

A topographic map of the state of Nevada, showing its geographical features, including mountain ranges, valleys, and a network of rivers and streams. The map is rendered in shades of brown, tan, and green, with blue lines representing water bodies. The map is centered on the page and serves as a background for the title text.

**Construction Site
Best Management Practices
(BMPs)
Field Manual**

January 2006

State of Nevada NDOT Construction Site BMPs Field Manual

January 2006

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NDOT's Construction Site BMPs Field Manual

Introduction

This Construction Site Best Management Practices (BMPs) Field Manual (BMP Field Manual) was adapted from the Storm Water Quality Manual: Construction Site Best Management Practices Manual (BMP Manual) to provide NDOT's construction inspectors with a quick reference for proper BMP installation and maintenance. NDOT developed the BMP Manual to assist NDOT personnel and contractors in regulatory guidance and temporary BMP selection and application.

BMPs are any measure, practice, or control implemented to protect water quality and reduce the pollutant content in storm water runoff. NDOT has approved a selection of temporary structural and non-structural BMPs to be employed at construction sites. These BMPs address Soil Stabilization, Sediment Control, Tracking Controls, Non-Storm Water Management, and Waste Management and Pollution Controls. The BMP Manual provides the full working details of each temporary BMP.

NDOT has defined the Minimum Requirements of BMPs for construction projects. All NDOT construction projects are required to implement the minimum required BMPs as described in Table 1. Not all BMPs listed in Table 1 are written up in this BMP Field Manual, as some are straight-forward and do not require extensive discussion here. Refer to the BMP Manual for a description of BMPs in Table 1 that are not discussed in this BMP Field Manual. The BMPs are grouped to show selection opportunities or possible combinations of BMPs for enhanced protection. Additional BMPs may be implemented at particular projects depending on the project assessment by NDOT and the contractor.

Table 1 Construction Site BMPs Minimum Requirements ⁽¹⁾

| Best Management Practice | Re- quired | Option |
|---|-----------------------|---------------|
| SEDIMENT CONTROL (In addition to all required BMPs employ at least one BMP option) | | |
| Scheduling (SS-1) | X | |
| Preservation of Existing Vegetation (SS-2) | X | |
| Sediment Basin (SC-2) | | X |
| Sediment Trap (SC-3) | | X |
| Check Dam (SC-4) | | X |
| Street Sweeping and Vacuuming (SC-7) | X | |
| Storm Drain Inlet Protection | X | |
| SEDIMENT BARRIER (See Tables 2 and 3 for implementation guidance) | | |
| Silt Fence (SC-1) | | X |
| Sediment Logs (SC-5) | | X |
| Gravel Bag Berm (SC-6) | | X |
| NON-STORM WATER MANAGEMENT | | |
| All NS BMPs as applicable (NS-1 thru NS-16) | X | |
| WASTE MANAGEMENT AND MATERIAL POLLUTION CONTROL | | |
| Stabilized Construction Entrance/Exit (TC-1) | X | |
| All WM BMPs as applicable (WM-1 thru WM-8) | X | |
| SLOPE PROTECTION (See Tables 2 and 3 for implementation guidance) | | |
| Geotextiles & Erosion Control Blankets/Mats (SS-7) | | X |
| Earth Dikes/Drainage Swales & Lined Ditches | | X |
| Slope Drains (SS-11) | | X |
| Sediment Logs (SC-5) | | X |

| Best Management Practice | Required | Option |
|---|------------------|------------------|
| Gravel Bag Berm (SC-6) | | X |
| SOIL STABILIZATION (DISTURBED AREAS) (Employ at least one BMP option) | | |
| Wind Erosion Control (SS-13) | X | |
| Soil Stabilizer (SS-5) | | X |
| Hydraulic/Straw/Wood Mulch (SS-3) (SS-6) | | X |
| Geotextiles, Plastic Covers, & Erosion Control Blankets/Mats (SS-7) | | X |
| Hydroseeding (SS-4) | X ⁽²⁾ | X ⁽²⁾ |

⁽¹⁾ Reference Tables 2 & 3 and the BMP Manual for application specifics and selection and implementation guidance.

⁽²⁾ When specified.

