- Not appropriate for projects where dewatering is necessary.
- Not appropriate to completely dam streamflow.

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

- For the filter fabric isolation method, a non-woven or heavy-duty fabric (refer to Standard Specifications Section 96-1.02B) is recommended over standard silt fence. Using rolled geotextiles allows non-standard widths to be used.
- Anchor filter fabric with gravel-filled bags filled with clean, washed gravel. Do not use sand. If a bag should split open, the gravel can be left in the stream if permitted under the project's 404 permit, where it can provide aquatic habitat benefits.
- Another anchor alternative is a continuous berm, made with the Continuous Berm Machine. This is a gravel-filled bag that can be made in very long segments. The length of the berms is usually limited to 20 ft for ease of handling.
- Place the fabric on the bottom of the stream, and place either a bag of clean, washed gravel or a continuous berm over the bottom of the fabric, such that a bag-width of fabric lies on the stream bottom. The bag should be placed on what will be the outside of the isolation area.
- Pull the fabric up, and place a metal t-post immediately behind the fabric, on the inside of the isolation area; attach the fabric to the post with three diagonal nylon ties.
- Continue placing fabric as described above until the entire work area has been isolated, staking the fabric at least every 6 ft.
- During construction, inspect daily during the workweek.
- Schedule additional inspections during storm events.
- Immediately repair any gaps, holes or scour.
- Remove sediment buildup.
- Ensure pipe diversion is properly anchored to prevent shifting or leaking during use.
- Remove BMP upon completion of construction activity. Recycle or re-use if applicable.

- Re-vegetate areas disturbed by BMP removal if needed.

Turbidity Curtain Isolation Technique

- A turbidity curtain is a fabric barrier used to isolate the near shore work area. The barriers are intended to confine the suspended sediment. The curtain is a floating barrier, and thus does not prevent water from entering the isolated area; rather, it prevents suspended sediment from getting out.

- Turbidity curtains should be used where sediment discharge to a stream is unavoidable. They are used when construction activities adjoin quiescent waters, such as lakes, ponds, lagoons, bays, and slow flowing rivers. The curtains are designed to deflect and contain sediment within a limited area and provide sufficient retention time so that the soil particles will fall out of suspension.

- Prior to using this technique consider the following:

  - Turbidity curtains should not be used in flowing water; they are best suited for use in quiescent ponds, lakes, lagoons, bays, and very slow-moving rivers.

  - Turbidity curtains should not be placed across the entire width of a channel.

  - Removing sediment that has been deflected and settled out by the curtain may create a discharge problem through the re-suspension of particles and by accidental dumping by the removal equipment.

  - Turbidity curtains may require a higher level of maintenance, adjustments, and relocation when deployed in comparison to structural isolation methods. However, turbidity curtains consist of flexible materials and may be repositioned and reconfigured as the limits of construction activity change.

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

  - Turbidity curtains should be oriented parallel to the direction of flow wherever possible to avoid exerting excessive pressure on the fabric.

  - The curtain should extend the entire depth of the watercourse in calm-water situations.

  - In wave conditions, the curtain should extend to within 1 ft of the bottom of the watercourse, such that the curtain does not stir up sediment by hitting the bottom repeatedly. If it is desirable for the curtain to reach the bottom in an active-water situation, a pervious filter fabric may be used for the bottom 1 ft.

- The top of the curtain should consist of flexible flotation buoys, and the bottom shall be held down by a load line incorporated into the curtain fabric. The fabric shall be a brightly colored impervious mesh.

- The curtain shall be held in place by anchors placed at least every 100 ft, or as recommended by the manufacturer based on site-specific conditions, such as flow rate, wind speeds, currents, tidal influence, and wave action.

- First place the anchors, then tow the fabric out in a furled condition, and connect to the anchors. The anchors should be connected to the flotation devices, and not to the bottom of the curtain. Once in place, cut the furling lines, and allow the bottom of the curtain to sink. A second set of anchors may be required in tidally-influenced waters to secure the curtain against both the flood and ebb tides.

- Sediment that has been deflected and settled out by the curtain may be removed if so directed by the on-site inspector or the RE. Consideration must be given to the probable outcome of the removal procedure. It must be asked if it will create more of a sediment problem through re-suspension of the particles or by accidental dumping of material during removal. It is recommended that the soil particles trapped by the turbidity curtain only be removed if there has been a significant change in the original contours of the affected area in the watercourse.

- Particles should always be allowed to settle for a minimum of 6 to 12 hours prior to their removal or prior to removal of the turbidity curtain.

- The curtain should be inspected daily for holes or other problems, and any repairs needed should be made promptly.

- Allow sediment to settle for 6 to 12 hours prior to removal of sediment or curtain. This means that after removing sediment, wait an additional 6 to 12 hours before removing the curtain.

- To remove, install furling lines along the curtain, detach from anchors, and tow out of the water. Water quality monitoring is typically required before removing the turbidity curtain to verify that the entrained water, sediment, and other potential contaminants, such as sulfides, would not violate a water quality standard when released.

K-rail River Isolation

- This is temporary sediment control, or stream isolation method that uses K-rails to form the sediment deposition area, or to isolate the in-stream or near-bank construction area.

- Barriers are placed end-to-end in a pre-designed configuration and gravel-filled bags are used at the toe of the barrier and also at their abutting ends to seal and prevent movement of sediment beneath or through the barrier walls.

- The K-rail isolation can be used in streams with higher water velocities than many other isolation techniques.

Prior to using this technique consider the following:

  - The K-rail method does not allow for full dewatering.

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

  - To create a floor for the K-rail, move large rocks and obstructions. Place washed gravel and gravel-filled bags to create a level surface for K-rail to sit.

  - Place the bottom two K-rails adjacent to each other, and parallel to the direction of flow; fill the center portion with gravel bags. Then place the third K-rail on top of the bottom two; there should be sufficient gravel bags between the bottom K-rails such that the top one is supported by the gravel. Place plastic sheeting around the K-rails, and secure at the bottom with gravel bags.

  - Further support can be added by pinning and cabling the K-rails together. Also, large riprap and boulders can be used to support either side of the K-rail, especially where there is strong current.

  - The barrier should be inspected at least once daily, and any damage, movement or other problems should be addressed immediately.

  - Sediment should be allowed to settle for at least 6 to 12 hours prior to removal of sediment, and for 6 to 12 hours prior to removal of the barrier.

Stream Diversions

Stream diversions consist of a system of structures and measures that intercept an existing stream upstream of the project and, transports it around the work area, and discharges it downstream. The selection of which stream diversion technique to use depends upon the type of work involved, physical characteristics of the site, and the volume of water flowing through the project.

- Pumped diversions are appropriate in areas where de-watering is necessary.

- Dam-type diversions may serve as temporary access to the site.

- Where work areas require isolation from flows.

Prior to using this technique consider the following:

  - Pumped diversions have limited flow capacity.

- Pumped diversion require frequent monitoring of pumps.
- Large flows during storm events can overtop dams.
- Flow diversion and re-direction with small dams involves in-stream disturbance and mobilization of sediment.

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

- Installation guidelines will vary based on existing site conditions and type of diversion used.
- Diversions shall be sized to convey design flood flows.
- Pump capacity must be sufficient for design flow; the upper limit is approximately 10 cfs (the capacity of two 8 inch pumps).
- Adequate energy dissipation must be provided at the outlet to minimize erosion.
- Dam materials used to create dams upstream and downstream of diversion should be erosion resistant; materials such as steel plate, sheetpile, sandbags, continuous berms, inflatable water bladders, etc. would be acceptable.
- When constructing a diversion channel, begin excavation of the channel at the proposed downstream end, and work upstream. Once the watercourse to be diverted is reached, and the excavated channel is stable, breach the upstream end, and allow water to flow down the new channel. Once flow has been established in the diversion channel, install the diversion weir in the main channel; this will force all water to be diverted from the main channel.
- Inspect diversion/encroachment structures before and after significant storms, and at least once per week while in service. Inspect daily during the construction.
- Pumped diversions require frequent monitoring of pumps.
- Inspect embankments and diversion channels before and after significant storms, and at least once per week while in service for damage to the linings, accumulating debris, sediment buildup, and adequacy of the slope protection. Remove debris and repair linings and slope protection as required. Repair holes, gaps, or scour.

- Upon completion of work, the diversion or isolation structure should be removed and flow should be re-directed through the new culvert or back into the original stream channel. Recycle or re-use if applicable.

SWPPP or WPCP

- Clear Water Diversion must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.

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Illicit Connection and Illegal Discharge Detection and Reporting

NS-6

Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☐

Definition and Purpose

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

Appropriate Applications

- Illicit connection and illegal discharge detection and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.
- This BMP applies to all construction projects.

Limitations

- Illicit connections and illegal discharges or dumping, for the purposes of this BMP, refer to discharges and dumping caused by parties other than the contractor.
- Procedures and practices presented in this BMP are general. Contractor shall use extreme caution, immediately notify the RE when illicit connections or illegal dumping or discharges are discovered, and take no further action unless directed by the RE.
- If pre-existing hazardous materials or wastes are known to exist onsite, the contractor's responsibility will be detailed in separate special provisions. Onsite area should be clearly marked and described in the SWPPP or WPCP.

Standards and Specifications

Inspection

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

Illicit Connection and Illegal Discharge Detection and Reporting

- Solids - Look for debris or trash piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.
- Liquids – signs of illegal liquid dumping or discharge can include:
  - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils.
  - Pungent odors coming from the drainage systems.
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.
  - Abnormal water flow during the dry weather season.
- Urban Areas - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:
  - Abnormal water flow during the dry weather season.
  - Unusual flows in subdrain systems used for dewatering.
  - Pungent odors coming from the drainage systems.
  - Discoloration or oily substances in the water or stains and residues detained within ditches, channels or drain boxes.
  - Excessive sediment deposits, particularly adjacent to or near active off-site construction projects.
- Rural Areas - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
  - Abnormal water flow during the dry weather season.
  - Non-standard drainage junction structures.

- Broken concrete or other disturbances at or near junction structures.

Reporting

- Notify the RE of any illicit connections and illegal dumping or discharge incidents at the time of discovery. Do not take further action unless ordered.
- The RE will notify the District Construction Storm Water Coordinator and the Construction Hazmat Coordinator for reporting.

Inspection, Cleanup and Removal

- Notify the RE of any illicit connections and illegal dumping or discharge incidents at the time of discovery. Do not take further action unless ordered.
- The contractor is not responsible for investigation and clean up of illicit or illegal dumping or discharges not generated by the contractor. Caltrans may direct contractor to clean up non-hazardous dumped or discharged material on the construction site. Assume that unlabeled or unidentifiable material is hazardous.
- Inspect the entire project site at least weekly to check for illicit connection or illegal discharges.

SWPPP or WPCP

- Illicit Connection and Illegal Discharge Detection and Reporting must be discussed in Section 500.4.1 of the SWPPP or Section 30.3 of the WPCP.

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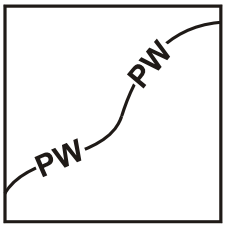
Potable Water/Irrigation

NS-7



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☐

Definition and Purpose

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

Appropriate Applications

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

Limitations

- None identified.

Standards and Specifications

- Inspect irrigated areas within the construction limits for excess watering. Adjust watering times and schedules to ensure that the appropriate amount of water is being used and to minimize runoff. Consider factors such as soil structure, grade, relative compaction, time of year, and type of plant material in determining the proper amounts of water for a specific area.
- Take precautions to prevent irrigation water from eroding soil, wetting vehicles and pavement, or otherwise causing sediment, hydrocarbons, and other non-visible pollutants that accumulate on those surfaces to discharge into a storm drain system or receiving waterbody.
- When possible, discharges from water line flushing or temporary Active Treatment Systems (see Appendix C "Temporary Active Treatment System) should be reused for landscaping purposes.
- Resident Engineer (RE) approval is required prior to commencing any washing activities that could discharge to the storm drain or receiving waterbody.

- Where possible, direct water from off-site sources around or through a construction site in a way that minimizes contact with the construction site.
- Perform pressure tests on the irrigation system supply lines to test for leaks, which could result in erosion or runoff if breached.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Protect downstream storm water drainage systems and receiving waters from water pumped or bailed from trenches excavated to repair water lines.

Maintenance and Inspection

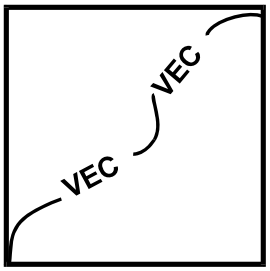
- Repair broken water lines as soon as possible or as directed by the RE.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

SWPPP or WPCP

- Potable Water/Irrigation must be discussed in Section 500.4 of the SWPPP and/or Section 30.3 of the WPCP.

Vehicle and Equipment Cleaning

NS-8



Standard Symbol

BMP Objectives	
Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☐

Definition and Purpose

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

Appropriate Applications

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

Limitations

- This BMP may be limited or disallowed under regulatory agency permits, particularly near Environmentally Sensitive Areas (ESAs).
- Generates non-stormwater that requires management, and, in some cases, the disposal of hazardous waste.

Standards and Specifications

General Requirements

- Limit vehicle and equipment cleaning or washing at the job site except for the safety and protection of the equipment and as needed to comply with regulatory agency permits and approvals.
- Cleaning of vehicles and equipment with soap, solvents or steam shall not occur on the job site unless the RE has been notified in advance and the resulting wastes are fully contained in accordance with Standard Specifications Section 14-11 or 13-4.03D (5), whichever is applicable. Do not use diesel to clean vehicles and minimize the use of solvents.
- Vehicle and equipment wash water shall be contained for percolation or evaporative drying away from storm drain inlets or receiving waters and should not be discharged within the highway right-of-way. Apply other appropriate BMPs as applicable.

- All vehicles/equipment that regularly enter and leave the construction site must be cleaned off-site.
- Resulting wastes and by-products shall not be discharged or buried within the highway right-of-way, and must be captured and recycled or disposed according to the requirements of WM-10, "Liquid Waste Management" or WM-6, "Hazardous Waste Management," depending on the waste characteristics.

Implementation

- When vehicle/equipment washing/cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall have the following characteristics, and shall be arranged with the WPC Manager, QSD, or QSP as well as the Construction Storm Water Coordinator:
  - Located away from storm drain inlets, drainage facilities, or watercourses.
  - Paved with concrete or asphalt and bermed to contain wash waters and to prevent run-on and runoff.
  - Configured with a sump to allow collection and disposal of wash water.
  - Wash waters shall not be discharged to storm drains or watercourses.
  - Used only when necessary.
- When cleaning vehicles/equipment with water:
  - Use as little water as possible. High pressure sprayers may use less water than a hose, and shall be considered.
  - Use positive shutoff valve to minimize water usage.
  - Facility wash racks shall discharge to a sanitary sewer, recycle system or other approved discharge system and shall not discharge to the storm drainage system or watercourses.

Maintenance and Inspection

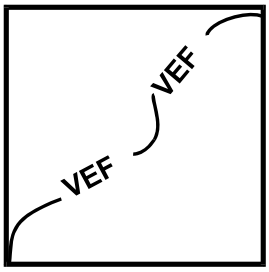
- The control measure shall be inspected at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Inspect wash area and sump regularly. Remove liquids and sediment as needed or as directed by the RE.

SWPPP or WPCP

- Vehicle Equipment Cleaning must be discussed in Section 500.4.2 of the SWPPP or Section 30.3 of the WPCP.

Vehicle and Equipment Fueling

NS-9



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☐

Definition and Purpose

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

Appropriate Applications

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

Limitations

- This BMP may be limited or disallowed under regulatory agency permits, particularly near Environmentally Sensitive Areas (ESAs).
- Onsite vehicle and equipment fueling should only be used where it's impractical to send vehicles and equipment off-site for fueling.

Standards and Specifications

- When fueling must occur onsite, the contractor shall select and designate an area or areas to be used, subject to approval of the RE.
- Dedicated fueling areas shall be protected from stormwater run-on and runoff, and shall be located at least 50 feet from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms or dikes to prevent run-on, runoff, and to contain spills.
- For long-term projects, consider constructing roofs or using portable tents over maintenance and fueling areas.
- Absorbent spill clean-up materials and spill kits shall be available in fueling areas and on fueling trucks and used on small spills instead of hosing down or burying techniques. Affected absorbent material and spill kits should be removed promptly and disposed of properly after use.

- Drip pans or absorbent pads shall be readily available during vehicle and equipment fueling.
- Vehicle and equipment fueling areas shall not be left unattended during fueling activities.
- Nozzles used in vehicle and equipment fueling shall be equipped with an automatic shut-off to control drips.
- Use vapor recovery nozzles to help control drips as well as air pollution where required by the Air Quality Management Districts.
- Ensure the nozzle is secured upright when not in use.
- Fuel tanks shall not be "topped-off."
- Federal, state, and local requirements shall be observed for any stationary above ground storage tanks. Refer to WM-1, “Material Delivery and Storage” for specifics as to what needs to be included for BMP protection and documented in the SWPPP or WPCP.
- Portable fuel canisters should be kept in a flammable cabinet when not in use.

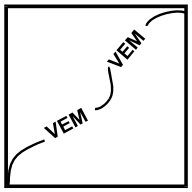
Maintenance and Inspection

- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or problem vehicles or equipment shall be removed from the project site.
- Fueling areas and storage tanks shall be inspected at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Immediately cleanup spills and properly dispose of contaminated soil and cleanup materials.

SWPPP or WPCP

- Vehicle and Equipment Fueling must be discussed in Section 500.4.2 of the SWPPP or Section 30.3 of the WPCP.

Vehicle and Equipment Maintenance NS-10



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☐

Definition and Purpose

Procedures and practices to minimize or eliminate the discharge of pollutants to the storm drain systems or to receiving waters from vehicle and equipment maintenance activities.

Appropriate Applications

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

Limitations

- This BMP may be limited or disallowed under regulatory agency permits, particularly near Environmentally Sensitive Areas (ESAs).
- Onsite vehicle and equipment maintenance should only be used where it's impractical to send vehicles and equipment off-site for fueling.

Standards and Specifications

- When maintenance must occur onsite, the contractor shall select and designate an area to be used, subject to approval of the RE and implement appropriate controls for the activities to be performed.
- Dedicated maintenance areas shall be on level ground and protected from storm water run-on and runoff, and shall be located at least 50 ft from downstream drainage facilities and receiving waters.
- Protect maintenance areas with berms or dikes to prevent run-on, runoff, and to contain spills.
- For long-term projects, consider constructing roofs or using portable tents over maintenance areas.
- Absorbent spill clean-up materials and spill kits shall be available in maintenance areas and used on small spills instead of hosing down or burying techniques. Affected absorbent material and spill kits should be removed promptly and disposed of properly after use.

- Drip pans or absorbent pads shall be placed under vehicles and equipment when performing maintenance work that involves fluids. Vehicles and equipment maintenance areas shall not be left unattended during maintenance activities.
- Drip pans or plastic sheeting shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is planned to be idle for more than one hour.
- Properly dispose or recycle used batteries and tires as well as any other vehicle or equipment parts.
- Substances used to coat asphalt transport trucks and asphalt-spreading equipment shall be non-toxic.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not dump fuels and lubricants onto the ground.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Do not bury used tires.
- Repair fluid and oil leaks immediately.
- Provide spill containment dikes or secondary containment around stored oil and chemical drums. Refer to WM-1, "Material Delivery and Storage" for details.

