs through waste stockpiles.	Locate stockpiles away from drainage courses or place a berm, dike, or temporary diversion structure around stockpiles.
Lunch trash is left on the ground.	Place trash receptacles in yards, field trailers, or where workers gather for lunch and breaks. Instruct personnel on waste disposal procedures.
Trash containers leak.	Install watertight liner, remove, or replace leaky containers.
The public dumps trash on site.	Block access to areas where dumping occurs. Keep trash cleaned up to discourage dumping. Place sign that illegal dumping is prohibited.
Hazardous waste is intermixed with solid waste.	Segregate hazardous waste from solid waste. Instruct employees and workers to identify and properly dispose of hazardous waste.

WM-6 HAZARDOUS WASTE MANAGEMENT

Hazardous wastes should be collected, stored, and disposed of using practices that prevent contact with storm water. The following types of wastes are considered hazardous: petroleum products, concrete curing compounds, palliatives, septic wastes, paints, stains, wood preservatives, asphalt products, pesticides, acids, solvents, and roofing tar. There may be additional wastes on the project that are considered hazardous. It is also possible that non-hazardous waste could come into contact with these hazardous wastes, such that they become contaminated and are therefore considered hazardous waste.

Applications

All construction projects

Key Points

Key Point #1 – Hazardous Material Use

Use containment berms in fueling areas. Provide secondary containment in paint mixing areas (Photo 1) and paint clean-up areas. Place hazardous waste collection containers at convenient locations.

Photo 1

Key Point #2 – Hazardous Waste Storage Areas

Ensure that adequate waste storage volume is provided and is located away from storm drains and receiving waters. Provide temporary containment sufficient to contain precipitation from a 24-hour, 25-year storm event, plus 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 should be impervious to spilled wastes for a minimum of 72 hours (Photo 2). Equip storage areas with appropriate spill clean-up materials. Allow sufficient space between storage containers to allow for spill cleanup and emergency response access.

Key Point #3 – Hazardous Waste Containers

Store hazardous wastes in appropriate sealed containers that are clearly labeled with contents and starting date of accumulation. Do not mix different types of waste together in one container. Do not store incompatible wastes in the same temporary containment facility. If dry waste containers are not watertight, store containers on pallets. Prior to predicted rain events, cover the containment area (Photo 3).

Photo 2

Photo 3

Key Point #4 – Disposal

Hazardous waste is to be transported from the site by a licensed hazardous waste transporter and disposed of at an authorized, licensed disposal or recycling facility within 90 days of being accumulated. Properly dispose of rain water removed from temporary containment that may have mixed with hazardous waste.

Key Point #5 – Education

Contractor and subcontractor employees should be educated regarding identification, storage, and disposal of hazardous wastes. Ongoing hazardous waste training should be incorporated into regular safety meetings.

Key Point #6 – Inspection and Maintenance

Ensure that hazardous waste storage areas are inspected in conformance with contract provisions. Repair or replace perimeter controls, containment structures, covers, and liners as needed.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Rain water mixes with hazardous materials.	Collect rain water and then properly dispose of as hazardous waste.
Hazardous waste containers are stored in the open.	Place hazardous waste containers in temporary containment and cover prior to rain events.
Hazardous waste containers are not labeled.	Clearly label all hazardous waste containers with the waste being stored and the beginning date of accumulation.
Temporary containment area is inadequate to contain waste or hazardous materials.	Temporary containment facilities should be constructed to contain precipitation from a 24-hour, 25-year storm event, plus 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 facilities are not covered.	When practicable, cover containment facilities at all times. At a minimum, cover containment facilities on non-working days and prior to rain events.
Dry wastes are stored on the ground.	Unless in watertight containers, store dry wastes on pallets

WM-7 CONTAMINATED SOIL MANAGEMENT

Contaminated soil on construction sites should be managed to prevent any pollutants from entering storm drain systems or receiving waters. Typical soil contamination is due to spills, illicit discharges, underground storage tank leaks, or aerially deposited lead (ADL). Contaminated soils tend to occur on projects in urban or industrial areas. Soil contaminants and locations are often identified in the project plans and specifications.

Applications

Areas of contamination as identified on project plans and specifications
Suspected areas of contamination due to site history, spills, leaks, soil discoloration/odor, abandoned tanks, pipes, or buried debris
Highway widening project where adjoining soils may contain ADL

Key Points

Key Point #1 – Aerially Deposited Lead (ADL)

Soil from areas with ADL may be used as indicated in the contract special provisions providing that operations result in no visible dust. When excavating soils containing ADL, monitor air quality. Soils containing ADL may also be transported to a licensed landfill or other disposal site. At all times, prevent storm water, groundwater, etc. from mixing with and transporting contamination.