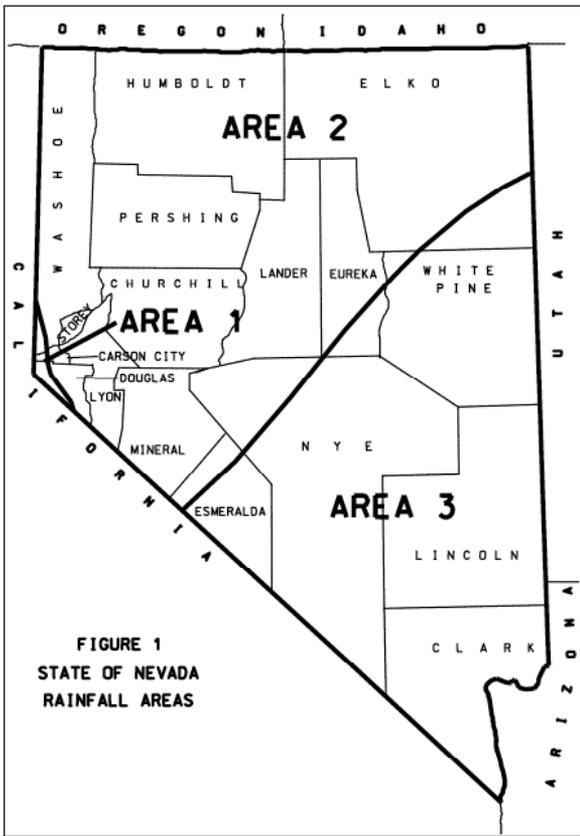


Table 2
Required Combination of Temporary Slope Protection
and Temporary Sediment Barriers ^{(5) (6)}
NON-ACTIVE DISTURBED SOIL AREAS

| | AREA | TEMPORARY BMP | SLOPE ⁽¹⁾ | | | |
|--------------------|------|---------------------------------------|----------------------|---------------------|------------------|-------|
| | | | ≤ 20:1 | > 20:1 ≤ 4:1 | > 4:1 ≤ 2:1 | > 2:1 |
| RAINY SEASON | 1 | SLOPE PROTECTION ⁽⁴⁾ | X | X | X | X |
| | | SEDIMENT BARRIER ⁽⁴⁾ | X | X | X | X |
| | | SEDIMENT BASIN OR TRAP ⁽²⁾ | | X | X | X |
| | 2 | SLOPE PROTECTION ⁽⁴⁾ | X ⁽⁷⁾ | X | X | X |
| | | SEDIMENT BARRIER | X ⁽⁷⁾ | X | X | X |
| | | SEDIMENT BASIN OR TRAP | | | | X |
| | 3 | SLOPE PROTECTION ⁽⁴⁾ | X | X | X | X |
| | | SEDIMENT BARRIER | X | X | X | X |
| | | SEDIMENT BASIN OR TRAP | | | | X |
| NON - RAINY SEASON | 1 | SLOPE PROTECTION ⁽⁴⁾ | X ⁽³⁾ | X ⁽³⁾ | X | X |
| | | SEDIMENT BARRIER | | X ⁽³⁾ | X | X |
| | | SEDIMENT BASIN OR TRAP | | | | |
| | 2 | SLOPE PROTECTION | | X ⁽³⁾⁽⁷⁾ | X ⁽⁷⁾ | X |
| | | SEDIMENT BARRIER | | X ⁽³⁾⁽⁷⁾ | X ⁽⁷⁾ | X |
| | | SEDIMENT BASIN OR TRAP | | | | |
| | 3 | SLOPE PROTECTION | | | | |
| | | SEDIMENT BARRIER | | | X | X |
| | | SEDIMENT BASIN OR TRAP | | | | |

(1) Unless otherwise noted, the temporary BMP is required for the slope inclinations indicated on slope lengths greater than 10 ft. The maximum slope length is 100 ft. for slope inclinations between 20:1 and 2:1 and 50 ft. for steeper slopes.

(2) Required in addition to the temporary sediment barrier, where feasible depending on site-specific factors.

(3) Implementation of controls not required except 24 hours prior to predicted rain events.

(4) The indicated temporary BMP is required on all slope lengths.

(5) Temporary sediment barrier BMPs are equivalent to what are sometimes referred to as perimeter systems. Provide a barrier to the transport of sediment at the downslope edge of disturbed soil areas.

(6) Permanent erosion control seeding shall be applied to all non-active areas deemed substantially complete. Comply with seeding window in.

