City and County of Honolulu

Storm Water Best Management Practice Manual

CONSTRUCTION

Draft
August 2017

Prepared by
City and County of Honolulu,
Department of Facility Maintenance

EC-1: Scheduling

Objectives	
●	EC - Erosion Control
▲	SE - Sediment Control
▲	TR - Tracking Control
▲	WE - Wind Erosion Control
▲	NS - Non-Storm Water Management Control
▲	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
	Oil and Grease
	Organics

Legend:
● = Primary Objectives
▲ = Secondary Objectives

Potential Alternatives
None

Description and Purpose

Scheduling is the development of a written plan that includes sequencing of construction activities and the implementation of BMPs such as erosion control and sediment control while taking local climate (rainfall, wind, etc.) into consideration. The purpose is to reduce the amount and duration of soil exposed to erosion by wind, rain, runoff, and vehicle tracking, and to perform the construction activities and control practices in accordance with the planned schedule.

Suitable Applications

Proper sequencing of construction activities to reduce erosion potential should be incorporated into the schedule of every construction project especially during rainy season. Use of other, more costly yet less effective, erosion and sediment control BMPs may often be reduced through proper construction sequencing.

The Rules Relating to Water Quality requires trenching permits and Category 1- 5 projects to include a statement of schedules and sequence of construction operations. The scheduled start date shall be submitted to the DPP in writing 2 weeks prior to commencing any work. For projects with 1 acre or more disturbed sites, the Hawaii State Department of Health (DOH) and Clean Water Branch (CWB) requires a schedule so that construction is sequenced to minimize the exposure time of the cleared surface area.

Limitations

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

Implementation

- Avoid rainy periods. Schedule major grading operations during dry months when practical. Allow enough time before rainfall begins to stabilize the soil with vegetation or physical means or to install sediment trapping devices.
- Plan the project and develop a schedule showing each phase of construction. Clearly show how the rainy season relates to soil disturbing and re-stabilization activities. Incorporate a construction schedule and rain response plan that identifies the work that will not be performed during rain events/conditions into the ESCP.
- Include on the schedule, details on the rainy season implementation and deployment of:
  - Erosion Control BMPs,
  - Sediment Control BMPs,
  - Tracking Control BMPs,
  - Wind Erosion Control BMPs,
  - Non-Storm Water Management Control BMPs, and
  - Waste Management and Materials Pollution Control BMPs.
- Include dates for activities that may require non-storm water discharges such as dewatering, saw-cutting, grinding, drilling, boring, crushing, blasting, painting, hydro-demolition, mortar mixing, pavement cleaning, etc.
- Work out the sequencing and timetable for the start and completion of each item such as site clearing and grubbing, grading, excavation, paving, foundation pouring utilities installation, etc., to minimize the active construction area during the rainy season:
  - Sequence trenching activities so that most open portions are closed before new trenching begins;
  - Incorporate staged seeding and re-vegetation of graded slopes as work progresses; and
  - Schedule establishment of permanent vegetation during appropriate planting time for specified vegetation.
- Non-active areas should be stabilized as soon as practical after the cessation of soil disturbing activities or 1 day prior to the onset of precipitation.
- Monitor the weather forecast for rainfall.
- When rainfall is predicted, adjust the construction schedule to allow the implementation of soil stabilization and sediment treatment controls on all disturbed areas prior to the onset of rain.
- Be prepared year round to deploy erosion control and sediment control BMPs. Erosion may be caused during dry seasons by un-seasonal rainfall, wind, and vehicle tracking. Keep the site stabilized year round, and retain and maintain rainy season sediment trapping devices in operational condition.
- Apply permanent erosion control to areas deemed substantially complete during the project's defined seeding window.
- For additional Scheduling information, refer to the City & County of Honolulu, Department of Planning and Permitting "Rules Relating to Water Quality" (August 2016, as amended), Section 20-3-28 Project Scheduling.

Costs

Construction scheduling to reduce erosion may increase other construction costs due to reduced economies of scale in performing site grading. The cost effectiveness of scheduling techniques should be compared with the other less effective erosion and sedimentation controls to achieve a cost effective balance.

Inspection and Maintenance

- Copies of the approved ESCP and Project Schedule must be kept on the Project Site at all times and immediately made available for review by the Director upon request. A complete version of the Project Log shall be on site or electronically accessible from the site at all times and immediately made available for inspection by the Director upon request.
- Verify that work is progressing in accordance with the schedule. If progress deviates, take corrective actions.
- Amend the schedule when changes are warranted.
- Amend the schedule prior to the rainy season to show updated information on the deployment and implementation of construction site BMPs.

References

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

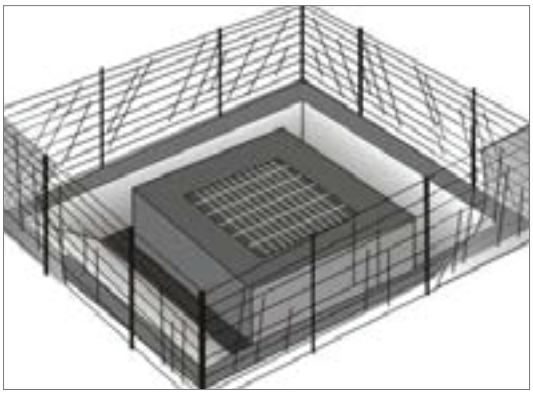
Hawaii Administrative Rules, Title 11, Chapter 55, Water Pollution Control, Appendix C, NPDES General Permit Authorizing Discharges of Storm Water Associated with Construction Activity, Hawaii State Department of Health (DOH) Clean Water Branch, p. 55-C-11 http://www.hawaii.gov/health/about/rules/admrules.html

Revised Ordinances of Honolulu Section 14, Article 15. Grading, Grubbing & Stockpiling, http://www.honolulu.gov/menu/government/gov_resources/refs/index.html

Stormwater Management for Construction Activities Developing Pollution Prevention Plans and Best Management Practices (EPA 832-R-92-005), U.S. Environmental Protection Agency, Office of Water, September 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

SE-10: Storm Drain Inlet Protection



Objectives	
	EC - Erosion Control
●	SE - Sediment Control
	TR - Tracking Control
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	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
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	Metals
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Legend:
● = Primary Objectives
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Potential Alternatives	
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-8	Sandbag Barrier

Description and Purpose

Storm drain inlet protection consists of a sediment filter or an impounding area around or upstream of a storm drain, drop inlet, or curb inlet. Storm drain inlet protection measures temporarily pond runoff before it enters the storm drain, allowing sediment to settle. Some filter configurations also remove sediment by filtering, but usually the ponding action results in the greatest sediment reduction.

Suitable Applications

Every storm drain inlet receiving sediment-laden runoff should be protected. All drain inlets and catch basins that are not connected to a sediment basin or trap must be protected by sediment barriers or inlet protection devices if they are capable of receiving sediment or runoff from the project site unless severe weather conditions make the use of such devices unsafe or infeasible.

Limitations

- Drainage area should not exceed 1 acre.
- Not applicable for inlets within pedestrian or vehicle travel ways.
- Requires an adequate area for water to pond without encroaching into portions of the roadway subject to traffic.
- Inlet protection usually requires other methods of temporary protection to prevent sediment-laden storm water and non-storm water discharges from entering the storm drain system.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden. If high flow conditions are expected, use other onsite sediment trapping techniques in conjunction with inlet protection.

- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff should be routed to a sediment-trapping device designed for larger flows. See BMPs SE-2: Sediment Basin and SE-3: Sediment Traps.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected, and overflow capability is needed.
- Sediment levels may not exceed 1/3 of the height of a sediment barrier or inlet protection device at any point along the length of the sediment barrier or the inlet protection device.

Implementation

General

Large amounts of sediment may enter the storm drain system when storm drains are installed before the upslope drainage area is stabilized, or where construction is adjacent to an existing storm drain. In cases of extreme sediment loading, the storm drain itself may clog and lose a major portion of its capacity. To avoid these problems, it is necessary to prevent sediment from entering the system at the inlets.

Inlet control measures presented in this manual should not be used for inlets draining more than one (1) acre. Runoff from larger disturbed areas should be first routed through SE-2: Sediment Basin or SE-3: Sediment Trap. Different types of inlet protection are appropriate for different applications depending on site conditions and the type of inlet. Inlet protection methods not presented in this manual should be approved by the City DPP.

Design and Layout

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

- Limit upstream drainage area to 1 acre maximum. For larger drainage areas, use SE-2: Sediment Basin or SE-3: Sediment Trap, upstream of the inlet protection device.
- The key to successful and safe use of storm drain inlet protection devices is to know where runoff will pond or be diverted.
  - Determine the acceptable location and extent of ponding in the vicinity of the drain inlet. The acceptable location and extent of ponding will influence the type and design of the storm drain inlet protection device.
  - Determine the extent of potential runoff diversion caused by the storm drain inlet protection device. Runoff ponded by inlet protection devices may flow around the device and towards the next downstream inlet. In some cases, this is acceptable; in other cases, serious erosion or downstream property damage can be caused by these diversions. The possibility of runoff diversions will influence whether or not storm drain inlet protection is suitable; and, if suitable, the type and design of the device.
- The location and extent of ponding, and the extent of diversion, can usually be controlled through appropriate placement of the inlet protection device. In some cases, moving the inlet protection device a short distance upstream of the actual inlet can provide more efficient sediment control, limit ponding to desired areas, and prevent or control diversions.

- Five (5) types of inlet protection are presented below. However, it is recognized that other effective methods and proprietary devices exist and may be selected.
  - Filter Fabric Fence: Appropriate for drainage basins with less than a 5% slope, sheet flows, and flows under 0.5 cubic feet per second.
  - Excavated Drop Inlet Sediment Trap: An excavated area around the inlet to trap sediment (SE-3).
  - Gravel bag barrier: Used to create a small sediment trap upstream of inlets on sloped, paved streets. Appropriate for sheet flow or when concentrated flow may exceed 0.5 cubic feet per second, and where overtopping is required to prevent flooding.
  - Block and Gravel Filter: Appropriate for flows greater than 0.5 cubic feet per second.
  - Temporary Geotextile Insert: Application dependent on type and manufacturer.
- Select the appropriate type of inlet protection and design as referred to or as described in this fact sheet.
- Provide area around the inlet for water to pond without flooding structures and property.
- Grates and spaces around all inlets should be sealed to prevent seepage of sediment-laden water.
- Excavate sediment sumps (where needed) 1 to 2 feet with 2:1 side slopes around the inlet.

Installation

- **DI Protection Type 1 - Filter Fabric Fence**: The filter fabric fence (Type 1) protection is shown in the attached figure. Similar to constructing a silt fence; see BMP SE-1: Silt Fence. Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.
  - Excavate a trench approximately 6 inches wide and 6 inches deep along the line of the silt fence inlet protection device.
  - Place a 2-inch by 2-inch wooden stakes, metal stakes or #4 rebar with cap around the perimeter of the inlet a maximum of 3 feet apart and drive them at least 18 inches into the ground or 12 inches below the bottom of the trench. The stakes should be at least 48 inches.
  - Lay fabric along bottom of trench, up side of trench, and then up stakes. See SE-1: Silt Fence, for details. The maximum silt fence height around the inlet is 24 inches.
  - Staple the filter fabric (for materials and specifications, see SE-1: Silt Fence) to stakes. Use heavy-duty wire staples or wire at least 1 inch in length.
  - Backfill the trench with gravel or compacted earth all the way around.
- **DI Protection Type 2 - Excavated Drop Inlet Sediment Trap**: The excavated drop inlet sediment trap (Type 2) is shown in the attached figures. Install filter fabric fence in accordance with DI Protection Type 1. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 cubic yard per acre of drainage area.
- **DI Protection Type 3 - Gravel bag**: The gravel bag barrier (Type 3) is shown in the figures. Flow from a severe storm should not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with SE-6: Gravel Bag Berm. Gravel bags should be used due to their high permeability.
  - Use sand bag made of geotextile fabric (not burlap) and fill with 0.75-inch rock or 0.25-inch pea gravel.
  - Construct on gently sloping street.

  - Leave room upstream of barrier for water to pond and sediment to settle.
  - Place several layers of sand bags - overlapping the bags and packing them tightly together.
  - Leave gap of 1 bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
- **DI Protection Type 4 - Gravel Filter**: The gravel filter (Type 4) is shown in the figures. Gravel filters are suitable for curb inlets commonly used in residential, commercial, and industrial construction.
  - Place hardware cloth or comparable wire mesh with 0.5-inch openings over the drop inlet so that the wire extends a minimum of a foot beyond each side of the inlet structure. If more than 1 strip is necessary, overlap the strips. Place filter fabric over the wire mesh.
  - Place wire mesh over the outside vertical face (open end) of the inlet to prevent stone from being washed through. Use hardware cloth or comparable wire mesh with 0.5-inch opening.
  - Pile washed aggregate against the wire mesh to the top of the inlet. Use 0.75- to 3-inch aggregate.
- **DI Protection Type 5 – Temporary Geotextile Insert (proprietary)** – Many types of temporary inserts are available. Most inserts fit underneath the grate of a drop inlet or inside a curb inlet and are fastened to the outside of the grate or curb. These inserts are removable and many can be cleaned and reused. Installation of these inserts differs between products and manufactures. Please refer to manufacturer instruction for installation of proprietary devices.

Costs

Average annual cost for installation and maintenance (1 year useful life) is $200 per inlet in California. Note that Hawaii's unit prices are higher than California's unit prices.

Inspection and Maintenance

- Inspect BMPs prior to forecast rain, daily during extended rain events, after rain events, weekly during the rainy season, and at 2-week intervals during the non-rainy season.
- During flash flood warning or advisories from the National Weather Service DOH-CWB recommends that the contractor perform maintenance on all site BMPs followed by removal of inlet protection. At these times, public (human) health and safety is paramount to control of pollutants entering the waterways. Reinstall all inlet protection when warning or advisories ended.
- Filter Fabric Fences. If the fabric becomes clogged, torn, or degrades, it should be replaced. Make sure the stakes are securely driven in the ground and are in good shape (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes. Check for gaps in the fabric, where the fabric overlaps, and if the posts need cross bracing due to high water levels.
- Gravel Filters. If the gravel becomes clogged with sediment, it shall be carefully removed from the inlet and either cleaned or replaced. Since cleaning gravel at a construction site may be difficult, consider using the sediment-laden stone as fill material and put fresh stone around the inlet. Inspect bags for holes, gashes, and snags, and replace bags as needed. Check gravel bags for proper arrangement and displacement.
- Sediment that accumulates in the BMP must be periodically removed in order to maintain BMP effectiveness. Sediment should be removed when the sediment accumulation reaches 1/3 of the

barrier height. Sediment removed during maintenance may be incorporated into earthwork on the site ore disposed at an appropriate location.

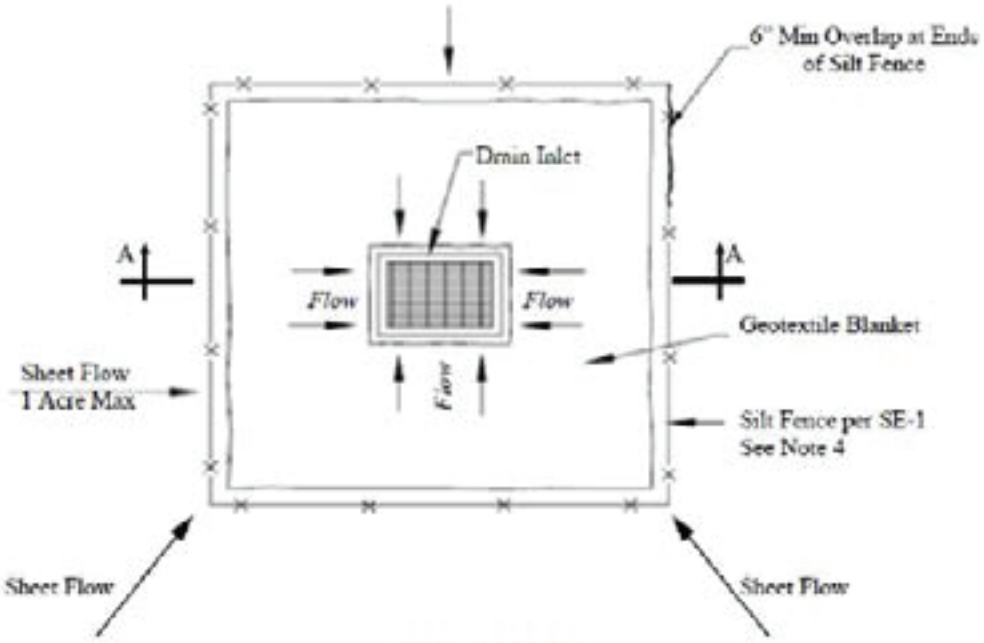
- Remove storm drain inlet protection once the drainage area is stabilized. Clean and regrade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.

References

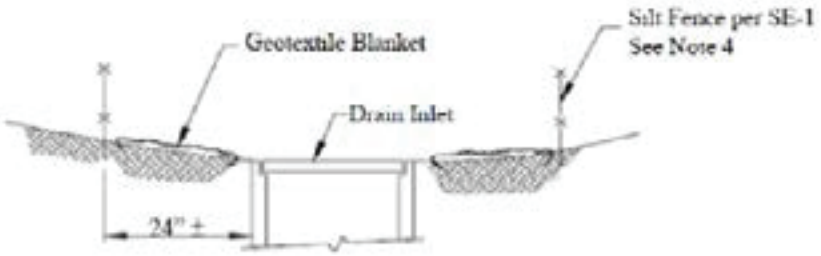
Stormwater Management Manual for The Puget Sound Basin, Washington State Department of Ecology, Public Review Draft, 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

DI Protection Type 1, Filter Fabric Fence



Detail "A"
Not to Scale

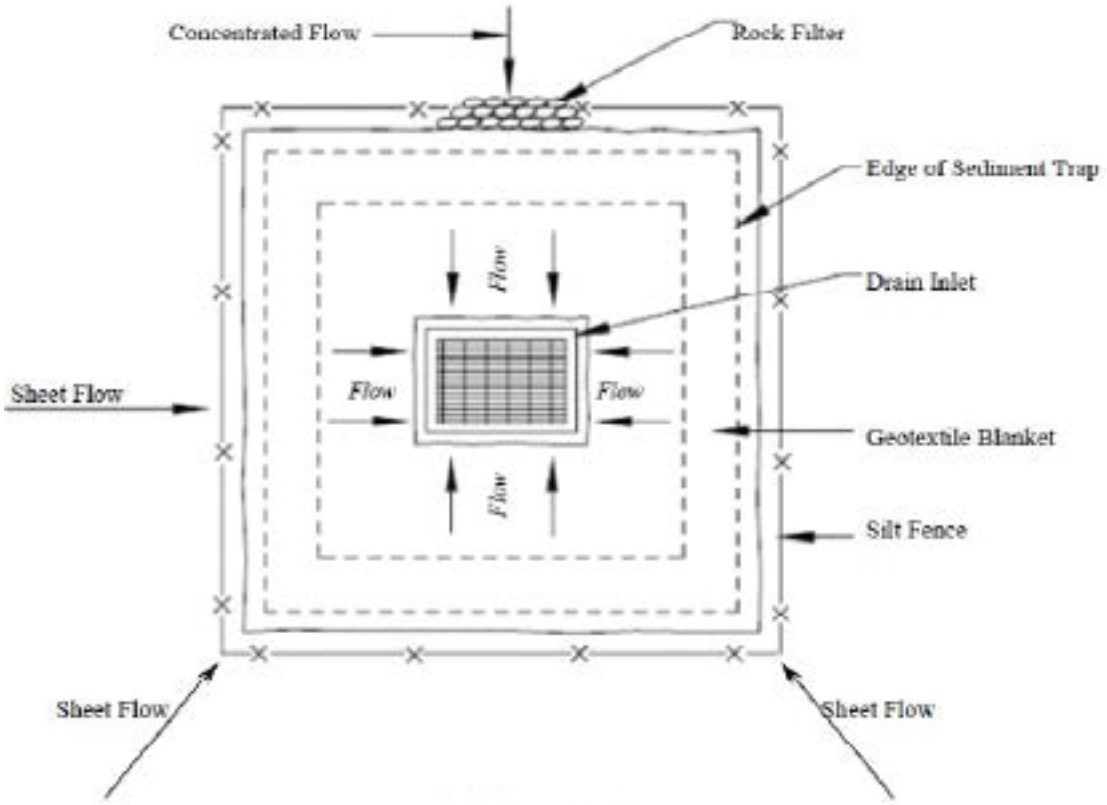


Section A-A
Not to Scale

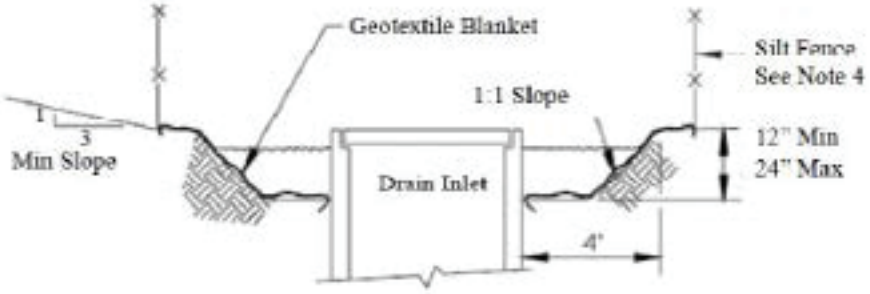
Notes:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable in concentrated flows.
4. Refer to BMP SE-1: Silt Fence for construction.