Maintenance and Inspection

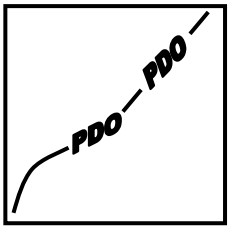
- Vehicles and equipment shall be inspected on each day of use for leaks. Leaks shall be repaired immediately or removed from the project site.
- Maintenance areas and storage tanks shall be inspected regularly.
- Maintain waste fluid containers in leak proof condition.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.
- Inspection and Maintenance of these areas must be properly documented and the WPC Manager must ensure no potential for discharges occur from these areas as part of the non-visible monitoring requirements.

SWPPP or WPCP

- Vehicle and Equipment Maintenance must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.

Pile Driving Operations

NS-11



Standard Symbol

Definition and Purpose

The construction and retrofit of bridges and retaining walls often include driving piles for foundation support and shoring operations. Driven piles are typically constructed of concrete, steel, or timber. Driven sheet piles are used for shoring and cofferdam construction. 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 receiving waters.

Appropriate Applications

These procedures apply to construction sites near or adjacent to surface waters or groundwater where permanent and temporary pile driving operations (impact and vibratory) take place, including operations using pile shells for construction of cast-in-steel-shell and cast-in-drilled-hole piles.

Limitations

None identified.

Standards and Specifications

- Have spill kits and cleanup materials available at all locations of pile driving. Refer to WM-4 "Spill Prevention and Control."
- Place drip pans, absorbent pads, or plastic sheeting with absorbent material under vehicles and equipment performing pile driving activities. Refer to NS-9 "Vehicle and Equipment Fueling" and NS-10 "Vehicle and Equipment Maintenance."
- Protect pile driving equipment, including hammers and other hydraulic attachments, by parking them on plywood and covering it with plastic sheeting when precipitation is forecasted.
- When not in use, store pile driving equipment on level ground away from concentrated flows of storm water, drainage courses, and inlets.
- Use less hazardous vegetable oil instead of hydraulic fluid, when practicable.

- Keep equipment that is in use in streambeds; or on docks, barges, or other structures over water bodies, leak free. The storage or use of equipment in streambeds or other bodies of water shall comply with all applicable regulatory permits. Refer to NS-13, "Material and Equipment Use Over Water."
- Implement other BMPs as applicable, such as NS-2 "Dewatering Operations," WM-5 "Solid Waste Management," WM-6 "Hazardous Waste Management," and WM-10 "Liquid Waste Management."

Maintenance and Inspection

- Inspect pile driving areas and equipment for leaks and spills daily when they are in operation or within or next to water.
- Inspect pile driving areas and equipment for leaks and spills at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Inspect equipment routinely and repair equipment as needed (e.g., worn or damaged hoses, fittings, gaskets).
- Inspection and Maintenance of these areas must be properly documented and the WPC Manager must ensure no potential for discharges occur from these areas as part of the non-visible monitoring requirements.

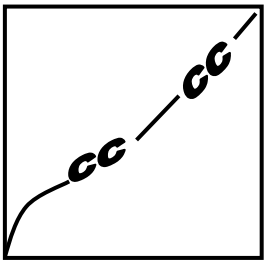
SWPPP or WPCP

- Pile Driving Operations must be discussed in Section 500.4 and 600.2[1] of the SWPPP or Section 30 of the WPCP.

[1]Section 600.2 applies to the LTCGP SWPPP

Concrete Curing

NS-12



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☑

Definition and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, and pump houses. Concrete curing includes the use of both chemical and water methods. Proper procedures to minimize any potential for runoff during concrete curing must take place.

Appropriate Applications

All concrete elements of a structure (e.g., footings, columns, abutments, stems, soffit, deck) are subject to curing requirements.

Limitations

None identified.

Standards and Specifications

Chemical Curing

- Avoid over-spray of curing compounds.
- Minimize the drift of chemical cure as much as possible by applying the curing compound close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds. Refer to WM-1, "Material Delivery and Storage."
- Protect drain inlets prior to the application of curing compounds. Refer to SC-10, "Temporary Drainage Inlet Protection."
- Implement WM-4, "Spill Prevention and Control."

Water Curing for Bridge Decks, Retaining Walls, and Other Structures

- Direct cure water away from inlets and receiving waters to collection areas for removal as approved by the RE and in accordance with all applicable permits.
- Collect cure water and transport or dispose of water in accordance with all applicable permits
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Maintenance and Inspection

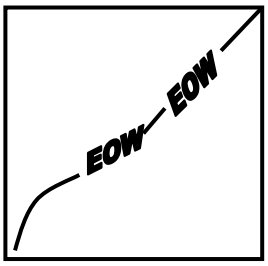
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect any temporary diversion devices, lined channels, or swales for washouts, erosion, runoff or debris. Replace lining and remove debris as necessary.
- Inspect cure containers and spraying equipment for leaks. Also, inspect concrete curing areas daily when there are ongoing operations.
- The WPC Manager or QSP must ensure no concrete curing activities occur when rain is forecasted that could lead to a discharge.

SWPPP or WPCP

- Concrete Curing must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.

Material and Equipment Use Over Water

NS-13



Standard Symbol

Definition and Purpose

Procedures for the proper use, storage, and disposal of materials and equipment on barges, boats, temporary construction pads, or similar locations that minimize or eliminate the discharge of potential pollutants into storm drain inlets or receiving waters.

Appropriate Applications

These procedures shall be implemented for construction materials and wastes (solid and liquid) and any other materials that may be detrimental if released. Applies where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse.

Limitations

Specific requirements may be included in the contract documents and permit documents associated with regulatory agencies such as the Regional Water Quality Control Board (RWQCB), U.S. Army Corps of Engineers, and California Department of Fish and Wildlife.

Standards and Specifications

- Measures to prevent the discharge of potential pollutants into storm drain inlets or receiving waters while operating equipment or using materials over water are considered BMPs by the regulatory agencies and should be documented in the SWPPP.
- Implement this BMP in accordance with all necessary permits required for construction within or near receiving waters, such as RWQCB, U.S. Army Corps of Engineers, Department of Fish and Wildlife and other local permitting agencies.

- Place drip pans and absorbent materials under equipment and vehicles and ensure that an adequate supply of spill cleanup materials is onsite in accordance with a spill response plan, if applicable. Ensure that staff are trained regarding the deployment of the spill response plan.
- Drip pans shall be placed under all vehicles and equipment placed on docks, barges, or other structures over water bodies when the vehicle or equipment is expected to be idle for more than one hour.
- Install watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from falling off the barge, platform, dock, etc.
- Secure all materials to prevent discharges to receiving waters via wind.
- Discharges to receiving waters shall be reported to the RE and the WPC Manager immediately upon discovery.
- Maintain vehicles and equipment in accordance with NS-10, "Vehicle and Equipment Maintenance." If a leaking line cannot be repaired, remove equipment from over the water and repair immediately.
- Collect and contain demolished material in accordance with NS-15, "Structure Demolition/Removal Over or Adjacent to Water."
- Refer to WM-1, "Material Delivery and Storage" and WM-4, "Spill Prevention and Control."
- Ensure the timely and proper removal of accumulated wastes over water. Refer to WM-5, "Solid Waste Management" and WM-6, "Hazardous Waste Management."

Maintenance and Inspection

- Inspect vehicles and equipment for leaks and spills daily when they are in operation, make necessary repairs.
- Ensure that employees and subcontractors implement appropriate measures for storage and use of materials and equipment.
- Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the watercourse.
- Inspect materials and equipment for leaks and spills at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Inspect equipment routinely and repair equipment as needed (e.g., worn or damaged hoses, fittings, gaskets).

- Inspection and Maintenance of these areas must be properly documented and ensure no potential for discharges occur from these areas as part of the non-visible monitoring requirements.

SWPPP or WPCP

- Material and Equipment Use Over Water must be discussed in Section 500.4.1 of the SWPPP or Section 30.3.1 of the WPCP.

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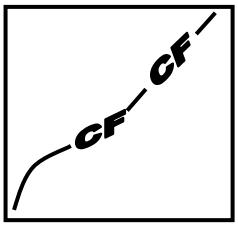
Concrete Finishing

NS-14



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☑

Definition and Purpose

Concrete finishing methods are used for bridge deck rehabilitation, paint removal, curing compound removal, and final surface finish appearances. Methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Proper procedures minimize the impact that concrete finishing methods may have on runoff.

Appropriate Applications

These procedures apply to all construction locations where concrete finishing operations are performed.

Limitations

Specific permit requirements may be included in the contract documents for certain concrete finishing operations.

Standards and Specifications

General Requirements

- Follow containment requirements stated in the project special provisions.
- Collect and properly dispose of water and solid waste from high-pressure water blasting operations.
- Collect and properly dispose of water from water blasting operations, sand and solid waste from sandblasting operations.
- Protect drainage inlets within 50 feet of the sandblasting prior to beginning sandblasting operations. Refer to SC-10, “Temporary Drainage Inlet Protection.”
- Implement SC-7, “Street Sweeping” within the sand blasting and surrounding area.
- Minimize the drift of dust and blast material as much as possible by keeping the blasting nozzle close to the surface.

- Discharges to waterways shall be reported to the RE by the WPC Manager immediately upon discovery.

Other Considerations

- Direct water from blasting operations away from inlets and receiving waters to collection areas for removal (e.g., dewatering) as approved in advance by the RE and in accordance with applicable permits.
- When blast residue contains a potentially hazardous waste, refer to WM-6, "Hazardous Waste Management."
- Implement WM-8, "Concrete Waste Management" in combination with this BMP.

Maintenance and Inspection

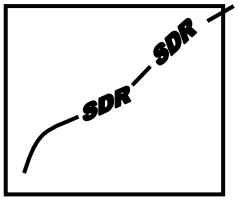
- At a minimum, inspect containment structures, if any, for damage or voids prior to use each day and prior to a likely forecasted rain event.
- At the end of each work shift, remove and contain the liquid and solid wastes from containment structures, if any, and from the general work area.
- Inspect concrete finishing areas at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Inspection and Maintenance of these areas must be properly documented and ensure no potential for discharges occur from these areas as part of the non-visible monitoring requirements.

SWPPP or WPCP

- Concrete Finishing must be discussed in Section 500.4 of the SWPPP or Section 30.3.1 of the WPCP.

Structure Demolition/Removal Over or Adjacent to Water

NS-15



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☑
Materials and Waste Management	☐

Definition and Purpose

Procedures to protect water bodies from debris and wastes associated with structure demolition or removal over or adjacent to receiving waters.

Appropriate Applications

- Full bridge demolition and removal projects.
- Partial bridge removal (e.g., barrier rail, edge of deck) associated with bridge widening projects.
- Projects that involve concrete channel removal.
- Any other project with structure removal that could potentially affect water quality.

Limitations

Specific requirements may be included in the contract documents and permit documents associated with regulatory agencies such as the Regional Water Quality Control Board, U.S. Army Corps of Engineers, and California Department of Fish and Wildlife.

Standards and Specifications

General Requirements

- A plan summarizing material containment, collection, and handling may be required to be submitted and fully implemented with the SWPPP.
- Do not allow demolished material to enter storm drain systems and receiving waters. Use covers and platforms authorized by the RE to collect debris.
- Collect and contain all demolished material within the containment system including process water and visible dust produced during demolition and cleaning operations daily. Handle debris according to Standard Specifications Section 13-4.03D.

- Implement in combination with NS-13, "Material and Equipment Use Over Water" and WM-04 "Spill Prevention and Control," for handling of materials and equipment.
- Routinely sweep and vacuum work area to remove excess dust and debris in accordance with SC-07, "Street Sweeping."
- Use inlet protection in accordance with SC-10, "Temporary Drainage Inlet Protection," to protect storm drain inlets.
- Refer to NS-5, "Clear Water Diversion" to direct water away from work areas.
- Stockpile accumulated debris and waste generated during demolition away from drainage inlets and receiving waters and in accordance with WM-3, "Stockpile Management."
- For structures containing hazardous materials (e.g., lead paint or asbestos) refer to WM-6, "Hazardous Waste Management." For demolition work involving soil excavation around lead-painted structures, refer to WM-7, "Contaminated Soil Management."
- Discharges to drainage inlets and receiving waters shall be reported to the RE and WPC Manager immediately upon discovery. A written discharge notification must follow.
- Keep adequate spill kit material onsite in accordance with a spill response plan, if applicable. Ensure that staff are trained regarding the deployment of the spill response plan.
- Ensure safe passage of wildlife, refer to Standard Specifications 83-3 Concrete Barriers.

Other Considerations

- Use attachments on construction equipment, such as backhoes and debris baskets, or barges to catch debris from demolition operations. Use plastic bibs to prevent hydraulic fuel leaks.
- Install perimeter controls and secondary containment to prevent leaks and spills from entering receiving waters. Perimeter controls and secondary containment may include sealed plywood and/or plastic sheeting, plastic liners and/or tarps, netting, silt fences, drip pans, containment booms and berms, and absorbent material.

Maintenance and Inspection

- Contractor must inspect demolition areas and containment systems over or adjacent to receiving waters daily when operations are ongoing.
- Any debris-catching devices and containment systems shall be emptied daily. Collected debris shall be removed and stored away from the drainage inlets and receiving waters and protected from run-on and runoff.
- Inspect demolition and containment systems over or adjacent to for leaks and spills at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Inspection and Maintenance of these areas must be properly documented and ensure no potential for discharges occur from these areas as part of the non-visible monitoring requirements.

SWPPP or WPCP

- Structure Demolition/Removal Over or Adjacent to Water must be discussed in Section 500.4.1 of the SWPPP or Section 30 of the WPCP

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Section 8
Waste Management and Materials Pollution Control BMPs

8.1 Waste Management and Materials Pollution Control

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

8.1.1 Waste Management BMPs

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

8.1.2 Materials Pollution Control BMPs

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

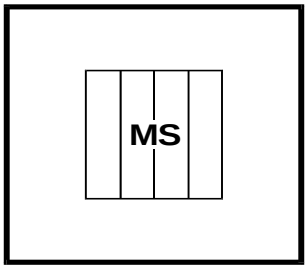
Table 8-1 lists the waste management and materials pollution control BMPs.

Table 8-1. Waste Management and Materials Pollution Control BMPs	
ID	BMP Name
WM-1	Material Delivery and Storage
WM-2	Material Use
WM-3	Stockpile Management
WM-4	Spill Prevention and Control
WM-5	Solid Waste Management
WM-6	Hazardous Waste Management
WM-7	Contaminated Soil Management
WM-8	Concrete Waste Management
WM-9	Sanitary and Septic Waste Management
WM-10	Liquid Waste Management

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

Material Delivery and Storage

WM-1



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

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

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

- Asphalt and concrete components
- Pesticides and herbicides
- Other materials that may be detrimental if released to the environment.

Limitations

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

Standards and Specifications

General

- Train employees and subcontractors on the proper material delivery and storage practices.
- Temporary storage area shall be located away from vehicular traffic.
- Safety Data Sheets (SDS) shall be supplied to the RE for all materials stored. Can be done at any time but at least 5 days prior to material being used or stored onsite.
- Must comply with Caltrans Standard Specification 13-4, "Job Site Management", and 14-11, "Hazardous Waste and Contamination."

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall be placed in temporary containment facilities for proper storage.
- Each temporary containment facility shall have a permanent cover and side wind protection or be covered during non-working days and whenever a storm event is forecasted.
- A temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of ten percent of the aggregate volume of all containers or 100 percent of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids shall be sent to an approved disposal site.

- Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
- Materials shall be stored in their original containers and the original product labels shall be maintained in place in a legible condition. Damaged or otherwise illegible labels shall be replaced immediately.
- Bagged and boxed materials shall be stored on pallets and shall not be allowed to accumulate on the ground. To provide protection from wind and rain, bagged and boxed materials shall be covered during non-working days and prior to rain events.
- Stockpiles shall be protected in accordance with WM-3, "Stockpile Management."
- Have proper storage instructions posted at all times in an open and conspicuous location and include it as an informal training component of the tailgates and ongoing WPC training.
- Do not store hazardous chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet, under cover in secondary containment.
- Keep ample supply of appropriate spill clean up material near storage areas.
- Also, see WM-6, "Hazardous Waste Management," for storing of hazardous materials.

Material Delivery Practices

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

Spill Clean-up

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

Maintenance and Inspection

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

SWPPP or WPCP

- Material Delivery and Storage must be discussed in Section 500.4.2 of the SWPPP or Section 30.3.2 of the WPCP.

Material Use

WM-2

Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

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

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

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

Limitations

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

Standards and Specifications

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

Maintenance and Inspections

- Inspect storage areas before, during and after rainfall events, and at least weekly during other times. Collect and place into drums any spills or accumulated rainwater and dispose of properly.
- Spot check employees and subcontractors throughout the job, include appropriate practices as part of the informal tailgate training.

SWPPP or WPCP

- Material Use must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.

Stockpile Management

WM-3

Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

Implemented in all projects that stockpile soil and other materials.

Limitations

Use of plastic cover might be restricted depending on the location of the site and regulatory permits.

Standards and Specifications

- Stockpiles must comply with Standard Specification 13-4.03C (3) Stockpile Management.
- Protection of stockpiles is a year-round requirement.
- Locate stockpiles a minimum of 50 ft. away from concentrated flows of storm water, drainage courses, and inlets.
- Utilize run-on and run-off BMPs to ensure stockpile materials are protected and do not have the potential to discharge material.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information see WE-1, "Wind Erosion Control."
- Stockpiles of contaminated soil shall be managed in accordance with WM-7, "Contaminated Soil Management."
- Bagged materials should be placed on pallets and under cover.

Protection of Inactive Stockpiles

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

- Soil stockpiles:
  - soil stockpiles shall be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times. If no longer needed, they should be removed and disposed of properly.
- Stockpiles of portland cement concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate subbase:
  - the stockpiles shall be covered or protected with a temporary perimeter sediment barrier at all times. If no longer needed, they should be removed and disposed of properly.
- Stockpiles of "cold mix":
  - Cold mix stockpiles shall be placed on and covered with plastic or comparable material at all times and surround by a berm.
- Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate:
  - Treated wood shall be covered with plastic or comparable material and placed on pallets.