(7) Implement Slope Protection or Sediment Barrier

Table 3
Required Combination of Temporary Slope Protection
Temporary Sediment Barriers
ACTIVE DISTURBED SOIL AREAS ⁽³⁾ ⁽⁶⁾

| | AREA | TEMPORARY BMP | SLOPE ⁽¹⁾ | | |
|------------------|------|---------------------------------------|----------------------|-----------------|------------------|
| | | | ≤ 20:1 | > 20:1 ≤ 2:1 | > 2:1 |
| RAINY SEASON | 1 | SLOPE PROTECTION | | X | X |
| | | SEDIMENT BARRIER ⁽⁴⁾ | X | X | X |
| | | SEDIMENT BASIN OR TRAP ⁽²⁾ | | X | X |
| | 2 | SLOPE PROTECTION | | | X ⁽⁵⁾ |
| | | SEDIMENT BARRIER | | X | X |
| | | SEDIMENT BASIN OR TRAP ⁽²⁾ | | | X ⁽⁵⁾ |
| | 3 | SLOPE PROTECTION | | | X ⁽⁵⁾ |
| | | SEDIMENT BARRIER | | X | X |
| | | SEDIMENT BASIN OR TRAP ⁽²⁾ | | | X ⁽⁵⁾ |
| NON-RAINY SEASON | 1 | SLOPE PROTECTION | | | |
| | | SEDIMENT BARRIER | | X | X |
| | | SEDIMENT BASIN OR TRAP ⁽²⁾ | | | X ⁽⁵⁾ |
| | 2 | SLOPE PROTECTION | | | |
| | | SEDIMENT BARRIER | | | |
| | | SEDIMENT BASIN OR TRAP | | | |
| | 3 | SLOPE PROTECTION | | | |
| | | SEDIMENT BARRIER | | | |
| | | SEDIMENT BASIN OR TRAP | | | |

- ⁽¹⁾ Unless otherwise noted, the BMP is required for the slope inclinations indicated on slope lengths greater than 10 ft.
- ⁽²⁾ Required in addition to the temporary sediment barrier, where feasible. Feasibility will depend on site-specific.
- ⁽³⁾ Implementation of soil stabilization controls not required except prior to predicted rain.
- ⁽⁴⁾ The indicated temporary BMP required on all slope lengths.
- ⁽⁵⁾ The indicated temporary BMP required on slope lengths greater than 50 feet.
- ⁽⁶⁾ Temporary sediment barrier BMPs are equivalent to what are sometimes referred to as perimeter systems. Provide a barrier to the transport of sediment at the downslope edge of disturbed soil areas.

To account for rainfall patterns (time frames, intensities, and amounts) and to a lesser extent general soil type differences, the State has been divided into three areas requiring common protection requirements. These rainfall areas are depicted in Figure 1. See BMP Manual Figure 2-1 and Section 2.3.4 for background. The specific temporary soil stabilization and sediment control BMPs for DSA protection in each area are determined from Tables 2 and 3 (for non-active disturbed soil areas and active disturbed soil areas, respectively). The slope length and slope inclination are the most important criteria for soil stabilization and sediment control requirements, as these factors have the largest potential impact on the erosion rate. DSAs shall be protected as follows:

- Temporary BMPs (as required in Table 2) shall be implemented on non-active DSAs within 14 days from the cessation of soil-disturbing activities or one day prior to the onset of precipitation, whichever occurs first.
- Temporary BMPs for active DSAs (as required in Table 3) shall be implemented prior to the onset of precipitation and throughout each day for which precipitation is forecasted.
- For non-active DSAs, limit the erosive effects of storm water flow on slopes by implementing BMPs such as sediment logs or gravel bag berms to break up the slope lengths as follows:
 - Slope inclination 4:1 and flatter: BMPs shall be placed on slopes at intervals no greater than 20 ft.
 - Slope inclination between 4:1 and 2:1: BMPs shall be placed on slopes at intervals no greater than 15 ft.
 - Slope inclination 2:1 or greater: BMPs shall be placed on slopes at intervals no greater than 10 ft.
- For non-active DSAs, permanent erosion control shall be applied to areas deemed substantially complete during the project's defined seeding window.
- Provide construction site BMPs in addition to those specified in Tables 2 and 3 to convey concentrated flows in a non-erodible fashion.