DI Protection Type 2, Evacuate Drop Inlet Sediment Trap



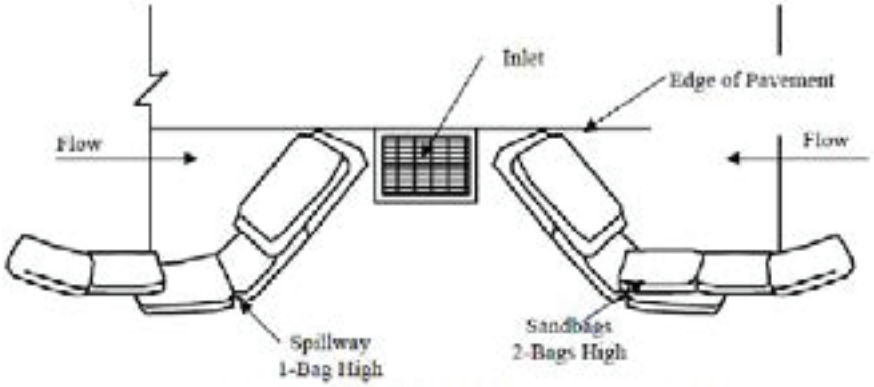
Detail "B"
Not to Scale



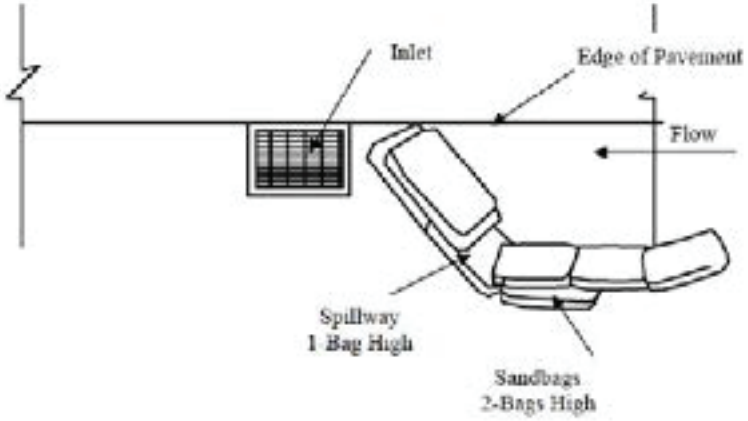
Notes:

1. For use in cleared and grubbed and in graded areas.
2. For concentrated flows, shape basin in 2:1 (L:W) ratio with length oriented towards direction of flow.
3. Size excavated trap to provide a minimum storage capacity calculated at the rate 67 cubic yard/acre of drainage area.
4. Refer to BMP SE-1: Silt Fence for construction.

DI Protection Type 3, Gravel Bag



Typical Protection for Inlet on Sump, Detail "C"
Not to Scale



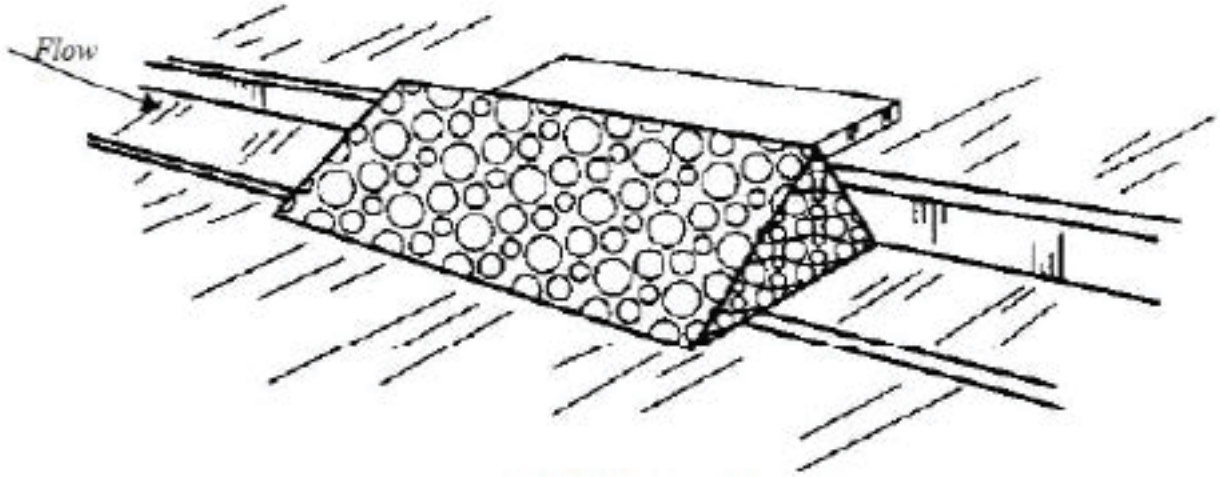
Typical Protection for Inlet on Grade, Detail "D"
Not to Scale

Notes:

1. Intended for short-term use. Not suitable for roads open to traffic.
2. Used to inhibit non-storm water flow.
3. Bags **should** be removed after adjacent operation is completed.
4. Not applicable in areas with high silts and clays without filter fabric.
5. Use sand bag made of geotextile fabric (not burlap) and fill with 0.75-inch rock or 0.25-inch pea gravel.
6. Construct on gently sloping street.
7. Leave room upstream of barrier for water to pond and sediment to settle.
8. Place several layers of sand bags - overlapping the bags and packing them tightly together.
9. Leave gap of 1 bag on the top row to serve as a spillway. Flow from a severe storm (e.g., 10 year storm) should not overtop the curb.
10. Do not use sandbags for roadways subject to traffic.
11. For traffic area, insert geotextile filter inserts instead of sandbags.

DI Protection Type 4, Gravel and Wire Mesh for Club Curb Inlet

Detail "E"
Not to Scale

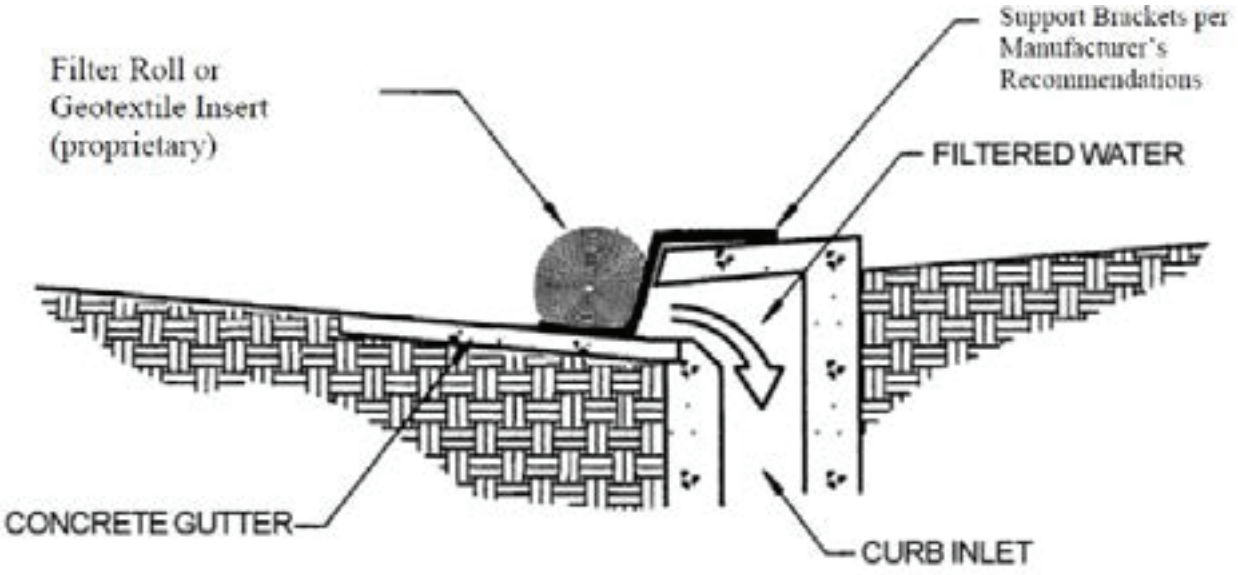


Section E-E
Not to Scale

Notes:

1. Place hardware cloth or comparable wire mesh with 0.5-inch openings over the drop inlet so that the wire extends a minimum of a foot beyond each side of the inlet structure. If more than 1 strip is necessary, overlap the strips.
2. Place filter fabric over the wire mesh.
3. Place wire mesh over the outside vertical face (open end) of the inlet to prevent stone from being washed through. Use hardware cloth or comparable wire mesh with 0.5-inch opening.
4. Pile washed stone against the wire mesh to the top of the inlet. Use 0.75- to 3-inch stones.
5. Do not use gravel within vehicle and pedestrian traffic areas.
6. For traffic areas, insert geotextile filter inserts instead of gravel filters.

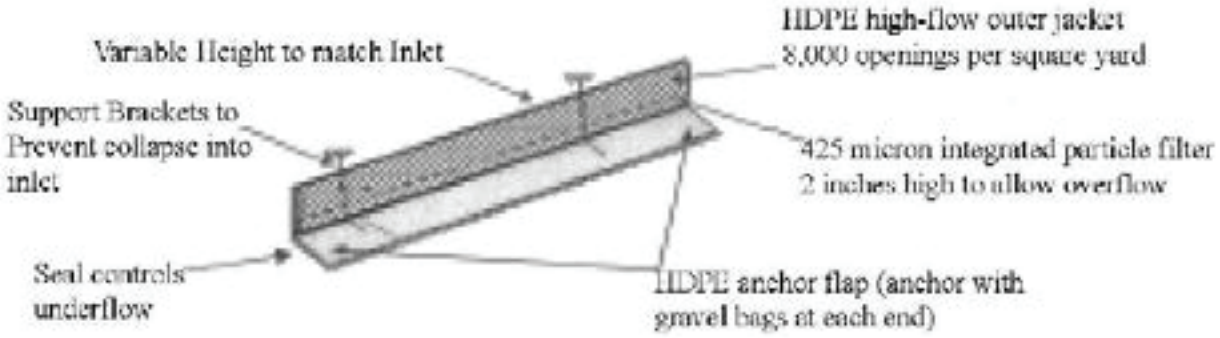
DI Protection Type 5, Filter Roll or Geotextile Insert with Supports for Club Inlet



Detail "F"

Not to Scale and May Use Various Types of Geotextile Inserts

DI Protection Type 5, Geotextiles Insert with Supports for Curb Inlet



Detail "G"

Not to Scale and May Use Various Types and Styles of Geotextile Inserts

SE-16: Compost Socks and Berms

Objectives	
▲	EC - Erosion Control
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▲	Bacteria
▲	Oil and Grease
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Legend:
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Potential Alternatives	
SE-1	Silt Fence
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm
SE-8	Sandbag Barrier

Description and Purpose

Composite socks and berms act as three (3)-dimensional biodegradable filtering structures to intercept runoff where sheet flow occurs and are generally placed at the perimeter or at intervals on sloped areas. Compost socks are generally a mesh sock containing compost and a compost berm is a dike of compost, trapezoidal in cross section. When employed to intercept sheet flow, both BMPs are placed perpendicular to the flow of the runoff allowing filtered runoff to pass through the compost and retaining sediment (and potentially other pollutants in runoff). A compost sock can be assembled on site by filling a mesh sock with compost (i.e. using a pneumatic blower or similar) or they can be manufactured off site and delivered to the site for installation. The compost berm should be constructed using a backhoe or equivalent and/or a pneumatic delivery (blower) system and should be properly compacted after placement. Compost socks and berms act as filters, reduce runoff velocities, and in some cases, aid in future establishment of vegetation.

Compost is organic, biodegradable, and renewable. Compost provides soil structure that allows water to infiltrate the compost medium which helps reduce rill erosion and the retained moisture promotes seed germination and vegetation growth, in addition to providing organic matter and nutrients important for fostering vegetation. Compost improves soil quality and productivity. The compost of the compost sock or berm can be selected to target site-specific objectives in capturing sediment and other pollutants, supporting certain vegetation, or additional erosion controls.

Compost is typically derived from leaf/yard trimmings or wood. The primary targeted sources of compost are products of the City green waste programs. Compost is organic and biodegradable and in most cases

can be left onsite once construction activity is completed. There are many types of compost with a variety of properties with specific functions, and accordingly compost selection is an important design consideration in the application of this type of erosion and sediment control.

Suitable Applications

- Along toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow (compost berms should only be used at the top of slopes or on slopes 4:1 (H:V) or less, all other slopes applications should use compost socks or other BMPs);
- Along perimeter of project;
- As check dams in unlined ditches (socks only);
- Down-slope of exposed soil areas; and
- Around temporary stockpiles.

Compost socks and berms do not require special trenching or BMP removal as compared to other sediment control methods (e.g. silt fences or fiber rolls). Since installing compost socks does not require trenching or disturbing the earth, compost socks can be effectively installed during a rain event if immediate sediment and erosion control is required. Compost socks and berms can remain in place after earth disturbing activities are completed or the compost components can be spread over the site providing nutrients for plant growth and augmenting soil structure. BMPs that remain in place are particularly advantageous below embankments, especially adjacent to streams, by limiting re-entry and the continued disturbance to sensitive areas.

Compost socks can be manufactured in 20’ coils, similar to other sediment retention fiber roll (SRFR) devices (straw wattles, etc.) and placed on a pallet for easy storage, transportation, and installation. Pre-made compost sock coils can be stored on the site in preparation for BMP maintenance activities and rain events.

Compost can be pre-seeded prior to application (recommended by USEPA for construction site storm water runoff control, USEPA Website-Compost Filter Socks) or seeded after installation (primarily for compost berms).

Limitations

- Compost can potentially leach nutrients (dissolved phosphorous and nitrogen) into runoff and potentially impact water quality. Compost should not be used directly upstream from nutrient impaired waterbodies;
- Compost may also contain other undesirable constituents that are detrimental to water quality choose source of compost selectively;
- Application by hand is time intensive and potentially costly. Using a pneumatic blower truck is the recommended cost effective method of distribution;
- Heavy vegetation should be removed to ensure close contact of compost with the existing ground surface;
- Compost socks and berms should not be employed at the base of slopes greater than 2:1. They can be employed in combination with other erosion control methods for steeper slopes;
- Difficult to move once saturated;
- Compost berms should not be applied in areas of concentrated flows;

- Compost socks and berms are easy to fix; however they are susceptible to damage by frequent traffic. Compost socks can be used around heavy machinery, but regular disturbance decreases sock performance; and
- Different strength socks are available by compost sock manufacturers, select sock which is of sufficient strength to handle anticipated disturbances.

Implementation

Compost Materials

- Compost should meet or exceed AASHTO R 51-10, Standard Specification for Compost for Erosion/Sediment Control (Filter Berms and Filter Socks);
- Compost quality shall comply with all local, state, and Federal requirements;
- Particle size is an important parameter for selecting compost. Well consolidated coarser grades of compost (e.g. mixture of small and larger pieces) perform better for filtration objectives, while finer grades support vegetation better. Particle size of the compost should be selected based on site conditions, such as expected participation rates, filtration goals, and/or long term plant nutrient requirements;
- Compost moisture should be considered for composition quality and application purposes. A range of 30-50% is typical. Compost that is too dry is hard to apply and compost that is too wet is more difficult (and more expensive) to transport. For arid or semi-arid areas, or for application during the dry season, use compost with greater moisture content than areas with wetter climates. For wetter or more humid climates or for application during the wet season, drier composts can be used as the compost will absorb moisture from the ambient air;
- If vegetation establishment is a desired function of the compost, a compost sample should be inspected by a qualified individual;
- Organic content of the compost is also important and should range from 30-65% depending on site conditions and uses for vegetation establishment;
- Compost should not be derived from mixed municipal solid waste or biosolids and should be free of visible contaminants;
- Compost used should not emit objectionable odors; and
- Compost should be weed and alien plant free.

Installation

- Prior to application, prepare locations for socks and/or berms by removing brush and thick vegetation. The compost of the sock and/or berm should be allowed to come in full contact with the ground surface;
- If manufacturing on site select method to apply the compost berm or fill sock. A pneumatic blower is most cost effective and most adaptive in applying compost to steep, rough terrain, and hard to reach locations;
- If compost sock has been manufactured off site, the sock shall be manufactured in pre-made lengths that are easily, safely, and efficiently handled by construction laborers;
- Overlap the ends of adjoining sock lengths by a minimum of 6”;
- The compost of the berm should be distributed evenly to the surface, compacted, and shaped trapezoidal (refer to AASHTO Specification R 51-10);

- Compost socks can be assembled on site by filling mesh socks with selected compost. Mesh socks can be tied at one end, filled, and then tied at the other end. The ends of socks can be interlocked until the desired length is achieved. Alternatively, use a filter sock equivalent to length of slope if practicable. The sock diameter is a function of slope steepness and length (refer to AASHTO Specification R 51-10) – typically 8" to 18" in diameter;
- Compost socks are typically placed in contours perpendicular to sheet flow. They can also be placed in V formation on a slope. Compost socks must be anchored, typically staked, through center of the sock although alternative anchor methods may be prescribed by the compost sock manufacturer;
- Turn ends of socks up slope to prevent flow around ends;
- When used as a Slope Interruption Device (SID) locate compost socks and berms on level contours spaced as follows:
  - Slopes greater than or equal to 2:1 should be placed at a maximum interval of 10 feet, with the first row near the slope toe.
  - Slopes greater than 4:1 but less than 2:1 should be placed at a maximum interval of 15 feet, with the first row near the slope toe.
  - Slopes less than 4:1 should be placed at a maximum interval of 20 feet, with the first row near the slope toe.
- If used at toe of slopes, the compost sock or berm should at minimum of 5 to 10 feet away from toe;
- Compost socks and berms can be effective over rocky ground if secured properly;
- It is recommended that the drainage areas of these compost BMPs do not exceed 0.25 acre per 100 feet placement interval and runoff does not exceed 1 cubic feet per second; and
- Layout in accordance with attached details or as specified in SWPPP.

Other Materials

- Wood stakes should be commercial quality lumber with nominal size of ¾" by ¾" and minimum length of 16 inches designed for the staking of compost socks and/or sediment retention fiber rolls (SRFRs). Each stake should be free from decay, splits or cracks longer than the thickness of the stake or other defects that would weaken the stakes and cause the stakes to be structurally unsuitable. Larger sized wood anchor stakes may be installed at the discretion of the installer, or as specified by the Project Engineer. Rebar or other metal rods are not recommended.
- Typical sock materials are; 1) high density polyethylene (HDPE) expandable, tubular, biodegradable or photodegradable, 2) polyester knitted mesh netting fabric sock, and 3) composite 2-layered compost sock can be constructed using a polyester knitted mesh netting fabric sock as the outermost layer (outer filtration mesh) and a high density polyethylene (HDPE) expandable, tubular, biodegradable or photodegradable netting as the innermost layer (inner confinement netting). Sock materials shall be of sufficient diameter to allow the compost sock to be manufactured to the desired finished size. Aperture size (apparent opening of tubular net and knitted mesh netting) can range in size based on desired performance and intended function, but in no case shall outermost layer have an apparent size greater than 3/8".

Costs

Recently obtained Hawaii vendor cost indicated $6.50 per linear foot for compost berm application and $3.50 per linear foot for 10” (8.5” effective height) socks. Costs do not include final compost sock and berm functions at the end of construction activities, including spreading or removal, if required.

Inspection and Maintenance

- Inspect BMPs prior to forecasted rain, daily during extended rain events, after rain events 0.5” or greater which occurs in a 24-hour period, weekly during the rainy season, and at 2-week intervals during the non-rainy season.
- Remove sediment which has accumulated to within 1/3 of the sock or berm height.
- Once damage is identified mend or reapply sock or berm as needed. Washed out areas should be replaced. If the sock or berm height is breached during a storm, an additional sock can be stacked to increase the sock height and similarly the berm dimensions can be increased, as applicable. An additional sock or berm may be installed upslope, as needed.
- Limit traffic to minimize damage to BMPs or impede vegetation establishment.

References

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, November 2009.

Hawaii Department of Transportation (HDOT) Best Management Practices Field Manual Construction, January 2008.

http://stormwaterhawaii.com/program_plan/pdfs/app_e6.pdf.

National Pollutant Discharge Elimination System (NPDES), Compost Filter Socks, U.S. Environmental Protection Agency (USEPA).

http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=120.

National Pollutant Discharge Elimination System (NPDES), Compost Filter Berms, U.S. Environmental Protection Agency (USEPA).

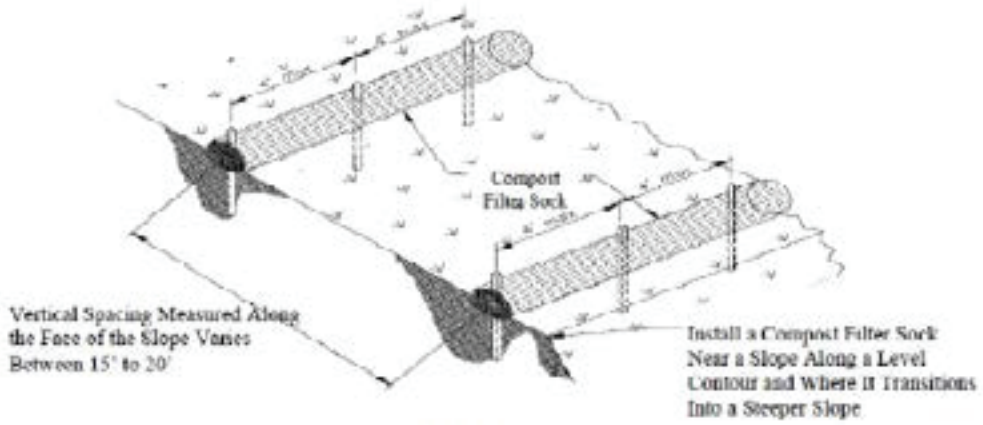
http://cfpub.epa.gov/npdes/stormwater/menuofbmps/index.cfm?action=factsheet_results&view=specific&bmp=119&minmeasure=4.

AASHTO. 2010 Standard Practice for Transportation Materials and Methods of Sampling and Testing, Designation R 51-10, Compost for Erosion/Sediment Control (Filter Berms and Filter Socks), American Association of State Highway Officials, Washington, D.C.

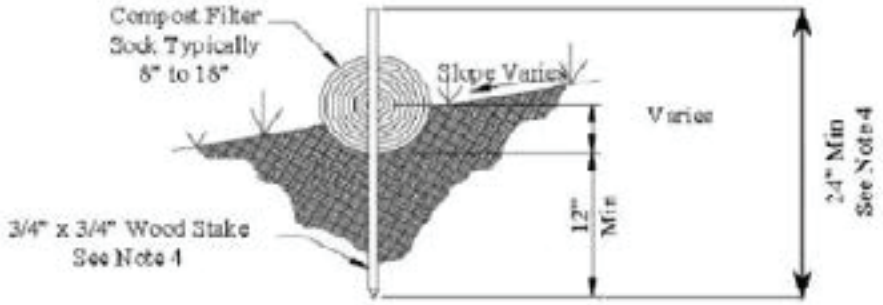
Faucette, et al. 2005. Evaluation of Stormwater from Compost and Conventional Erosion Control Practices in Construction Activities, Journal of Soil and Water Conservation, 60:6, 288-297.