Key Point #2 – Identification and Coordination

If needed, staff from a Caltrans-approved certified lab shall test suspected soil. Upon confirmation of contamination, contractor shall work with appropriate local, state, and federal agencies to implement appropriate excavation, transportation, and disposal practices.

Key Point #3 – Stockpiling

Avoid stockpiling contaminated soils. If stockpiling is necessary, cover stockpile with plastic sheeting or tarps, install a berm around stockpile to prevent run-on, and locate the stockpile away from storm drains and receiving waters. Photo 1 shows contaminated soil stockpiled too close to an inlet.

Photo 1

Key Point #4 – Underground Storage Tank Removal

Obtain required approvals and permits from applicable local, state, and federal agencies prior to removal. If tank contains liquid or sludge, ensure that it is tested for hazardous substances prior to removal. Test underlying soils to determine if there is contamination. Prevent storm water, groundwater, etc. from mixing with and transporting contaminated substances from the storage tank. Ensure that tank and any liquid, sludge, or contaminated soils are transported and disposed of properly.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Contaminated soil must be stockpiled onsite.	Cover the stockpile with plastic sheeting or a tarp. Construct a berm around the stockpile to prevent runoff from leaving the area. Do not place stockpiles near storm drains or watercourses.
Water becomes mixed with contaminated soils.	Collect the water and treat or transport to an appropriate disposal site.

WM-8 CONCRETE WASTE MANAGEMENT

Concrete waste materials must be properly managed to minimize or eliminate contact with storm water.

Applications

On construction sites where new concrete is placed or demolition of concrete structures occurs
Where concrete slurries are generated such as sawing, coring, grinding, and grooving
At mortar mixing stations

Key Points

Key Point #1 – Concrete Slurry Waste

Place temporary berms or sandbags around coring and saw-cutting locations to contain slurry. Vacuum slurry waste or collect it in a temporary lined pit and allow it to dry. Dispose of concrete waste in compliance with Solid Waste Management (WM-5).

Key Point #2 – Temporary Concrete Washout

Wash out concrete trucks in designated areas only (Photo 1). Locate washout facilities a minimum of 15 m (50 ft) from storm drains or receiving waters. Keep the washout areas away from areas of construction traffic. A sign shall be installed at each location in accordance with Standard Specification Section 56-2, “Roadside Signs.” The facility shall have a pit or berm to provide sufficient volume to contain all concrete waste resulting from washout. Allow concrete waste to dry and then dispose of on a regular basis in conformance with Standard Specifications, Section 15-3.02, “Removal Methods.”

Key Point #3 – Above Grade Washout Facilities

Above grade facilities (Photo 2) shall be constructed as shown in the details. A minimum length and width of 3 m (10 ft) is recommended, but the area should have sufficient volume to contain the anticipated waste. The lining material shall be a minimum of 10-mil polyethylene sheeting, free of holes or other defects.

Photo 1

Photo 2

Key Point #4 – Below Grade Washout Facilities

Below grade facilities shall be constructed as shown in the details. A minimum length and width of 3 m (10 ft) is recommended, but the area should have sufficient volume to contain the anticipated waste from operation. The lining material shall be a minimum of 10-mil polyethylene sheeting, free of holes or other defects. Commercial type lath and flagging shall be used.

Key Point #5 – Inspection and Maintenance

Washouts should be maintained to provide a minimum 100 mm (4 in) freeboard for above ground facilities and 300 mm (1 ft) freeboard for below grade facilities. Maintenance includes removal and disposal of hardened concrete as previously described. Existing facilities must be cleaned or additional facilities constructed when the washout is 75% full (Photo 3).

Photo 3

Key Point #6 – Washout Removal

Materials used to construct the facility become the property of the contractor and shall be removed and disposed of outside the highway right-of-way in conformance with Standard Specifications, Section 7-1.13. Holes and depressions shall be backfilled and repaired in conformance with Standard Specifications, Section 15-1.02, "Preservation of Property."

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Concrete washout overflows.	Discontinue using washout and construct new facility to contain anticipated washout operations.
Concrete washout discharges into storm drain.	Notify the Construction Storm Water Coordinator of potential non-compliance. Clean up as much of the waste as possible. Place washout at least 15 m (50 ft) from drainage facilities or receiving waters. Ensure the washout is designed to contain the volume of anticipated wastes. Protect storm drain while conducting washout with inlet cover, sandbags or other BMP.
Drivers wash out trucks at locations of their choosing.	Place sign at washouts and instruct drivers of the washout locations.