To insure permit compliance and therefore proper BMP implementation, NDOT must perform weekly inspections at construction sites consistent with the General Permit for Storm Water Discharges Associated with Construction Activity NVR100000 (General Permit) requirements. The inspectors review both structural

and non-structural temporary BMPs to insure that the control measures are operating as designed. NDOT inspectors report inspection results to the Resident Engineer (RE) who works with the contractor to correct any problems. A weekly Construction Site Discharge Inspection Checklist (NDOT Form 040-054) is used to record the results of the inspection.

This form needs to be completed on a weekly basis for all contracts and completed from the Notice to Proceed date through the final working day, including any job suspensions.

The following text highlights the minimum inspection protocol:

- Priority:

NDOT inspectors shall inspect at a minimum all disturbed areas of the construction site that have not been finally stabilized, areas used for storage of materials that are exposed to precipitation, structural control measures (i.e., silt fence, check dams, sediment logs, etc.), locations where vehicles enter or exit the site, and the low drainage spots where storm water would discharge from the site into a receiving water body or MS4 (refer to checklist).

- Frequency:

At least once every seven (7) calendar days and within 24 hours of the end of a storm event of 0.5 inches or greater. For weather information and precipitation totals in your area visit the Western Regional Climate Center at http://www.wrcc.dri.edu/state_climate.html.

- Proper Course of Action:

Contractor should be notified of any deficiencies immediately. Repairs of temporary pollution control BMPs shall begin within 24 hours of notification and shall be completed within 7 days. Should this restriction be exceeded, work may be immediately suspended and no other items of work shall be performed until the repairs are completed. Working days will continue to be assessed during the suspension period and partial payments as set forth under Subsection 109.06 of the Standard Specifications may not be forthcoming until said repairs are completed.

There are three main water pollution control permits that require BMPs depending on the project scope and location. They are: The Nevada Division of Environmental Protection (NDEP) issued General Permit, the Tahoe Regional Planning Agency (TRPA) issued construction permit; and the NDEP issued Temporary Working in Waterways/Discharge Permit.

NDOT's construction projects which disturb more than one acre of land and discharge to a WOUS require coverage under the General Permit. Disturbance is defined as clearing, grading, or excavating underlying and/or surrounding soil as part of a repaving operation. If repaving operations create loose fine-grained material (e.g., asphalt millings) that is not immediately disposed of and/or is stockpiled on the site and the area disturbed is greater than one acre, NDEP requires General Permit coverage. If the material is immediately overlaid or hauled off-site, a permit is not required. NDEP may require General Permit coverage for construction activities that do not discharge storm water to Waters of the United States, including sites disturbing less than one acre, sites that may potentially violate a water quality standard or may significantly contribute pollutants to Waters of the United States. Conversely, NDEP has the authority to waive General Permit requirements, such as preparing and implementing a Storm Water Pollution Prevention Plan (SWPPP) for small construction projects that will not have adverse impacts to water quality. Contact the Environmental Services Division (775-888-7013) if it is speculated the project subscribes to the aforementioned.

Please note that sites between one and five acres that have a rainfall erosivity factor less than 5 during the period of construction may also be able to obtain a waiver. NDEP has the option not to allow waivers for small construction activity based on other criteria. Please refer to the following NDEP website or contact NDOT's Environmental Services Division for further information about the rainfall erosivity factor waiver program, General Permit requirements and conditions, etc.: <http://ndep.nv.gov/bwpc/storm01.htm>. Please note all temporary plants or operations set up to produce concrete, asphalt or other materials for a construction project should be permitted with the project but require a separate SWPPP. Material site SWPPPs are subject to inspection compliance.

For projects requiring coverage under the General Permit, NDOT, being the owner, is ultimately responsible and liable for discharges from construction sites. NDOT's contractor actually files the Notice of Intent (NOI) with associated fee at least 48 hours before construction begins to obtain permit coverage and therefore is the permittee. The SWPPP must be prepared prior to submittal of the NOI. Because NDOT is the owner, NDEP addresses the official Letter of Authorization with a unique 5-digit number to the RE and the contractor is copied. The contractor submits a Notice of Termination (NOT) when final site stabilization is achieved or the contractor is released from control of the site.