USEPA. 1998. An Analysis of Composting as an Environmental Remediation Technology. U.S. Environmental Protection Agency, Solid Waste and Emergency Response (5305W), EPA530-R-98-008, April 1998.

Compost Filter Sock (Slope Interruption Device)



Detail "A"
Not to Scale

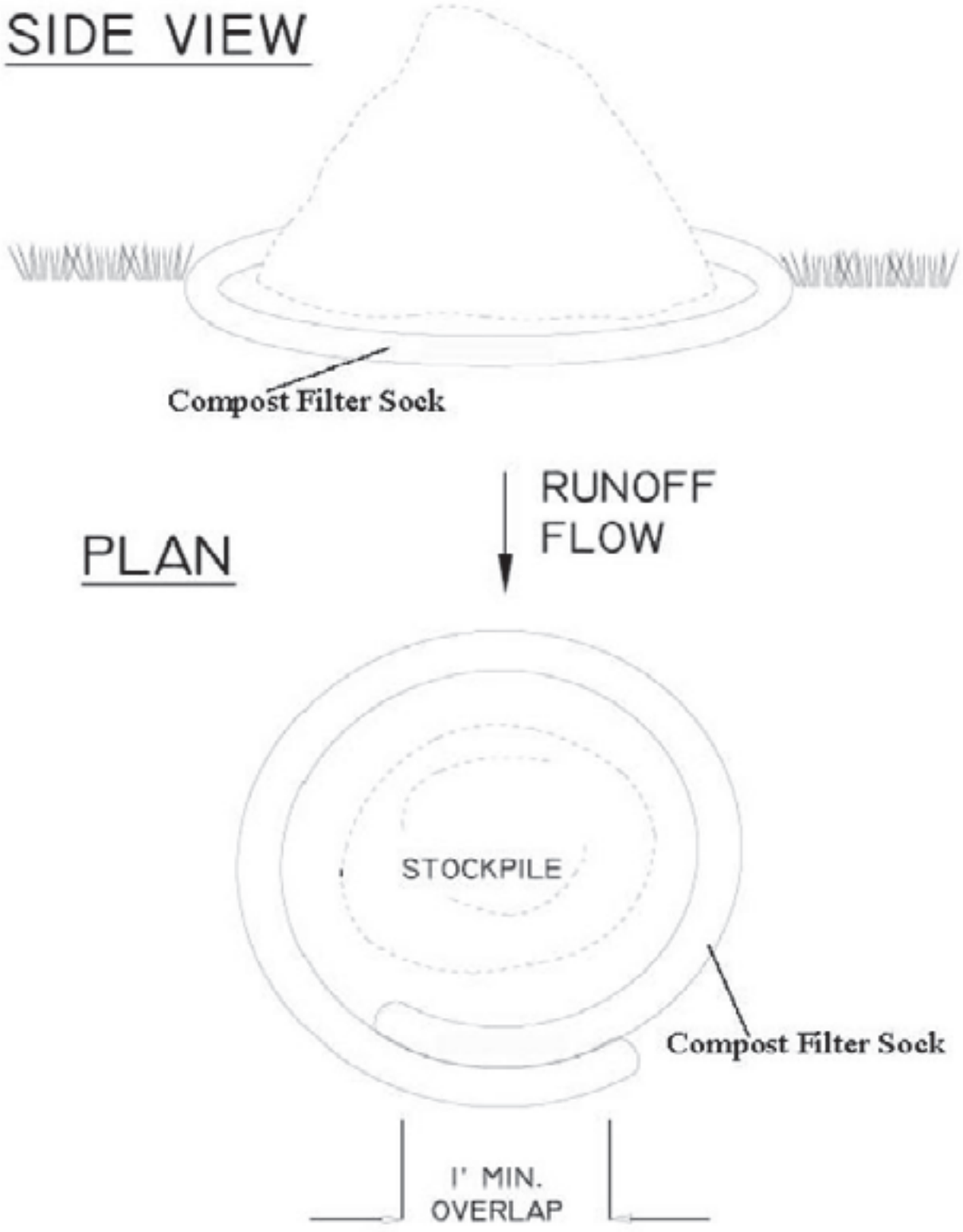


Section A-A
Not to Scale

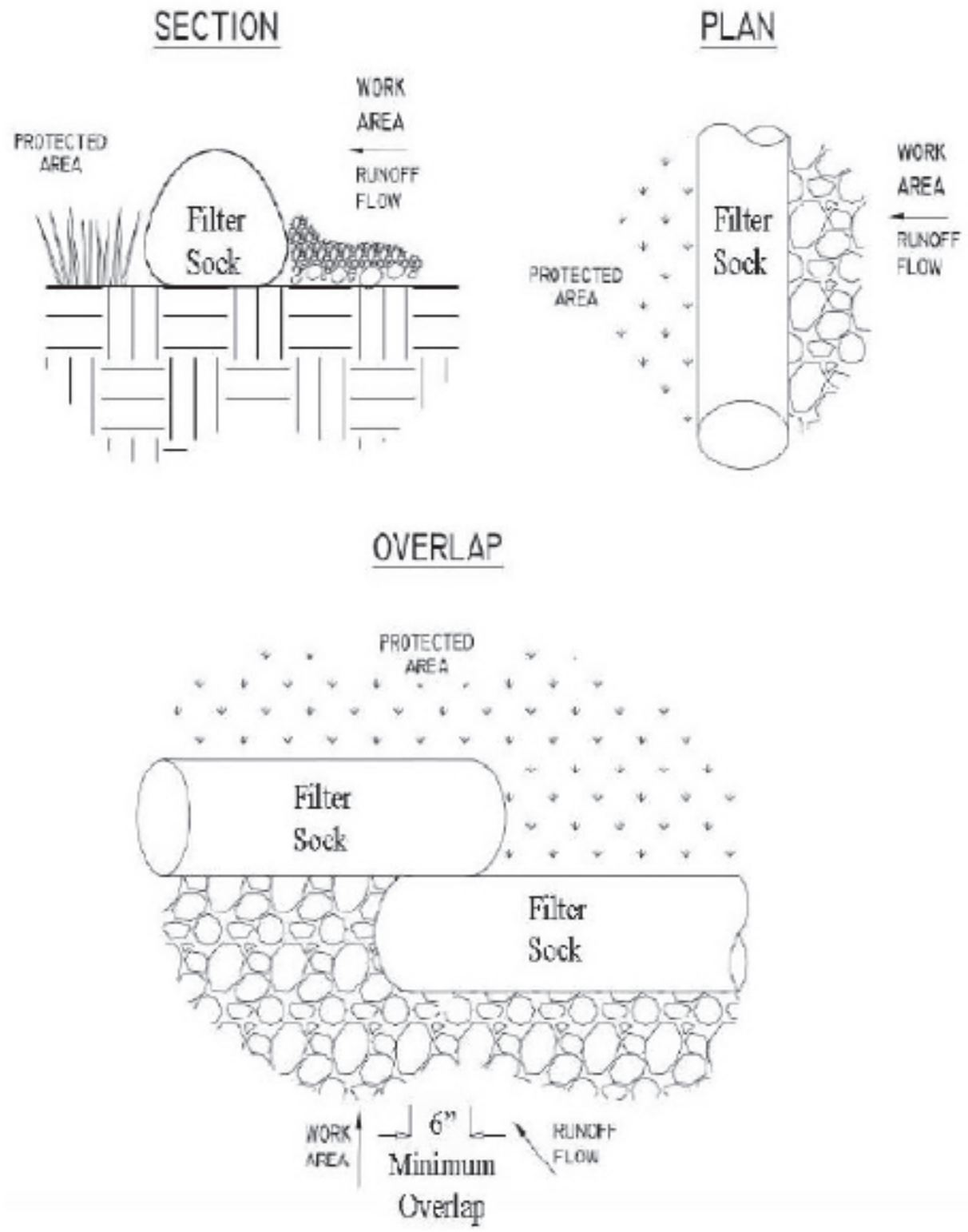
Notes:

1. Compost Filter Socks should be either prefabricated or assembled at site.
2. Locate Compost Filter Socks on level contours spaced as follows:
   a. Slope inclination of 4:1 (H:V) or flatter: Compost Filter Socks and/or berms should be place at a maximum interval of 20 feet.
   b. Slope inclination between 4:1 and 2:1 (H:V): Compost Filter Socks (use of berms not recommended) should be placed at a maximum interval of 15 feet (a closer spacing is more effective).
   c. Slope inclination of 2:1 (H:V) or greater: Compost Filter Socks should be placed at maximum interval of 10 feet.
3. Turn the ends of the Compost Filter Socks up slope to prevent runoff from going around the roll.
4. Stake Compost Filter Socks with stakes with a minimum length of 14 inches and spaced 4 feet on center.
5. If more than 1 Compost Filter Socks is placed in a row, the rolls should be overlapped, not abutted.

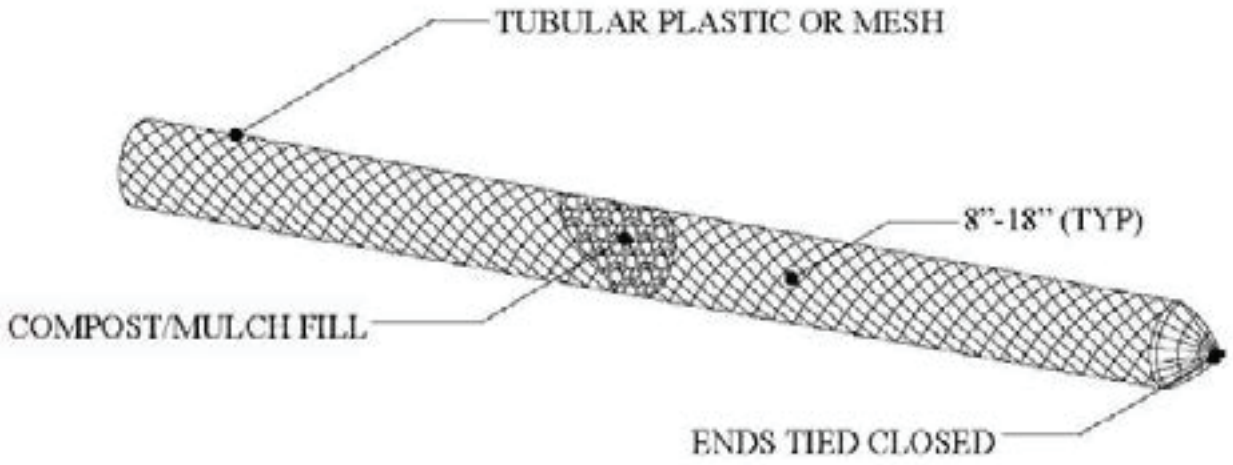
Compost Filter Sock (Stockpile Protection)



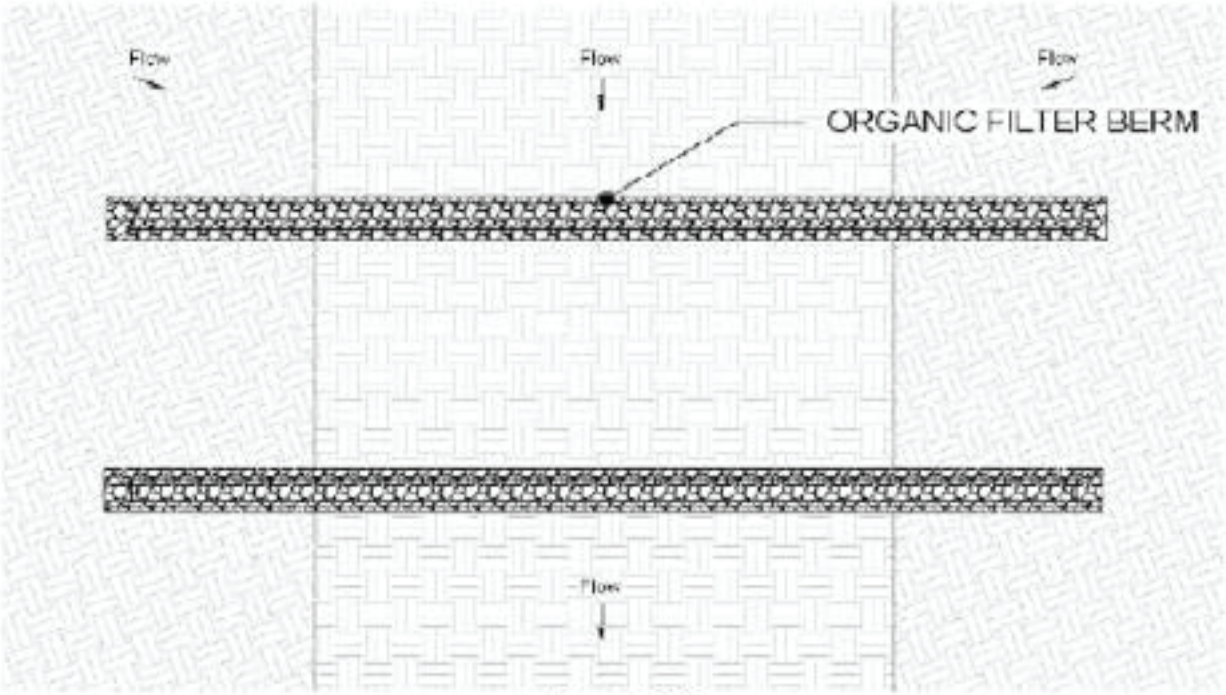
Compost Filter Sock (Perimeter Control)



Compost Filter Sock



Compost Filter Berm



Plan "B"
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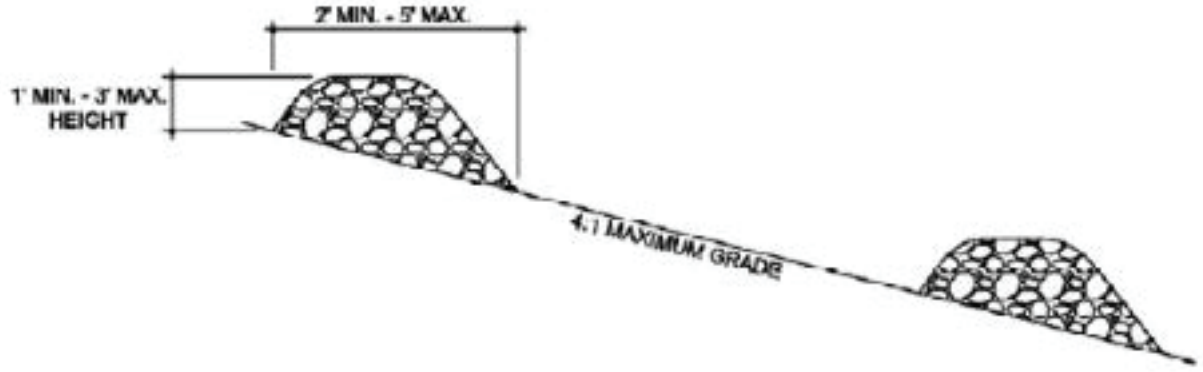

Section "B-B"
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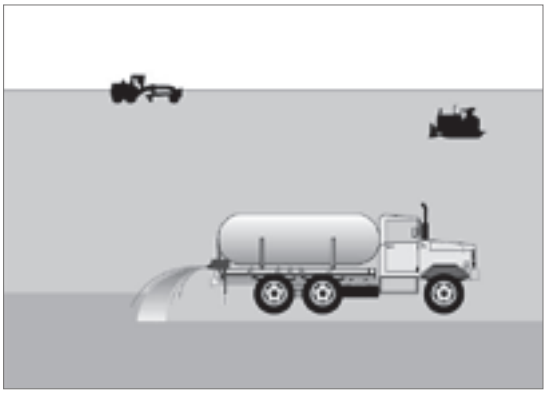
WE-1: Wind Erosion Control



Objectives	
	EC - Erosion Control
▲	SE - Sediment Control
	TR - Tracking Control
●	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Wind erosion or dust control consists of applying water or other dust palliatives as necessary to prevent or alleviate dust nuisance generated by construction activities. Covering small stockpiles or areas is an alternative to applying water or other dust palliatives.

Suitable Applications

Wind erosion control BMPs are suitable during the following construction activities:

- Construction vehicle traffic on unpaved roads,
- Drilling and blasting activities,
- Sediment tracking onto paved roads,
- Soils and debris storage piles,
- Batch drop from front-end loaders,
- Areas with unstabilized soil, and/or
- Final grading/site stabilization.

Limitations

- Watering prevents dust only for a short period and should be applied daily (or more often) to be effective.
- Over watering may cause erosion.
- Oil or oil-treated subgrade should not be used for dust control because the oil may migrate into drainageways and/or seep into the soil.
- Effectiveness depends on soil, temperature, humidity, and wind velocity.

- Chemically treated subgrades may make the soil water repellant, interfering with long-term infiltration and the vegetation/re-vegetation of the site.
- Asphalt, as a mulch tack or chemical mulch, requires a 24-hour curing time to avoid adherence to equipment, worker shoes, etc. Application should be limited because asphalt surfacing may eventually migrate into the drainage system.
- In compacted areas, watering and other liquid dust control measures may wash sediment or other constituents into the drainage system.

Implementation

General

During these dry seasons, construction activities are at their peak, and disturbed and exposed areas are increasingly subject to wind erosion, sediment tracking and dust generated by construction equipment.

Dust control, as a BMP, is a practice that is already in place for many construction activities.

City and County of Honolulu has enacted dust control in the grading permit that cause dust to be transported beyond the construction project property line.

The following are measures that the City may have already implemented as requirements for dust control from contractors:

- Construction and Grading Permits: Require provisions for dust control (ROH Section 14-15.1 (k), 14-15.2 (e)).
- DOH NOI-C for projects greater than 1-acre. SWPPP: Integrate dust control measures into the plan.

Dust Control Practices

Dust control BMPs generally stabilize exposed surfaces and minimize activities that suspend or track dust particles. The following table shows dust control practices that can be applied to site conditions that cause dust. For heavily traveled and disturbed areas, wet suppression (watering), chemical dust suppression, gravel asphalt surfacing, temporary gravel construction entrances, equipment wash-out areas, and haul truck covers can be employed as dust control applications. Permanent or temporary vegetation and mulching can be employed for areas of occasional or no construction traffic. Preventive measures would include minimizing surface areas to be disturbed, limiting onsite vehicle traffic to 15 mph, and controlling the number and activity of vehicles on a site at any given time.

Dust Control Practices

Site Condition	Permanent Vegetation	Mulching	Wet Suppression (Watering)	Chemical Dust Suppression	Gravel or Asphalt	Silt Fences	Temporary Gravel Construction Entrances/ Equipment Wash Down	Haul Truck Covers	Minimize Extent of Disturbed Area
Disturbed Areas not Subject to Traffic	x	x	x	x	x				x
Disturbed Areas Subjected to Traffic			x	x	x		x		x
Material Stock Pile Stabilization			x	x		x			x
Demolition			x				x	x	
Clearing/ Excavation			x	x		x			x
Truck Traffic on Unpaved Roads			x						
Mud/Dirt Carry Out					x		x		

Additional preventive measures include:

- Schedule construction activities to minimize exposed area (EC-1, Scheduling);
- Quickly stabilize exposed soils using vegetation, mulching, spray-on adhesives, calcium chloride, sprinkling, and stone/gravel layering;
- Identify and stabilize key access points prior to commencement of construction;
- Minimize the impact of dust by anticipating the direction of prevailing winds;
- Direct most construction traffic to stabilized roadways within the project site;
- Water should be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution;
- All distribution equipment should be equipped with a positive means of shutoff;
- Unless water is applied by means of pipelines, at least 1 mobile unit should be available at all times to apply water or dust palliative to the project;
- If reclaimed waste water is used, the sources and discharge must meet Hawaii Department of Health Wastewater Branch, Guidelines for the Treatment and Use of Recycled Water (2002) water reclamation criteria. Non-potable water should not be conveyed in tanks or drain pipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes, and other conveyances should be marked, “NON-POTABLE WATER - DO NOT DRINK.”;

- Materials applied as temporary soil stabilizers and soil binders also generally provide wind erosion control benefits;
- Pave or chemically stabilize access points where unpaved traffic surfaces adjoin paved roads;
- Provide covers for haul trucks transporting materials that contribute to dust;
- Provide for wet suppression or chemical stabilization of exposed soils;
- Provide for rapid clean up of sediments deposited on paved roads. Furnish stabilized construction road entrances and vehicle wash down areas;
- Stabilize inactive construction sites using vegetation or chemical stabilization methods; and
- Limit the amount of areas disturbed by clearing and earth moving operations by scheduling these activities in phases.

For chemical stabilization, there are many products available for chemically stabilizing gravel roadways and stockpiles. If chemical stabilization is used, the chemicals should not create any adverse effects on storm water, plant life, or groundwater.

Costs

Installation costs for water and chemical dust suppression are low, but annual costs may be quite high since these measures are effective for only a few hours to a few days.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Check areas protected to ensure coverage.
- Most dust control measures require frequent, often daily, or multiple times per day attention.

References

Best Management Practices and Erosion Control Manual for Construction Sites, Flood Control District of Maricopa County, Arizona, September 1992.

California Air Pollution Control Laws, California Air Resources Board, 1992.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Caltrans, Standard Specifications, Sections 10, “Dust Control”; Section 17, “Watering”; and Section 18, “Dust Palliative.”

Hawaii Administrative Rules 11-60.1-33 Air Pollution Control.

Hawaii Department of Health Wastewater Branch, Guidelines for the Treatment and Use of Recycled Water, May 2002.

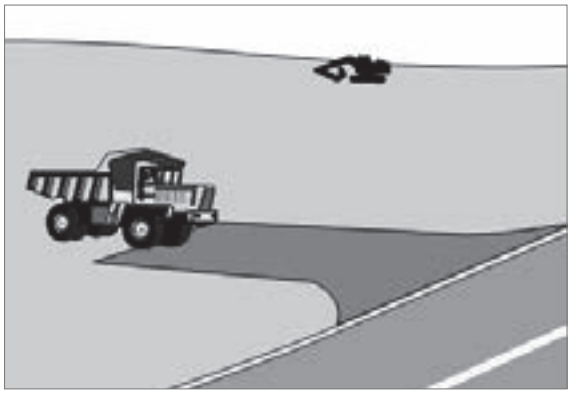
Prospects for Attaining the State Ambient Air Quality Standards for Suspended Particulate Matter (PM10), Visibility Reducing Particles, Sulfates, Lead, and Hydrogen Sulfide, California Air Resources Board, April 1991.