Protection of Active Stockpiles

Active stockpiles shall be protected further as follows:

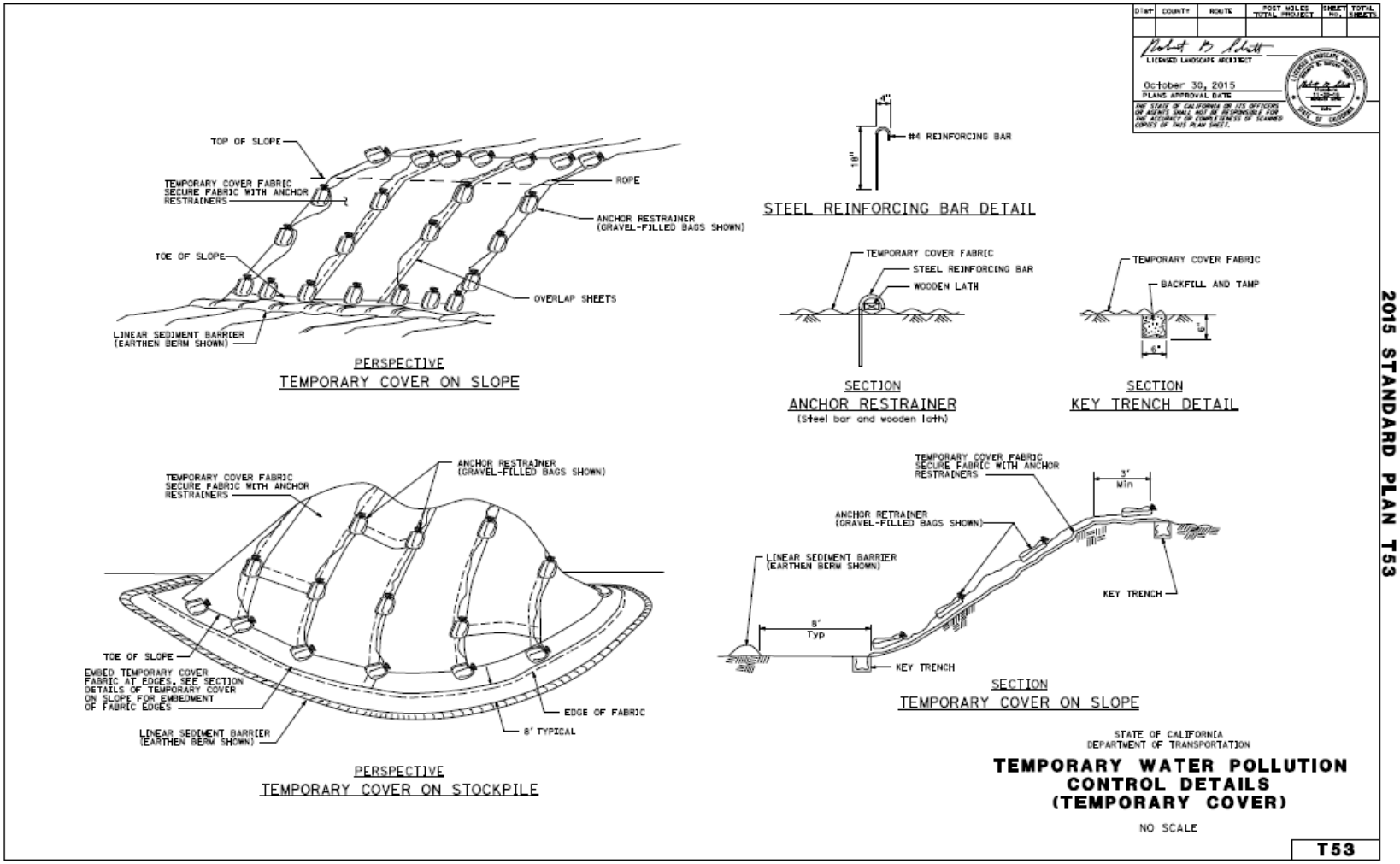
- All stockpiles shall be covered, stabilized, or protected with a temporary linear sediment barrier prior to the onset of precipitation.
- Stockpiles of "cold mix" shall be placed on and covered with plastic or comparable material prior to the onset of precipitation.
- All Stockpiles should be removed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

Maintenance and Inspections

- Inspect Stockpile Management areas before, during and after rainfall events, and at least weekly during other times.
- Repair and/or replace perimeter controls and covers to keep Stockpile Management functioning properly.
- Stockpile Management areas must be shown on the WPCDs and reflect site conditions.

SWPPP or WPCP

- Stockpile Management must be discussed in Section 500.4.2 of the SWPPP or Section 30.3.2 of the WPCP.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LICENSED LANDSCAPE ARCHITECT
October 30, 2015
PLANS APPROVAL DATE
THE STATE OF CALIFORNIA OR ITS OFFICERS OR AGENTS SHALL NOT BE RESPONSIBLE FOR THE ACCURACY OR COMPLETENESS OF SCANNED COPIES OF THIS PLAN SHEET.
TOP OF SLOPE
TEMPORARY COVER FABRIC SECURE FABRIC WITH ANCHOR RESTRAINERS
ROPE
ANCHOR RESTRAINER (GRAVEL-FILLED BAGS SHOWN)
TOE OF SLOPE
OVERLAP SHEETS
LINEAR SEDIMENT BARRIER (EARTHEN BERM SHOWN)
PERSPECTIVE
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WOODEN LATH
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(Steel bar and wooden lath)
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DEPARTMENT OF TRANSPORTATION
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T53
2015 STANDARD PLAN T53

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Spill Prevention and Control

WM-4

Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Application

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

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

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

Limitations

- This BMP only applies to spills caused by the contractor. Other spills or discharges observed or discovered must be reported to the RE.
- Procedures and practices presented in this BMP are general. Contractor shall identify appropriate practices for the specific materials used or stored on-site and follow the appropriate Safety Data Sheets (SDS).

Standards and Specifications

- Must comply with Caltrans Standard Specifications 13-4.03B Spill Prevention and Control.
- To the extent that it doesn't compromise clean up activities, spills shall be covered and protected from stormwater run-on.
- Spills shall not be buried or washed with water. Potable water has chlorine and therefore should not be allowed to be discharged off the project site.
- Used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose shall be stored and properly disposed of.
- Water used for cleaning and decontamination shall not be allowed to enter storm drains or watercourses and shall be collected and disposed of in accordance with WM-10, "Liquid Waste Management."
- Water overflow or minor water spillage shall be contained and shall not be allowed to discharge into drainage facilities or watercourses.
- Proper storage, clean-up and spill reporting instruction for hazardous materials stored or used on the project site shall be posted at all times in an open, conspicuous and accessible location.
- Waste storage areas shall be kept clean, well organized and equipped with ample clean-up supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers and liners shall be repaired or replaced as needed to maintain proper function.

Education

- Educate employees and subcontractors on what a "significant spill" is for each material they use, and what is the appropriate response for "significant" and "insignificant" spills.
- Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.
- Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

- The WPC Manager shall oversee and enforce proper spill prevention and control measures.
- The list of reportable quantities can be found at https://www.bnl.gov/esh/env/compliance/docs/SaraTitleList.pdf.

Cleanup and Storage Procedures

- Minor Spills:
  - Minor spills typically involve small quantities of oil, gasoline, paint, etc., which can be controlled by the first responder at the discovery of the spill.
  - Use absorbent materials on small spills rather than hosing down or burying the spill.
  - Remove the absorbent materials promptly and dispose of properly.
  - The practice commonly followed for a minor spill is:
    - Contain the spread of the spill.
    - Recover spilled materials.
    - Clean the area and/or properly dispose of contaminated materials.
- Semi-Significant Spills:
  - Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.
- Clean-up spills immediately:
    - Notify the WPC Manager immediately. The WPC Manager shall notify the RE and prepare the proper notifications as required.
- Contain spread of the spill.
    - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials.
    - If the spill occurs in dirt areas, immediately contain the spill. Dig up and properly dispose of contaminated soil.
    - If the spill occurs during rain, cover spill with tarps to prevent contaminating runoff.

- Significant/Hazardous Spills:
  - For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps shall be taken:
    - Notify the RE immediately and follow up with a written report.
    - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper county officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site.
    - Notify the Governor's Office of Emergency Services Warning Center, (800) 852-7550 or 1-916-845-8911.
    - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor shall notify the National Response Center at (800) 424-8802.
    - Notification shall first be made by telephone and followed up with a written report. The reporting form is located at http://www.caloes.ca.gov/FireRescueSite/Documents/304%20-%20Written%20Report%20Form.pdf.
    - The services of a spills contractor or a Haz-Mat team shall be obtained immediately. Construction personnel shall not attempt to clean up the spill until the appropriate and qualified staff have arrived at the job site.
    - Other agencies which may need to be consulted include, but are not limited to, the Fire Department, the Public Works Department, the Coast Guard, the Highway Patrol, the City/County Police Department, Department of Toxic Substances, California Division of Oil and Gas, Cal/OSHA, RWQCB, etc.

Maintenance and Inspection

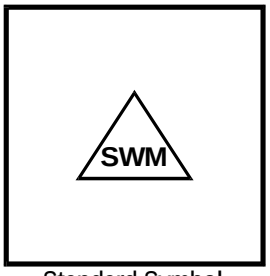
- Verify weekly that spill control clean-up materials are located near material storage, unloading, and use areas.
- Update spill prevention and control plans and stock appropriate clean-up materials when changes occur in the types of chemicals used or stored onsite.
- Improper clean-up might trigger need for water quality or soil testing. The WPC Manager should be proactive in ensuring controls are in place and adequate to contain and prevent further issues.

SWPPP or WPCP

- Spill Prevention and Control must be discussed in Section 500.4 of the SWPPP or Section 30.3.2 of the WPCP.

Solid Waste Management

WM-5



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

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

Solid wastes include but are not limited to:

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

Limitations

None identified.

Standards and Specifications

Education

- The WPC Manager shall oversee and enforce proper solid waste procedures and practices.

- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings and tailgate sessions).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Wherever possible, minimize production of solid waste materials.
- Must comply with Standard specification 14-10 Solid Waste Disposal and Recycling and 13-4 Job Site Handling.

Collection, Storage, and Disposal

- Dumpsters of sufficient size and number shall be provided to contain the solid waste generated by the project and be properly serviced. Must ensure that containers are watertight and have a cover.
- Littering on the project site shall be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines shall be a priority.
- Trash receptacles shall be provided in the Contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Construction debris and litter from work areas within the construction limits of the project site shall be collected and placed in watertight dumpsters at least weekly regardless of whether the litter was generated by the Contractor, the public, or others. Collected litter and debris shall not be placed in or next to drain inlets, storm water drainage systems or watercourses.
- Full dumpsters shall be removed from the project site and the contents shall be disposed of outside the highway right-of-way in conformance with the provisions in the Standard Specifications Section 14-10 Solid Waste Disposal and Recycling.
- Litter stored in collection areas and containers shall be handled and disposed of by trash hauling contractors.
- Construction material visible to the public shall be stored or stacked in an orderly manner to the satisfaction of the RE.

- Stormwater run-on shall be prevented from contacting stored solid waste by berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas shall be located at least 50 ft. from drainage facilities and watercourses and shall not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters shall be securely covered from wind and rain by covering the waste with tarps or plastic sheeting.
- Dumpster washout on the project site is not allowed.
- Notify trash hauling contractors that only watertight dumpsters are acceptable for use on-site.
- Plan for additional containers during the demolition phase of construction.
- Plan for more frequent pickup during the demolition phase of construction.
- Construction waste shall be stored in a designated area and shown in the WPCDs.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Keep the site clean of litter debris.
- Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Dispose of non-hazardous waste in accordance with Standard Specification 14-10 Solid Waste Disposal and Recycling.
- For disposal of hazardous waste, see BMP WM-6, "Hazardous Waste Management." Have hazardous waste hauled to an appropriate disposal and/or recycling facility.
- Salvage or recycle useful vegetation debris, packaging and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Maintenance and Inspection

- The WPC Manager shall monitor onsite solid waste storage and disposal procedures.

- Specific locations for Solid Waste Storage or Containment must be shown in the WPCDs and must be inspected and maintained regularly.

SWPPP or WPCP

- Solid Waste Management must be discussed in Section 500.4 of the SWPPP or Section 30.3.2 of the WPCP.

Hazardous Waste Management

WM-6

Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

- This best management practice (BMP) applies to all construction projects.
- Hazardous waste management practices are implemented on construction projects that generate waste from the use of:
  - Petroleum Products
  - Asphalt Products
  - Concrete Curing Compounds
  - Pesticides
  - Palliatives
  - Acids
  - Paints
  - Stains
  - Solvents
  - Septic Wastes
  - Wood Preservatives

- Roofing Tar, or
- Any materials deemed a hazardous waste in California, Title 22 Division 4.5, or listed in 40 CFR Parts 110, 117, 261, or 302.

Limitations

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

Standards and Specifications

Education

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

Storage Procedures

- Wastes shall be stored in sealed containers constructed of a suitable material and shall be labeled as required by Title 22 CCR, Division 4.5 and 49 CFR Parts 172,173, 177 and 178, 179.
- All hazardous waste shall be stored, transported, and disposed as required in Title 22 CCR, Division 4.5 and 49 CFR 261-263.

- Waste containers shall be stored in temporary containment facilities that shall comply with the following requirements:
  - Temporary containment facility shall provide for a spill containment volume able to contain precipitation from a 24-hour, 25-year storm event, plus the greater of ten percent of the aggregate volume of all containers or 100 percent of the capacity of the largest tank within its boundary, whichever is greater.
  - Temporary containment facility shall be impervious to the materials stored there for a minimum contact time of 72 hours.
  - Temporary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks accumulated rainwater and spills shall be placed into drums after each rainfall. These liquids shall be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids shall be sent to an approved disposal site.
  - Sufficient separation shall be provided between stored containers to allow for spill cleanup and emergency response access.
  - Incompatible materials, such as chlorine and ammonia, shall not be stored in the same temporary containment facility.
  - Temporary containment facilities shall be covered during non-working days, and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs. A storage facility having a solid cover and sides is preferred to a temporary tarp. Storage facilities shall be equipped with adequate ventilation.
- Drums shall not be overfilled and wastes shall not be mixed.
- Unless watertight, containers of dry waste shall be stored on pallets.
- Paint brushes and equipment for water and oil based paints shall be cleaned within a contained area and shall not be allowed to contaminate site soils, watercourses or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused shall be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths shall be disposed of as solid waste.
- Ensure that adequate hazardous waste storage volume is available.
- Ensure that hazardous waste collection containers are conveniently located.

- Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.
- Minimize production or generation of hazardous materials and hazardous waste on the job site.
- Use containment berms in fueling and maintenance areas and where the potential for spills is high.
- Segregate potentially hazardous waste from non-hazardous construction site debris.
- Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.
- Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.
- Place hazardous waste containers in secondary containment.
- Do not allow potentially hazardous waste materials to accumulate on the ground.
- Do not mix wastes.

Disposal Procedures

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

- Attention is directed to "Hazardous Material", "Contaminated Material", and "Aerially Deposited Lead" of the contract documents regarding the handling and disposal of hazardous materials.

Maintenance and Inspection

- The WPC Manager or QSP shall monitor on-site hazardous waste storage and disposal procedures.
- Waste storage areas shall be kept clean, well-organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.
- Storage areas shall be inspected in conformance with the provisions in the contract documents. At a minimum, storage areas must be inspected before, daily during extended storm event, after every storm event and weekly year-round. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.
- Hazardous spills shall be cleaned up and reported in conformance with the applicable Safety Data Sheet (SDS) and the instructions posted at the project site.
- The National Response Center, at (800) 424-8802, shall be notified of spills of Federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.
- Copy of the hazardous waste manifests shall be provided to the RE.

SWPPP or WPCP

- Hazardous Waste Management must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.

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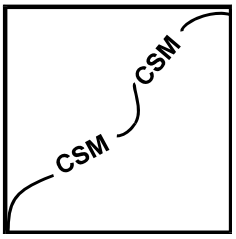
Contaminated Soil Management

WM-7



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

These are procedures and practices to minimize or eliminate the discharges of pollutants to the drainage system or to receiving waters from contaminated soil.

Appropriate Applications

- Contaminated soil management is implemented on construction projects where soil contamination may have occurred due to spills, illicit discharges, and leaks from underground storage tanks.
- It may also apply to highway widening projects in older areas where median and shoulder soils may have been contaminated by aerially deposited lead (ADL).

Limitations

The procedures and practices presented in this best management practice (BMP) are general. The contractor shall identify appropriate practices and procedures consistent with the plans and specifications for the specific contaminants known to exist or discovered on site.

Standards and Specifications

Identifying Contaminated Areas

- Contaminated soils are often identified during project planning and development with known locations identified in the plans and specifications. The contractor shall review applicable reports and examine applicable call-outs in the plans and specifications.
- The contractor may discover contaminated soils not identified in the plans and specifications by observing:
- Spills and leaks, discoloration, odors or abandoned underground tanks or pipes.

- Spills and leaks caused by the contractor are the contractor's responsibility for removal, testing, and disposal.

  If unanticipated asbestos or hazardous substances are discovered, that were not released by the contractor, the contractor shall stop work in that area and immediately notify the RE. The contractor shall not resume work in the area until directed to do so.

Education

- Prior to performing any excavation work at the locations containing material classified as hazardous, employees and subcontractors shall complete a safety training program which meets 29 CFR 1910.120 and 8 CCR 5192 covering the potential hazards as identified.
- Educate employees and subcontractors in identification of contaminated soil and on contaminated soil handling, containment and disposal procedures.
- Hold regular meetings to discuss and reinforce contaminated soil handling, containment and disposal procedures (incorporate into regular safety meetings and tailgates).

Handling Procedures for Material with Aerially Deposited Lead (ADL)

- Materials from areas designated as containing (ADL) may, if allowed by the contract special provisions, be excavated, transported, and used in the construction of embankments and/or backfill.
- Must comply with Standard specification requirements outlined in Section 14-11 Hazardous Waste and Contamination.
- Must comply with the DTSC ADL agreement for specific requirements regarding handling, stockpiling and hauling of material.
- Excavation, transportation, and placement operations shall result in no visible dust.
- Use caution to prevent spillage of lead containing material during transport.
- Monitor the air quality during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Contaminated soil shall be disposed of properly in compliance with the specifications and all applicable regulations. in Title 22, CCR, Division 4.5 and section 14-11 of the specifications.
- If required by the specifications test contaminated soils at a SWRCB ELAP certified laboratory.

- If the soil is contaminated, work with the local regulatory agencies to develop options for treatment and/or disposal.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- If temporary stockpiling is allowed by the specifications.
- Place plastic sheeting or tarps underneath material and cover the stockpile with plastic sheeting or tarps if required by the specifications.
- Install a berm around the stockpile to prevent run-on or run-off from leaving the area.
- Do not stockpile in or near storm drains or receiving water.
- Install berms or run-on controls to prevent stormwater from commingling with contaminated areas.
- Contaminated material and hazardous material on exteriors of transport vehicles shall be removed and placed either into the current transport vehicle or the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality during excavation operations if required.
- Procure all permits and licenses, pay all charges and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, including registration for transporting vehicles carrying the contaminated material and the hazardous material.
- Collect water from decontamination procedures and treat and/or dispose of it at an appropriate disposal site.
- Collect non-reusable protective equipment, once used by any personnel, and dispose of at an appropriate disposal site.
- Install temporary security fence to surround and secure the exclusion zone. Remove fencing when no longer needed.
- Excavation, transport, and disposal of contaminated material and hazardous material shall be in accordance with the rules and regulations of the following agencies (the specifications of these agencies supersede the procedures outlined in this BMP):
  - United States Department of Transportation (USDOT).
  - United States Environmental Protection Agency (USEPA).
  - California Environmental Protection Agency (CAL-EPA).

- California Division of Occupation Safety and Health Administration (CAL-OSHA).

- Local regulatory agencies.

Procedures for Underground Storage Tank Removals

- If an unknown underground storage tank is discovered, the contractor shall stop work in that area and immediately notify the RE. The contractor shall not resume work in the area until directed to do so.

- If tank removal operations are required by the contract, follow the contract requirements for obtaining permits and approval from the federal, state, and local agencies, which have jurisdiction over such work.

- If tank removal operations are required by the contract, the underground storage tank, any liquid and/or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal shall be transported to disposal facilities as required by the contract Specifications.

Water Control

- Take all necessary precautions and preventive measures to prevent the flow of water, including ground water, from mixing with contaminated or hazardous materials or entering contaminated soil excavations. Such preventative measures may consist of, but are not limited to: berms, cofferdams, grout curtains, freeze walls, and seal course concrete or any combination thereof.