For projects in the Lake Tahoe Basin, the NDOT Lake Tahoe Environmental Improvement Coordinator (Hydraulics Section) applies for a TRPA construction permit typically requiring more stringent water quality and environmental controls than the General Permit. The final PS&E includes all applicable permit requirements including the temporary erosion and sediment structural controls (bid items).

The NDEP issued Temporary Working in Waterways/Discharge Permit requires contractors to develop and implement a BMP Plan for projects within or in the vicinity of Waters of the United States. The plan is essentially the same as a SWPPP, however addresses erosion and sedimentation controls for working in or immediately adjacent to a Water of the United States as well as water diversion and dewatering water pollution control elements. This plan is reviewed and approved by NDEP. The individual temporary permit is only valid for 6 months. Refer to Section 637 of the Standard Specifications for further information.

SS-3 Hydraulic Mulch

Hydraulic mulch consists of applying a fiber matrix and a stabilizing emulsion or tackifier with hydro-mulching equipment.



Hydraulic Mulch are applied to:

- Disturbed areas requiring temporary protection until permanent vegetation is established.
- Disturbed areas that must be re-disturbed following an extended period of inactivity.

Limitations:

- Wood fiber hydraulic mulches are generally short-lived (only part of a growing season) and need 24 hours to dry unless approved by the RE.
- Should not be used in areas where mulch is incompatible with future earthwork activities and has to be removed.
- Paper mulches are not permitted.

Installation:

- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.
- Paper-based hydraulic mulches alone shall not be used for temporary soil stabilization applications.

Hydraulic Mulches:

- Wood fiber mulch typically applied at the rate of 2,000 to 4,000 lb/acre.

Hydraulic Matrices:

- Apply a wood fiber base layer mixed with acrylic polymers as binders.
- Apply as a liquid slurry using a hydro-seeder at the following minimum rates to achieve complete coverage of the target area:
 - 750 lb/acre wood fiber mulch;
 - 55 gal/acre of acrylic copolymer; or
 - As specified by the Special Provisions.

Bonded Fiber Matrix:

- BFMs are biodegradable and typically are applied at rates from 3,000 to 4,000 lb/acre based on manufacturer's recommendation.
- The binder in the BFM should be biodegradable and not dissolve or disperse upon re-wetting.
- Typically, biodegradable BFMs should not be applied immediately before, during, or immediately after rainfall if the soil is saturated.
- BFMs typically require 12 to 24 hours to dry.

Maintenance and Inspections:

- Maintain an unbroken, temporary mulched ground cover throughout the period of construction when the soils are not being reworked.
- Inspect and repair any damaged ground cover and re-mulch exposed areas of bare soil prior to and after rainstorms.

SS-4 Hydroseeding

Hydroseeding consists of applying a mixture of wood fiber, seed, fertilizer, and stabilizing emulsion with hydro-mulch equipment.



Hydroseeding is applied to:

- Disturbed areas requiring temporary protection until permanent vegetation is established.
- Disturbed areas that must be re-disturbed following an extended period of inactivity.

Limitations:

- Steep slopes are difficult to protect with temporary seeding.

Installation:

- Hydroseeding uses a multiple-step or one-step process. When the one-step process is used, the seed rate shall be increased to compensate for all seeds not having direct contact with the soil.
- Prior to application, roughen the slope and fill area with the furrows trending along the contours.
- Apply a straw mulch.
- Each seed bag shall be delivered to the site sealed and labeled with species, purity, percent germination, dealer's guarantee, dates of test, and pure live seed (PLS); provide the RE with documentation.
- All legume seed shall be pellet-inoculated and applied at a rate of 2 lb. of inoculant per 100 lb. of seed (2% inoculant by weight).
- Fertilizer shall be in pelleted or granular form.
- Follow-up applications shall be made as needed to cover weak spots.
- Avoid over-spray onto the travel way, sidewalks, lined drainage channels and existing vegetation.
- In the Tahoe Basin, seed mixes shall use only the approved species listed in TRPA's Native and Adapted Plant List.

Maintenance and Inspection:

- All seeded areas shall be inspected for failures and re-seeded, fertilized, and mulched within the planting season using not less than half the original application rates.

SS-5 Soil Stabilizers / Dust Palliatives

Soil stabilizers are applied to exposed or disturbed soil to reduce wind and water erosion, during or after construction activity. Dust palliatives are used during construction to reduce dust emissions due to mechanical and wind forces, and typically do not have the longevity of soil stabilizers.