Revised Ordinances of Honolulu Article 15 Grading, Grubbing and Stockpiling.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Revised Ordinances of Honolulu Article 14 Permits, Bonds and Inspection for Grading, Soil Erosion and Sediment Control, 1990 as Amended.

TR-1: Stabilized Construction Entrance/Exit



Objectives	
▲	EC - Erosion Control
▲	SE - Sediment Control
●	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

A stabilized construction access is defined by a point of entrance/exit to a construction site that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.

Suitable Applications

Use at construction sites:

- Where dirt or mud can be tracked onto public roads,
- Adjacent to water bodies,
- Where poor soils are encountered, and/or
- Where dust is a problem during dry weather conditions.

Limitations

- Entrances and exits require periodic top dressing with additional stones.
- This BMP should be used in conjunction with street sweeping on adjacent public right of way.
- Entrances and exits should be constructed on level ground only.
- Stabilized construction entrances are rather expensive to construct and when a wash rack is included, a sediment trap of some kind must also be provided to collect wash water runoff.

Implementation

General

A stabilized construction entrance is a pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving a construction site to or from a public right of way, street, alley, sidewalk, or parking area. The purpose of a stabilized construction entrance is to reduce or eliminate the tracking of sediment onto public rights of way or streets. Reducing tracking of sediments and other

pollutants onto paved roads helps prevent deposition of sediments into local storm drains and production of airborne dust.

Where traffic will be entering or leaving the construction site, a stabilized construction entrance should be used. NPDES permits require that appropriate measures be implemented to prevent tracking of sediments onto paved roadways, where a significant source of sediments is derived from mud and dirt carried out from unpaved roads and construction sites.

Stabilized construction entrances are moderately effective in removing sediment from equipment leaving a construction site. The entrance should be built on level ground. Advantages of the Stabilized Construction Entrance/Exit are that it does remove some sediment from equipment and serves to channel construction traffic in and out of the site at specified locations. Efficiency is greatly increased when a washing rack is included as part of a stabilized construction entrance/exit.

See the City and County of Honolulu's "Rules Relating to Water Quality " for additional information.

Design and Layout

- Construct on level ground where possible.
- Select 3- to 6-inch diameter stones gravel placed upon a geotextile mat.
- Use minimum depth of stones of 12 inches for projects that disturb an acre or more and 8 inches for Category 3 projects.
- Construct length of 50 feet minimum, and 30 feet minimum width for Category 1C, 4, and 5 projects.
- Construct length of 30 feet minimum, and 20 feet minimum width for Category 3 projects.
- Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
- Provide ample turning radii as part of the entrance.
- Limit the points of entrance/exit to the construction site.
- Limit speed of vehicles to control dust.
- Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphalt concrete (AC), concrete) based on longevity, required performance, and site conditions. Do not use AC grindings for stabilized construction access/roadway.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least a 12-inch depth, or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 inches but not exceeding 6 inches should be used.
- Designate combination or single purpose entrances and exits to the construction site.
- Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
- Implement SE-7: Street Sweeping and Vacuuming, as needed.
- All exit locations intended to be used for more than a 2-week period should have stabilized construction entrance/exit BMPs.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMPs are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect local roads adjacent to the site daily. Sweep or vacuum to remove visible accumulated sediment.
- Remove aggregate, separate and dispose of sediment if construction entrance/exit is clogged with sediment.
- Keep all temporary roadway ditches clear.
- Check for damage and repair as needed.
- Replace gravel material when surface voids are visible.
- Remove all sediment deposited on paved roadways within 24 hours.
- Remove gravel and filter fabric at completion of construction.

Costs

In California, average annual cost for installation and maintenance may vary from $1,200 to $4,800 each, averaging $2,400 per entrance. Costs will increase with addition of washing rack, and sediment trap. With wash rack, costs range from $1,200 - $6,000 each, averaging $3,600 per entrance. Note that Hawaii's unit prices are higher than California's unit prices.

References

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Guidance Specifying Management Measures for Nonpoint Pollution in Coastal Waters, EPA 840-B-9-002, USEPA, Office of Water, Washington, DC, 1993.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

National Management Measures to Control Nonpoint Source Pollution from Urban Areas, USEPA Agency, 2002.

Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Work Group Working Paper, USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

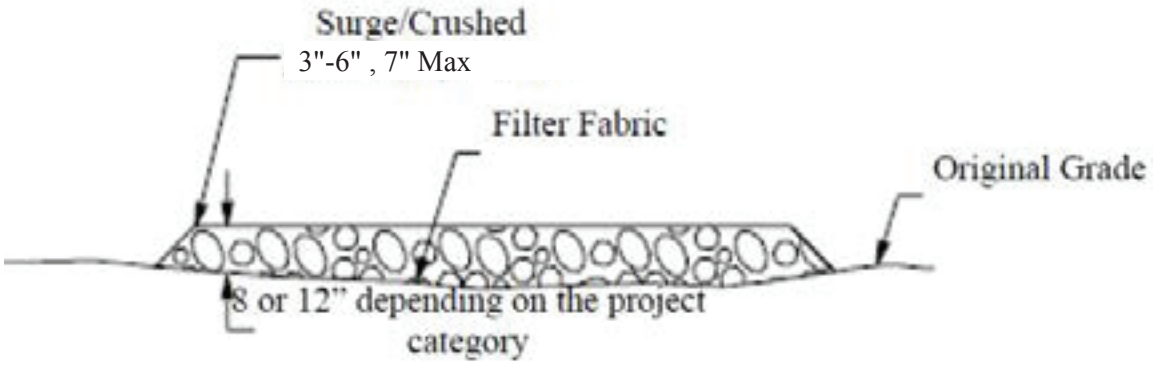
Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

Stabilized Construction Entrance/Exit

Detail "A"

Not to Scale



Section A-A

Not to Scale

Stabilized Construction Entrance/Exit

Notes:

1. Construct on level ground where possible.
2. Select 3- to 6-inch diameter stones.
3. Use minimum depth of stones of 8 inches for Category 3 projects and 12 inches for Category 1C, 4, and 5 projects or as recommended by soils engineer.
4. Construct length of 50 feet minimum, and 30 feet minimum width for Category 1C, 4, and 5 and length of 30 feet minimum and 20 feet minimum width for Category 3.
5. Rumble racks constructed of steel panels with ridges and installed in the stabilized entrance/exit will help remove additional sediment and to keep adjacent streets clean.
6. Provide ample turning radii as part of the entrance.
7. Limit the points of entrance/exit to the construction site.
8. Limit speed of vehicles to control dust.
9. Properly grade each construction entrance/exit to prevent runoff from leaving the construction site.
10. Route runoff from stabilized entrances/exits through a sediment trapping device before discharge.
11. Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
12. Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions. Do not use AC grindings for stabilized construction access/roadway.
13. Place crushed aggregate over geotextile fabric to at least 8 inches (Category 3 projects) or 12 inches depth (Category 1C, 4, or 5 projects), or place aggregate to a depth recommended by a geotechnical engineer. A crushed aggregate greater than 3 inches but not exceeding 6 inches should be used.
14. Designate combination or single purpose entrances and exits to the construction site.
15. Require that all employees, subcontractors, and suppliers utilize the stabilized construction access.
16. Implement SE-7: Street Sweeping and Vacuuming, as needed.
17. All exit locations intended to be used for more than a 2-week period should have stabilized construction entrance/exit BMPs.
18. Construct sediment Barrier and channel runoff to sediment trapping device as appropriate.

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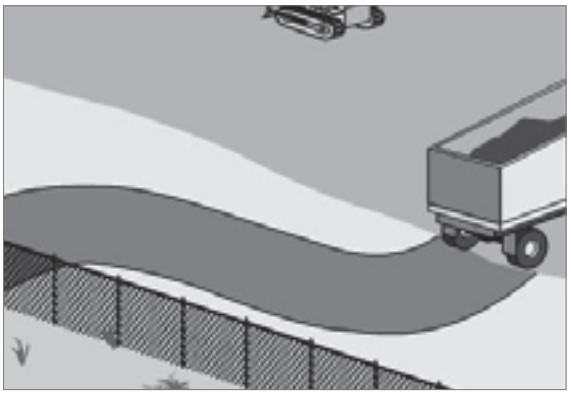
TR-2: Stabilized Construction Roadway



Objectives	
▲	EC - Erosion Control
▲	SE - Sediment Control
●	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Access roads, subdivision roads, parking areas, and other onsite vehicle transportation routes should be stabilized immediately after grading, and frequently maintained to prevent erosion and control dust.

Suitable Applications

This BMP should be applied for the following conditions:

- Temporary Construction Traffic:
  - Phased construction projects and offsite road access, or
  - Construction during wet weather.
- Construction roadways and detour roads:
  - Where mud tracking is a problem during wet weather,
  - Where dust is a problem during dry weather,
  - Adjacent to water bodies, or
  - Where poor soils are encountered.

Limitations

- The roadway must be removed or paved when construction is complete.
- Certain chemical stabilization methods may cause storm water or soil pollution and should not be used. See WE-1: Wind Erosion Control.
- Management of construction traffic is subject to air quality control measures. Contact the local air quality management agency.
- Materials will likely need to be removed prior to final project grading and stabilization.
- Use of this BMP may not be applicable to very short duration projects.

Implementation

General

Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion and dust. The exposed soil surface is continually disturbed, leaving no opportunity for vegetative stabilization. Such areas also tend to collect and transport runoff waters along their surfaces. During wet weather, they often become muddy quagmires that generate significant quantities of sediment that may pollute nearby streams or are transported offsite on the wheels of construction vehicles. Dirt roads can become so unstable during wet weather that they are virtually unusable.

Efficient construction road stabilization not only reduces onsite erosion but also can significantly speed onsite work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather.

Installation/Application Criteria

Permanent roads and parking areas should be paved as soon as possible after grading. As an alternative where construction will be phased, the early application of gravel or chemical stabilization may solve potential erosion and stability problems. Temporary gravel roadway should be considered during the rainy season and on slopes greater than 5%.

Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slope should not exceed 15%. Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section or 1 side in the case of a super elevated section. Simple gravel berms without a trench can also be used.

Installed inlets should be protected to prevent sediment laden water from entering the storm sewer system (SE-10: Storm Drain Inlet Protection). In addition, the following criteria should be considered.

- Road should follow topographic contours to reduce erosion of the roadway.
- The roadway slope should not exceed 15%.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust (WE-1: Wind Erosion Control).
- Properly grade roadway to prevent runoff from leaving the construction site.
- Design stabilized access to support heaviest vehicles and equipment that will use it.
- Stabilize roadway using aggregate, asphalt concrete (AC), or concrete based on longevity, required performance, and site conditions. The use of cold mix asphalt or AC grindings for stabilized construction roadway is not allowed.
- Coordinate materials with those used for stabilized construction entrance/exit points.
- If aggregate is selected, place crushed aggregate over geotextile fabric to at least 12-inch depth. A crushed aggregate greater than 3 inches but smaller than 6 inches should be used.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.

- Keep all temporary roadway ditches clear.
- When no longer required, remove stabilized construction roadway and re-grade and repair slopes.
- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered 3 or more times per day during the dry season.

Costs

Gravel construction roads are moderately expensive, but cost is often balanced by reductions in construction delay. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Management of the Puget Sound Basin, Technical Manual, Publication #91-75, Washington State Department of Ecology, February 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Virginia Erosion and Sedimentation Control Handbook, Virginia Department of Conservation and Recreation, Division of Soil and Water Conservation, 1991.

Water Quality Management Plan for the Lake Tahoe Region, Volume II, Handbook of Management Practices, Tahoe Regional Planning Agency, November 1988.

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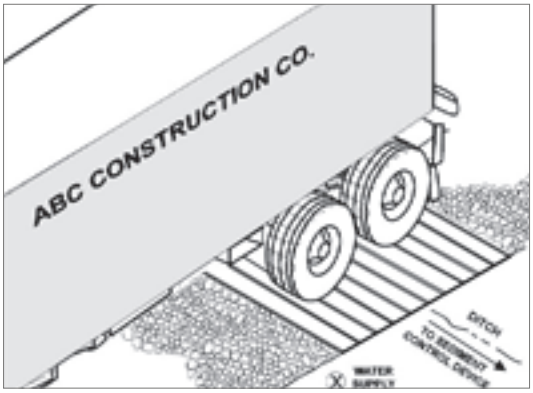
TR-3: Entrance/Outlet Tire Wash



Objectives	
	EC - Erosion Control
▲	SE - Sediment Control
●	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives	
TR-1	Stabilized Construction Entrance/Exit

Description and Purpose

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

Suitable Applications

Tire washes may be used on construction sites where dirt and mud tracking onto public roads by construction vehicles may occur.

Soil erosion control designer to exercise professional judgment on its application to a project.

Limitations

- The tire wash requires a supply of wash water.
- A turnout or doublewide exit is required to avoid having entering vehicles drive through the wash area.
- Do not use where wet tire trucks leaving the site leave the road dangerously slick.
- Implementation
- Incorporate with a stabilized construction entrance/exit. See TR-1: Stabilized Construction Entrance/Exit.
- Construct on level ground when possible, on a pad of coarse aggregate greater than 3 inches but not exceeding 6 inches. A geotextile fabric should be placed below the aggregate.
- Wash rack should be designed and constructed/manufactured for anticipated traffic loads.
- Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device sized for the anticipated amount of vehicle washing and rainfall. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.

- Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
- Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
- Implement SE-7: Street Sweeping and Vacuuming, as needed.

Costs

Costs are low for installation of wash rack.

Inspection and Maintenance

- Inspect and verify that activity–based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharge daily while non-storm water discharges occur.
- Remove accumulated sediment in wash rack and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

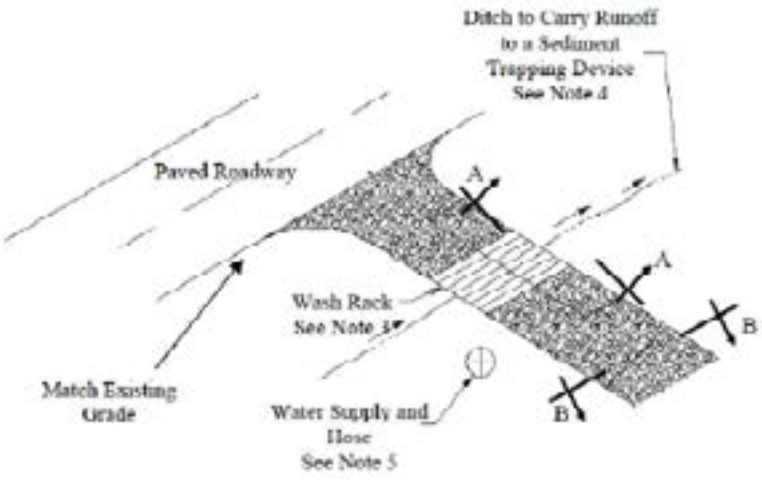
Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Manual of Standards of Erosion and Sediment Control Measures, Association of Bay Area Governments, May 1995.

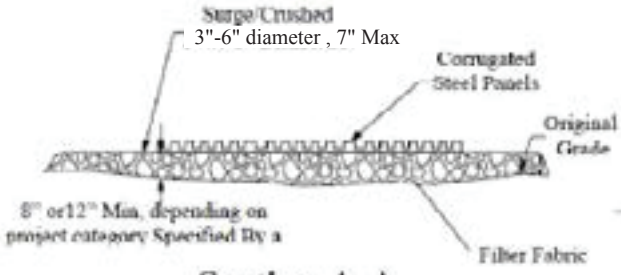
Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

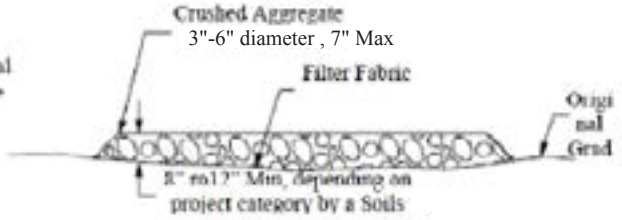
Typical Tire Wash



Plan "A"
Not to Scale



Section A-A
Not to Scale



Section B-B
Not to Scale

Notes:

1. Incorporate with a stabilized construction entrance/exit. See TR-1: Stabilized Construction Entrance/Exit.
2. Construct on level ground when possible, on a pad of coarse aggregate greater than 3 inches but not exceeding 6 inches. A geotextile fabric should be placed below the aggregate.
3. Wash rack should be designed and constructed/manufactured for anticipated traffic loads.
4. Provide a drainage ditch that will convey the runoff from the wash area to a sediment trapping device sized for the anticipated amount of vehicle washing and rainfall. The drainage ditch should be of sufficient grade, width, and depth to carry the wash runoff.
5. Use hoses with automatic shutoff nozzles to prevent hoses from being left on.
6. Require that all employees, subcontractors, and others that leave the site with mud caked tires and undercarriages to use the wash facility.
7. Implement SE-7: Street Sweeping and Vacuuming, as needed.

NS-2: Dewatering Operations

Objectives	
	EC - Erosion Control
▲	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
●	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives	
SE-5	Fiber Rolls
SE-6	Gravel Bag Berm

Description and Purpose

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

Suitable Applications

These practices are implemented for discharges of non-storm water from construction sites. Non-storm waters include, but are not limited to, groundwater, water from cofferdams, water diversions, and waters used during construction activities that must be removed from a work area.

Practices identified in this section are also appropriate for implementation when managing the removal of accumulated precipitation (storm water) from depressed areas at a construction site.

Limitations

- Site conditions will dictate design and use of dewatering operations.
- The controls discussed in this best management practice (BMP) address sediment only.
- The controls detailed in this BMP only allow for minimal settling time for sediment particles. Use only when site conditions restrict the use of the other control methods.
- Dewatering operations will require, and must comply with, applicable local permits.
- Dewatered sludge effluent shall not discharge into the storm drain system.
- Avoid dewatering discharges where possible by using the water for dust control, by infiltration, etc.
- Dewatering non-storm water cannot be Discharged from the site without prior notice to and approval from the DOH.

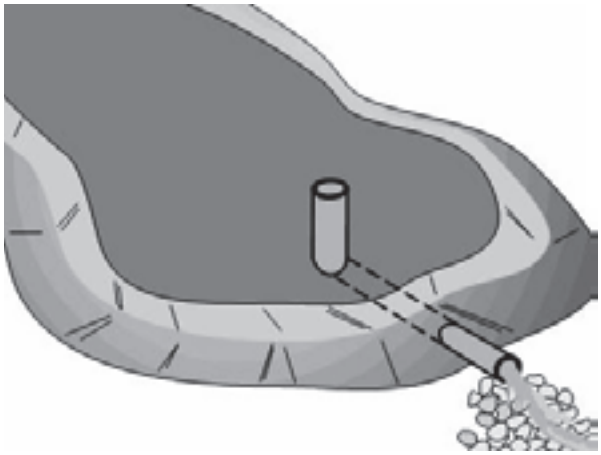
Implementation

- Dewatering non-storm water cannot be discharged without prior notice to and approval from the State of Hawaii Department of Health, Clean Water Branch (CWB) and City and County of Honolulu Planning and Permitting (DPP). This includes storm water that is co-mingled with groundwater or other non-storm water sources. Once the discharge is allowed, appropriate BMPs must be implemented to ensure the discharge complies with all permit requirements and regional and watershed-specific requirements.
- CWB may require a separate NPDES permit prior to the dewatering discharge of non-storm water. These permits will have specific testing, monitoring, and discharge requirements and can take significant time to obtain.
- The flow chart shown in the figure at the end of this BMP should be utilized to guide dewatering operations.
- The owner will coordinate monitoring and permit compliance.
- Additional permits or permissions from other agencies may be required for dewatering cofferdams or diversions.
- Dewatering discharges must not cause erosion at the discharge point.
- A variety of methods can be used to treat water during dewatering operations. Several devices are presented below and provide options to achieve sediment removal. The size of particles present in the sediment and Permit or receiving water limitations on sediment are key considerations for selecting sediment treatment option(s); in some cases, the use of multiple devices may be appropriate.

Toxics and Petroleum Products

- In areas suspected of having groundwater pollution, sample the groundwater near the excavation site and have the water tested for known or suspected pollutants at a certified laboratory. Check with CWB and City DPP for their requirements for dewatering, additional water quality tests, and disposal options.
- With permits from CWB and City DPP, discharge to the storm drainage system is allowed. With a permit from a publicly owned treatment works (POTW), contaminated groundwater can be treated and discharged to the POTW via sanitary sewer.

Sediment Basin (See also SE-2)



Description

A sediment basin is a temporary basin with a controlled release structure that is formed by excavation or construction of an embankment to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment basins are generally larger than Sediment Traps (SE-3).

Appropriate Applications

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

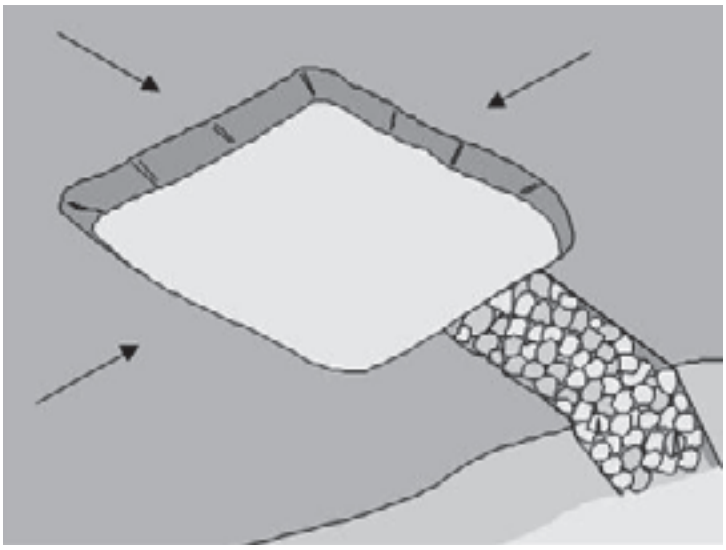
Implementation

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

Maintenance

- Maintenance is required for safety fencing, vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by 1/2.

Sediment Trap (See also SE-3)



Description

A sediment trap is a temporary basin formed by excavation and/or construction of an earthen embankment across a waterway or low drainage area to detain sediment-laden runoff and allow sediment to settle out before discharging. Sediment traps are generally smaller than Sediment Basins (SE-2).