- If water does enter an excavation and becomes contaminated, such water, when necessary to proceed with the work, shall be dewatered consistent with NS-2, "Dewatering Operations" and the Caltrans *Field Guide to Construction Site Dewatering* Manual, and in compliance with the specifications.

Maintenance and Inspection

- The WPC Manager shall monitor on-site contaminated soil storage and disposal procedures.

- Monitor the air quality during excavation operations if required

- Manage contaminated soils and hazardous substances/waste under the appropriate federal, state, and local requirements.

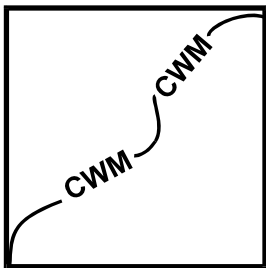
- Inspect stockpiles, hazardous waste receptacles and storage areas regularly.

SWPPP or WPCP

- Contaminated Soil Management must be discussed in Section 500.4 of the SWPPP or Section 30.3.2 of the WPCP.

Concrete Waste Management

WM-8



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

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

Limitations

- None identified.

Standards and Specifications

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- The WPC Manager shall oversee and enforce concrete waste management procedures.

Concrete Demolition Wastes

- Stockpile concrete demolition wastes in accordance with BMP WM-3, "Stockpile Management."
- Disposal of hardened PCC and AC waste shall be in conformance with Standard Specifications Section 14-10 Solid Waste Disposal and Recycling.

Concrete Slurry Waste Management and Disposal

- PCC and AC waste shall not be allowed to enter storm drainage systems or watercourses.
- A sign shall be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.
- The WPCM must ensure that onsite concrete working tasks are being monitored, such as saw cutting, coring, grinding and grooving to ensure proper methods are implemented.
- Residue from saw cutting, coring and grinding operations shall be picked up by means of a vacuum device. Residue shall not be allowed to flow across the pavement and shall not be left on the surface of the pavement. See also NS-3, "Paving and Grinding Operations."
- Vacuumed slurry residue shall be disposed in accordance with WM-5, "Solid Waste Management" and Standard Specifications Section 7-1.13. Slurry residue shall be temporarily stored in a facility as described in "Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures" below), or within an impermeable containment vessel or bin.
- Collect and dispose of all residues from grooving and grinding operations in accordance with Standard Specifications Section 14-10 Solid Waste Disposal and Recycling and Standard Specifications 14-11 Hazardous Waste and Contamination.

Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures

- Temporary concrete washout facilities shall be located a minimum of 50 ft. from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the RE. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign shall be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities. The sign shall be installed as shown on the plans and in conformance with the provisions in Standard Specifications Section 56-2, Overhead Sign Structure.

- Temporary concrete washout facilities shall be constructed above grade or below grade at the option of the Contractor. Temporary concrete washout facilities shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities shall have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Perform washout of concrete mixers, delivery trucks, and other delivery systems in designated areas only.
- Wash concrete only from mixer chutes into approved concrete washout facility. Washout may be collected in an impermeable bag or other impermeable containment devices for disposal.
- Pump excess concrete in concrete pump bin back into concrete mixer truck.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete shall be broken up, removed, and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02.

Temporary Concrete Washout Facility Type "Above Grade"

- Temporary concrete washout facility Type "Above Grade" shall be constructed as shown on Page 6 or 7, with a recommended minimum length and minimum width of10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval from the RE.
- Straw bales, wood stakes, and sandbag materials shall conform to the provisions in SC-9, "Straw Bale Barrier."
- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes, tears or other defects that compromise the impermeability of the material. Liner seams shall be installed in accordance with manufacturers' recommendations.

- Portable delineators shall conform to the provisions in Standard Specifications Section 12-3.04, "Portable Delineators." The delineator bases shall be cemented to the pavement in the same manner as provided for cementing pavement markers to pavement. Portable delineators shall be applied only to a clean, dry surface.

Temporary Concrete Washout Facility (Type Below Grade)

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

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

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

- Temporary washout facilities shall implement BMPs to prevent run-on and run-off from the facility.

Removal of Temporary Concrete Washout Facilities

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

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

Maintenance and Inspection

- Inspect Concrete Waste Management areas before, during and after rainfall events, and at least weekly during other times.

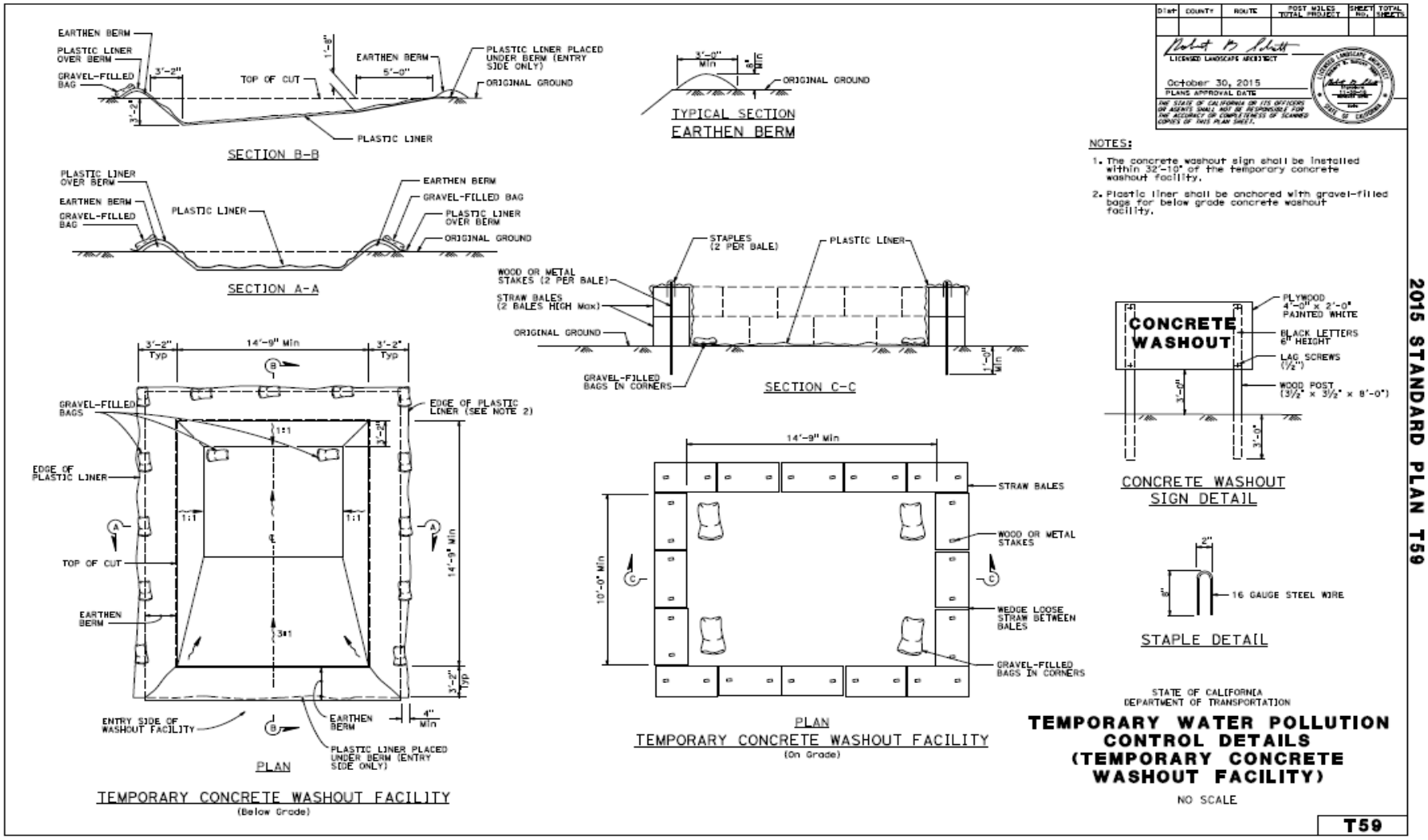
- The WPC Manager shall monitor concrete working tasks, such as sawcutting, coring, grinding and grooving daily to ensure proper methods are employed or as directed by the RE.

- Temporary concrete washout facilities shall be maintained to provide adequate holding capacity with a minimum freeboard of 4 inches for above grade facilities and 12 inches for below grade facilities.
- Maintaining temporary concrete washout facilities shall include removing and disposing of hardened concrete and returning the facilities to a functional condition.
- Hardened concrete materials shall be removed and disposed of in conformance with the provisions in Standard Specifications Section 7-1.13 or 15-3.02.
- Existing facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.
- Temporary concrete washout facilities shall be inspected for damage (i.e. tears in polyethylene liner, missing sandbags, etc.). Damaged facilities shall be repaired.
- Inspection and Maintenance of these areas must be properly documented and ensure no potential for discharges occur from these areas as part of the non-visible monitoring requirements.

SWPPP or WPCP

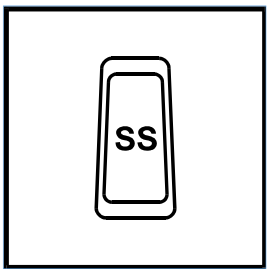
- Concrete Waste Management must be discussed in Section 500.4.2 of the SWPPP or Section 30.3.2 of the WPCP.

Concrete Waste Management



Sanitary and Septic Waste Management

WM-9



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

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

Appropriate Applications

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

Limitations

None identified.

Standards and Specifications

Education

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

Storage and Disposal Procedures

- Temporary sanitary facilities shall be located away from drainage facilities, receiving waters, and from traffic circulation.
- When subjected to high winds or risk for overtopping, temporary systems must be properly secured.
- Wastewater shall not be discharged or buried within the highway right-of-way.
- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, shall comply with the local health agency, city, county, and sewer district requirements.
- If using an on-site disposal system, such as a septic system, comply with local health agency requirements.
- Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.
- Ensure that sanitary and septic facilities are maintained in good working order by a licensed service.
- Use only reputable, licensed sanitary/septic waste haulers.

Maintenance and Inspection

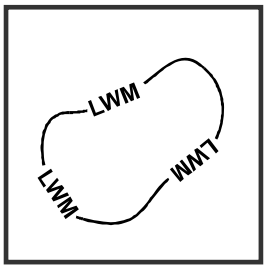
- Inspect onsite sanitary and septic waste storage and disposal procedures at least weekly, prior to a forecasted rain event, daily during extended rain events and post-storm events.
- Locations for portable Santiary Systems must be shown on the WPCDs and reflect current site conditions.

SWPPP or WPCP

- Sanitary and Septic Waste Management must be discussed in Section 500.4.2 of the SWPPP or Section 30.3.2 of the WPCP.

Liquid Waste Management

WM-10



Standard Symbol

BMP Objectives

Soil Stabilization	☐
Sediment Control	☐
Tracking Control	☐
Wind Erosion Control	☐
Non-Stormwater Management	☐
Materials and Waste Management	☑

Definition and Purpose

Procedures and practices to prevent discharge of pollutants to the storm drain system or to receiving waters as a result of the creation, collection, and disposal of non-hazardous liquid wastes.

Appropriate Applications

Liquid waste management is applicable to construction projects that generate any of the following non-hazardous byproducts, residuals, or wastes:

- Drilling slurries and drilling fluids.
- Grease-free and oil-free wastewater and rinse water.
- Dredgings.
- Other non-storm water liquid discharges not permitted by separate permits.

Limitations

- Disposal of some liquid wastes may be subject to specific laws and regulations, or to requirements of other permits secured for the construction project (e.g., NPDES permits, Army Corps permits, Coastal Commission permits, etc.).
- Does not apply to dewatering operations (see NS-2, “Dewatering Operations”), solid waste management (see WM-5, “Solid Waste Management”), hazardous wastes (see WM-6, “Hazardous Waste Management”), or concrete slurry residue (see WM-8, “Concrete Waste Management”).

- Does not apply to non-stormwater discharges permitted by any NPDES permit held by the pertinent Caltrans District, unless the discharge is determined by Caltrans to be a source of pollutants. Typical permitted non-stormwater discharges can include: water line flushing; landscape irrigation; diverted stream flows; rising ground waters; uncontaminated pumped ground water; discharges from potable water sources; foundation drains; irrigation water; springs; water from crawl space pumps; footing drains; lawn watering; flows from riparian habitats and wetlands; and, discharges or flows from emergency firefighting activities. See 2016 SWMP for complete list of permitted non-stormwater discharges.

Standards and Specifications

General Practices

- Must comply with Standard Specification 13-4.03 Spill Prevention and Control.
- The WPC Manager shall oversee and enforce proper liquid waste management procedures and practices.
- Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.
- Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage structure, waterway, or receiving water.
- Educate employees and subcontractors on liquid waste generating activities, and liquid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings and tailgates).
- Verify which non-stormwater discharges are permitted by the Caltrans NPDES permit; different regions might have different requirements not outlined in this permit. Some listed discharges may be prohibited if Caltrans determines the discharge to be a source of pollutants.
- Apply the NS-8, "Vehicle and Equipment Cleaning" BMP for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

- Drilling residue and drilling fluids shall not be allowed to enter storm drains and receiving waters and shall be disposed of outside the highway right-of-way in conformance with the provisions in Standard Specifications.
- If an appropriate location is available, as determined by the RE, drilling residue and drilling fluids that are exempt under California Code of Regulations (CCR) Title 23 §2511(g) may be dried by infiltration and evaporation in a containment facility constructed in conformance with the

provisions concerning the Temporary Concrete Washout Facilities detailed in WM-08, "Concrete Waste Management."

- Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, shall be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.
- Contain liquid wastes in a controlled area, such as a holding pit, sediment basin, roll-off bin, or portable tank.
- Containment devices must be structurally sound and leak free.
- Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.
- Take precautions to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined in WM-4, "Spill Prevention and Control."
- Do not locate containment areas or devices where accidental release of the contained liquid can threaten health or safety, or discharge to water bodies, channels, or storm drains.

Capturing Liquid Wastes

- Capture all liquid wastes running off a surface, which has the potential to affect the storm drainage system, such as wash water and rinse water from cleaning walls or pavement.
- Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.
- If the liquid waste is sediment laden, use a sediment trap SC-3, "Sediment Trap/Curb Cutback" for capturing and treating the liquid waste stream, or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

- Typical method is to dewater the contained liquid waste, using procedures such as described in NS-2, "Dewatering Operations", and SC-2, "Sediment/Desilting Basin"; and dispose of resulting solids per WM-5, "Solid Waste Management."
- Method of disposal for some liquid wastes may be prescribed in Water Quality Reports, NPDES permits, Environmental Impact Reports, 401 Water Quality Certifications or 404 permits, local agency discharge permits, etc., and may be defined elsewhere in the special provisions.

- Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.
- For disposal of hazardous waste, see WM-6, "Hazardous Waste Management."
- If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Maintenance and Inspection

- Spot check employees and subcontractors at least monthly throughout the job to ensure appropriate practices are being employed. At a minimum, liquid waste containment areas must be inspected before, during and after rain events, findings must be properly documented and any deficiencies timely corrected.
- Remove deposited solids in containment areas and capturing devices as needed, and at the completion of the task. Dispose of any solids as described in WM-5, "Solid Waste Management."
- Inspect containment areas and capturing devices frequently for damage, and repair as needed.
- Improper storage, containment or disposal might trigger sampling requirements per section 700 of the SWPPP.
- Locations for Liquid Waste Management must be shown on the WPCDs and reflect current site conditions.

SWPPP or WPCP

- Liquid Waste Management must be discussed in Section 500.4 of the SWPPP or Section 30.3 of the WPCP.

Appendix A: Definition of Terms

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Appendix A

Definition of Terms

Active Areas. An area where soil disturbing activities have occurred at least once within 14 days.

Areas of Construction. All areas subject to land surface disturbance activities related to the project including, but not limited to, project staging areas, immediate access areas and storage areas.

Active Treatment System (ATS). A treatment system that employs chemical coagulation, chemical flocculation, or electrocoagulation to aid in the reduction of turbidity caused by fine suspended sediment.

Air Deposition. Airborne particulates from construction activities.

Best Available Technology Economically Achievable (BAT). As defined by USEPA, BAT is a technology-based standard established by the CWA as the most appropriate means available on a national basis for controlling the direct discharge of toxic and nonconventional pollutants to navigable waters. The BAT effluent limitations guidelines, in general, represent the best existing performance of treatment technologies that are economically achievable within an industrial point source category or subcategory.

Best Conventional Pollutant Control Technology (BCT). As defined by USEPA, BCT is a technology-based standard for the discharge from existing industrial point sources of conventional pollutants including BOD, total suspended sediment (TSS), fecal coliform, pH, oil and grease.

Best Management Practices (BMPs). BMPs are scheduling of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants. BMPs also include treatment requirements, operating procedures, and practices to control site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Caltrans Permit. The Caltrans Statewide NPDES Permit for discharges from Caltrans properties, facilities, and activities (Order No. 2012-011-DWQ, NPDES No. CAS000003), issues by the SWRCB.

Construction Activity. Includes clearing, grading, or excavation and Contractor activities that result in soil disturbance.

Construction Site. The area involved in a construction project as a whole.

Construction Site BMPs. Temporary control practices (BMPs) that are required only temporarily to address a short-term stormwater contamination threat as a result of construction activities. For example, silt fences are located near the base of newly graded slopes that have substantial area of exposed soil. Then, during rainfall, the silt fences allow capture of sediment from erosion of the slopes.

Contractor. Party responsible for carrying out the contract per plans and specifications. The Standard Specifications and contract special provisions contain stormwater protection requirements the Contractor must address.

Contractor-Support Facilities. Contractor-support facilities include: Staging areas, storage yards for equipment and materials, mobile operations, batch plants for Portland Cement Concrete and Hot Mix Asphalt, crushing plants for rock and aggregate, other facilities installed for Contractor convenience such as haul roads.

Debris. Litter, rubble, discarded refuse, and remains of destroyed inorganic anthropogenic waste.

Direct Discharge. When surface runoff directly enters the surface water body without first flowing through a municipal separate storm sewer system (MS4).

Discharge. Any release, spill, leak, pump, flow, escape, dumping, or disposal of any liquid, semi-solid or solid substance.

Disturbed Soil Areas (DSAs). Areas of exposed, erodible soil, including stockpiles, that are within the construction limits and that result from construction activities.

Drainage Area. The area of land that drains water, sediment, pollutants, and dissolved materials to a common outlet.

Effluent. Any discharge of water by a discharger either to the receiving water or beyond the property boundary controlled by the discharger.

Environmental Protection Agency (EPA). Agency that issued the regulations to control pollutants in stormwater runoff discharges (The Clean Water Act and NPDES permit requirements).

Erosion. The process, by which soil particles are detached and transported by the actions of wind, water, or gravity.

Erosion Control BMPs. Vegetation, such as grasses and wildflowers, and other materials, such as straw, fiber, stabilizing emulsion, protective blankets, etc., placed to stabilize areas of disturbed soils, reduce loss of soil due to the action of water or wind, and prevent water pollution.

Exempt Construction Activities. Activities exempt from the CGP, including routine maintenance to maintain original line and grade, hydraulic capacity, or original purpose of the facility; and emergency construction activities required to protect public health and safety. Local permits may not exempt these activities.

Existing vegetation. Any vegetated area that has not already been cleared and grubbed.

Final Stabilization. All soil disturbing activities at each individual parcel within the site have been completed in a manner consistent with the requirements in this General Permit.

Forecasted Storm Event. A storm that produces or is forecasted to produce at least 0.10 inch of precipitation within a 24-hour period.