Soil Stabilizers are:

- Applied to disturbed areas requiring protection.
- Applied on stockpiles to prevent water and wind erosion.

Dust Palliatives are:

- Applied to disturbed areas to reduce dust emissions.

Limitations:

- Require a curing time that may be 24 hours or longer.
- May not cure if low temperatures occur within 24 hours of application.
- May need reapplication after a storm event.
- Soil stabilizers will likely experience spot failures during heavy rainfall events.
- Runoff penetrating the soil at the top of a slope treated with a soil stabilizer, may undercut the stabilized soil layer and discharge at a point further down slope.
- Many soil stabilizers do not hold up to pedestrian or vehicular traffic across treated areas.
- Soil stabilizers and dust palliatives may not penetrate soil surfaces made up primarily of silt and clay, particularly when compacted.
- Establishing long-term landscape may be limited in areas soil stabilizers have been applied.

Selecting a Soil Stabilizer:

- Use Tables 4 and 5 to select an appropriate soil stabilizer. Factors to consider when selecting a soil stabilizer include:

Plant-Material Based (Short Lived)

- Guar shall be applied at the rate of 10 to 15 lb per 1,000 gal of water, depending on application machine capacity.

Recommended minimum application rates are as follows:

| | | | | | |
|---------|------|-----|-----|-----|-----|
| Slope | Flat | 4:1 | 3:1 | 2:1 | 1:1 |
| lb/acre | 40 | 45 | 50 | 60 | 70 |

- Psyllium is applied as a dry powder or in a wet slurry. Approximate drying time is 12 to 18 hours. Application rate is 80 to 200 lb/acre, with enough water in solution to allow for a uniform slurry flow.
- Starch is mixed with water with an application rate of 150 lb/acre. Approximate drying time is 9 to 12 hours.

Plant-Material Based (Long Lived)

- Tall oil pitch / pitch and rosin emulsion is diluted and shall be applied as follows:
 - For clayey soil: 5 parts water to 1 part emulsion
 - For sandy soil: 10 parts water to 1 part emulsion
- Lignin Sulfonate shall be diluted and applied per the manufacturer specifications. High solubility leads to runoff during heavy rain events, and high BOD causes water quality issues. Best if confined to traffic areas.

Polymeric Emulsion Blends

- Acrylic copolymers and polymers shall air cure within a maximum of 36 to 48 hours. Liquid copolymer shall be diluted at a rate of 10 parts water to 1 part polymer and applied at a rate of 1,175 gal/acre. The polymeric compound:

- Shall be handled and mixed that will not cause foaming or shall contain an anti-foaming agent.
 - Shall not exceed its shelf life or expiration date; manufacturers shall provide the expiration date.
 - Shall be readily miscible in water, non-injurious to seed or animal life, non-flammable, shall provide surface soil stabilization for various soil types without totally inhibiting water infiltration; and
 - Shall not re-emulsify when cured.
- Liquid polymers of methacrylates and acrylates is diluted with water and applied with a hydraulic seeder at the rate of 20 gal/acre. Approximate drying time is 12 to 18 hours.
 - Copolymers of sodium acrylates and acrylamides are mixed with water and applied to the soil surface at rates determined by slope gradient:

| Slope Gradient | lb/acre |
|-----------------------|----------------|
| Flat to 5:1 | 3.0 – 5.0 |
| 5:1 to 2:1 | 5.0 – 10.0 |
| 2:1 to 1:1 | 10.0 – 20.0 |

- Poly-acrylamide and copolymer of acrylamide is diluted at a rate of 10 lb/1,000 gal of water and applied at the rate of 5.0 lb/acre.
- Hydro-colloid polymers are mixed with water and applied at rates of 50 to 60 lb/acre. Approximate drying times are 0 to 4 hours.

Cementitious-Based Stabilizers

- Gypsum readily mixes with water and mulch in a hydraulic seeder and is applied at rates of 4,000 to 12,000 lb/acre. Approximate drying time is 4 to 8 hours.

Petroleum-Based Stabilizers

- These products coat soil particles, increasing their mass and decreasing their likelihood of becoming airborne, but do not exhibit adhesive properties. They are water insoluble once

cured, and hence provide a degree of surface waterproofing, and have good residual effectiveness. Used oils are prohibited as a soil stabilizers or dust palliatives because they contain toxic substances. Petroleum resin products should only be used for traffic areas such as haul roads, parking and staging areas.