Appropriate Applications

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

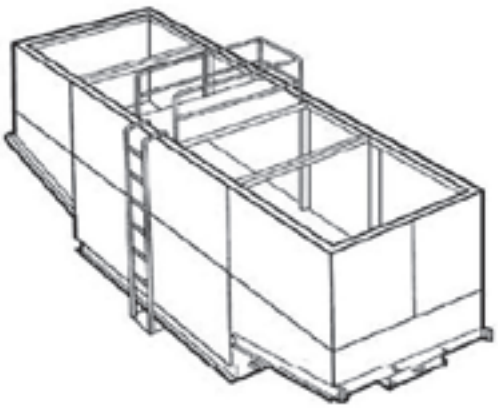
Implementation

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

Maintenance

- Maintenance is required for vegetation, embankment, inlet and outfall structures, as well as other features.
- Removal of sediment is required when the storage volume is reduced by 1/3.

Weir Tanks



Description

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

Appropriate Applications

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

Implementation

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

Maintenance

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

Dewatering Tanks

Description

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

Appropriate Applications

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

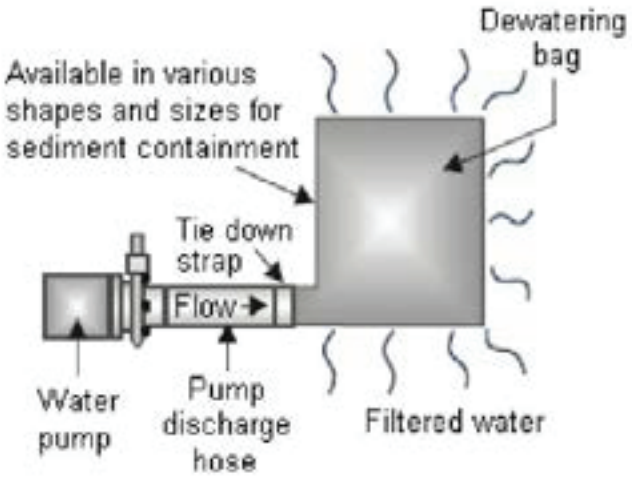
Implementation

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

Maintenance

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

Gravity Bag Filter



Description

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

Appropriate Applications

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

Implementation

- Water is pumped into 1 side of the bag and seeps through the bottom and sides of the bag.
- A secondary barrier, such as a rock filter bed or straw/hay bale barrier, is placed beneath and beyond the edges of the bag to capture sediments that escape the bag.

Maintenance

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

Sand Media Particulate Filter

Description

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

Appropriate Applications

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

Implementation

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

Maintenance

- The filters require regular service to monitor and maintain the level of the sand media. If subjected to high loading rates, filters can plug quickly.
- Vendors generally provide data on maximum head loss through the filter. The filter should be monitored daily while in use and cleaned when head loss reaches target levels.
- If cleaned by backwashing, the backwash water may need to be hauled away for disposal or returned to the upper end of the treatment train for another pass through the series of dewatering BMPs.

Pressurized Bag Filter

Description

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

Appropriate Applications

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

Implementation

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

Maintenance

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

Cartridge Filter

Description

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

Appropriate Applications

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

Implementation

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

Maintenance

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

Costs

Sediment controls are low to high cost measures depending on the dewatering system that is selected. Pressurized filters tend to be more expensive than gravity settling, but are often more effective. Simple tanks are generally rented on a long-term basis (1 or more months) and can range from $360 per month for a 1,000 gallon tank to $2,660 per month for a 10,000 gallon tank in California. Mobilization and demobilization costs vary considerably. Note that Hawaii's rental fees are higher than California's unit prices.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharges daily where non-storm water discharges occur.
- Unit-specific maintenance requirements are included with the description of each unit.
- Sediment removed during the maintenance of a dewatering device may be either spread onsite and stabilized, or disposed of at a disposal site as approved by the owner.
- Sediment that is commingled with other pollutants must be disposed of in accordance with all applicable laws and regulations and approved by the owner.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

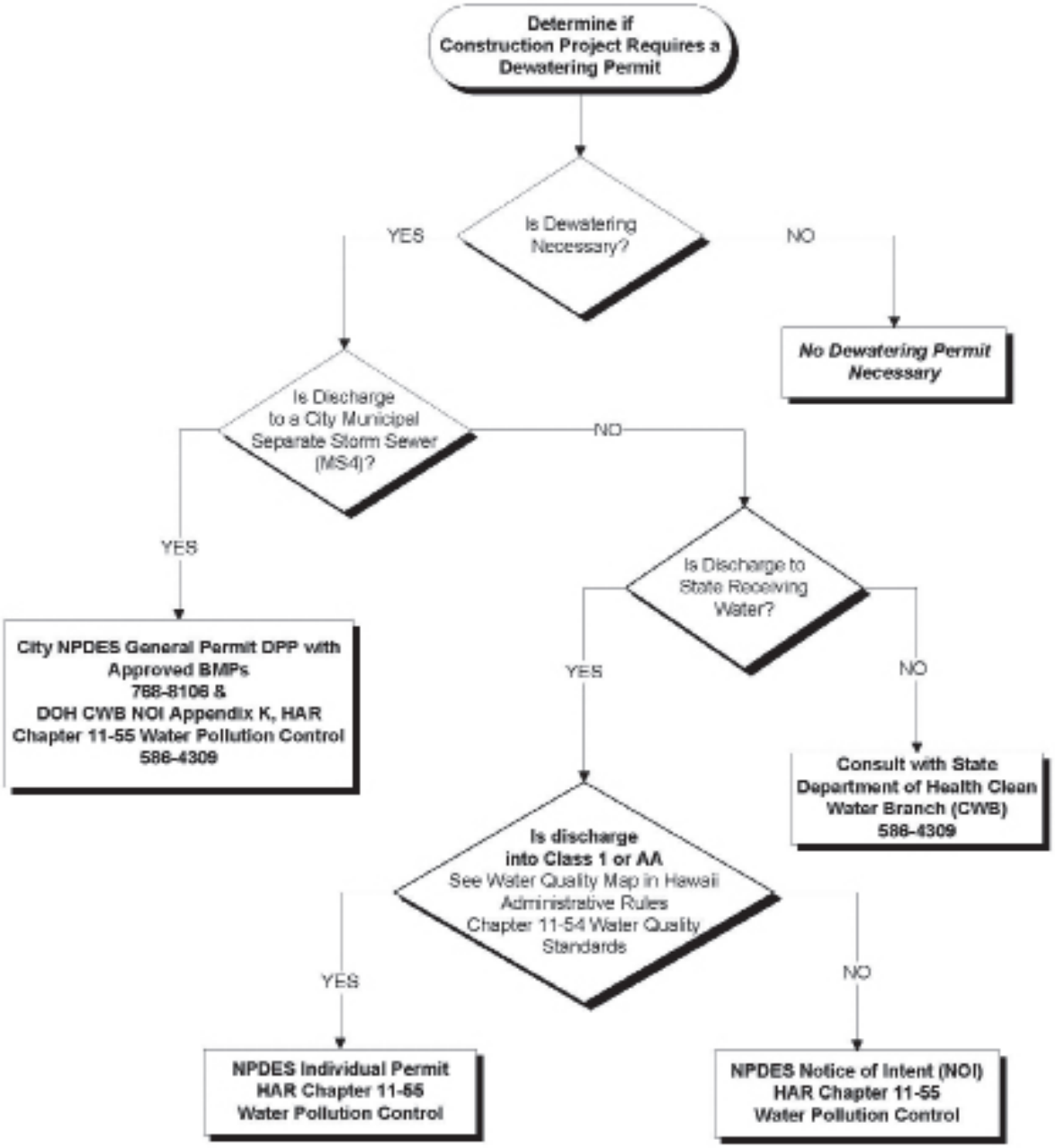
Hawaii Administrative Rules 11-55 CWB NOI Form G Construction Activity Dewatering Effluent.

Labor Surcharge & Equipment Rental Rates, April 1, 2002 through March 31, 2003, California Department of Transportation (Caltrans).

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Dewatering Permit Flow Chart



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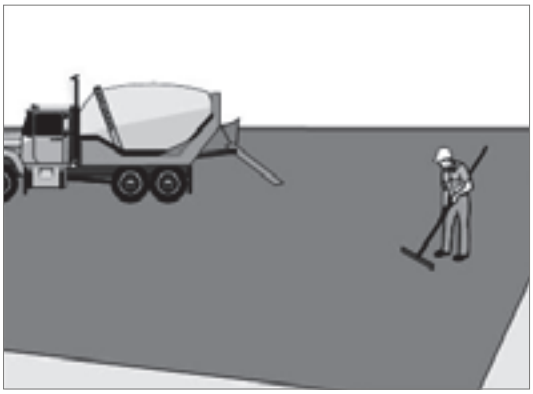
NS-3: Paving and Grinding Operations



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
●	NS - Non-Storm Water Management Control
▲	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
●	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the discharge of pollutants from paving operations, using measures to prevent run-on and runoff pollution, properly disposing of wastes, and training employees and subcontractors.

Suitable Applications

These procedures are implemented where paving, surfacing, resurfacing, or sawcutting, may pollute storm water runoff or discharge to the storm drain system or watercourses.

Limitations

- Finer solids are not effectively removed by filtration systems.
- Paving opportunities may be limited during wet weather.

Implementation

General

- Avoid paving during the wet season when feasible.
- Reschedule paving and grinding activities if rain is in the forecast.
- Train employees and sub-contractors in pollution prevention and reduction.
- Store materials away from drainage courses to prevent storm water run-on (see WM-1: Material Delivery and Storage).
- Protect drainage courses, particularly in areas with a grade, by employing BMPs to divert runoff or to trap and filter sediment.
- Avoid applying tack or prime coats if rain is expected. Place BMPs to trap and filter oil sheen. Use multiple lines of BMPs to protect drain inlets.

- If paving involves an onsite mixing plant, follow the storm water permitting requirements for industrial activities.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses. These materials should be stored consistent with WM-3: Stockpile Management.
- Disposal of PCC and AC waste should be in conformance with WM-8: Concrete Waste Management.

Saw Cutting, Grinding, and Pavement Removal

- Shovel or vacuum saw-cut slurry and remove from site. Cover or barricade storm drains during saw cutting to contain slurry.
- When paving involves AC, the following steps should be implemented to prevent the discharge of grinding residue, uncompacted or loose AC, tack coats, equipment cleaners, or unrelated paving materials:
  - AC grindings, pieces, or chunks used in embankments or shoulder backing must not be allowed to enter any storm drains or watercourses. Install silt fence until structure is stabilized or permanent controls are in place. Examples of temporary perimeter controls can be found in EC-9: Earth Dikes and Drainage Swales; SE-1: Silt Fence; or SE-5: Fiber Rolls;
  - Collect and remove all broken asphalt and recycle when practical. Old or spilled asphalt must be recycled or disposed; and
  - Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least a foot of material.
- Do not allow saw-cut slurry to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also WM-8: Concrete Waste Management, and WM-10: Liquid Waste Management.
- Dig out activities should not be conducted in the rain.
- Collect dig out material by mechanical or manual methods. This material may be recycled for use as shoulder backing or base material.
- If dig out material cannot be recycled, transport the material back to an approved storage site.

Asphaltic Concrete Paving

- If paving involves asphaltic cement concrete, follow these steps:
  - Do not allow sand or gravel placed over new asphalt to wash into storm drains, streets, or streams. Vacuum or sweep loose sand and gravel and properly dispose of this waste by referring to WM-5: Solid Waste Management;
  - Old asphalt must be disposed of properly. Collect and remove all broken asphalt from the site and recycle whenever possible; and
  - Use of asphalt concrete as fill shall meet inert fill definition given by Hawaii Revised Statutes (HRS) Chapter 342H Solid Waste Pollution.

Portland Cement Concrete Paving

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile or dispose of properly.

- Allow aggregate rinse to settle. Then, either allow rinse water to dry in a lined temporary pit as described in WM-8: Concrete Waste Management, or pump the water to the sanitary sewer if allowed by the local (Federal, City or private) wastewater authority.

Sealing Operations

- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate must not be allowed to enter any storm drain or water courses. Apply temporary perimeter controls until structure is stabilized.
- Drainage inlet structures and manholes should be covered with filter fabric during application of seal coat, tack coat, slurry seal, and fog seal.
- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period.

Paving Equipment

- Leaks and spills from paving equipment can contain toxic levels of heavy metals and oil and grease. Place drip pans or absorbent materials under paving equipment when not in use. Clean up spills with absorbent materials rather than burying. See NS-10: Vehicle and Equipment Maintenance, WM-4: Spill Prevention and Control, and WM-10: Liquid Waste Management.
- Substances used to coat asphalt transport trucks, and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.
- Use only non-toxic substances to coat asphalt transport trucks and asphalt spreading equipment.
- Paving equipment parked onsite should be parked over plastic to prevent soil contamination.
- Clean asphalt coated equipment offsite whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as described in WM-5, Solid Waste Management. Any cleaning onsite should follow NS-8: Vehicle and Equipment Cleaning.

Thermoplastic Striping

- Thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the storm water drainage system, or watercourses.
- Pre-heaters should be filled carefully to prevent splashing or spilling of hot thermoplastic. Leave 6 inches of space at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.
- Do not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.
- Clean truck beds daily of loose debris and melted thermoplastic. When possible, recycle thermoplastic material.

Raised/Recessed Pavement Marker Application and Removal

- Do not transfer or load bituminous material near drain inlets, the storm water drainage system, or watercourses.
- Melting tanks should be loaded with care and not filled to beyond 6 inches from the top to leave room for splashing when vehicle is deadheaded.
- When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.

- On large-scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep ample supplies of drip pans or absorbent materials onsite.
- Inspect and maintain machinery regularly to minimize leaks and drips.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Hot Mix Asphalt-Paving Handbook AC 150/5370-14, Appendix I, U.S. Army Corps of Engineers, July 1991.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

NS-7: Potable Water/Irrigation

Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
●	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
	Trash
●	Metals
	Bacteria
	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Potable Water/Irrigation 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.

Suitable Applications

Implement this BMP whenever potable water or irrigation water discharges occur at or enter a construction site.

Limitations

None identified.

Implementation

- Direct water from offsite sources around or through a construction site, where feasible, in a way that minimizes contact with the construction site.
- Discharges from water line flushing should be reused for landscaping purposes where feasible.
- Shut off the water source to broken lines, sprinklers, or valves as soon as possible to prevent excess water flow.
- Recommend installation of rain shut-off devices and precision sprinkler heads for irrigation systems.
- Protect downstream storm water drainage systems and watercourses from water pumped or bailed from trenches excavated to repair water lines.

- 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, time of year, and type of plant material in determining the proper amounts of water for a specific area.

Costs

Cost to manage potable water and irrigation are low and generally considered to be a normal part of related activities.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharges daily while non-storm water discharges occur.
- Repair broken water lines as soon as possible.
- Inspect irrigated areas regularly for signs of erosion and/or discharge.

References

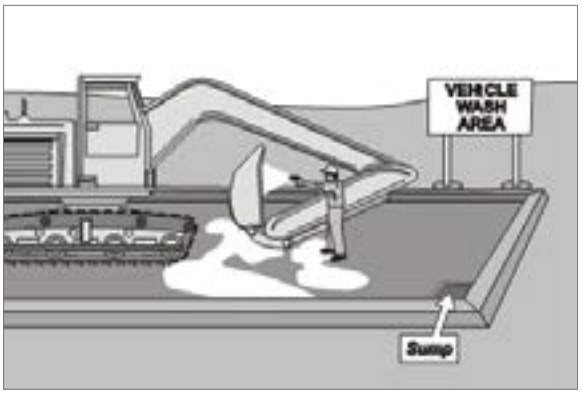
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

NS-8: Vehicle and Equipment Cleaning



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
●	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
	Trash
	Metals
	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Vehicle and equipment cleaning procedures and practices eliminate or reduce the discharge of pollutants to storm water from vehicle and equipment cleaning operations. Procedures and practices include but are not limited to: using offsite facilities; washing in designated, contained areas only; eliminating discharges to the storm drain by infiltrating the wash water; and training employees and subcontractors in proper cleaning procedures.

Suitable Applications

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

Limitations

Even phosphate-free, biodegradable soaps have been shown to be toxic to fish before the soap degrades. Sending vehicles/equipment offsite should be done in conjunction with TR-1: Stabilized Construction Entrance/Exit.

Implementation

Other options to washing equipment onsite include contracting with either an offsite or mobile commercial washing business. These businesses may be better equipped to handle and dispose of the wash waters properly. Performing this work offsite can also be economical by eliminating the need for a separate washing operation onsite.

If washing operations are to take place onsite, then:

- Use phosphate-free, biodegradable soaps;
- Educate employees and subcontractors on pollution prevention measures;
- Do not permit steam cleaning onsite. Steam cleaning can generate significant pollutant concentrates;
- Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site unless resulting wastes are fully contained and disposed of. Resulting wastes should not be discharged or buried and must be captured and recycled or disposed according to the requirements of WM-10: Liquid Waste Management or WM-6: Hazardous Waste Management, depending on the waste characteristics. Minimize use of solvents. Use of diesel for vehicle and equipment cleaning is prohibited;
- All vehicles and equipment that regularly enter and leave the construction site must be cleaned offsite;
- When vehicle and equipment washing and cleaning must occur onsite, and the operation cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area should have the following characteristics:
  - 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;
  - No discharge of wash waters to storm drains or watercourses; and
  - Used only when necessary.
- When cleaning vehicles and equipment with water:
  - Install high-efficiency water fixtures. Use as little water as possible. High-pressure sprayers may use less water than a hose and should be considered;
  - Use positive shutoff valve to minimize water usage; and
  - Facility wash racks should discharge to a sanitary sewer, recycle system or other approved discharge system and must not discharge to the storm drainage system, watercourses, or to groundwater.

Costs

Cleaning vehicles and equipment at an offsite facility may reduce overall costs for vehicle and equipment cleaning by eliminating the need to provide similar services onsite. When onsite cleaning is needed, the cost to establish appropriate facilities is relatively low on larger long-duration projects and moderate to high on small short-duration projects.

Inspection and Maintenance

Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.

- Inspect BMPs subject to non-storm water discharges daily while non-storm water discharges occur.

- Inspection and maintenance is minimal, although some berm repair may be necessary.
- Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.
- Inspect sump regularly and remove liquids and sediment as needed.
- Prohibit employees and subcontractors from washing personal vehicles and equipment on the construction site.

References

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Swisher, R.D. Surfactant Biodegradation, Marcel Decker Corporation, 1987.

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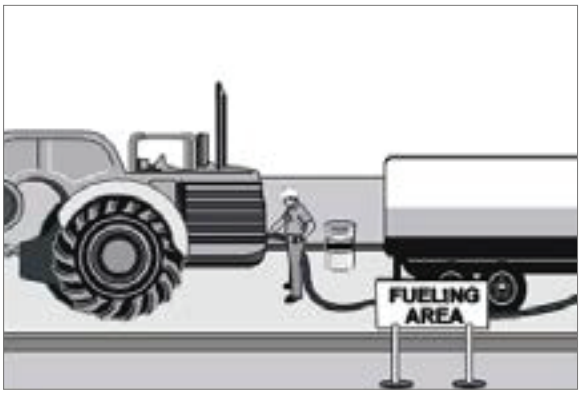
NS-9: Vehicle and Equipment Fueling



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
●	NS - Non-Storm Water Management Control
	WM - Waste Management and Material Pollution Control
Targeted Constituents	
	Sediment
	Nutrients
	Trash
	Metals
	Bacteria
●	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Vehicle equipment fueling procedures and practices are designed to prevent fuel spills and leaks and reduce or eliminate contamination of storm water. This can be accomplished by using offsite facilities, fueling in designated areas only, enclosing or covering stored fuel, implementing spill controls, and training employees and subcontractors in proper fueling procedures.

Suitable Applications

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

Limitations

Onsite vehicle and equipment fueling should only be used where it is impractical to send vehicles and equipment offsite for fueling. Sending vehicles and equipment offsite should be done in conjunction with TR-1: Stabilized Construction Entrance/Exit.

Implementation

- Use offsite fueling stations as much as possible. These businesses are better equipped to handle fuel and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate fueling area at a site.
- Discourage "topping-off" of fuel tanks.
- Absorbent spill cleanup materials and spill kits should be available in fueling areas and on fueling trucks and should be disposed of properly after use.
- Drip pans or absorbent pads should be used during vehicle and equipment fueling, unless the fueling is performed over an impermeable surface in a dedicated fueling area.

- Use absorbent materials on small spills. Do not hose down or bury the spill. Remove the adsorbent materials promptly and dispose of properly.
- Avoid mobile fueling of mobile construction equipment around the site; rather, transport the equipment to designated fueling areas. With the exception of tracked equipment such as bulldozers and large excavators, most vehicles should be able to travel to a designated area with little lost time.
- Train employees and subcontractors in proper fueling and cleanup procedures.
- When fueling must take place onsite, designate an area away from drainage courses to be used. Fueling areas should be identified in the ESCP.
- Dedicated fueling areas should be protected from storm water run-on and runoff, and should be located at least 50 feet away from downstream drainage facilities and watercourses. Fueling must be performed on level-grade areas.
- Protect fueling areas with berms and dikes to prevent run-on, runoff, and to contain spills.
- Nozzles used in vehicle and equipment fueling should be equipped with an automatic shutoff to control drips. Fueling operations should not be left unattended.
- Use vapor recovery nozzles to help control drips as well as air pollution.
- Federal, state, and local requirements should be observed for any stationary above ground storage tanks.

Costs

All of the above measures are low cost except for the capital costs of above ground tanks that meet all local environmental, zoning, and fire codes.

Inspection and Maintenance

- Vehicles and equipment should be inspected each day of use for leaks. Leaks should be repaired immediately or problem vehicles or equipment should be removed from the project site.
- Keep ample supplies of spill cleanup materials onsite.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

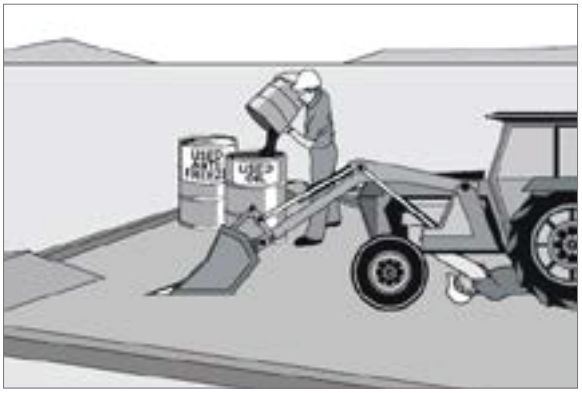
California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

NS-10: Vehicle and Equipment Maintenance



Objectives	
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Targeted Constituents	
	Sediment
●	Nutrients
●	Trash
	Metals
	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the contamination of storm water resulting from vehicle and equipment maintenance by running a "dry and clean site". The best option would be to perform maintenance activities at an offsite facility. If this option is not available then work should be performed in designated areas only, while providing cover for materials stored outside, checking for leaks and spills, and containing and cleaning up spills immediately. Employees and subcontractors must be trained in proper procedures.