General Permit. The Construction General Permit for Storm Water Discharges Associated with Construction Activity (Order No. 2009-000-DWQ, NPDES Permit CAS000002) and amendments (Order No. 2010-0014-DWQ and Order No. 2012-0006-DWQ) issued by the SWRCB.

Good Housekeeping. A common practice related to the storage, use, or cleanup of materials, performed in a manner that minimizes the discharge of pollutants.

Good Housekeeping BMPs. BMPs designed to reduce or eliminate the addition of pollutants to construction site runoff through analysis of pollutant sources, implementation of proper handling/disposal practices, employee education, and other actions. Grading Phase (part of the Grading and Land Development Phase) includes reconfiguring the topography and slope including; alluvium removals; canyon cleanouts; rock undercuts; keyway excavations; land form grading; and stockpiling of select material for capping operations.

Indirect Discharge. When surface runoff enters the surface water body through an MS4 stormwater conveyance system or unlisted tributary before reaching the surface water.

National Pollutant Discharge Elimination System (NPDES) Permit. A permit issued pursuant to the CWA that requires the discharge of pollutants to waters of the United States from stormwater be controlled.

Inactive Construction Area. Any area not considered to be an active construction area. Active construction areas become inactive construction areas whenever construction activities are expected to be discontinued for a period of 14 days or longer.

Non-Storm Water Discharges. Non-Storm Water Discharges are discharges that do not originate from forecasted storm events. They can include, but are not limited to, discharges of process water, air

conditioner condensate, non-contact cooling water, vehicle wash water, sanitary wastes, concrete washout water, paint wash water, irrigation water, or pipe testing water.

Non-Visible Pollutants. Pollutants associated with a specific site or activity that can have a negative impact on water quality, but cannot be seen though observation (ex: chlorine). Such pollutants being discharged are not authorized.

pH. Unit universally used to express the intensity of the acid or alkaline condition of a water sample. The pH of natural waters tends to range between 6 and 9, with neutral being 7. Extremes of pH can have deleterious effects on aquatic systems.

Pollution. The man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water. An alteration of the quality of the water of the state by waste to a degree, which unreasonably affects either the waters for beneficial uses or facilities that serve these beneficial uses.

Post-Construction BMPs. Structural and non-structural controls which detain, retain, or filter the release of pollutants to receiving waters after final stabilization is attained.

Qualified SWPPP Developer (QSD). Individual who is authorized to develop and revise SWPPPs.

Qualified SWPPP Practitioner (QSP). Individual assigned responsibility for non-storm water and storm water visual observations, sampling and analysis, and responsibility to ensure full compliance with the permit and implementation of all elements of the SWPPP, including the preparation of the annual compliance evaluation and the elimination of all unauthorized discharges.

Receiving Waters. All surface water bodies within the permit area.

Regional Water Quality Control Board (RWQCB). California agencies that implement and enforce CWA Section 402(p) NPDES permit requirements, and are issuers and administrators of these permits as delegated by USEPA. There are nine regional boards working with the SWRCB.

Resident Engineer (RE). The Caltrans representative charged with administration of construction contracts. The RE decides questions regarding acceptability of material furnished and work performed. The RE has "contractual authority" to direct the Contractor and impose sanctions if the Contractor fails to take prompt and appropriate action to correct deficiencies. The following contractual sanctions can be imposed by the RE: (a) withholding payments (or portions of payments), (b) suspending work, (c) bringing in a separate Contractor to complete work items (the Contractor is billed for such costs), (d) assessing liquidated damages including passing along fines for permit violations, (e) initiating cancellation of the construction contract.

Routine Maintenance. Activities intended to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Runoff Control BMPs. Measures used to divert run-on from off-site and runoff within the site.

Runoff Effect. The effect that a particular soil stabilization product has on the production of stormwater runoff. Runoff from an area protected by a particular product may be compared to the amount of runoff measured for bare soil

Run-on. Discharges that originate off-site and flow onto the property of a separate project site.

Sediment. Solid particulate matter, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below sea level.

Sedimentation. Process of deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the liquid below the point at which it can transport the suspended material.

Sediment Control BMPs. Practices that trap soil particles after they have been eroded by rain, flowing water, or wind. They include those practices that intercept and slow or detain the flow of storm water to allow sediment to settle and be trapped (e.g., silt fence, sediment basin, fiber rolls, etc.).

Sheet Flow. Flow of water that occurs overland in areas where there are no defined channels where the water spreads out over a large area at a uniform depth.

Soil Amendment. Any material that is added to the soil to change its chemical properties, engineering properties, or erosion resistance that could become mobilized by storm water.

State Water Resources Control Board (SWRCB). California agency that implements and enforces CWA Section 402(p) NPDES permit requirements, is issuer and administrator of these permits as delegated by EPA. Works with the nine Regional Water Quality Control Boards.

Storm Drain System. Streets, gutters, inlets, conduits, natural or artificial drains, channels and watercourses, or other facilities that are owned, operated, maintained and used for the purpose of collecting, storing, transporting, or disposing of stormwater.

Stormwater. Rainfall runoff, snow melt runoff, and surface runoff and drainage. It excludes infiltration and runoff from agricultural land.

Stormwater Pollution Prevention Plan (SWPPP). A plan required by the CGP or the LTCGP that includes site map(s), an identification of construction/contractor activities that could cause pollutants in the stormwater, and a description of measures or practices to control these pollutants. It must be prepared and authorized before construction begins. A SWPPP prepared in accordance with the Special Provisions and the Handbooks will satisfy Standard Specifications Section 13 Water Pollution Control

Temporary Construction Site BMPs. Construction Site BMPs that are required only temporarily to address a short-term stormwater contamination threat. For example, silt fences are located near the base of newly graded slopes that have a substantial area of exposed soil. Then, during rainfall, the silt fences filter and collect sediment from runoff flowing off the slope.

Water Pollution Control Manager (WPC Manager). The person responsible for the implementation of the SWPPPP or WPCP, whichever is applicable for the project. The WPC Manager must be a QSP whenever the project requires a WPCP. The WPC Manager must be a QSD whenever the project requires a SWPPP.

Water Pollution Control Program (WPCP). A WPCP is a plan to identify water quality management practices to be implemented that must be prepared for all construction projects that do not require preparation of a SWPPP. For Caltrans projects disturbing more than one acre, a SWPPP satisfies the requirement for a WPCP.

Waters of the United States. Generally, refers to surface waters, as defined by the federal Environmental Water quality objectives are defined in the California Water Code as limits or levels of water quality constituents or characteristics, which are established for the reasonable protection of beneficial uses of water or the prevention of nuisance within a specific area.

Appendix B: Selection of Temporary Soil Stabilization Controls

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Appendix B

Selection of Temporary Soil Stabilization Controls

Temporary Soil Stabilization BMPs (SS BMPs) are designed to eliminate or reduce the erosion of disturbed soil areas and to reduce the transport of sediment and pollutants by stormwater during construction. SS BMPs are used to bind soil particles together, or coat the disturbed soil surface area, thereby protecting the disturbed soil area from the erosive forces of water and wind.

Section 3 of this Manual provides guidance on the selection, limitations, installation, and maintenance for approved SS BMPs. This appendix provides additional details for Field Staff and Contractors on relevant factors to consider for selecting appropriate products for project specific construction sites/areas.

Caltrans has approved six types of SS BMPs (Standard Specifications Section 13-5) listed below. These BMPs are to be applied to disturbed soil areas to eliminate or reduce erosion and the potential transport and discharge of sediment and other pollutants from Caltrans right-of-way. The SS BMPs listed as sub bullets are acceptable alternatives because they have the same general function. For example, when a project requires the use of Mulch (SS-3) both Temporary Hydraulic Mulch or Temporary Bonded Fiber Matrix Hydraulic Mulch can be used to meet the requirement.

- Mulch (SS-3)
  - Temporary Hydraulic Mulch
  - Temporary Bonded Fiber Matrix Hydraulic Mulch
- Temporary Hydroseed (SS-4)
- Soil Binders (SS-5)
  - Temporary Cementitious Binder Hydraulic Mulch
  - Temporary Soil Binder
- Temporary Tacked Straw (SS-6)
  - Temporary Tacked Straw
- Temporary Rolled Erosion Control Products (SS-7)
  - Temporary Erosion Control Blanket
  - Erosion Control Blanket
  - Temporary Covers
- Temporary Wood Mulch (SS-8)
  - Temporary Mulch

Subsection B.1 includes general factors that should be considered when the SS BMPs listed above may be selected. Subsection B.2 includes a flowchart and tables that will guide the user through the site evaluation to optimize the selection of SS BMPs for the specific construction area. Subsection B.3 includes some general description of sediment control BMPs, as they should be used in conjunction with SS BMPs to optimize BMP coverage and comply with Permit requirements.

B.1 – General factors to consider for maximizing usage of Temporary Soil Stabilization BMPs

Understanding the characteristics of a construction site/area, including how it will impact stormwater and how stormwater will impact it, is important for SS BMP planning and selection. The following characteristics must be considered before selecting a SS BMP(s).

- Preparing soil to optimize SS BMP effectiveness
  - The proper application of SS BMPs can be improved by ensuring that the area(s) that will receive SS BMPs have adequate soil preparation, whether it is track walking the slope, imprinting, or using soil amendments, or to ensure long-term vegetation sustainability having seed testing done prior to seeding the area. These techniques, in conjunction with the selection of correct SS BMP, can prevent sediment-laden discharges, reduce the need for continuous maintenance, and increase establishment of permanent vegetative cover.
- Proper Timing for application of SS BMPs
  - Consider the timing of construction as it relates to the seasonal distribution of erosive rainfall and the climate regime that the construction site/area is located in. Large areas of California are located in a Mediterranean climate regime where summers are hot and dry and winters are cool and rainy. Simply timing the application of stabilization measures prior to the beginning of the rainy season in late fall makes a significant difference in erosion and sediment delivery rates. Construction during a period of high erosive potential requires a much shorter bare soil period and will influence the choice of sediment controls. Those sediment controls that provide instant protection will be preferred over those requiring germination and establishment of vegetation.
- Determining the Specific Soil Erosivity Potential
  - A proper evaluation of the soil erosive potential and sediment delivery rates for the project specific construction site/area during the planned construction period is crucial to preventing both multiple applications of SS BMPs and sediment-laden discharges. Caltrans has a variety of tools available, from their refined RUSLE, which conform to Caltrans construction sites and is more user friendly, to the Caltrans Landscape Architecture Toolbox which can be accessed via http://www.dot.ca.gov/hq/LandArch/16_la_design/guidance/roadside_safety_tb/index.htm . The RUSLE assessment and the Landscape Toolbox can be used to evaluate soil conditions, erosivity potential, and proposed soil stabilization concepts for any construction sites/areas, even those that are less than an acre in size, and not subject to CGP or LTCGP.

B.2 Site Evaluation

The following flowchart and tables are an abridged and modified summary of the *Guidance for Temporary Soil Stabilization* (July 2003) and it is intended to be used to determine the most appropriate SS BMP to be deployed. All steps shown in Figure B-1 must be completed.

Step 1 – Start.

The Construction Field Staff or Contractor should use Figure B-1, the guidance provided in this section, and the tables that follow to determine the best option to stabilize the project specific construction site/area.

Continue to the next step.

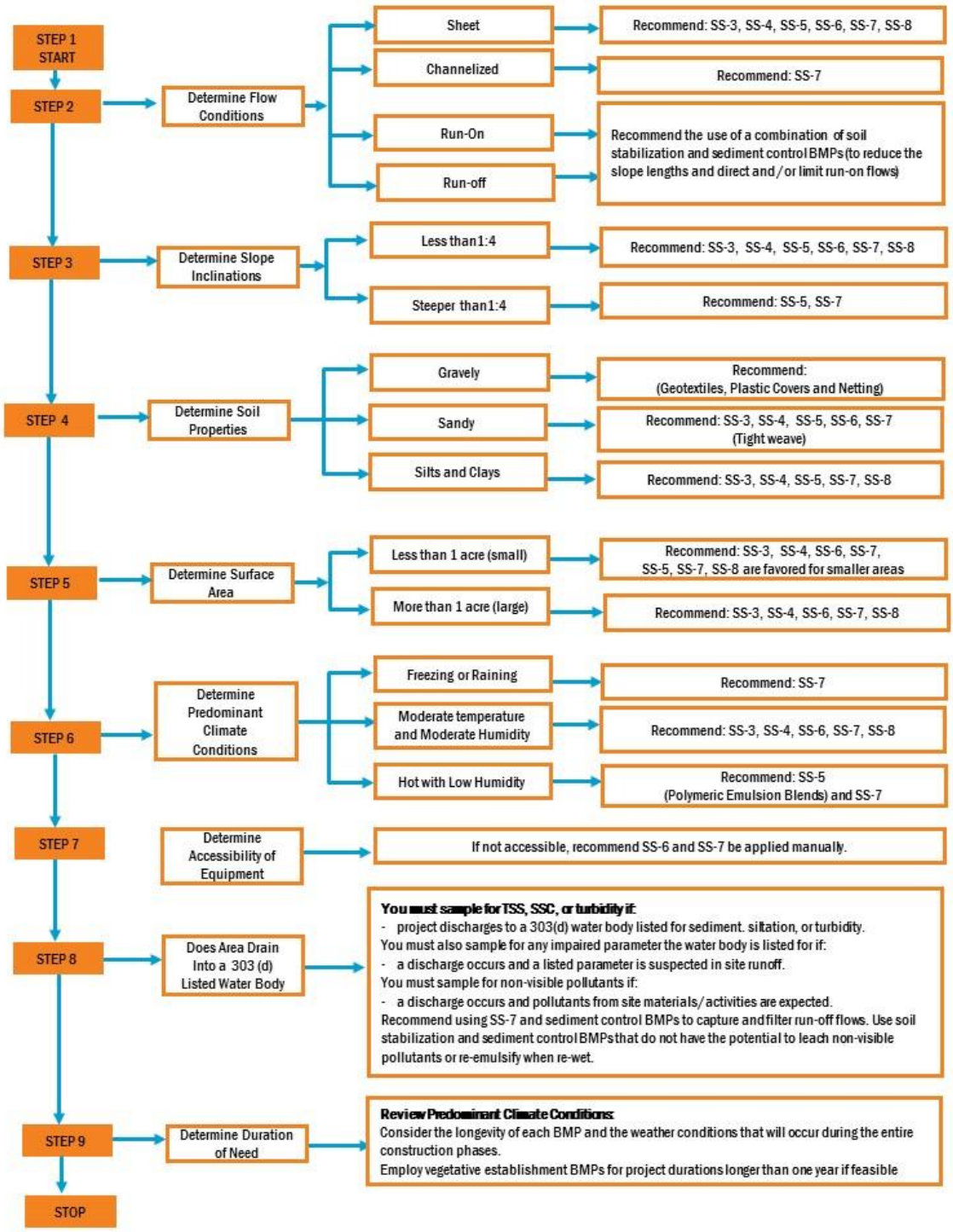

Figure B-1. Consideration of Temporary SS BMPs

Step 2-Assess the flow conditions for the area that will receive the SS BMP.

- Sheet Flow
- Channelized Flow
- Run-on Flow
- Run-off Flow

As velocities increase, the options for SS BMPs decrease. Areas that will receive direct run-on or run-off must be hydraulically evaluated to ensure there will be no additional sediment deposition. It is recommended to use a combination of SS BMPs and Temporary Sediment Control BMPs (SC BMPs) to control impacts due to run-on or run-off.

There are specific inspection requirements in the CGP or the LTCGP that must be complied with and documented by the QSP or QSD as noted in the flowchart.

Continue to the next step.

Step 3-Assess the Slope Inclination and Slope Length of area that will receive the SS BMP.

- Less than 1:4 (V:H)
- Greater than 1:2 (V:H)

The slope length is measured or calculated along the continuous inclined surface. A discrete slope can be measured between the following criteria:

- From the top of the slope to the toe of the slope (if there are no benches[1])
- From the top of the slope to the bench directly below within the slope.
- From a bench within the slope to the bench directly below within the slope.
- The lowest bench within the slope to the toe of the slope.

Continue to the next step.

Step 4-Assess the soil properties and erodibility for the area that will receive the SS BMP

Soil properties relate to available soil moisture, available soil nutrients for plant growth, and depth and presence of rock fragments that hinder temporary and permanent seeding establishment. When choosing temporary measures on various soils, the larger concern is the erosion potential (erodibility) of the soil.

soil erosion rates can be predicted by RUSLE2 on construction sites/areas. RUSLE2 uses USDA Soil Survey data which contains the soil erodibility or K factor for all mineral soils. RUSLE2 requires a K factor to run so in cases where the soil has been disturbed or when no soil K factors range from 0.01 to 0.64. The higher the k the higher the potential erosion rate.

Table B.2-1 provides the soil properties in relation to the Unified Soil Classification and USDA Texture.