Applying Soil Stabilizers:

- Soil surface must be prepared before applying the soil stabilizer. The untreated soil surface must contain sufficient moisture to assist the agent in achieving uniform distribution.
- The following steps shall be followed:
 - Follow manufacturer's recommendations for application rates, pre-wetting the application area, and cleaning equipment after use.
 - Prior to application, roughen embankment and fill areas. Track walking shall only be used where rolling is impractical.
 - Consider the drying time for the soil stabilizer and apply with sufficient time before anticipated rainfall. Soil stabilizers shall not be applied during or immediately before rainfall.
 - Avoid over-spray onto the traveled way, sidewalks, lined drainage channels, sound walls, and existing vegetation.
 - Soil stabilizers shall not be applied to frozen soil, areas with standing water, under freezing or rainy conditions, or when the air temperature is below 40°F during the curing period.
 - More than one treatment is often necessary; the second treatment may be diluted or have a lower application rate.
 - Soil stabilizers require a minimum curing time of 24 hours.
- For liquid agents:
 - Crown or slope ground to avoid ponding.
 - Uniformly pre-wet ground at 0.03 to 0.3 gal/yd² or according to manufacturer's recommendations.
 - Apply solution under pressure. Overlap solution 6 to 12 in.
 - Allow treated area to cure at least 24 hours.
 - In low humidity, reactivate chemicals by re-wetting with water at 0.1 to 0.2 gal/yd².

Maintenance and Inspection:

- Reapplying the soil stabilizer may be needed for proper maintenance.
- High traffic areas shall be inspected daily and lower traffic areas inspected weekly.
- Maintain any unbroken, temporary mulched ground cover while DSAs are non-active. Repair any damaged ground cover and re-mulch exposed areas.

Table 4
Properties of Soil Stabilizers (Non-Traffic Areas)

| Chemicals | Plant Material Based (Short Lived) | Plant Material Based (Long Lived) | Polymeric Emulsion Blends | Cementitious-Based Stabilizers |
|--|------------------------------------|-----------------------------------|--|--|
| Relative Cost | Low | Low | Low | Low |
| Resistance to Leaching | High | High | Low to Moderate | Moderate |
| Resistance to Abrasion | Moderate | Low | Moderate to High | Moderate to High |
| Longevity | Short to Medium | Medium | Medium to Long | Medium |
| Minimum Curing Time before Rain | 9 to 18 hours | 19 to 24 hours | 0 to 24 hours | 4 to 8 hours |
| Compatibility with Existing Vegetation | Good | Poor | Poor | Poor |
| Mode of Degradation | Biodegradable | Biodegradable | Photodegradable/ Chemically Degradable | Photodegradable/ Chemically Degradable |

| | | | | |
|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| Labor Intensive | No | No | No | No |
| Specialized Application Equipment | Water Truck or Hydraulic Mulcher |
| Liquid/Powder | Powder | Liquid | Liquid/Powder | Powder |
| Surface Crusting | Yes, but dissolves on rewetting | Yes | Yes, but dissolves on rewetting | Yes |
| Clean-Up | Water | Water | Water | Water |
| Erosion Control Application Rate | Varies | Varies | Varies | 480 to 1,450 gal/ac |

**Table 5
Properties of Soil Stabilizers (Traffic Areas)**

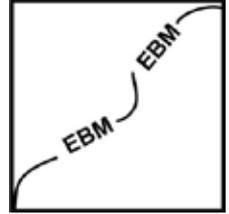
| | | | |
|-----------------------------------|----------------------------------|--|----------------------------------|
| Chemicals | Lignin Sulfonate | Tall Oil Pitch Emulsion | Petroleum Resin Emulsion |
| Relative Cost | Moderate | Moderate | Moderate |
| Resistance to Leaching | Low | High | High |
| Longevity | Medium | Medium to Long | Medium |
| Minimum Curing Time Before Rain | 24 hours + | 30-60 min (prime coat) 8-24 hrs (mixed into base) | 0-4 hours |
| Mode of Degradation | Biodegradable | Biodegradable | Photo/Chemically Degradable |
| Labor Intensive | No | No | No |
| Specialized Application Equipment | Water Truck or Hydraulic Mulcher | Water Truck or Hydraulic Mulcher | Water Truck or Hydraulic Mulcher |



| | | | |
|------------------|---------------------------------|------------------------|------------------------|
| Surface Crusting | Yes, but dissolves on rewetting | Yes | Yes |
| Clean-up | Water | Water, before it dries | Water, before it cures |

SS-7 Geotextiles, Mats, Plastic Covers, and Erosion Control Blankets

Geotextiles, mats, plastic covers and erosion control blankets are used to temporarily stabilize disturbed soil areas and protect soils from erosion by wind or water.