Suitable Applications

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

Limitations

Onsite vehicle and equipment maintenance should only be used where it is impractical to send vehicles and equipment offsite for maintenance and repair. Sending vehicles/equipment offsite should be done in conjunction with TR-1: Stabilized Construction Entrance/Exit.

Outdoor vehicle or equipment maintenance is a potentially significant source of storm water pollution. Activities that can contaminate storm water include engine repair and service, changing or replacement of fluids, and outdoor equipment storage and parking (engine fluid leaks). For further information on vehicle or equipment servicing, see NS-8: Vehicle and Equipment Cleaning, and NS-9: Vehicle and Equipment Fueling.

Implementation

- Use offsite repair shops as much as possible. These businesses are better equipped to handle vehicle fluids and spills properly. Performing this work offsite can also be economical by eliminating the need for a separate maintenance area.
- If maintenance must occur onsite, use designated areas, located away from drainage courses. Dedicated maintenance areas should be protected from storm water run-on and runoff and should be located at least 50 feet from downstream drainage facilities and watercourses.
- Drip pans or absorbent pads should be used during vehicle and equipment maintenance work that involves fluids, unless the maintenance work is performed over an impermeable surface in a dedicated maintenance area.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- All fueling trucks and fueling areas are required to have spill kits and/or use other spill protection devices.
- Use adsorbent materials on small spills. Remove the absorbent materials promptly and dispose of properly.
- Inspect onsite vehicles and equipment daily at startup for leaks and repair immediately.
- Keep vehicles and equipment clean; do not allow excessive build-up of oil and grease.
- Segregate and recycle wastes, such as greases, used oil or oil filters, antifreeze, cleaning solutions, automotive batteries, hydraulic and transmission fluids. Provide secondary containment and covers for these materials if stored onsite.
- Train employees and subcontractors in proper maintenance and spill cleanup procedures.
- Drip pans or plastic sheeting should 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 1 hour.
- For long-term projects, consider using portable tents or covers over maintenance areas if maintenance cannot be performed offsite.
- Consider use of new, alternative greases and lubricants, such as adhesive greases, for chassis lubrication and fifth-wheel lubrication.
- Properly dispose of used oils, fluids, lubricants, and spill cleanup materials.
- Do not place used oil in a dumpster or pour into a storm drain or watercourse.
- Properly dispose of or recycle used batteries.
- Do not bury used tires.
- Repair leaks of fluids and oil immediately.

Listed below is further information if you must perform vehicle or equipment maintenance onsite.

Safer Alternative Products

- Consider products that are less toxic or hazardous than regular products. These products are often sold under an “environmentally friendly” label.
- Consider use of grease substitutes for lubrication of truck fifth-wheels. Follow manufacturers label for details on specific uses.
- Consider use of plastic friction plates on truck fifth-wheels in lieu of grease. Follow manufacturers label for details on specific uses.

Waste Reduction

Parts are often cleaned using solvents such as trichloroethylene, trichloroethane, or methylene chloride. Many of these cleaners are listed in HAR, Title 11, Chapter 261, Hazardous Waste Management Identification and Listing of Hazardous Waste as pollutants. These materials are harmful and must not contaminate storm water. They must be disposed of as a hazardous waste. Reducing the number of solvents makes recycling easier and reduces hazardous waste management costs. Often, 1 solvent can perform a job as well as 2 different solvents. Also, if possible, eliminate or reduce the amount of hazardous materials and waste by substituting non-hazardous or less hazardous materials. For example, replace chlorinated organic solvents with non-chlorinated solvents. Non-chlorinated solvents like kerosene or mineral spirits are less toxic and less expensive to dispose of properly. Check the list of active ingredients to see whether it contains chlorinated solvents. The "chlor" term indicates that the solvent is chlorinated. Also, try substituting a wire brush for solvents to clean parts.

Recycling and Disposal

Separating wastes allows for easier recycling and may reduce disposal costs. Keep hazardous wastes separate, do not mix used oil solvents, and keep chlorinated solvents (like,-trichloroethane) separate from non-chlorinated solvents (like kerosene and mineral spirits). Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around. Provide cover and secondary containment until these materials can be removed from the site.

Oil filters can be recycled. Ask your oil supplier or recycler about recycling oil filters.

Do not dispose of extra paints and coatings by dumping liquid onto the ground or throwing it into dumpsters. Allow coatings to dry or harden before disposal into covered dumpsters.

Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Costs

All of the above are low cost measures. Higher costs are incurred to setup and maintain onsite maintenance areas.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharges daily while non-storm water discharges occur.
- Keep ample supplies of spill cleanup materials onsite.
- Maintain waste fluid containers in leak proof condition.
- Vehicles and equipment should be inspected on each day of use. Leaks should be repaired immediately or the problem vehicle(s) or equipment should be removed from the project site.
- Inspect equipment for damaged hoses and leaky gaskets routinely. Repair or replace as needed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

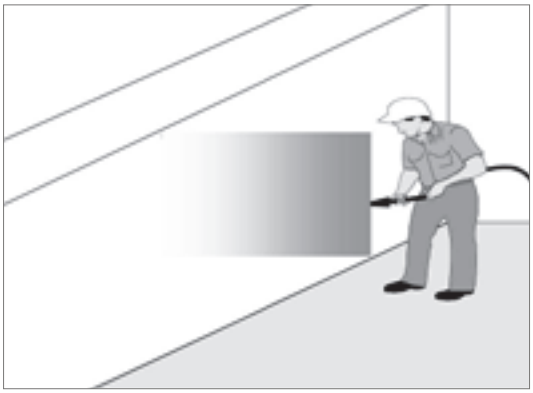
Coastal Nonpoint Pollution Control Program; Program Development and Approval Guidance, Working Group, Working Paper; USEPA, April 1992.

Hawaii Administrative Rules, Title 11, Chapter 54, Water Quality Standards.

Hawaii Administrative Rules, Title 11, Chapter 261, Hazardous Waste management Identification and Listing of Hazardous Waste.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

NS-12: Concrete Curing



Objectives	
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	Bacteria
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	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Concrete curing is used in the construction of structures such as bridges, retaining walls, pump houses, large slabs, and structured foundations. Concrete curing includes the use of both chemical and water methods. Discharges of storm water and non-storm water exposed to concrete during curing may have a high pH and may contain chemicals, metals, and fines. Proper procedures reduce or eliminate the contamination of storm water runoff during concrete curing.

Suitable Applications

Suitable applications include all projects where Portland Cement Concrete (PCC) and concrete curing chemicals are placed where they can be exposed to rainfall, runoff from other areas, or where runoff from the PCC will leave the site.

Limitations

None identified.

Implementation

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 WM-4: Spill Prevention and Control.

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

- Direct cure water away from inlets and watercourses to collection areas for infiltration or other means of removal in accordance with all applicable permits.
- Collect cure water at the top of slopes and transport or dispose of water in a non-erodible manner. See EC-9: Earth Dikes and Drainage Swales, EC-10: Velocity Dissipation Devices, and EC-11: Slope Drains.
- Utilize wet blankets or a similar method that maintains moisture while minimizing the use and possible discharge of water.

Costs

All of the above measures are generally low cost.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharges daily while non-storm water discharges occur.
- Ensure that employees and subcontractors implement appropriate measures for storage, handling, and use of curing compounds.
- Inspect cure containers and spraying equipment for leaks.

References

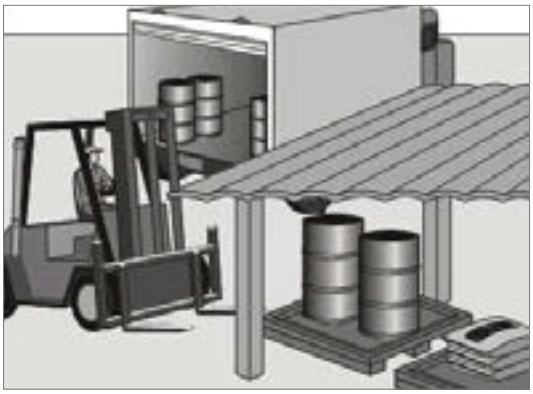
Blue Print for a Clean Bay-Construction-Related Industries: Best Management Practices for Stormwater Pollution Prevention; Santa Clara Valley Non Point Source Pollution Control Program, 1992.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Stormwater Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

WM-1: Material Delivery and Storage



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●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent, reduce, or eliminate the discharge of pollutants from material delivery and storage to the storm water system or watercourses by minimizing the storage of hazardous materials onsite, storing materials in a designated area, installing secondary containment, conducting regular inspections, and training employees and subcontractors.

This best management practice covers only material delivery and storage. For other information on materials, see WM-2: Material Use, or WM-4: Spill Prevention and Control. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

These procedures are suitable for use at all construction sites with delivery and storage of the following materials:

- Soil stabilizers and binders;
- Pesticides and herbicides;
- Fertilizers;
- Detergents;
- Plaster;
- Petroleum products such as fuel, oil, and grease. Note that spill prevention, control, and countermeasure (SPCC) plan are necessary if total above ground storage (AST) volume is equal to or greater than 1320 gallons (40 CFR 112.1 (d)(2)(ii)). See WM-04: SPill PRevention and Control;

- Asphalt and concrete components;
- Hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds;
- Concrete compounds; and/or
- Other materials that may be detrimental if released to the environment.

Limitations

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

Implementation

The following steps should be taken to minimize risk:

- Temporary storage area should be located away from vehicular traffic;
- Material Safety Data Sheets (MSDS) should be supplied for all materials stored;
- Construction site areas should be designated for material delivery and storage;
- Material delivery and storage areas should be located near the construction entrances, away from waterways, if possible:
  - Avoid transport near drainage paths or waterways;
  - Surround with earth berms (See EC-9: Earth Dikes and Drainage Swales) or approved containment device; and
  - Place in an area which will be paved.
- Storage of reactive, ignitable, or flammable liquids must comply with the City and County of Honolulu fire codes. Contact the Honolulu Fire Department (HFD) to review site materials, quantities, and proposed storage area to determine specific requirements. See the Flammable and Combustible Liquid Code, NFPA30;
- An up to date inventory of materials delivered and stored onsite should be kept;
- Hazardous materials storage onsite should be minimized;
- Hazardous materials should be handled as infrequently as possible;
- During the rainy season, consider storing materials in a covered area. Store materials in secondary containment such as earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays;
- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, in secondary containment;
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting;
- Chemicals should be kept in their original labeled containers;
- Employees and subcontractors should be trained on the proper material delivery and storage practices;

- Employees trained in emergency spill cleanup procedures must be present when dangerous materials or liquid chemicals are unloaded;
- If significant residual materials remain on the ground after construction is complete, properly remove materials and any contaminated soil. See WM-7: Contaminated Soil Management. If the area is to be paved, pave as soon as materials are removed to stabilize the soil; and
- Maintain a complete set of material safety data sheets at the project site.

Material Storage Areas and Practices

- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 should be stored in approved containers and drums and should not be overfilled. Containers and drums should be placed in temporary containment facilities for storage.
- A temporary containment facility should provide for a spill containment volume able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest container within its boundary, whichever is greater.
- A temporary containment facility should be impervious to the materials stored therein for a minimum contact time of 72 hours.
- A temporary containment facility should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be collected and placed into drums. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. All collected liquids or non-hazardous liquids should be sent to an approved disposal site.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.
- Throughout the rainy season, each temporary containment facility should be covered during non-working days, prior to, and during rain events.
- Materials should be stored in their original containers and the original product labels should be maintained in place in a legible condition. Damaged or otherwise illegible labels should be replaced immediately.
- Bagged and boxed materials should be stored on pallets and should not be allowed to accumulate on the ground. To provide protection from wind and rain throughout the rainy season, bagged and boxed materials should be covered during non-working days and prior to and during rain events.
- Stockpiles should be protected in accordance with WM-3: Stockpile Management.
- Materials should be stored indoors within existing structures or sheds when available.
- Proper storage instructions should be posted at all times in an open and conspicuous location.
- An ample supply of appropriate spill cleanup material should be kept near storage areas.
- Also see WM-06: Hazardous Waste Management, for storing of hazardous materials.

Material Delivery Practices

- Keep an accurate, up-to-date inventory of material delivered and stored onsite.
- Arrange for employees trained in emergency spill cleanup procedures to be present when dangerous materials or liquid chemicals are unloaded.

Spill Cleanup

- Contain and clean up any spill immediately.
- Properly remove and dispose of any hazardous materials or contaminated soil if significant residual materials remain on the ground after construction is complete. See WM-7: Contaminated Soil Management.
- See WM-4: Spill Prevention and Control, for spills of chemicals and/or hazardous materials.

Cost

The largest cost of implementation may be in the construction of a material's storage area that is covered and provides secondary containment.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Keep an ample supply of spill cleanup materials near the storage area.
- Keep storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

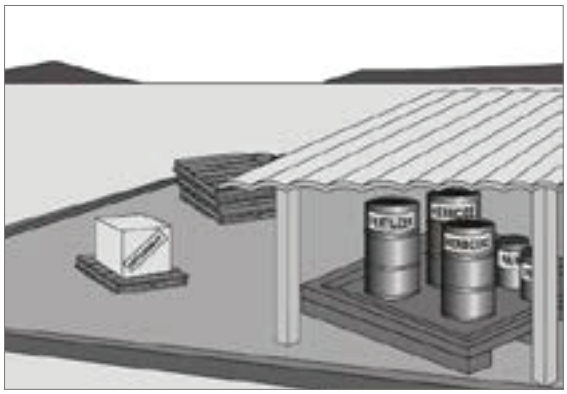
Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Revised Ordinances of Honolulu Chapter 20 Fire Code of the City & County of Honolulu.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

WM-2: Material Use



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
●	Trash
●	Metals
	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the discharge of pollutants to the storm drain system or watercourses from material use by using alternative products, minimizing hazardous material use onsite, and training employees and subcontractors.

Suitable Applications

This BMP is suitable for use at all construction projects. These procedures apply when the following materials are used or prepared onsite:

- Pesticides and herbicides;
- Fertilizers;
- Detergents;
- Plaster;
- Petroleum products such as fuel, oil, and grease;
- Asphalt and other concrete components;
- Other hazardous chemicals such as acids, lime, glues, adhesives, paints, solvents, and curing compounds;
- Concrete compounds; and/or
- 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.

Implementation

The following steps should be taken to minimize risk:

- Minimize use of hazardous materials onsite;
- Follow manufacturer instructions regarding uses, protective equipment, ventilation, flammability, and mixing of chemicals;
- Train employees and subcontractors in proper material use;
- Supply Material Safety Data Sheets (MSDS) for all materials;
- Use recycled and less hazardous products when practical. Recycle residual paints, solvents, non-treated lumber, and other materials;
- Use materials only where and when needed to complete the construction activity. Use safer alternative materials as much as possible. Reduce or eliminate use of hazardous materials onsite when practical;
- Train personnel who use pesticides. The State Department of Agriculture (DOA), Pesticides Branch, licensed pesticide dealers, certifies pesticides applicators, and conducts on-site inspections;
- Do not over-apply fertilizers, herbicides, and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over-application is expensive and environmentally harmful. Unless on steep slopes, till fertilizers into the soil rather than hydro seeding. Apply surface dressings in several smaller applications, as opposed to 1 large application, to allow time for infiltration and to avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains;
- Do not remove the original product label; it contains important safety and disposal information. Use the entire product before disposing of the container;
- Use temporary scaffolding to hang drop cloths or draperies to prevent drift during painting work. Application equipment that minimizes overspray also helps. When using sealants on woods, pavement, roofs, etc., quickly clean up spills. Remove excess liquid with absorbent material or rags;
- If painting requires scraping or sand blasting of the existing surface, use a drop cloth to collect most of the chips. Dispose the residue properly. If the paint contains lead or tributyl tin, it is considered a hazardous waste. Refer to the waste management BMPs;
- Dispose of sand blasted material properly. Chips and dust from marine paints or paints containing lead should be disposed of as hazardous waste. Paint chips and dust from non-hazardous dry stripping and sand blasting may be swept up and disposed of as trash;
- Dispose of latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths, when thoroughly dry and are no longer hazardous, with other construction debris;
- Mix paint indoors or in a containment area. Never clean paintbrushes or rinse paint containers into a street, gutter, storm drain, or watercourse. Dispose of any paint thinners, residue, and sludge(s) that cannot be recycled, as hazardous waste;
- For water-based paint, clean brushes to the extent practicable, and rinse to a drain leading to a sanitary sewer where permitted, or into a concrete washout pit or temporary sediment trap. For oil-based paints, clean brushes to the extent practicable, and filter and reuse thinners and solvents;
- When working on roofs, if small particles have accumulated in the gutter, either sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout. A sock or geofabric

placed over the outlet may effectively trap the materials. If the downspout is lined tight, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vacuum (vactor) truck, and clean the catch basin sump and plug;

- Keep an ample supply of spill cleanup material near use areas. Train employees in spill cleanup procedures; and
- Avoid exposing applied materials to rainfall and runoff unless sufficient time has been allowed for them to dry.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and at 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Maintenance of this best management practice is minimal.
- Spot check employees and subcontractors throughout the job to ensure appropriate practices are being employed.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Coastal Nonpoint Pollution Control Program: Program Development and Approval Guidance, Working Group Working Paper; USEPA, April 1992.

Hawaii Administrative Rules, Title 4, Chapter 66, Pesticides.

Hawaii Administrative Rules, Title 149, Hawaii Pesticides Law.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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WM-3: Stockpile Management

Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
●	Trash
●	Metals
	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Stockpiles can be a significant source of erosion and sediment, and measures should be taken to mitigate the potential for nonpoint source pollution. Information to be provided to the City and County of Honolulu, Department of Planning and Permitting, when applying for a stockpiling permit include "a plot plan showing the property lines, easements and setbacks, topography, and the location of the proposed stockpile, quantities, height of stockpile, life of stockpile and source of the material to be stockpiled," and other information as may be required to "control the emission of air-borne dust, drainage runoff or erosion problems."

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

Suitable Applications

- Stockpiles for gravel or topsoil in roadway areas.
- Stockpiles for excavated material to be moved to off-site locations.
- Stockpiles of imported material.
- Stockpiles for surcharging to stabilize or consolidate an area.

Limitations

Stockpiles are for temporary storage of materials. Provisions should be made for permanent movement of stockpiled material. Failure to contain stockpiled material may cause downstream erosion or flood damage. Stockpiles not properly stabilized may cause fugitive dust problems.

Keep maximum height of stockpiles no greater than 15 feet high. Anything greater than 15 feet requires 8 feet wide benching (ROH Article 15).

Implementation

- Provide adequate setback from waterways.
- Provide earth dikes or other diversion to keep runoff away from stockpiles.
- Provide silt fences at the toe of the stockpile to mitigate runoff during rain events.
- Cover, grass or provide other stabilization measures.
- Provide adequate setback distance from lot lines.
- Provide silt basins where required.

Protection of stockpiles is a year-round requirement. To properly manage stockpiles:

- Locate stockpiles a minimum of 50 feet away from concentrated flows of storm water, drainage courses, and inlets.
- Sediment barriers or silt fences shall be used around the base of all stockpiles.
- Stockpiles shall not exceed 15 feet in height. Stockpiles greater than 15 feet in height shall require 8 feet wide benching in accordance with ROH Chapter 14, Article 15.
- Protect all stockpiles from storm water run-on using a temporary perimeter sediment barrier such as berms, dikes, fiber rolls, silt fences, sandbag, gravel bags, or straw bale barriers.
- Implement wind erosion control practices as appropriate on all stockpiled material. For specific information, see WE-1: Wind Erosion Control.
- Manage stockpiles of contaminated soil in accordance with WM-7: Contaminated Soil Management.
- Place bagged materials on pallets and under cover.
- Stockpiles must be covered with Plastic Sheeting or a comparable material if they will not be actively used within 7 days.

Protection of Non-Active Stockpiles

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

Soil Stockpiles

- During the rainy season, soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- During the non-rainy season, soil stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of Portland Cement Concrete Rubble, Asphalt Concrete, Asphalt Concrete Rubble, Aggregate Base, or Aggregate Sub Base

- During the rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier at all times.
- During the non-rainy season, the stockpiles should be covered or protected with a temporary perimeter sediment barrier prior to the onset of precipitation.

Stockpiles of "Cold Mix"

- During the rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material at all times.
- During the non-rainy season, cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Stockpiles/Storage of Pressure Treated Wood with Chromate Copper Arsenate or Ammoniacal Copper Zinc Arsenate

- During the rainy season, treated wood should be covered with plastic or comparable material at all times.
- During the non-rainy season, treated wood should be covered with plastic or comparable material at all times and cold mix stockpiles should be placed on and covered with plastic or comparable material prior to the onset of precipitation.

Protection of Active Stockpiles

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

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

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Repair and/or replace perimeter controls and covers as needed to keep them functioning properly.

References

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Revised Ordinances of Honolulu Chapter 14, Article 14 Permits, Bonds and Inspection for Grading, Soil Erosion and Sediment Control, 1990 as amended.

Revised Ordinances of Honolulu Article 15 Grading, Grubbing and Stockpiling. Stormwater Quality Handbooks Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

WM-4: Spill Prevention and Control

Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
●	Trash
●	Metals
	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the discharge of pollutants to drainage systems or watercourses from leaks and spills by reducing the chance for spills, stopping the source of spills, containing and cleaning up spills, properly disposing of spill materials, and training employees.

This best management practice covers only spill prevention and control. However, WM-1 Materials Delivery and Storage, and WM-2 Material Use, also contain useful information, particularly on spill prevention. For information on wastes, see the waste management BMPs in this section.