[1] *A bench is a drainage feature or a Temporary Sediment Control BMP that intercepts surface flow and conveys the resulting concentrated flow away from the slope.*

Table B.2-1 Soil properties						
USDA Texture	Unified Soil Classification	K factor Undisturbed Condition	General Erodibility	K factor Highly Disturbed Conditions	Hydrologic Class	General Runoff Classification
Gravely Clay	GC	0.17	Low	-	D	Highest
	GC	0.24	Moderately Low	-	D	Highest
Gravely Clay Loam	GC-Gm	0.2	Low	-	C	Moderately High
	GC-GM	0.28	Moderately Low	-	C	Moderately High
Gravely Loam	GC-GM	0.2	Low	-	A	Lowest
	GC-GM	0.05	Very Low	-	A	Lowest
Gravely Sand	GW	0.02	Very Low	-	A	Lowest
	GP	0.05		-		
Gravely Sandy Clay Loam	GP-GC	0.2	Low	-	C	Moderately High
	GP-GC	0.28	Moderately Low	-	C	Moderately High
Gravely Sandy Loam	GP-GM	0.15	Low	-	B	Moderately Low
	GP-GM	0.2	Low	-	B	Moderately Low
Gravely Silt Loam	GW-GM	0.24	Moderately Low	-	C	Moderately High
	GW-GM	0.32	Moderate	-	C	Moderately High
Gravely Silty Clay	GW-GC	0.15	Low	-	D	Highest
	GW-GC	0.2	Low	-	D	Highest
Gravely Silty Clay Loam	GW-GM	0.24	Moderately Low	-	C	Moderately High
	GW-GM	0.32	Moderate	-	C	Moderately High
Clay	CH	0.32	Moderate	0.17	D	Highest
	CH	0.32	Moderate	0.11	D	Highest
	CH	0.28	Moderate	0.16	D	Highest
Clay Loam	CI	0.32	Moderate	0.23	C	Moderately High
	CL	0.24	Moderate	0.18	C	Moderately High
	CL	0.37	Moderately High	0.29	D	Highest
	CL	0.28	Moderate	0.18	C	Moderately High
	CL	0.32	Moderate	0.26	D	Highest
	CL	0.37	Moderately High	0.29	C	Moderately High
Loam	MI	0.32	Moderate	0.38	C	Moderately High
	ML	0.24	Moderate	0.29	C	Moderately High
	ML	0.37	Moderately High	0.43	D	Highest
	ML	0.28	Moderate	0.35	D	Highest
	ML	0.32	Moderate	0.4	D	Highest
	ML	0.37	Moderately High	-	D	Highest
Loamy Sand	SM	0.17	Low	0.13	A	Lowest
Loamy Coarse Sand	SM	0.2	Low	-	A	Lowest

Table B.2-1 Soil properties						
USDA Texture	Unified Soil Classification	K factor Undisturbed Condition	General Erodibility	K factor Highly Disturbed Conditions	Hydrologic Class	General Runoff Classification
Loamy Fine Sand	SM	0.19	Low	-	A	Lowest
Loamy Very Fine Sand	SM	0.2	Low	-	A	Lowest
Sand	SW-SP	0.15	Low	0.069	A	Lowest
Fine Sand	SW	0.11	Low	-	A	Lowest
Very Fine Sand	SW	0.11	Low	-	A	Lowest
Sandy Clay Loam	SW-SC, SP-SC	0.32	Moderate	0.18	C	Moderately High
	SW-SC, SP-SC	0.24	Moderate	0.13	C	Moderately High
	SW-SC, SP-SC	0.37	Moderately High	0.23	D	Highest
	SW-SC, SP-SC	0.28	Moderate	0.2	C	Moderately High
	SW-SC, SP-SC	0.32	Moderate	0.16	D	Highest
	SW-SC, SP-SC	0.37	Moderately High	-	C	Moderately High
Sandy Loam	SW-SM, SP-SM	0.24	Moderate	0.33	B	Moderately Low
Coarse Sandy Loam	SW-SM	0.33	Moderate	-	B	Moderately Low
Fine Sandy Loam	SW-SM	0.33	Moderate	-	B	Moderately Low
Sandy Loam	SW-SM, SP-SM	0.28	Moderate	0.35	C	Moderately High
Sandy Loam	SW-SM, SP-SM	0.2	Low	0.23	B	Moderately Low
Sandy Loam	SW-SM, SP-SM	0.24	Moderate	0.3	C	Moderately High
Sandy Loam	SW-SM, SP-SM	0.28	Moderate	-	B	Moderately Low
Very Fine Sandy Loam	SW-SM	0.33	Moderate	-	B	Moderately Low
Silt	MI	0.57	Very High	0.57	C	Moderately High
Silt Loam	MI, CI	0.37	Moderately High	0.42	C	Moderately High
	ML, CL	0.28	Moderate	0.33	C	Moderately High
	ML, CL	0.43	Moderately High	-	C	Moderately High
	ML, CL	0.43	Moderately High	0.47	D	Highest
	ML, CL	0.37	Moderately High	0.44	D	Highest
	ML, CL	0.32	Moderate	0.39	C	Moderately High
Silty Clay	CI	0.28	Moderate	0.18	D	Highest
	CL	0.32	Moderate	0.18	D	Highest

Table B.2-1 Soil properties						
USDA Texture	Unified Soil Classification	K factor Undisturbed Condition	General Erodibility	K factor Highly Disturbed Conditions	Hydrologic Class	General Runoff Classification
	CL	0.28	Moderate	0.17	D	Highest
	CL	0.37	Moderately High	0.29	C	Moderately High
	CL	0.28	Moderate	0.2	C	Moderately High
Silty Clay Loam	Cl	0.43	Moderately High	-	C	Moderately High
	CL	0.43	Moderately High	0.33	D	Highest
	CL	0.32	Moderate	0.26	C	Moderately High
	CL	0.37	Moderate	0.29	D	Highest

Continue to the next step.

Step 5-What is the total surface area that will receive the SS BMP

Surface area is the amount of disturbed soil area on the construction site/area that will require protection from erosion with various SS BMPs. Surface area categories are grouped in the following way:

- Small: 1 acre or less
- Large: 1 acre or more

In order to maximize effectiveness, the field staff must ensure that the surface area to be stabilized is adequate for the stabilization crew to complete their application prior to onset of rain, and can be accessed as discussed in steps below

Continue to the next step.

Step 6-What is the Predominant Climate Atmospheric Condition on the day the soil stabilization will be installed

Atmospheric conditions on the day of installation can limit the type of BMP that can be applied to the disturbed soil area because some SS BMPs are not effective in extreme weather conditions such as snow or heat. Other BMPs may require drying times and should not be applied to slopes while it is raining. Climate variations are caused primarily by distance from the coast and elevation. When selecting SS BMPs consider the temperature ranges, frequency and intensity of rainfall, wind, and humidity.

Continue to the next step.

Step 7- Any issues with Accessibility of Equipment

The accessibility of equipment refers to whether a road or pad capable of supporting equipment for applying SS BMPs is within range of the disturbed soil area. If the construction site/area does not have vehicular access, only SS BMPs applied manually are applicable.

Continue to the next step.

Step 8-Where is the site discharging to, any 303(d) Listed Water Bodies?

Within the Clean Water Act regulations, Section 303(d) listed water bodies that are impaired by various pollutants and are designated for developing Total Maximum Daily Loads (TMDLs). If a construction site drains into a Section 303(d) listed water body, understanding and meeting the required TMDL is essential for compliance.

It is essential to understand site run-off dynamics and control needs. The limitations of the SS BMPs, with respect to their potential water quality impacts, must be clearly understood. Proper selection and installation of SS BMPs can facilitate compliance by eliminating pollutants that discharge into Section 303(d) listed water bodies.

Continue to the next step.

Step 9- What is the duration of need?

The timeframe for which SS BMPs are needed will depend on the construction schedule and has a direct correlation to the longevity of the temporary SS BMP selected. Longevity ranges are typically:

- Less than 3 months
- Between 3 and 12 months
- Greater than 12 months
  - Stop.

Construction site/area characteristics applicable to the SS BMPs are provided in Table B.2.2 while the timing and cost associated with the SS BMPs are provided in Table B.2.3.

Table B.2-2 – Applicability of Temporary Soil Stabilization BMPs to Site Characteristics

Type	Method of Binding	Class	Flow Conditions	Max Slope Inclination (V:H) (1)	Surface Area	Atmospheric Conditions	Accessibility	Drains to 303(d)Listed Water Body	Duration of Need(G)	Initial Erosion Prevention Effectiveness (4)	Decomposition Rate per day (5)
Hydraulic Mulch	NA	Biodegradable	Sheet	1:2	large	A	B	C,D	3 to 12 months	87%	0.0039
Hydraulic Matrix	NA	Biodegradable				A	B	C,D	Less than 3 months	88%	0.0039
Bonded Fiber Matrix	NA	Biodegradable				A	B	C,D	3 to 12 months	91%	0.0039
Mechanically Bonded Fiber Matrix	NA	Biodegradable and Photodegradable				A	B	C,D	Greater than 12 months	90%	0.0058
Hydroseed (standalone)	NA	NA		1:3	small to large	A	B	D		17%	N/A
Hydroseed with Hydraulic Mulch	NA	NA		1:2		A	B	C		84%	0.0058
Hydroseed with Soil Binder	NA	NA				A	B	C		28%	0.023
Hydroseed with Straw Mulch Integrated	NA	NA				A	B	D		90%	0.008
Hydroseed - Straw Mulch and Soil Binder	NA	NA				A	B	C,D		91%	0.008
Hydroseed with Rolled Erosion Control Products	NA	NA	Channelized and Sheet	1:1	small	A	E	D		84%	0.0015
Guar	NA	Plant-Based Material (Short Lived)	Sheet	1:2	large	A	B	C,D	Less than 3 months	80%	0.046
Starch	NA					A	B	C,D		25%	0.046
Psyllium	NA					A	B	C,D	Between 3 and12 months	30%	0.023
Pitch & Rosin Emulsion	NA	Plant-Based Material (Long Lived)				A	B	C,D		70%	0.017
Liquid Polymers of Methacrylates& Acrylates	NA	Polymeric Emulsion Blends				A	B	C,D	Less than 3 months	unrated	unrated

Table B.2-2 – Applicability of Temporary Soil Stabilization BMPs to Site Characteristics

Type	Method of Binding	Class	Flow Conditions	Max Slope Inclination (V:H) [1]	Surface Area	Atmospheric Conditions	Accessibility	Drains to 303(d)Listed Water Body	Duration of Need[G]	Initial Erosion Prevention Effectiveness (4)	Decomposition Rate per day (5)
Copolymers of Sodium Acrylates & Acrylamides	NA					A	B	C,D		unrated	unrated
Poly-Acrylamides & Copolymer of Acrylamides	NA		Sheet	1:2		A	B	C,D	Between 3 and12 months	30-60%	0.017
Hydro-Colloid Polymers	NA					A	B	C,D		unrated	unrated
Acrylic Copolymers & Polymers	NA					A	B	C,D	Greater than 12 months	unrated	unrated
Gypsum	NA	Cementitious-Based Binders				A	B	C,D	Between 3 and 12 months	80%	0.017
Wheat, Rice, or Barley	Integrated	NA			small to large	A	B	D		89%	0.008
	Soil Binder	NA				A	B	C,D		89%	0.008
	RECP	NA			small	A	E	D		89%	0.008
Geotextiles[2] - Woven	NA	Non-Biodegradable	Channelized and/or Sheet	1:1		all	E	D		92%	0.0013
Plastic Covers[2] - Rolled Plastic Sheeting	NA	Non-Biodegradable				all	E	D		98%	0.002
		Photodegradable	Sheet	1:2							
Plastic Mesh	NA					all	E	D	Greater than 12 months	92%	0.0013
Erosion Control Blankets - Jute	NA	Biodegradable				all	E	D	Between 3 and 12 months	65%	0.0039
Erosion Control Blankets - Straw Blanket	NA					all	E	D		80%	0.008
Erosion Control Blankets - Coconut Fiber Blanket	NA			1:1.5		all	E	D	Greater than 12 months	85%	0.0015
Erosion Control Blankets - Coconut Fiber Mesh	NA					all	E	D		70-85%	0.0015

Table B.2-2 – Applicability of Temporary Soil Stabilization BMPs to Site Characteristics											
Type	Method of Binding	Class	Flow Conditions	Max Slope Inclination (V:H) (1)	Surface Area	Atmospheric Conditions	Accessibility	Drains to 303(d)Listed Water Body	Duration of Need(G)	Initial Erosion Prevention Effectiveness (4)	Decomposition Rate per day (5)
Erosion Control Blankets - Straw Coconut Fiber Blanket	NA					all	E	D		85%	0.003
Erosion Control Blankets - Wood Fiber Blanket	NA	Biodegradable and Photodegradable	Sheet	1:2		all	E	D	Between 3 and 12 months	80%	0.0019
Erosion Control Blankets - Excelsior (Curled Wood Fiber)	NA		Sheet	1:2		all	E	D		70%	0.0019
Erosion Control Blankets - Biodegradable Fibers with Synthetic Netting	NA			1:1.5		all	E	D	Greater than 12 months	80%	0.0019
Mats(3) - Biodegradable Fibers with Synthetic Netting	NA	Non-Biodegradable	Channelized and/or Sheet	1:1.5		all	E	D		85%	0.0039
Mats(3) - Synthetic Fiber with Synthetic Netting	NA			1:1		all	E	D		85%	0.0013
Mats(3) - Bonded Synthetic Fibers	NA			1:1	Small	all	E	D		85%	0.0013
Compost/Recycled Green Material	NA	NA	Sheet	1:3		A	B, E	C,D	Between 3 and 12 months	67%	0.0069
Shredded Wood/Bark	NA	NA		1:3		A	B, E	C,D		71%	0.0023

Reference: *Guidance for Temporary Soil Stabilization (Caltrans, 2003)*

Reference: *Guidance for Temporary Soil Stabilization (Caltrans, 2003)*

NA – Not Applicable

(1): Conservative Maximum Slope Inclination (V:H) recommended by Caltrans for product applicability, manufacturer may recommend greater slope inclinations

(2): Are not applicable with hydroseeding. Plastic materials should not be used for more permanent applications, near ESAs, or where prohibited by regulatory permits.

(3): Using hydroseed with turf reinforcement mats in channelized flow situations may have limited success due to potentially turbulent flows.

A: The BMP cannot be applied during a storm event or freezing conditions. Avoid applying in strong winds and over spraying. B: The disturbed soil area must be accessible to equipment.

B: If disturbed soil area drains to 303(d) listed water body, potential non-visible pollutant.

C: If disturbed soil area drains to 303(d) listed water body, potential pollutants if breach or malfunction occurs.

D: The product is applied manually; therefore, road or pad proximity limitations do not affect their applicability.

F: May be difficult to insert pins into frozen ground.

G: Data obtained from the URS Greiner Woodward Clyde, Soil Stabilization for Temporary Slopes, 1999

Table B.2-3 – Time and Cost Associated with Temporary Soil Stabilization BMPs				
Type	Delivery Time[Y]	Installation Time	Time Until Effective	Cost of Installation[X]
	days	hours/acre	days	$/acre
HYDRAULIC MULCH (SS-3)				
Hydraulic Mulch	3-7	4(1)	1 to 2	900 - 1,300
Hydraulic Matrix	3-7	4(1)	1 to 2	900 - 1,300
Bonded Fiber Matrix	3-7	4(1)	1 to 2	5,000 - 6,500
Mechanically Bonded Fiber Matrix	3-7	4(1)	1 to 2	5,000 - 6,500
HYDROSEEDING (SS-4)				
Stand Alone	3-14	4(1)	28[Y]	870 - 2,170
Hydraulic Mulch	3-14	4(1)	28[Y]	2,170 – 3,470
Soil Binder	3-14	4(1)	28[Y]	1,570 – 3,670
Straw Mulch	3-14	6(2)	28[Y]	2,670 – 4,270
Straw Mulch and Soil Binder	3-14	10(3)	28[Y]	3,370 – 5,770
Rolled Erosion Control Products	3-14	43(4)	28[Y]	6,870 – 57,170
SOIL BINDERS (SS-5)				
Guar	3-7	4(1)	12 - 18[Y]	700 - 900
Starch	3-7	4(1)	9 - 12[Y]	700 - 900
Psyllium	3-7	4(1)	12 – 18[Y]	700 - 900
Pitch & Rosin Emulsion	3-7	4(1)	19 - 24[Y]	1,200 -1,500
Liquid Polymers of Methacrylates & Acrylates	7-14	4(1)	12 - 18[Y]	700 - 1,500
Copolymers of Sodium Acrylates & Acrylamides	7-14	4(1)	12 - 18[Y]	700 - 1,500
Poly-Acrylamides & Copolymer of Acrylamides	7-14	4(1)	4 - 8[Y]	700 - 1,500
Hydro-Colloid Polymers	7-14	4(1)	0 - 4[Y]	700 - 1,500
Acrylic Copolymers & Polymers	3-7	4(1)	36 - 48[Y]	700 - 1,500
Gypsum	3-7	4(1)	4 – 8[Y]	800 - 1,200

Table B.2-3 – Time and Cost Associated with Temporary Soil Stabilization BMPs					
Type		Delivery Time[Y]	Installation Time	Time Until Effective	Cost of Installation[X]
		days	hours/acre	days	$/acre
STRAW MULCH (SS-6)					
Wheat, Rice, or Barley	integrated	3-5	2[1]	ASAA	1,800 - 2,100
	soil binder	3-5	6[5]	1 to 2	2,500 – 3,600
	Rolled Erosion Control Product	3-5	106[6]	ASAA	6,800 – 8,600
ROLLED EROSION CONTROL PRODUCTS (SS-7)					
Woven		3-5	15[1, Z]	ASAA	12,000 - 28,000
Rolled Plastic Sheeting		3-5	15[1, Z]	ASAA	0.19 – 0.28 ($/ft2)
Plastic Netting		7-14	15[1, Z]	ASAA	5,000 - 6,500
Plastic Mesh		7-14	15[1, Z]	ASAA	3,000 -3,500
Jute		3-5	15[1, Z]	ASAA	6,000 - 7,000
Straw Blanket		3-5	15[1, Z]	ASAA	8,000 - 10,500
Coconut Fiber Blanket		3-5	15[1, Z]	ASAA	13,000 - 14,000
Coconut Fiber Mesh		3-5	15[1, Z]	ASAA	30,000 - 33,000
Straw Coconut Fiber Blanket		3-5	15[1, Z]	ASAA	10,000 - 12,000
Wood Fiber Blanket		3-5	15[1, Z]	ASAA	8,000 - 10,500
Excelsior (Curled Wood Fiber)		3-5	15[1, Z]	ASAA	8,000 - 10,500
Biodegradable Fibers with Synthetic Netting		7-14	15[1, Z]	ASAA	30,000 - 36,000
Biodegradable Fibers with Synthetic Netting		7-14	39[1, Z]	ASAA	30,000 - 36,000
Synthetic Fiber with Synthetic Netting		7-14	39[1, Z]	ASAA	34,000 - 40,000
Bonded Synthetic Fibers		7-14	39[1, Z]	ASAA	45,000 - 55,000
WOOD MULCH (SS-8)					
Compost/Recycled Green Material		3-5	130[1]	ASAA	900 - 1,200
Shredded Wood/Bark		3-5	130[1]	ASAA	4,000 - 9,000

Reference: *Guidance for Temporary Soil Stabilization (Caltrans, 2003)*

ASAA- As soon as applied

(1): Assumes a 2-man crew with one 3000-gallon water truck (or access to water) that can cover 2 acres per day. Actual installation time may vary depending on location and field conditions.

(2): Assumes installation of hydroseed is done by a 2-man crew with one 3000-gallon water truck (or access to water) that can cover 2 acres per day. Followed by the application of straw mulch that is bound to the soil by integration (crimped or punched). Also, assumes that the straw mulch is applied by a 6-man crew with 2 straw blowers that can cover 4 acres per day. Actual installation time may vary depending on location and field conditions.

(3): Assumes the application (first pass) of the hydroseed is done by a 2-man crew with one 3000-gallon water truck (or access to water) that can cover 2 acres per day. Followed by the application of straw mulch (second pass) that will be bound together by a soil binder. Assumes the straw mulch is applied by a 6-man crew with 2 straw blowers that can cover 4 acres per day. Followed by the application of the soil binder (third pass). Assumes the application of the soil binder is done by a 2-man crew with one 3000-gallon water truck (or access to water) that can cover 2 acres per day. Actual installation time may vary depending on location and field conditions.

(4): Assumes the application of the hydroseed is done by a 2-man crew with one 3000-gallon water truck (or access to water) that can cover 2 acres per day. Assumes the application of the rolled erosion control product is done by a 2-man crew. Actual installation time may vary depending on location and field conditions.

(5): Assumes the straw mulch (first pass) is applied by a 6-man crew with 2 straw blowers that can cover 4 acres per day. Followed by the application of the soil binder (second pass). Assumes the application of the soil binder is done by a 2-man crew with one 3000-gallon water truck (or access to water) that can cover 2 acres per day. Actual installation time may vary depending on location and field conditions.

(6): Assumes the straw mulch (first pass) is applied by a 6-man crew with 2 straw blowers that can cover 4 acres per day. Assumes the application of the rolled erosion control product is done by a 2-man crew. Actual installation time may vary depending on location and field conditions.

(7): Assumes that the rolled erosion control product is installed by a 2-man crew.

(8): Assumes the use of a skid steel loader to apply the mulch, 1 equipment operator, and a 4-man crew to spread the wood mulch. Actual installation time may vary depending on location and field conditions.

(X): Data obtained from the Caltrans, Erosion Control Manual (Draft), Training Materials, 2003

(Y): Data obtained from the URS Greiner Woodward Clyde, Soil Stabilization for Temporary Slopes, 1999.