WM-9 SANITARY/SEPTIC WASTE MANAGEMENT

This BMP includes procedures to prevent the introduction of wastes from construction site toilet facilities to storm drains or receiving waters.

Applications

All construction sites that use temporary or portable sanitary/septic waste systems

Key Points

Key Point #1 – Installation

Temporary sanitary facilities should not be located near drainage facilities (Photo 1) or receiving waters, nor should they be located in areas that will collect water (Photo 2). If the site is deemed to be a high wind area by the RE, the facilities shall be secured to prevent overturning.

Photo 1

Photo 2

Key Point #2 – Sanitary Sewer Discharge

Discharges direct to the sanitary sewer should be in compliance with local health agency and sewer district requirements. Ensure that the temporary facility is properly connected to the sanitary sewer to prevent illicit discharges.

Key Point #3 – On-Site Disposal

Waste water shall not be discharged or buried within the highway right-of-way (Photo 3). Ensure that any on-site disposal systems comply with local health agency requirements.

Photo 3

Key Point #4 – Inspection and Maintenance

The contractor's Water Pollution Control Manager (WPCM) shall monitor sanitary/septic waste storage and disposal procedures weekly. Ensure that the sanitary/septic facilities are maintained in good working order and wastes are transported offsite by a licensed service.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Sanitary facilities tip over.	Place sanitary facility on level surface and out of drainage paths or traffic areas. Use Spill Prevention and Control (WM-4).
Sanitary facility leaks.	Repair or replace sanitary facility.
Sanitary facility is cleaned onsite near storm drain.	Place sanitary facility away from drainage inlets or receiving waters. Contain water in a temporary trapping device.

WM-10 LIQUID WASTE MANAGEMENT

This BMP includes procedures to prevent pollutants related to non-hazardous liquid wastes from entering storm drains or receiving waters. Liquid wastes include drilling slurries, drilling fluids, wastewater that is free from grease and oil, dredgings, and other non-storm water liquid discharges not covered by separate permits. This BMP does not apply to the following:

- Dewatering operations (See NS-2)
- Solid wastes (See WM-5)
- Hazardous wastes (See WM-6)
- Concrete slurries (See WM-8)
- Liquid wastes covered by specific laws or permits
- Non-storm water discharges permitted by any Caltrans NPDES permit unless Caltrans determines that the discharge contains pollutants

Applications

All construction sites where liquid wastes are generated

Key Points

Key Point #1 – Capture

Capture all liquid wastes that have the potential to impact water entering the storm drain system. Use temporary dikes or berms to direct surface flow of liquid wastes to a containment structure or device. If liquid waste contains sediment, capture and treat the flow to remove sediment or capture in a containment structure to allow sediment to settle.

Key Point #2 – Containment

Contain liquid wastes in a controlled area that is structurally sound, leak-free, and provides sufficient storage for the anticipated volume. Appropriate structures include holding pits, sediment basins, roll-off bins, and portable tanks. Locate the containment structure such that accidental releases do not discharge to storm drains or receiving waters or threaten health or safety.

Key Point #3 – Disposal

Some liquid wastes may require testing and certification that they are non-hazardous before an appropriate disposal method is selected. Liquid waste may need to be treated to remove sediment or other pollutants prior to disposal. Typical liquid waste disposal requires Dewatering (NS-2) with disposal of resulting solids per Solid Waste Management (WM-5) or Standard Specification Section 7-1.13, "Disposal of Material Outside the Highway Right-of-Way."

Key Point #4 – Inspection and Maintenance

Frequently inspect liquid waste containment areas and capturing devices for damage. Repair as needed.

Preventive Measures and Troubleshooting Guide

Field Condition:	Common solutions are:
Liquid waste is sediment-laden.	Construct a temporary Sediment Trap (SC-3) and allow sediment to settle. Properly dispose of liquid waste.
Liquid waste discharge is uncontrolled.	Capture flows by using temporary dikes or berms to intercept flows and direct them to a containment device.

District Construction Storm Water Coordinators

1	Kirk Carrington	(530)582-9129
2	Ted Schultz	(530)225-4640
3	Kirk Carrington	(530)582-9129
4	Frank Gorham	(510)286-5185
5	Pete Riegelhuth	(805)549-3661
6	Raafat Shehata	(559)488-4284
	Sheri West	(661)395-2795
7	James Burt	(213)897-1960
8	Walt Griffith	(909)232-6496
9	Richard Epler	(209)786-2932
10	Richard Epler	(209)786-2932
11	Michael Kolbenschlag	(858)467-4080
12	Mark Doroudian	(949)724-2834

www.dot.ca.gov/hq/env/stormwater/index.htm

Please fax comments, questions, or concerns regarding this manual or other BMP news to 714-567-2780.