Suitable Applications

This BMP is suitable for all construction projects. Spill control procedures are implemented anytime chemicals or hazardous substances are stored on the construction site, including the following materials:

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

Limitations

- In some cases it may be necessary to use a private spill cleanup company.
- This BMP applies to spills caused by the contractor and subcontractors.
- Procedures and practices presented in this BMP are general. Contractor should identify appropriate practices for the specific materials used or stored onsite.

Implementation

The following steps will help reduce the storm water impacts of leaks and spills:

Education

- Be aware that different materials pollute in different amounts. Make sure that each employee knows 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.
- Have contractor's superintendent or representative oversee and enforce proper spill prevention and control measures.

General Measures

- Provide a spill prevention control and countermeasure (SPCC) plan when the above ground storage volume is equal to or greater than 1320 gallons (40 CFR 112.1 (d)(2)(ii)).
- 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 should be contained and cleaned up immediately.
- Store hazardous materials and wastes in covered containers and protect from vandalism.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Train employees in spill prevention and cleanup.
- Designate responsible individuals to oversee and enforce control measures.
- Prepare and maintain a spill response plan at the project site.
- Spills should be covered and protected from storm water run-on during rainfall to the extent that it doesn't compromise cleanup activities.
- Do not bury or wash spills with water.
- Store and dispose of used clean up materials, contaminated materials, and recovered spill material that is no longer suitable for the intended purpose in conformance with the provisions in applicable BMPs.
- Do not allow water used for cleaning and decontamination to enter storm drains or watercourses. Collect and dispose of contaminated water in accordance with WM-10 Liquid Waste Management.
- Contain water overflow or minor water spillage and do not allow it to discharge into drainage facilities or watercourses.

- Place proper storage, cleanup, and spill reporting instructions for hazardous materials stored or used on the project site in an open, conspicuous, and accessible location.
- Keep waste storage areas clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Cleanup

- Clean up leaks and spills immediately.
- Use a rag for small spills on paved surfaces, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to either a certified laundry (rags) or disposed of as hazardous waste.
- Never hose down or bury dry material spills. Clean up as much of the material as possible and dispose of properly. See the waste management BMPs in this section for specific information.

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.
- Absorbent materials should be promptly removed and disposed of properly.
- Follow the practice below for a minor spill:
  - Contain the spread of the spill,
  - Recover spilled materials, and
  - Clean the contaminated area and 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.
- Spills should be cleaned up immediately:
  - Contain spread of the spill;
  - Notify the project foreman immediately;
  - If the spill occurs on paved or impermeable surfaces, clean up using "dry" methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely;
  - If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike. Dig up and properly dispose of contaminated soil; and
  - If the spill occurs during rain, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills

- For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the following steps should be taken:
  - Notify the local emergency response by dialing 911. In addition to 911, the contractor will notify the proper City and County officials. It is the contractor's responsibility to have all emergency phone numbers at the construction site;
  - For spills of federal reportable quantities, in conformance with the requirements in 40 CFR parts 110,119, and 302, the contractor should notify the National Response Center at (800) 424-8802;
  - Notification should first be made by telephone and followed up with a written report;
  - The services of a spills contractor or a HazMat team should be obtained immediately. Construction personnel should not attempt to clean up until the appropriate and qualified staffs have arrived at the job site; and
  - Other agencies which may need to be consulted include, but are not limited to Hawaii State Department of Health Hazard Evaluation and Emergency Response Office, Honolulu Local Emergency Planning Committee, Honolulu Fire Department, the Coast Guard, Hawaii National Guard, the Department of Transportation, the City and County Police Department, Department of Health Solid Waste & Hazardous Waste Branch, Department of Health Clean Water Branch, Department of Labor & Industrial Relations Hawaii Occupational Safety and Health Administration (HIOSH), etc.

Reporting

- Report significant spills to local agencies, such as the Fire Department; they can assist in cleanup.
- Federal regulations require that any significant oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hours).

Use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- If maintenance must occur onsite, use a designated area and a secondary containment, located away from drainage courses, to prevent the run-on of storm water and the runoff of spills.
- Regularly inspect onsite vehicles and equipment for leaks and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Place drip pans or absorbent materials under paving equipment when not in use.
- Use absorbent materials on small spills rather than hosing down or burying the spill. Remove the absorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don’t leave full drip pans or other open containers lying around.

- Oil filters disposed of in trashcans or dumpsters can leak oil and pollute storm water. Place the oil filter in a funnel over a waste oil-recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask the oil supplier or recycler about recycling oil filters.
- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- If fueling must occur onsite, use designate areas, located away from drainage courses, to prevent the run-on of storm water and the runoff of spills.
- Discourage "topping off" of fuel tanks.
- Always use secondary containment, such as a drain pan, when fueling to catch spills/leaks.

Costs

Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharge daily while non-storm water discharges occur.
- Keep ample supplies of spill control and cleanup materials onsite, near storage, unloading, and maintenance areas.
- Update your spill prevention and control plan and stock cleanup materials as changes occur in the types of chemicals onsite.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Hawaii Administrative Rules 11-262 Hazardous Waste Management Standards Applicable to Generators of Hazardous Waste.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

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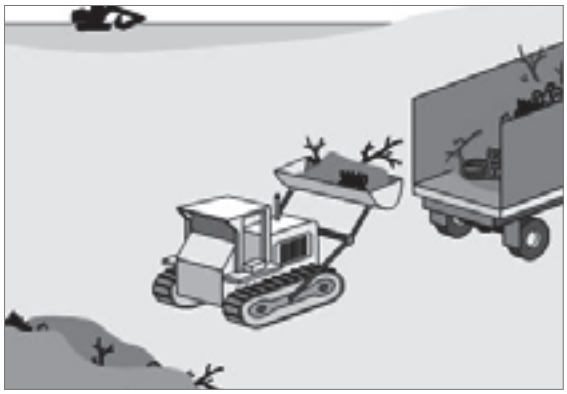
WM-5: Solid Waste Management



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
●	Trash
●	Metals
	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce discharge of pollutants to the land, groundwater, in storm water from solid waste or construction and demolition (C&D) waste by providing designated waste collection areas, separate containers for recyclable waste materials, timing collection of waste and recyclable materials with each stage of the construction or demolition project, and properly training subcontractors and employees.

Table 6.2: Quick Reference – Disposal Alternatives include guidance on solid waste reuse, recycling, and disposal by select activities.

Suitable Applications

Solid waste is 1 of the major pollutants resulting from both construction and demolition activities that also contribute to illegal dumping.

Construction and demolition (C&D) waste is defined as solid, largely inert waste, resulting from the demolition or razing of buildings, of roads, or other structures, such as concrete, brick, bituminous concrete, wood, and masonry, composition roofing, and roofing paper, steel, plaster, and minor amount of other metals such as copper. Cleanup materials contaminated with hazardous substances, friable asbestos, waste paint, solvents, sealers, adhesives, or similar materials are not acceptable at C&D disposal sites.

One (1) "subset" of C&D waste deserves special mention, because large volumes of these wastes are generated on construction demolition sites. Inert fill materials should not be commingled with other C&D waste, especially if intended for reuse.

Inert fill material is defined as earth, soil, rock, rock-like material such as cured asphalt, brick, and clean concrete (with no exposed steel-reinforcing rod) less than eight inches in its greatest dimension, except as specified by a registered soils engineer. The fill material shall not contain vegetation or organic material, or other solid waste.

Inert fill materials are wastes that essentially will not decompose or produce leachate or other releases of environmental concern, nor be contaminated with items of concern like asbestos, and lead-based paint (LBP). Place qualifying as inert fill material according to both City and County and State DOH regulations have reuse potential. County and State laws prohibit other types and volumes of solid waste from job-sites from being used as fill material; instead, we must transport for disposal to a DOH-permitted landfill.

Recycling/Reuse Encouraged Over Disposal

Some C&D waste generated on-site should be recycled or reused whenever and wherever possible. These wastes include but are not limited to:

- Recycling:
  - Asphalt pavement,
  - Cardboard,
  - Concrete aggregate (no LBP, asbestos-free),
  - Electronic equipment – wiring, fluorescent light ballasts and tubes,
  - Excavated rock,
  - Excavated soil (uncontaminated),
  - Freon from appliances – air conditioners and refrigerators,
  - Glass,
  - Green waste – yard and tree trimmings, trunks, limbs,
  - Metals, ferrous – steel from appliances, concrete rebar,
  - Metals, non-ferrous – aluminum brass, copper, stainless-steel,
  - Used tires, and/or
  - Wood and lumber (untreated, no LBP, asbestos-free) – esp. pallets.
- Reuse:
  - Reusable building materials for self-help housing projects,
  - Small appliances and other used household items (e.g., fixtures), and/or
  - Used furniture.

The State DOH, Office of Solid Waste Management has developed a guide, “Minimizing Construction and Demolition Waste,” especially for contractors, architects, builders, and design professionals. The DOH guide features:

- A checklist on how to start managing C&D waste,
- A list of available and DOH-permitted recycling and disposal facilities which can handle or process recyclable and reusable materials, and
- A brief regulatory overview of C&D waste and how important it is to recycle.

Free copies of the DOH guide can be obtained by calling (808) 586-4226.

In addition, the State Department of Business and Economic Development & Tourism (DBEDT), Clean Hawaii Center has a specialized waste management guide for contractors supervising construction and demolition activities. "A Contractor's Waste Management Guide: Best management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii" features a Solid Waste Management Checklist offering practical tips on:

- How to build with used building materials,
- What recycled-content materials to consider in the design phase,
- Deciding where best to use recycled-content materials (e.g., use cold-formed steel framing with a minimum of 25% recycle content, and assemble with good quality connectors to prevent corrosion),
- Choosing the most helpful suppliers,
- Training subcontractors to reduce waste,
- What job-site operations most effectively reduced job-site waste volumes,
- Specific, environmentally-friendly ways on controlling termites, and
- How to reduce framing waste using advanced-framing techniques.

The DBEDT manual also offers detailed, helpful tips on managing hazardous wastes (see page 1–17) and a "General Practices Checklist" for training subcontractors and employees how to maximize opportunities for on-site waste reduction recycling. For a free copy of the guide, contact DBEDT at (808) 587-3802.

The DBEDT emphasizes recycling and waste reduction as environmentally-responsible job-site waste management practices. And depending upon the type and scale of your project, implementing sound solid waste reduction practices may reduce your overall disposal costs. Other best management practices related to solid waste include: on-site separation of recyclable C&D materials from wastes intended for disposal; minimizing drive-by contamination of recycling bins, and shielding them from the weather; ensuring all refuse is promptly removed; ascertaining waste types generated at various stages of the project, and scheduling timed, specialized pickups for those recyclable materials. These solid waste management practices will mitigate health and safety hazards, enhance the appearance of the construction area, and help reduce waste management costs.

Limitations

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

Implementation

The following steps will help keep a clean site and reduce pollution to storm water, to the land and protect groundwater resources:

- Select designated waste collection areas onsite;
- Inform trash-hauling contractors that you will accept only watertight dumpsters for onsite use. Inspect dumpsters for leaks and repair any dumpster that is not watertight;
- Locate containers in a covered area or in a secondary containment;
- Provide an adequate number of containers with lids or covers that can be placed over the container to keep rain out or to prevent loss of wastes when it is windy;

- Plan for additional containers and more frequent pickup during the demolition phase of construction;
- Collect site trash daily, especially during rainy and windy conditions;
- Remove this solid waste promptly since erosion and sediment control devices tend to collect litter;
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris;
- Do not hose out dumpsters on the construction site. Leave dumpster cleaning to the trash hauling contractor;
- Arrange for regular waste collection before containers overflow;
- Clean up immediately if a container does spill; and
- Make sure that construction waste is collected, removed, and disposed of only at authorized disposal areas.

Education

- Have the contractor's superintendent or representative oversee and enforce proper solid waste management procedures and practices.
- Instruct employees and subcontractors on identification of solid waste and hazardous waste.
- Educate employees and subcontractors on solid waste storage and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Require that employees and subcontractors follow solid waste handling and storage procedures.
- Prohibit littering by employees, subcontractors, and visitors.
- Minimize production of solid waste materials wherever possible.

Collection, Storage, and Disposal

- Littering on the project site should be prohibited.
- To prevent clogging of the storm drainage system, litter and debris removal from drainage grates, trash racks, and ditch lines should be a priority.
- Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods.
- Litter from work areas within the construction limits of the project site should 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 should not be placed in or next to drain inlets, storm water drainage systems, or watercourses.
- Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project.
- Full dumpsters should be removed from the project site and the contents should be disposed of by the trash hauling contractor.
- Construction debris and waste should be removed from the site biweekly or more frequently as needed.

- Construction material visible to the public should be stored or stacked in an orderly manner.
- Storm water run-on should be prevented from contacting stored solid waste through the use of berms, dikes, or other temporary diversion structures or through the use of measures to elevate waste from site surfaces.
- Solid waste storage areas should be located at least 50 feet from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.
- Except during fair weather, construction and highway planting waste not stored in watertight dumpsters should be securely covered from wind and rain by covering the waste with tarps or plastic.
- Segregate potentially hazardous waste from non-hazardous construction site waste.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- For disposal of hazardous waste, see 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 surplus building materials when practical. For example, trees and shrubs from land clearing can be used as a brush barrier, or converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharge daily while non-storm water discharges occur.
- Inspect construction waste area regularly.
- Arrange for regular waste collection.
- Inspect construction waste and recycling areas regularly for signs of contamination.
- State collection of recycled materials according to each phase of the construction/demolition project.
- Also, refer to DBEDT's BMP guide outlined in this section.

References

A Contractor's Waste Management Guide: Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii, DBEDT, January 1999.

Best Management Practices and Erosion Control Manual for Construction Sites; Flood Control District of Maricopa County, AZ, September 1992.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Minimizing Construction and Demolition Waste: A C&D Waste Management Guide, First Edition, DOH, February 1998.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

Residential Construction Waste Management: A Builder's Field Guide (How to Save Money and Landfill Space), NAHB Research Center, 1997.

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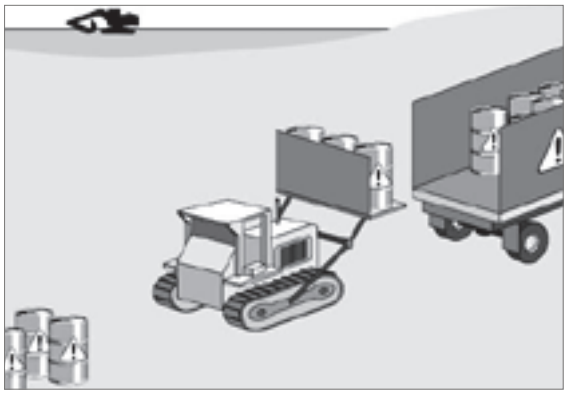
Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

WM-6: Hazardous Waste Management



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
●	Trash
●	Metals
●	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the discharge of pollutants to storm water from hazardous waste through proper material use, waste disposal, and training of employees and subcontractors.

Suitable 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,
- Concrete Curing Compounds,
- Palliatives,
- Septic Wastes,
- Stains,
- Wood Preservatives,
- Asphalt Products,
- Pesticides,
- Acids,
- Paints,
- Solvents,
- Roofing Tar, and/or
- C&D Wastes, including clean-up materials, contaminated with hazardous substances (for more information on C&D wastes, see WM-5: Solid Waste Management).

In addition, sites with existing structures may contain wastes, which must be disposed of in accordance with Federal and State regulations. These wastes include:

- Sandblasting grit or chips contaminated with lead-, cadmium-, or chromium-based paints, as regulated under the State of Hawaii Department of Health Noise Radiation and Indoor Air Quality Branch (NRIAQ) and Federal Clean Air Act;
- Asbestos as regulated under the State of Hawaii Department of Health Noise Radiation and Indoor Air Quality Branch (NRIAQ) and Federal Clean Air Act; and
- PCBs (particularly in older transformers) as regulated under the Federal Toxic Substances Control Act (TSCA).

To determine if a material or item is potentially hazardous waste:

- Check label and shipping papers;
- Look for words such as hazardous, danger, caustic or corrosive (dissolves skin, metal or other materials); flammable or ignitable (catches fire easily); carcinogenic (causes cancer); and toxic or poisonous (harms people and animals). A list of hazardous waste and criteria are found in Hawaii Administrative Rules (HAR) Title 11, Chapter 261 Hazardous Waste Management Identification and Listing of Hazardous Waste;
- Check the material safety data sheet (MSDS) the manufacturer must prepare for the product. Ask your supplier for a copy; and/or
- For questions and additional information including fact sheets and flyers, call the DOH, Hazardous Waste Program Office at (808) 586-4226.

Limitations

- Hazardous waste that cannot be reused or recycled must be disposed of by a professional hazardous waste hauler.
- Nothing in this BMP relieves the contractor from responsibility for compliance with federal and state 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-07: Contaminated Soil Management.

Implementation

The following steps will help reduce storm water and land pollution concerns resulting from hazardous wastes:

Material Use

- Wastes should be stored in sealed containers constructed of a suitable material.
- All hazardous waste should be stored, transported, and disposed as required.
- Waste containers should be stored in temporary containment facilities that should comply with the following requirements:
  - Temporary containment facility should provide for a spill containment volume equal to 1.5 times the volume of all containers able to contain precipitation from a 25 year storm event, plus the greater of 10% of the aggregate volume of all containers or 100% of the capacity of the largest tank within its boundary, whichever is greater;

  - Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours;
  - Temporary containment facilities should be maintained free of accumulated rain water and spills. In the event of spills or leaks, accumulated rain water and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site;
  - Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access;
  - Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility; and
  - Throughout the rainy season, temporary containment facilities should 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.
- Drums should not be overfilled and wastes should not be mixed.
- Unless watertight, containers of dry waste should be stored on pallets.
- Do not over-apply herbicides and pesticides. Prepare only the amount needed. Follow the recommended usage instructions. Over application is expensive and environmentally harmful. Apply surface dressings in several smaller applications, as opposed to 1 large application. Allow time for infiltration and avoid excess material being carried offsite by runoff. Do not apply these chemicals just before it rains. People applying restricted-use pesticides must be certified in accordance with Federal and State (HAR 4-6-66 Pesticide, Section 4-66-32 restricted use pesticides) regulations.
- Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste. When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste.
- Do not clean out brushes or rinse paint containers into the dirt, street, gutter, storm drain, or stream. “Paint out” brushes as much as possible. Rinse water-based paints to the sanitary sewer. Filter and reuse thinners and solvents. Dispose of excess oil-based paints and sludge as hazardous waste.
- Consult the “Hazardous Waste management Checklist” within the State Department of Business and Economic Development and Tourism (DBEDT’s) “A Contractor’s Waste Management Guide: Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii” for additional tips and BMPs on selecting and purchasing lesser-toxic building products.

The DBEDT manual also offers detailed, helpful tips on solid waste management (see WM-05) and a “General Practices Checklist” for training subcontractors and employees how to maximize opportunities for on-site waste reduction and recycling. For a free copy of the guide, contact DBEDT at (808) 587-3802.

- The following actions should be taken with respect to temporary contaminant:
  - Ensure that adequate hazardous waste storage volume is available;
  - Ensure that hazardous waste collection containers are conveniently located;

- Designate hazardous waste storage areas onsite 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 wastes 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 type of 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;
- Use all of the product before disposing of the container; and
- Do not remove the original product label; it contains important safety and disposal information.

Waste Recycling Disposal

- Select designated hazardous waste collection areas onsite.
- Hazardous materials and wastes should be stored in covered containers and protected from vandalism.
- Place hazardous waste containers in secondary containment.
- Do not mix wastes as it can cause chemical reactions, which makes recycling impossible and complicates disposal.
- Recycle any useful materials such as used oil or water-based paint.
- Make sure that toxic liquid wastes (used oils, solvents, and paints) and chemicals (acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.
- Arrange for regular waste collection before containers overflow.
- Make sure that hazardous waste (e.g., excess oil-based paint and sludge) is collected, removed, and disposed of only at authorized disposal areas.
- Consult the "Hazardous Waste Management Checklist" within the State DBEDT's "A Contractor's Waste Management Guide: Best Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii" for additional tips and BMPs on how to reduce hazardous waste volumes and how to best determine if a material or item is a potentially hazardous waste.

Disposal Procedures

- Waste should be disposed of by a professional hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.
- A laboratory following EPA methods and standards should sample waste to determine the appropriate disposal facility.

- Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.

Education

- Train employees and subcontractors in proper hazardous waste management. Consult the "Hazardous Waste management Checklist" within the State DBEDT's "A Contractor's Waste Management Practices and Tools for Job Site Recycling and Waste Reduction in Hawaii" for tips and other useful resources available to help you train your employees and subcontractors.
- Educate employees and subcontractors on hazardous waste storage and disposal procedures.
- Educate employees and subcontractors on potential dangers to humans and the environment from hazardous wastes.
- Instruct employees and subcontractors on safety procedures for common construction site hazardous wastes.
- Instruct employees and subcontractors in identification of hazardous and solid waste.
- Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).
- The contractor's superintendent or representative should 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.
- Warning signs should be placed in areas recently treated with chemicals.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- If a container does spill, clean up immediately.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and on 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Inspect BMPs subject to non-storm water discharge daily while non-storm water discharges occur.
- Hazardous waste should be regularly collected.
- A foreman or construction supervisor should monitor onsite hazardous waste storage and disposal procedures.
- Waste storage areas should be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored.
- Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.
- Hazardous spills should be cleaned up and reported in conformance with the applicable Material Safety Data Sheet (MSDS) and the instructions posted at the project site.

- The National Response Center, at (800) 424-8802, should be notified of spills of federal reportable quantities in conformance with the requirements in 40 CFR parts 110, 117, and 302.
- A copy of the hazardous waste manifests should be provided.
- In the event that hazardous materials are Discharged to the MS4, the property owner or ESCP Coordinator shall immediately notify the Department of Facilities Maintenance, Honolulu Fire Department, and Honolulu Police Department of the Discharge by telephone. A written report describing the Pollutants that were Discharged, the reasons for the Discharge, and the measures that have been taken or will be taken to prevent a reoccurrence of the Discharge shall be submitted to the Director no less than 3 days after notification by phone.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Hawaii Administrative Rules, Title 4, Chapter 66, Pesticides.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

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Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

WM-7: Contaminated Soil Management

Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
●	Sediment
●	Nutrients
●	Trash
●	Metals
●	Bacteria
●	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the discharge of pollutants to storm water from contaminated soil and highly acidic or alkaline soils by conducting pre-construction surveys, inspecting excavations regularly, and remediating contaminated soil promptly.