(Z): Data obtained from RS Means, site work and Landscape Cost Data, 22nd ed. 2003

For current cost estimates for soil stabilization methods, the Caltrans Landscape Architecture Toolbox should be reviewed at: http://www.dot.ca.gov/hq/LandArch/16_la_design/guidance/roadside_safety_tb/index.htm

B.3 Additional BMPs Used with SS BMPs

SS BMPs are more effective when used in conjunction with Temporary Sediment Control BMPs (SC BMPs) and other SS BMPs. To properly stabilize slopes and remove sediment from stormwater, other conditions must be addressed such as, directing and/or slowing concentrated flow, reducing slope lengths, and capturing sediment entrained in stormwater. Therefore, it is required that SS BMPs and SC BMPs are used in conjunction to comply with the General Construction Permit rules regarding erosion and sediment control.

Slope inclination and slope length are the most important factors affecting the installation of combined stabilizations BMPs and SC BMPs, as these factors have the largest potential impact on erosion rates. A combined increase in slope inclination and slope length will require an increase in the use of SS BMPs and SC BMPs.

To limit the erosive effects of stormwater flow the slope lengths shall be broken up with SC BMPs such as fiber rolls or gravel bags as follows:

- If the slope inclination is 1:4 (V:H) or flatter, break up the slope length with sediment control BMPs at intervals no greater than 20 feet.
- If the slope length is between 1:4 (V:H) and 1:2 (V:H), break up the slope length with sediment control BMPs at intervals no greater than 15 feet.
- If the slope inclination is 1:2 (V:H) or greater, break up the slope length with sediment control BMPs at intervals no greater than 10 feet.

Listed below are the SC BMPs applied to compliment the SS BMPs that cover or bind the soil of the disturbed soil areas (Standard Specifications 13-6 and 13-10). The information below also includes a brief explanation of their purpose and applications. Refer Section 4 of this Manual for details regarding the Limitations, Standards and Specifications, and design of SC BMPs. SC BMPs are implemented on a project-by-project basis and with other SS BMPs.

- Temporary Earthen Berm
- Temporary Silt Fences
- Temporary Reinforced Silt Fences
- Temporary Large Sediment Barrier
- Temporary Check Dams
- Temporary Straw Bale Barrier
- Temporary Drainage Inlet Protection
- Temporary Fiber Rolls
- Temporary Gravel Bag Berms
- Compost Socks
- Flexible Sediment Barriers

Appendix C: Active Treatment Systems

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Appendix C

Active Treatment Systems

C.1 Introduction

Temporary Active Treatment Systems (ATS) apply conventional water treatment technologies, in use for over a century, to stormwater quality. Neither the CGP nor the LTCGP requires the use of an ATS, but for waters and sites where the reliability of the stormwater quality is of concern, these systems may be used.

C.1.1 Overview

An ATS may be considered for a project under the following conditions:

- When necessary to meet water quality standards (WQS) of the receiving water.
- When necessary to meet the effluent limits of the CGP or LTCGP for turbidity and pH in stormwater.

Under the CGP and the LTCGP, an ATS is recommended for use at high risk work sites, including:

- Where space limits installation of properly-sized containment and detention facilities, such as a sediment trap (see SC-3 “Sediment Trap”) or sediment/desilting basin (see SC-2 “Sediment/Desilting Basin”).
- Where clay and/or highly erosive soils are present.
- Where the site has very steep slopes
- Where project work necessitates on-going and large amounts of disturbed soil area during the rainy season
- Where the project site is highly susceptible to stormwater run-on resulting in erosion and sediment-laden run-off.

An ATS uses a coagulant for the treatment of water with a sedimentation basin (or basins) for facilitating turbidity reduction. In addition, pH adjustment plus bag/cartridge/sand filters may be included. The exact configuration and sizing of the ATS will depend on the anticipated quantity and quality of the water to be treated, the amount of time needed for treatment, and receiving water requirements.

Coagulation can be used to destabilize suspended particles and remove them from suspension, which forms a byproduct referred to as floc or flocculant. There are many different coagulants for use; a coagulant may use different chemical properties and may be suited for different types of water conditions to be treated. Potential chemical residual (i.e., coagulant residual) in the treated effluent must be monitored and managed to attain applicable effluent limits prior to discharge.

An ATS is recommended to remove particles below 0.02 mm and may be warranted for locations that must meet strict turbidity requirements. Some receiving waters may be listed for other parameters of concern for which an ATS might be recommended; however, not all pollutants can be treated with readily available ATS technology.

C.1.2 CGP and LTCGP

An ATS, as covered by the CGP or the LTCGP, is used for the treatment of stormwater discharges generated from precipitation that falls on or runs through the construction area during a rain event. Other water generated from construction operations is considered non-stormwater.

In some cases, ATS designers may wish to include non-stormwater treatment as an aspect of, or supplement to, the ATS system. When doing so, any non-stormwater comingled with stormwater may both alter the performance values of the selected coagulant and place different or additional demands upon the other selected ATS components. These modifications of the system will need to be evaluated and if necessary coverage under a supplemental NPDES Permit, in addition to the CGP or LTCGP, may be required.

C.1.3 General Requirements

The following general requirements are applicable to projects that utilize an ATS:

1. Standard Specification Section 13-8 includes provisions for treating and discharging uncontaminated groundwater and accumulated stormwater from excavations or other areas with a temporary ATS.
2. Submit an ATS Plan to the RE within 20 days of contract approval. The ATS Plan must comply with Standard Specification Section 13-8.01C(2). At least 14 days prior to the planned operation of the ATS, the ATS Plan is required to be submitted electronically to the SWRCB and applicable RWQCB. Each element of the ATS Plan including but not limited to O&M Manual, Monitoring, Sampling & Reporting Plan including QA/QC, Health & Safety Plan, and Spill Prevention Plan must be assessed and evaluated to ensure compliance and functionality with the CGP or LTCGP operational requirements.
3. The design, installation, operation, and monitoring of the temporary ATS and monitoring of the treated effluent must comply with Attachment F of NPDES General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002).
4. For a project within the Lake Tahoe Hydrologic Unit, the design, installation, operation, and monitoring of the temporary ATS and monitoring of the treated effluent must comply with Attachment E of the NPDES General Permit for General Waste Discharge Requirements and National Pollutant Discharge Elimination System Permit for Storm Water Discharges Associated with Construction Activity in the Lake Tahoe Hydrologic Unit, counties of Alpine, El Dorado, and Placer, (Order No. R6T-2016-0010, and NPDES No. CAG616002).
5. For a project within the Lake Tahoe Hydrologic Unit, the discharger must perform toxicity testing that complies with Standard Specification Section 13-8.01D(2) if operating a temporary ATS in batch-treatment mode.
6. Training must be provided to each operator of the ATS.
7. The ATS must be designed for the site conditions and anticipated flow rate and must include (1) a treatment system, (2) a collection and conveyance system, and (3) a discharge method and location.
8. The ATS must be capable of capturing and treating within a 72-hour period a volume equal to the runoff from a 10-year, 24-hour rain event using a watershed coefficient of 1.0.
9. The control system must default to recirculation or shutoff during a power failure or catastrophic event.
10. The control system must control the amount of the coagulant to prevent overdosing. The coagulant must be mixed rapidly into the water to insure proper dispersion.
11. Pumps and piping must comply with Standard Specification Section 74-2.
12. Discharges may be made into a sanitary sewer system however; the effluent discharge must comply with the publicly-owned treatment works (POTW) requirements and must meet all criteria as set forth in any issued Batch Discharge Permit. The POTW Batch Discharge Permit should be secured

as part of the ATS planning process to ensure access and feasibility of discharging expected water quantities. This option is frequently utilized for short term or low volume discharges. The Department does not pay for obtaining the municipal batch discharge permit or for discharging the water.

13. Submit documentation for the delivery and removal of ATS components.
14. If observations and measurements confirm that a residual chemical or water quality standard is exceeded, submit the notice of discharge within 24 hours after exceeding the limits per the requirements of the CGP or the LTCGP.
15. Water discharged from a temporary ATS must comply with the Numeric Effluent Limits (NEL) for discharge effluents and the receiving waters.
16. If an NEL is exceeded, notify the RE and submit a Numeric Effluent Limitation Violation Report- ATS Discharge (CEM-2063[1]) within 6 hours. For a project in the Lake Tahoe Hydrologic Unit, the Numeric Effluent Limitation Violation Report- Lake Tahoe Hydrologic Unit – Lake Tahoe Hydrologic Unit (CEM-2063T[2]) must be submitted within 2 hours. The analytical results less than the method detection limits must be reported as less than the method detection limits. In compliance with the CGP or LTCGP, electronic filing of the exceedance report to the SWRCB and RWQCB shall occur within 24 hours of either obtaining the results or identifying the exceedance.
17. Calibrate the flow meter and devices for taking water quality measurements under the manufacturer's instructions as outlined in the ATS Plan.
18. Monitoring equipment must be interfaced with the control system of the ATS to provide shutoff or recirculation whenever effluent readings do not comply with the turbidity and pH limits.
19. Monitoring equipment for the ATS must record data at least once every 15 minutes and cumulative flow data daily. The recording system must have the capacity to record a minimum of 7 days of continuous data.

C.2 ATS Selection Criteria

In general, ATS selection is driven by the available area, and the soil type of the site. Each of these will drive the selection of an ATS that would reliably meet the requirements of the CGP or the LTCGP.

C.2.1 Risk Level

Generally, projects designated as Risk Level 1 under the CGP should implement typical Construction Site BMPs. Project designated as Risk Level 2 or 3 under the CGP should use the following factors to determine whether traditional BMPs are sufficient or an ATS is appropriate for use. The following factors should also be used for projects subject to the LTCGP.

C.2.2 Potential Storage Area and Peak Stormwater Flow

Project sites with enough potential storage area to detain the estimated quantity of stormwater from a rain event and allow sediment to settle out of suspension by gravity may be able to avoid using an ATS. These areas can be used for storage of water with enough detention (dwell) time to settle significant quantities of particles prior to discharge. The minimum detention time can be determined by dividing the available storage by the peak flow expected from a 5 year-24-hour storm. If the minimum detention time of a sedimentation basin can meet the minimum compliance requirements for sedimentation, an ATS is generally not required for turbidity removal. Other considerations that may influence minimum detention time and should be evaluated include, but are not limited to:

[1] This form can be found at: http://www.dot.ca.gov/hq/construc/forms/CEM2063.pdf

[2] This form can be found at: http://forms.dot.ca.gov/v2Forms/servlet/FormRenderer?frmid=CEM2063T

- The time required to treat stormwater from successive rain events.
- The quantity of stormwater that may run-on into the project.
- Conditions caused by on-going construction activities.

The above listed conditions are examples that may trigger the need for an ATS.

Determine the area available for potential stormwater storage (A_p). This can include assigned stormwater treatment locations, existing storage areas, or space outside of the construction footprint which is available for use. Often, these areas will necessitate an engineered design and construction specific to the location used, plus a management understanding of detention time commitment and the need to use this dedicated space exclusively for stormwater detention and treatment.

C.2.3 Soil Type

The minimum detention time required for a construction site will depend on the predominant soil type. Fine soils, such as clay, will remain suspended for much longer times than coarser soils, such as sand. To determine the initial minimum detention time required, the composition of the soil within the construction site must be determined. Anticipating and estimating for changing soil conditions from construction activities that affect and change the soil dynamics (e.g., mixing of soil types, compaction, cut/fill areas) may complicate this calculation. Repetitive rain events will also affect the evaluation.

C.2.4 Settling Velocity and Required Settling Area

A calculation of the maximum area for potential treatment must be made. Initially calculate the peak stormwater flow from the site based upon disturbed soil area and the rainfall intensity from a 5 year – 24-hour rain event using the Rational Equation (though this peak flow does not need to be the design flow of a potential ATS). Next, determine the predominant soil type within the construction area. Conservative estimates will use the minimum particle diameter of each soil type (sand, silt, or clay) in conjunction with Stokes Law to determine the settling velocity of the sediment.

Other methods or models may be substituted for Stokes Law if more information is readily available for project soils. Dividing the peak stormwater flow by the settling velocity will determine the minimum area required (A_r) for settling without active treatment. Note that these calculations should take into consideration the changing soil conditions and dynamics based on the phase and stage of the project, scope of soil work being performed, and other issues related to scheduled soil work.

C.2.5 Determine Appropriate Device

Comparing the minimum area required (A_r) to the potential area available (A_p) will determine whether an ATS may be necessary. If the area available is significantly larger (>20 percent) than the area required, evaluate BMPs based upon site characteristics. If the area required is significantly larger than the area available (>20 percent), then an ATS must be considered. If the area available and the area required are similar, only RL 3 sites should consider ATS as they require more reliability than RL 2 sites. If the design can be refined, such as increasing potential storage area or improving the accuracy of the settling velocity calculation, re-evaluate the site. If no other options are available, an ATS is recommended.

The CGP contains direction for implementation of ATS. Risk level 2 projects do not have NELs for pH and turbidity, unless an ATS is used. Therefore, careful evaluation is necessary before selection; check with the District/Regional Design Stormwater Coordinator.

C.3 Factors Affecting Preliminary Design

C.3.1 Pollution Prevention/Sediment Mitigation

Actions to reduce the quantity of sediment in stormwater directed to storage should be implemented in the work area regardless of the decision to use an ATS. With an ATS these measures can lead to more efficient treatment and operational cost savings. Closing off or stabilizing unused portions of the site will reduce the quantity of stormwater that could be impacted by construction activities. Focused consideration should be given to evaluating and installing run-on control and bypass controls means to reduce and minimize the amount of stormwater that would require treatment. Minimizing sheet flow and concentrated flows from up-slope areas and/or drainages coming into the project is critical to reducing not only the quantity of water requiring treatment but also the causative effects of scouring or transport of sediment in run-on water.

To prevent significant sediment loading to an ATS all applicable Construction Site BMPs, especially those that provide erosion and sediment control at the source and within conveyances, should be implemented. If stormwater run-on cannot be prevented from entering the project, installation of lined drainage ditches, bypass piping, or other means, should be considered to direct flows away from disturbed soil areas and steep slopes. This can minimize treatment requirements for run-on. The use of plastic cover is often a significant and beneficial implementation control to prevent direct contact of stormwater with disturbed soil. With plastic cover, the clean run-off can be re-routed, preventing it from entering the ATS collection system.

To minimize stormwater treatment, evaluate and design for the temporary redirection and bypass of roadway runoff to prevent contact with project disturbed soil areas when feasible. If project plans call for the abandonment or removal of existing storm drain conveyances, outfalls, inlets, or lined drainages consider scheduling the work after the rainy season. Considering staging and phasing of project work, evaluate adjustments to the schedule to minimize the removal of existing constructed storm drain systems until the next dry season approaches.

C.3.2 Collection System/Discharge Piping

Collection piping is required to convey the water generated onsite to the treatment system (i.e., the ATS and its component systems). The size and quantity of piping will be determined by the layout and terrain of the disturbed construction area. It may be necessary to include pumps to move large quantities of water across the site. It is also possible for the site to implement multiple ATS systems. Discharge piping and pumps are required to convey treated effluent to the appropriate discharge location. Proper sizing is required to prevent flow backup or sedimentation within the pipe. Some considerations when designing for and installing collection systems include the following:

- Can the stormwater draining toward the ATS collection system be directed through a lined drainage ditch or conveyance piping by which scour will not create additional sediment?
- Can the stormwater draining toward the ATS collection system be filtered by perimeter barriers such as filter lined drainage rock, silt fence, gravel bag check dams, etc., before entering the conveyance?
- Can the conveyance sump (where the pumps are placed) be designed large enough to ensure enough area to handle the run-on water?
- Can the conveyance sumps be designed and situated to prevent direct intake of silt, sediment, or soils? Can filters, screens, or protective barriers be installed that surround the sumps and/or pumps to minimize the up-take of transported heavier fines, particulates or floating materials, vegetative detritus, etc.?
- Can the conveyance pump be so situated by which it can be easily accessed or withdrawn for maintenance or replaced if needed?

- Can the pumps and conveyance piping and/or hose leading to the ATS system from the conveyance sump-pumps be designed to maximize speed of conveyance thereby preventing the sump-pump locations from flooding during peak runoff?

C.3.3 Storage/Pre-Sedimentation

If it is necessary to store large quantities of water onsite during significant rain events, locations such as swales, basins, and other areas conducive for storage may be used to retain water prior to treatment. These locations provide an additional benefit of settling out some sediment before treatment with an ATS. Design of these storage locations should be in accordance with criteria for those BMPs.

Systems with a high sediment loading may necessitate pretreatment. Pretreatment typically consists of a pre-sedimentation basin such as a weir tank for the removal of easily settleable sediment loads. Pretreatment can improve coagulant usage and effectiveness, as well as reduce the quantity of flocculant sludge, thus minimizing costs. Systems with pre-sedimentation and storage can be sized to smaller peak flows as large storms can be stored and treated over longer durations. The trade-off will depend on both the amount of storage and design capacity of the system. Additional considerations related to storage and pre-sedimentation may include:

- Can existing long term excavations, or existing curbed and/or walled in areas be used for temporary storage?
- Can a retention basin be constructed and excavated deep enough (or have above ground walls constructed) to minimize the footprint of the required area needed for holding the estimated maximum quantity of collected stormwater prior to conveyance to the ATS? Are there natural, pre-existing areas in the construction work area where stormwater can be collected for holding prior to conveyance? Can the holding areas be lined to minimize the up-take of resident loose sediment or soils?

C.3.4 Treatment Components

Different components may be used within the ATS. These components interact with each other and need to be considered individually and as an integrated treatment system. Recirculation piping will be necessary to meet turbidity and pH discharge requirements. Table C-1 and C-2 summarize many of the components available for integration into a temporary ATS and associated materials.

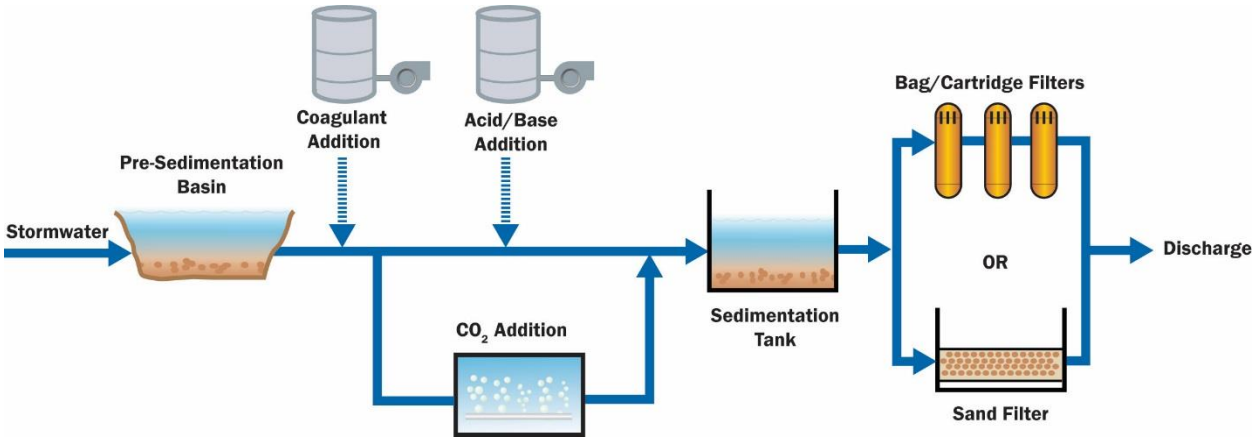

Figure C-1. Potential Treatment Schematic

Table C-1. Potential ATS Components	
Component	Use
Coagulant Dosing Equipment	Chemical for forming floc and removing turbidity
pH Adjustment Dosing Equipment	Chemical for adjusting pH within proper range
Sedimentation Tank (or Basin)	Gravity particulate removal and sludge removal/collection
Bag/Cartridge/Media Filters	Filters for particle removal

C.3.4.1 Coagulation and Flocculation

Different coagulants are available for use within an ATS system. The choice of a coagulant is an important consideration to achieve turbidity removal requirements. The anticipated water quality of the site based on existing soil/sediment conditions and scheduled contractor work will define which coagulants may be effective at forming floc and improving water quality. Coagulant dosing rates and usage will vary depending on the water quality, flow volumes, and coagulant selection. If evaluation and assessment of the performance values and parameters of a coagulant in relationship to the known and expected project conditions is required to achieve treated effluent quality values.

Some coagulants that have been used on past projects include Chitosan, Ferric Chloride, and Alum. Use of other coagulants/polymers may be more difficult for the RWQCB to approve due to uncertainties about potential effects on water quality. Regardless of the coagulant choice, monitoring of residual chemical in the discharge would likely be required.

Equipment such as a chemical feed pump, a rapid mixer (static or mechanical), and sufficient sedimentation will be necessary to properly dose any coagulant. A streaming current detector should be used to monitor and adjust coagulant dose.

A Coagulant-Handling Work Plan is required as part of the ATS Plan and should be prepared for any coagulant used to ensure protection from potentially toxic effects on both human and wildlife due to exposure from high concentrations of residue coagulant. At a minimum, the Coagulant-Handling Plan should include coagulant storage, monitoring, and disposal during the lifespan of the ATS.

When operating the ATS in a Batch Treatment Mode, the CGP requires acute toxicity testing and has specific criteria for testing methodology, laboratory analysis, and quality assurance. All toxicity testing data performed during ATS operation is required to be electronically uploaded to the State Water Boards Storm Water Multi-application and Reporting Tracking System (SMARTS).

Table C-2. Potential ATS Chemicals				
Class of Chemical	Chemical	Advantages	Disadvantages	Approximate Cost
pH Decrease	Hydrochloric Acid (HCl)	Low Dose	Safety Concerns	
	Sulfuric Acid (H_2SO_4)	Low Dose	Safety Concerns	
	Carbon Dioxide (CO_2)	Inert, Self-Buffering	Mechanically Intensive, Requires Diffuser/Basin	
pH Increase	Sodium Hydroxide (NaOH)	Low Dose	Safety Concerns	
Coagulant	Alum	Lower Cost	Drops pH, Can Require High Dose	
	Ferric (Chloride/Sulfate)	Lower Cost	Drops pH, Can Require High Dose	
	Chitosan	Low Dose	May Not Work Well for Certain Soils	$2,500 per Tote

C.3.4.2 pH Adjustment

For certain systems, pH adjustment may be necessary to maintain receiving water integrity. Certain site conditions may adversely affect pH and certain coagulant choices can alter pH and should be considered. There are multiple methods for pH adjustment depending on the water quality of the site and each method has inherent strengths and weaknesses dependent upon the condition under which it is used. Each option considered for use should be evaluated for its potential affect upon other aspects and components of the treatment system, both from a physical and chemical perspective. The nature of pH adjustment can not only be highly corrosive to the ATS equipment, but may also present a heightened risk to occupational health of the ATS operator or maintenance technician.

Carbon Dioxide (CO_2) can be used to lower the pH. CO_2 gas is bubbled through water forming carbonic acid (H_2CO_3) and thereby reducing pH. Carbon dioxide is mechanically more intensive, but the gas is much safer to store onsite. The CO_2 system requires a bubble diffuser and a separate basin for proper implementation.

Strong acids and bases may also be used; dosing generally occurs alongside coagulant addition. Dosing rates will vary depending on water quality, receiving water quality, and acid/base selection. Strong acids/bases have safety concerns associated with storage and dosing. In addition, acid/base selection is important to prevent possible interactions with other treatment components. Strong acids (e.g., hydrochloric acid, sulfuric acid) and bases (e.g., sodium hydroxide) would provide rapid pH response for most waters; an advantage to all the acids and bases listed in the table below is that the corresponding counter-ions (e.g., sulfate, chloride, sodium) are not expected to react with constituents in the treatment system. In contrast, some acids (e.g., citric acid) introduce counter ions (citrate) that can have undesirable side-effects, such as promoting bacterial growth or inhibiting floc formation.

Table C-3. Suggested pH Adjustment Chemicals	
Acids	Bases
Carbon Dioxide (CO_2) – Bubble Carbon Dioxide will form carbonic acid and drop pH	Sodium Hydroxide (NaOH)
Sulfuric Acid (H_2SO_4) – strong acid	
Hydrochloric Acid (HCl)	

C.3.4.3 Sedimentation Tanks

Sedimentation tanks are required to settle floc formed from coagulation. Sedimentation tanks must provide sufficient area and retention time to allow adequate settling of solids. Sedimentation tanks as opposed to weir tanks are recommended for use with high sediment loads. Weir tanks may be used for systems that have minimal influent sediment loading. Higher sediment loads will quickly fill weir tanks and would require sludge removal at higher frequencies compared to sedimentation tanks. Calculating accurate coagulant dosing rates based on site conditions should allow more accurate estimates of sedimentation tank(s) loading of settled floc and therefore lead to selection of the right size tanks. It is important to provide sufficient area for the settling of solids because accumulated floc increases treatment times and therefore reduces the amount of water that can be treated during rain events. In some cases, it may be more desirable to over-estimate the required area.

Figure C-2. Sedimentation Tank

C.3.4.4 Bag/Cartridge/Media Filter

Bag, cartridge, or media filters provide additional particle removal prior to discharge. Bag and cartridge filters pass water through mesh filters reducing particle sizes to a predetermined size. Media filters use sand or other granular media to remove particles. Bag and cartridge filters are removed, changed out and discarded. Media filters use treated water to backwash the filter and remove particles.

It may be necessary to reduce turbidity to approximately 25 NTU or below prior to filtration to prevent excessive buildup on the filter. For bag and cartridge filters, higher turbidity levels passed to the filters will cause increased frequency of change-out and likely increase operational costs. For sand filters, more frequent backwashing will be required which will cause greater work, more chemical usage, and more clean water for backwashing. When backwashing is required the on-going affect upon the treatment process must be calculated into the required treatment rate. When backwashing occurs, less influent is treated in that time.

Figure C-3. Bag/Cartridge Filters

C.3.4.5 Power Sources

An uninterruptible power supply and standby electric generator is recommended for any ATS system. Storms can routinely interrupt power supply systems; thus, it is necessary to provide a backup in such circumstances. An audible or observable alarm should be an aspect of the ATS design to notify personnel in the event of a power outage. Consequences from a non-operable ATS during a critical time may lead to project site flooding and potentially to a discharge with exceedances.

C.3.4.6 SCADA Monitoring Equipment

Supervisory Control and Data Acquisition (SCADA) systems are standard technology used to monitor and control all monitoring and mechanical systems within an ATS. These systems can record and store all relevant data to the project. Remote operation of an ATS is possible through SCADA systems, but connection stability must be maintained to ensure proper operation.

ATS effluent discharges should meet the requirements of the CGP or LTCGP. Monitoring equipment must be installed. These include, but are not limited to, turbidimeter, pH meters, and flow meters. These meters must be calibrated as recommended by the manufacturer or regulator. The frequency of calibration and a documented process to retrieve and verify data should be specified to the contractor and may be required by the RWQCB. In addition, some water quality analysis will be need to be conducted by outside labs for analysis such as total suspended solids (TSS), settleable solids (SS), or residual chemicals. Validate and maintain the sensors in the in-line ATS system that communicate values to the SCADA system regularly. If these sensors are not functioning properly, the SCADA data may be of limited value. Note: the CGP requires that all field recorded monitoring data including but not limited to turbidity, pH, residual chemical, flow rate, and volume be electronically uploaded every 30 days minimum to the State Water Board.

C.4 Active Treatment System Sizing

The size of the treatment system will be dependent on the acreage of the active disturbed soil area. The system is required to be sized such that the runoff from a 10-year 24-hour rain event would be captured and treated within 72 hours. Storms that are greater than the design event may cause the ATS to exceed the CGP restrictions. In these circumstances, the RWQCB will still expect the contractor to make efforts for meeting the CGP or other requirements.

C.4.1 Construction Area

The area of the basin will be defined by the contributing drainage area of the disturbed construction site. The contributing drainage areas will be defined by the designer depending on the orientation of the construction site. For long or flat construction sites, it may be necessary to subdivide the site and set up separate ATS locations. The conveyance systems required to funnel stormwater to a central ATS location may be prohibitive for certain site orientations.

If multiple receiving waters are present in the site, each receiving water basin may require a separate ATS to maintain watershed integrity. For some receiving waters, BMPs may be sufficient to meet turbidity goals.

C.4.1.1 Flowrate

Peak flowrate can be calculated for each area by the Rational Formula:

Q = C x I x A **(Eqn. 1)**

Q = Peak Runoff Rate, Cubic Feet per Second

C = Dimensionless Runoff Coefficient (use 1.0)

I = Rainfall intensity, Inches per Hour (10-year, 24-hour)

A = Basin Area, Acres

The rainfall intensity will vary by project location.

Per the Standard Specification Section 13-8, the designer shall use a runoff coefficient value of 1.0.

Basin area is the total contributing drainage area to the BMP or ATS.

C.4.1.2 Sedimentation Residence Time

Hydraulic Retention Time should be between 2 and 4 hours to allow sufficient floc settlement to meet turbidity requirements.

HRT = V/Q **(Eqn. 2)**

HRT = Hydraulic Retention Time, Hours

V = Volume of Sedimentation Basin, Gallons

Q = Flowrate, Gallons per Hour

C.5 Maintenance and Inspection

The ATS requires regular maintenance to ensure it is properly functioning and to prevent leaks. Repair or replace any component of the dewatering equipment that is not functioning properly or as required by the operations and maintenance outlined in the ATS Plan. The detail in the ATS Plan should be of significant nature to clarify most aspects of ATS function and servicing. Each piece of equipment to be used in the ATS needs to be fully described including its purpose and its inter-relationship to the other equipment. Inclusion of manufacturer specification sheets in the ATS Plan is of high value and should be considered. Descriptions of how to assess the ATS components for performance values is instrumental in trouble-shooting deficient operation. A section within the ATS Plan on maintenance scenarios and trouble-shooting examples for commonly known conditions or operational failures is highly recommended. Trouble-shooting questions could include the following:

- Is increased time required because the holding tank is reduced in capacity due to accumulated floc?
- Is increased time required because not enough coagulant is being dosed which could be caused by a degraded sensor?

The inclusion of set procedural steps for bringing on-line each piece of equipment of the ATS system and determinants of how to balance the system is invaluable when attempting to maximize operation or solve a functional problem. These aspects of an ATS Plan, if not considered in the planning stage and left out of the ATS Plan, could lead to failures of the system and on-going repeat deficiencies.

Remove sediment from the storage or treatment cells as necessary to ensure the cells maintain their required water storage and treatment capability. Sediments removed from the uncontaminated areas during maintenance of the treatment system may be dried, distributed uniformly, and stabilized at a location within the project limits where authorized. Generally accumulated floc from treatment, and any associated captured sediment in the system, is disposed of at a landfill permitted to receive such a waste stream.

If observations and measurements determine that the water quality limits are exceeded, immediately stop the discharge, notify the ATS designer, and start corrective measures to change, repair, or replace the equipment and procedures used to treat the water. If a situation occurs in which the operational perimeters of the ATS are exceeded or the criteria for allowed discharges values are compromised, the information must be retained for recordkeeping and reporting purposes. All corrective actions taken including time periods of non-compliance, and/or time periods to institute corrective actions, should be recorded. Record the quantity of discharge that may have been non-compliant. All test reports and records may be included in the report to the RWQCB. If a piece of equipment failed, broke, or an operation process was not followed this information should be noted to allow assessment of reasons for failure and corrective measures to be implemented to prevent a reoccurrence.

After the designer inspects and authorizes your corrective measures, resume treatment and discharge activities under the startup-phase sampling requirements before resuming regular-phase sampling. Ensure that all required recordkeeping and reporting is completed including submittal of Monthly Monitoring Reports and Exceedance Reports, if applicable.

While the ATS is in operation, at a minimum the following must be monitored:

- Influent and effluent turbidity and pH
- Residual chemical
- Effluent flow rate and volume

If treatment is on-going with dosing and injection of chemicals, the retention of recordkeeping data of the monitored pH and turbidity values is critical for the time periods and is required by the CGP. Uploading and saving of the data regularly as an aspect of the SCADA system, with on-going back-up and downloading to retain the monitored information, is recommended. Use of a standard time-period to backup data, such as every 72 hours, is recommended. The ability to perform both assessment and determination of compliance with instantaneous maximum discharge limitations, in addition to daily 24-hour averaging for turbidity values, is only feasible if the monitoring data is captured and available for evaluation.

Field ATS operator visual monitoring of the system readouts is standard operating procedure with physical documentation on daily logs that validate the data read-outs. The retention of data for on-going pH monitoring and discharge is an aspect of the CGP compliance process of recordkeeping. Without this data, the ability to validate adherence to Permit criteria is limited and not easily defensible with the RWQCB.

If the ATS discharges treated effluent, prepare a daily inspection report including monitoring information and submit within 24 hours, or as required. The ATS Plan should describe the information to include in the reports. Prepare a template form to clarify the required report information in advance. Adjust the template accordingly to accommodate changing conditions, when required. The daily inspection report will at a minimum include:

- Discharge volumes
- Water quality monitoring records
- Quantities (generally in gallons) of dosed coagulants in addition to pH chemical adjustment additives
- Significant repair or maintenance performed on the ATS including but not limited to clean-out of tanks or treatment vessels, maintenance or replacement of sensors or electronic monitoring equipment or components, replacement of pipes, pumps, injection devices, etc. It is important to document the process of ATS upkeep to demonstrate due diligence in maximizing the system's operation effectiveness and efficiency. This will be important if the system has an accidental upset, failure, or improper discharge.
- Discharge point information that includes:
  - Date and time
  - Weather conditions, including wind direction and velocity
  - A notation describing if a rain event has been continuous is recommended. If the on-site rain gauge is accessible for measurement, including this information can assist in illustrating the demand for the ATS. NOAA weather report data can validate that the rain event exceeds the design capacity of the ATS therefore clarifying maximization of discharge limitations.
  - Presence or absence of water fowl or aquatic wildlife
  - Color and clarity of the effluent discharge
  - Erosion or ponding downstream of the discharge point
  - This is applicable if not discharging to a storm drain inlet or piped outfall
  - Photographs labeled with the time, date, and location

C.6 Other ATS Considerations

If an ATS will be utilized on a project site for multiple rainy seasons, there are critical elements to both maintaining the ATS and sustaining its operational lifetime including:

- Ensure the ATS designer is experienced in treatment processes and regulatory requirements, and that the assigned operator(s) of the system are required to have demonstrated experience, knowledge, and skills in ATS operation, maintenance, field testing, data recordkeeping, and reporting.
- Selection during planning of equipment and materials that will withstand weather and environmental degradation. For example, choose piping that is UV resistant and sufficiently flexible to withstand some movement, and choose the proper tank such as double lined or walled to minimize breakthrough and leaking.
- Design the ATS layout to minimize movement and or relocation during the lifetime of the project to minimize potential for breakage, misalignment, or disruption of functional operations. This extends to the pre-planning and construction of appropriate collection and conveyance systems based on the staging and phasing of the project. If a substantially sized collection basin is required to hold the stormwater prior to treatment, then the location must be determined beforehand. Commit space for ATS usage during the lifetime of the system and include space to allow access for maintenance and repair.
- If a substantial number of collection sump/pumps will be required to convey the stormwater from multiple locations throughout the project, then the locations, conveyance piping, and drainage ditches must be depicted on plans and must account for scheduled construction work to prevent conflict of alignment. This consideration is to prevent damage to collection apparatus and to ensure stoppage of non-compliant stormwater discharges during critical periods of forecasted rain.

- If a complex ATS is required, ensure that the ATS Plan is critically evaluated for all operational components including engineering, field work, and administrative controls. Securing all requisite water quality data relative to the anticipated treatment scope and planning will be instrumental to the ATS selection and successful operation. Resourcing available technical information from CASQA, or leading industry providers of such systems, will be helpful.
- Dependent upon the project location, site receiving water bodies, discharge locations, and outfalls storm drain systems may not be allowed to receive the ATS treated effluent. Occasionally a point of discharge will be found to be infeasible due to a sensitive receiving water body, local ecological system, or tidally influenced drainage. In this case, a different discharge option must be explored to allow ATS treated effluent disposal.
- Supplemental and extended piping and pumping layouts may be required to convey the effluent to an acceptable location or to facilitate a discharge to a POTW, when feasible. During the planning phase, the discharge limitations and the local conditions must be evaluated. Early confirmation that selected discharge options are acceptable is desirable.

C.7 Treatment Considerations for Non-Stormwater and Groundwater

Most often construction projects require the management and treatment of stormwater. At times, construction projects may be required to consider management and treatment of groundwater and other non-stormwater due to the complexity and scheduling of different types of work. General site factors to consider in determining the most appropriate management or treatment strategy for the project site include but are not limited to project duration, location, size, affected waterbodies or sources, differing drainages and discharge points (natural and manmade), and pertinent historical and environmental protection considerations. A determination of whether water treatment (of any type) should be done together or as a separate treatment process must be made. These issues must be assessed and understood to achieve a successful treatment plan.

Project excavation work or ground disturbing activities may necessitate managing and treating groundwater in addition to managing construction impacted stormwater runoff. Previous fuel leaks, VOC spills, past chemical discharges, or introduction of hazardous contaminants during the construction phase will likely need management and treatment consideration.

A dual use stormwater/non-stormwater treatment system, if feasible, may be designed to treat and discharge the different water sources. Alternatively, separate treatment systems may be designed. When determining which system is most appropriate, consider first the maximum quantity of stormwater verse the maximum quantity of non-stormwater (e.g., groundwater, co-mingled surface water) that must be managed or treated. Consider the complexity of the treatment science that must be applied to achieve permit discharge requirements and to meet receiving water criteria. Consider also available space on the project site. Is there enough room to accommodate the temporary holding and storage of separate water sources during the treatment process? Can the system be designed to work in tandem to treat both water sources at the same time based on different treatment requirements? Is there a demand for separate treatment trains?

Coverage under different NPDES Permits for specific water sources often dictate the approach and desired outcome of treatment including but not limited to sampling, analysis, monitoring, recordkeeping, and reporting. The differing water management and treatment needs may be combined however insightful planning is critical. For example, the treatment of brackish groundwater from structure dewatering verse extracted groundwater polluted by petroleum products is different when compared to each other and when compared to the CGP and/or LTCGP. While the treatment process will be different, the goal of treatment is the same, to achieve an acceptable discharge water quality.

On occasion a project specific NPDES Permit may be issued to address project conditions that require additional water treatment considerations. In most instances, when multiple water sources require management and treatment during project work, a comprehensive evaluation of treatment options will be required. The evaluation should focus on project needs to better understand if a single treatment system designed to operate in an alternative manner would work, or perhaps a duel treatment system designed to achieve separate water quality objectives may be most appropriate for the project. These example considerations are not exhaustive and professional expertise in the decision-making process of water treatment system choice and design is recommended.

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