Suitable Applications

Contaminated soil management is implemented on construction projects in highly urbanized or industrial areas where soil contamination may have occurred due to spills, illicit discharges, aerial deposition, past use, and leaks from underground storage tanks.

Limitations

Contaminated soils that are hazardous and cannot be treated onsite must be disposed of offsite by a State of Hawaii Department of Health approved hazardous waste transporter. NOTE: If transporting petroleum-contaminated soil (PCS) loads off-site to other than permitted remediation facilities, use transporters approved by the DOH, Office of Solid Waste Management (OSWM). Any PCS loads to be taken to DOH-permitted remediation facilities must notify OSWM 48 hours prior (refer to Hawaii Revised Statues). The presence of contaminated soil may indicate contaminated water as well. See NS-02: Dewatering Operations, for more information.

The procedures and practices presented in this BMP are general. The contractor should identify appropriate practices and procedures for the specific contaminants known to exist or discovered onsite.

Implementation

Most owners and developers conduct pre-construction environmental assessments as a matter of routine. Contaminated soils are often identified during project planning and development with known locations identified in the plans, specifications, and in the ESCP. The contractor should review applicable reports and investigate appropriate call-outs in the plans, specifications, and ESCP. Recent court rulings holding contractors liable for cleanup costs when they unknowingly move contaminated soil highlight the need for contractors to confirm a site assessment is completed before earth moving begins.

The following steps will help reduce storm water and land pollution concerns resulting from contaminated soil:

- Conduct thorough pre-construction inspections of the site and review documents related to the site. If inspection or reviews indicated presence of contaminated soils, develop a plan before starting work.
- Look for contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris.
- Prevent leaks and spills. Contaminated soil can be expensive to treat and dispose of properly. However, addressing the problem before construction is much less expensive than after the structures are in place.
- The contractor may further identify contaminated soils by investigating:
  - Past site uses and activities;
  - Detected or undetected spills and leaks;
  - Acid or alkaline solutions from exposed soil or rock formations high in acid or alkaline forming elements;
  - Contaminated soil as evidenced by discoloration, odors, differences in soil properties, abandoned underground tanks or pipes, or buried debris; and/or
  - Suspected soils should be tested at a certified laboratory.
- Determine if level of contamination is considered hazardous, as defined by the Hawaii Administrative Rules Title 11, Chapter 261 (HAR 11-261) Hazardous Waste Management Identification and Listing of Hazardous Waste; and DOH policy "Technical Guidance Manual for Underground Storage Tank Closure and Release Responses-Reporting, Remediation, and Management of Petroleum Contaminated Soil" dated January 4, 1996.
- If the soil is contaminated and hazardous, work with the State DOH Solid and Hazardous Waste Branch (586-4226) to develop options for treatment and/or disposal. Tier 1 action levels are found in HAR Title 11 Chapter 281 Underground Storage Tanks, DOH Environmental management Division Solid and Hazardous Waste Branch Policy Update "Technical Guidance Manual for Underground Storage Tank Closure and Release Responses-Reporting, Remediation, and Management of Petroleum Contaminated Soil" dated January 4, 1996.
- Secure required State DOH permits such as Transportation of Petroleum-contaminated Soil (PCS).

Education

- Have employees and subcontractors complete a safety training program which meets 29 CFR 1910.120 covering the potential hazards as identified, prior to performing any excavation work at the locations containing material classified as hazardous.

- Educate employees and subcontractors in identification of contaminated soil, on contaminated soil handling, and disposal procedures.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

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.
- Excavation, transportation, and placement operations should result in no visible dust.
- Caution should be exercised to prevent spillage of lead containing material during transport.
- Quality should be monitored during excavation of soils contaminated with lead.

Handling Procedures for Contaminated Soils

- Minimize onsite storage. Contaminated soil should be disposed of properly in accordance with all applicable regulations.
- Guidance documents by local government provide by the State of Hawaii Department of Health Solid and Hazardous Waste Branch, Underground Storage Tank Section.
- Test suspected soils at an approved certified laboratory.
- Work with the state regulatory agencies to develop options for treatment or disposal if the soil is contaminated.
- Avoid temporary stockpiling of contaminated soils or hazardous material.
- Take the following precautions if temporary stockpiling is necessary:
  - Cover the stockpile with plastic sheeting or tarps;
  - Install a berm around the stockpile to prevent runoff from leaving the area;
  - Do not stockpile in or near storm drains or watercourses; and
  - Remove contaminated material and hazardous material on exteriors of transport vehicles and place either into the current transport vehicle or into the excavation prior to the vehicle leaving the exclusion zone.
- Monitor the air quality continuously during excavation operations at all locations containing hazardous material.
- 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 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.
- Excavate, transport, and dispose of contaminated material and hazardous material 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),
- State of Hawaii Department of Health Solid Waste and Hazardous Waste Branch,
- State of Hawaii Department of Labor & Industrial Relations, and
- Hawaii Occupational Safety and Health Administration (HIOSH).

Procedures for Underground Storage Tank (UST) Removals

- Refer to the Technical Guidance Manual for UST Close & Release Response, by the State of Hawaii Department of Health Solid and Hazardous Waste Branch, Underground Storage Tank Section.
- Prior to commencing UST removal operations, obtain the required UST removal permits and approval from the federal and state agencies that have jurisdiction over such work.
- To determine if the UST contains hazardous substances, arrange to have any liquid or sludge found in the UST tested prior to its removal.
- Following the UST removal, take soil samples beneath the excavated tank and perform analysis as required by the state agency representative(s).
- The UST, any liquid or sludge found within the tank, and all contaminated substances and hazardous substances removed during the tank removal and transported to disposal facilities permitted to accept such waste.

Water Control

- All necessary precautions and preventive measures should be taken to prevent the flow of water, including ground water, from mixing with hazardous substances or underground storage tank 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) should be discharged to clean, closed top, watertight transportable holding tanks, treated, and disposed of in accordance with federal and state laws.

Costs

While the prevention of leaks and spills is inexpensive, treatment or disposal of contaminated soil can be quite expensive.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for contractor's Water Pollution Control Manager, foreman, and/or construction supervisor to monitor onsite contaminated soil storage and disposal procedures.
- Monitor air quality continuously during excavation operations at all locations containing hazardous material.

- Coordinate contaminated soils and hazardous substances/waste management with the appropriate federal and state agencies.
- Implement WM-04: Spill Prevention and Control, to prevent leaks and spills as much as possible.

References

Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Hawaii Administrative Rules, Title 11, Chapter 261, Hazardous Waste Management Identification and Listing of Hazardous Waste.

Hawaii Administrative Rules, Title 11, Chapter 281, Underground Storage Tanks.

Processes, Procedures and Methods to Control Pollution Resulting from All Construction Activity, 430/9-73-007, USEPA, 1973.

State of Hawaii Department of Health, Solid and Hazardous Waste Branch Policy Update "Technical Guidance Manual for Underground Storage Tank Closure and Release Responses-Reporting, Remediation, and Management of Petroleum-Contaminated Soil," 04 January, 1996.

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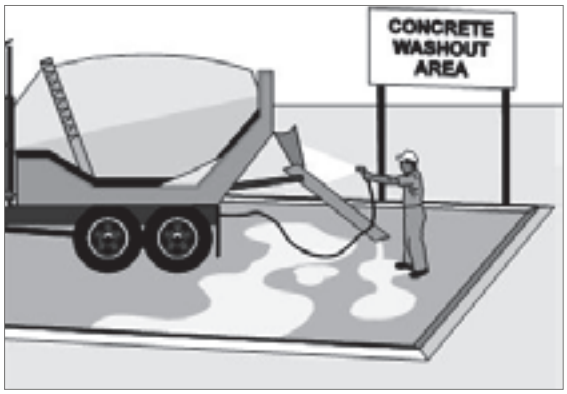
WM-8: Concrete Waste Management



Objectives	
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	Nutrients
	Trash
	Metals
●	Bacteria
	Oil and Grease
	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Prevent or reduce the discharge of pollutants to storm water from concrete waste by conducting washout offsite, performing onsite washout in a designated area, and training employee and subcontractors.

Suitable 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;
- Slurries containing portland cement concrete (PCC) or asphalt concrete (AC) are generated, such as from saw cutting, coring, grinding, grooving, and hydro-concrete demolition;
- Concrete trucks and other concrete-coated equipment are washed onsite;
- Mortar-mixing stations exist; and/or
- See also NS-08: Vehicle and Equipment Cleaning.

Limitations

Offsite washout of concrete wastes may not always be possible.

Implementation

The following steps will help reduce storm water pollution from concrete wastes:

- Discuss the concrete management techniques described in this BMP (such as handling of concrete waste and washout) with the ready-mix concrete supplier before any deliveries are made;

- Incorporate requirements for concrete waste management into material supplier and subcontractor agreements;
- Store dry and wet materials under cover, away from drainage areas;
- Avoid mixing excess amounts of fresh concrete;
- Perform washout of concrete trucks offsite or in designated areas only;
- Do not wash out concrete trucks into storm drains, open ditches, streets, or streams;
- Do not allow excess concrete to be dumped onsite, except in designated areas;
- For onsite washout:
  - Locate washout area at least 50 feet from storm drains, open ditches, or water bodies. Do not allow runoff from this area by constructing a temporary lined pit or bermed area large enough for liquid and solid waste; and
  - Wash out wastes into the temporary lined pit where the concrete can set, be broken up, and then disposed properly.
- Avoid creating runoff by draining water to a bermed or level area when washing concrete to remove fine particles and to expose the aggregate; and
- Do not wash sweepings from exposed aggregate concrete into the street or storm drain. Collect and return sweepings to aggregate base stockpile or dispose in the trash.
- Plastic lining material should be a minimum of 10 millimeter polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Education

- Educate employees, subcontractors, and suppliers on the concrete waste management techniques described herein.
- Arrange for contractor's superintendent or representative to oversee and enforce concrete waste management procedures.

Concrete Slurry Wastes

- PCC and AC waste should not be allowed to enter storm drains or watercourses.
- PCC and AC waste should be collected and disposed of or placed in a temporary concrete washout facility.
- A sign should be installed adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.
- Below grade concrete washout facilities are typical. Above grade facilities are used if excavation is not practical.
- A foreman or construction supervisor should monitor onsite concrete working tasks, such as saw cutting, coring, grinding, and grooving to ensure proper methods are implemented.
- Saw-cut PCC slurry should not be allowed to enter storm drains or watercourses. Residue from grinding operations should be picked up by means of a vacuum attachment to the grinding machine. Saw cutting residue should not be allowed to flow across the pavement and should not be left on the surface of the pavement. See also NS-3: Paving and Grinding Operations; and WM-10: Liquid Waste Management.

- Slurry residue should be vacuumed and disposed in a temporary pit (as described in Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures, below) and allowed to dry. Dispose of dry slurry residue in accordance with WM-5: Solid Waste Management.

Onsite Temporary Concrete Washout Facility, Transit Truck Washout Procedures

- Temporary concrete washout facilities should be located a minimum of 50 feet from storm drain inlets, open drainage facilities, and watercourses. Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary concrete washout facilities should be constructed above grade or below grade at the option of the contractor. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.
- Temporary washout facilities should have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Washout of concrete trucks should be performed in designated areas only.
- Only concrete from mixer truck chutes should be washed into concrete wash out.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into a designated washout area or properly disposed of offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed of per WM-5, Solid Waste Management. Dispose of hardened concrete on a regular basis.
- Temporary Concrete Washout Facility (Type Above Grade):
  - Temporary concrete washout facility (type above grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations; and
  - Plastic lining material should be a minimum of 10 mil in polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Temporary Concrete Washout Facility (Type Below Grade):
  - Temporary concrete washout facilities (type below grade) should be constructed as shown on the details at the end of this BMP, with a recommended minimum length and minimum width of 10 feet The quantity and volume should be sufficient to contain all liquid and concrete waste generated by washout operations;
  - Lath and flagging should be commercial type; and
  - Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.

Removal of Temporary Concrete Washout Facilities

- When temporary concrete washout facilities are no longer required for the work, the hardened concrete should be removed and disposed of. Materials used to construct temporary concrete washout facilities should be removed from the site of the work and disposed of.

- Holes, depressions or other ground disturbance caused by the removal of the temporary concrete washout facilities should be backfilled and repaired.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Temporary concrete washout facilities should 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 should include removing and disposing of hardened concrete and returning the facilities to a functional condition. Hardened concrete materials should be removed and disposed of.
- Washout facilities must be cleaned, or new facilities must be constructed and ready for use once the washout is 75% full.

References

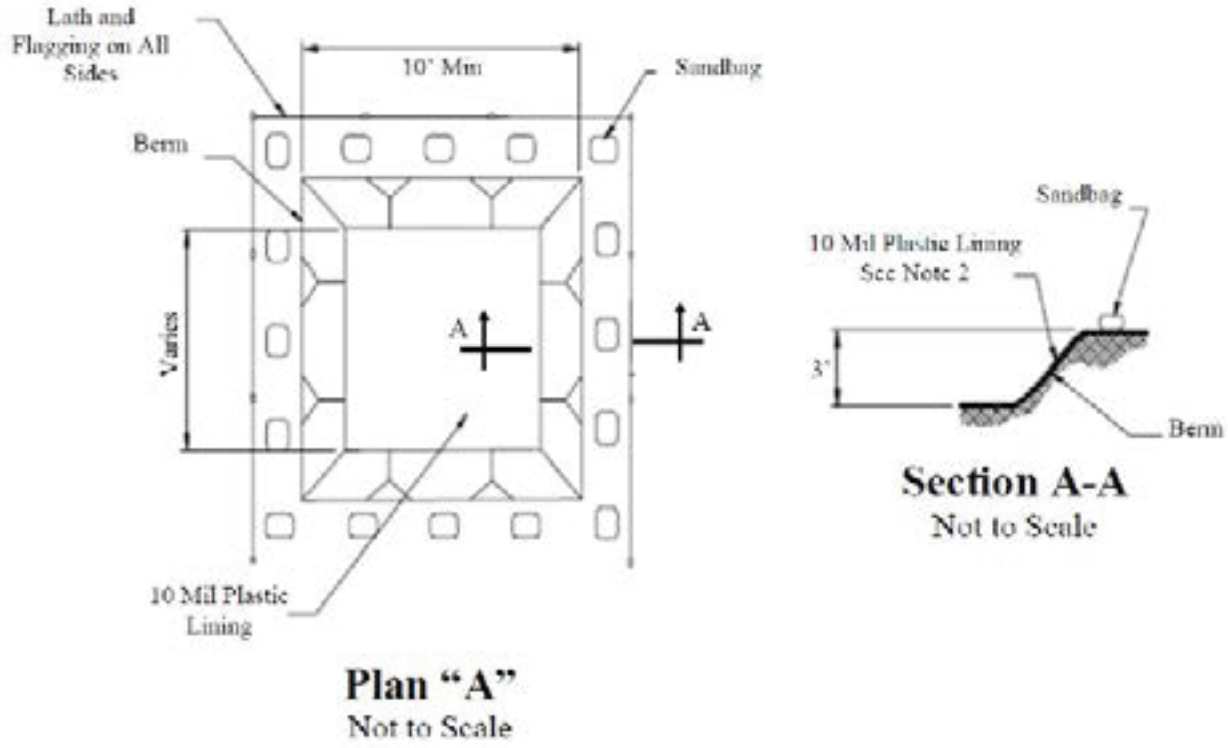
Blueprint for a Clean Bay: Best Management Practices to Prevent Stormwater Pollution from Construction Related Activities; Santa Clara Valley Nonpoint Source Pollution Control Program, 1995.

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.

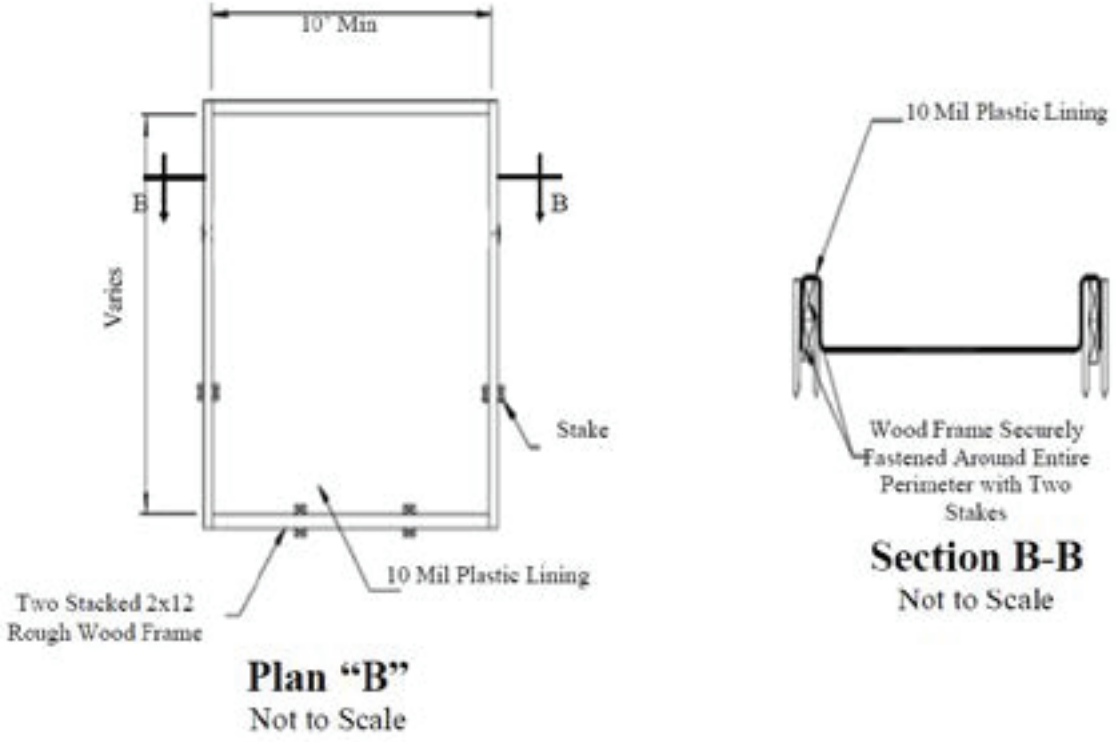
Below Grade Concrete Washout



Notes:

1. Temporary concrete washout facility (Below Grade) should be constructed with a minimum length and width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
2. Lath and flagging should be commercial type.
3. Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears or other defects that compromise the impermeability of the material.

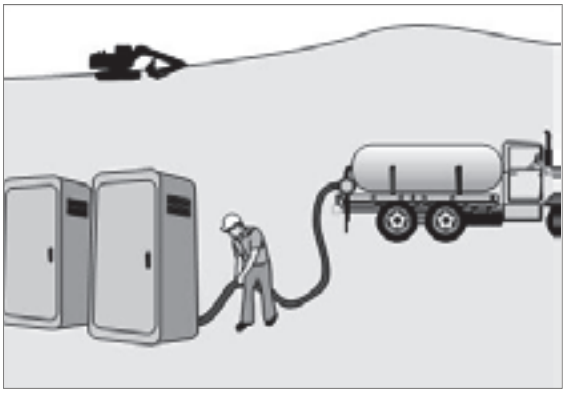
Below Grade Concrete Washout



Notes:

1. Temporary concrete washout facility (Above Grade) should be constructed with a minimum length and width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
2. Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears or other defects that compromise the impermeability of the material.

WM-9: Sanitary/Septic Waste Management



Objectives	
	EC - Erosion Control
	SE - Sediment Control
	TR - Tracking Control
	WE - Wind Erosion Control
	NS - Non-Storm Water Management Control
●	WM - Waste Management and Material Pollution Control
Targeted Constituents	
	Sediment
●	Nutrients
●	Trash
	Metals
●	Bacteria
	Oil and Grease
●	Organics
Legend: ● = Primary Objectives ▲ = Secondary Objectives	

Potential Alternatives
None

Description and Purpose

Proper sanitary and septic waste management prevent the discharge of pollutants to storm water from sanitary and septic waste by providing convenient, well-maintained facilities, and arranging for regular service and disposal.

Suitable Applications

Sanitary septic waste management practices are suitable for use at all construction sites that use temporary or portable sanitary and septic waste systems.

Limitations

None identified.

Implementation

Sanitary or septic wastes should be treated or disposed of in accordance with State and City requirements. In many cases, 1 contract with a local facility supplier will be all that it takes to make sure sanitary wastes are properly disposed.

Storage and Disposal Procedures

- Temporary sanitary facilities should be located away from drainage facilities, watercourses, and traffic circulation.
- Temporary sanitary facilities should be mounted or staked in to prevent overturning.
- Wastewater should not be discharged or buried within the project site.

- Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the State of Hawaii Department of Health Wastewater Branch, and City and County Department of Planning & Permitting requirements.
- Only reputable, professional sanitary and septic waste haulers should be used.
- Sanitary facilities should be located in a convenient location.
- Untreated raw wastewater should never be discharged or buried.
- If using an onsite disposal system (OSDS), such as a septic system, State of Hawaii Department of Health Wastewater Branch requirements must be followed.
- Temporary septic systems should treat wastes to appropriate levels before discharging.
- Temporary sanitary facilities that discharge to the sanitary sewer system should be properly connected to avoid illicit discharges.
- Sanitary and septic facilities should be maintained in good working order by a professional service.
- Regular waste collection by a professional hauler should be arranged before facilities overflow.

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 and septic wastes.
- Instruct employees, subcontractors, and suppliers in identification of sanitary and septic waste.
- Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).
- Establish a continuing education program to indoctrinate new employees.

Costs

All of the above are low cost measures.

Inspection and Maintenance

- Inspect and verify that activity-based BMPs are in place prior to the commencement of associated activities. While activities associated with the BMP are under way, inspect weekly during the rainy season and of 2-week intervals in the non-rainy season to verify continued BMP implementation.
- Arrange for regular waste disposal and servicing.
- Portable sanitary facilities must be mounted or staked in to prevent over turning.

References

California Stormwater Quality Association (CASQA) Best Management Practices Handbook Construction, 2003.

Stormwater Management for Construction Activities; Developing Pollution Prevention Plans and Best Management Practice, EPA 832-R-92005; USEPA, April 1992.

Stormwater Quality Handbooks - Construction Site Best Management Practices (BMPs) Manual, State of California Department of Transportation (Caltrans), November 2000.