Geotextiles, mats, plastic covers, or erosion control blankets are applied to:

- Steep slopes, generally steeper than 3:1.
- Slopes with loose soils or non-cohesive sandy and/or silty material.
- Slopes and disturbed soils where mulch must be anchored.
- Disturbed areas where plants are slow to develop.
- Channels with flows exceeding 3.3 ft/s.
- Channels to be vegetated.
- Stockpiles.
- Slopes adjacent to water bodies of environmentally sensitive areas.

Limitations:

- Blankets and mats are the most expensive of covers. Limit their application to areas inaccessible to hydraulic equipment, or where other measures are not applicable, such as channels.
- Blankets and mats are not suitable for excessively rocky sites or areas where the final vegetation will be mowed.
- Dispose plastic sheeting in a landfill.
- Non-degradable fabrics must be removed when permanent stabilization measures are ready to be installed.
- Plastic results in 100 percent runoff; may cause serious erosion in the areas receiving the increased flow.
- Limit plastic covers to stockpiles or very small graded areas for short periods.
- Geotextiles, mats, plastic covers, and blankets have maximum flow rate limitations.

Installation:

Geotextiles

- Secured in place with wire staples or sandbags and key into tops of slopes and edges to prevent infiltration of surface waters under geotextile.
- Reuse geotextiles if they are suitable for the use intended and approved by the RE.

Plastic Covers

- Plastic sheeting shall have a minimum 6 mil thickness.
- Keyed in sheeting at the top of slope and firmly hold in place with sandbags or other weights placed no more than 10 ft. apart.
- Seams are taped or weighted down their entire length with a 12 to 24 in. overlap of all seams.
- Edges shall be embedded a minimum of 6 in. in soil.

Erosion Control Blankets/Mats

- Biodegradable rolled erosion control products (RECPs).
 - Jute is a natural fiber in a biodegradable mesh secured to the soil with U-shaped staples or stakes.
 - Excelsior (curled wood fiber) blanket is a mat supplied in rolled strips a minimum of 48 in. wide secured in place with wire staples.
 - Straw blanket is a mat with netting supplied in rolled strips a minimum of 6.5 ft. wide and 82 ft. long secured in place with wire staples.
 - Wood fiber blanket with netting is supplied in rolled strip and secured to the ground with U-shaped staples or stakes.
 - Coconut fiber blanket with netting is supplied in rolled strips a minimum of 6.5 ft. wide and 82 ft. long secured in place with wire staples.
 - Coconut fiber mesh is a yarn woven into a mat supplied in rolled strips and secured to the soil with U-shaped staples or stakes.

-
- Straw coconut fiber blanket with netting is supplied in rolled strips a minimum of 6.5 ft. wide and 82 ft. long secured in place with wire staples.
 - Non-biodegradable RECPs.
 - Plastic netting is used to secure loose mulch and is supplied in rolled strips secured with U-shaped staples or stakes.
 - Plastic mesh is used with re-vegetation or to secure loose mulch and is supplied in rolled strips secured with U-shaped staples.
 - Synthetic fiber with netting is a mat used with revegetation and is supplied in rolled strips secured with U-shaped staples or stakes.
 - Bonded synthetic fibers is a geomatrix nylon matting installed over prepared soil followed by seeding into the mat. The material is supplied in rolled strips secured with U-shaped staples or stakes.
 - Combination synthetic and biodegradable RECPs consist of biodegradable fibers with a heavy polypropylene net. The material is supplied in rolled strips secured with U-shaped staples or stakes.

Site Preparation:

- Grade and shape the installation area.
- Remove all rocks, clods, vegetation or other obstructions so that the blankets or mats have complete and direct contact with the soil.
- Prepare seedbed by loosening 2 in. to 3 in. of topsoil. Follow the manufacturer's guidelines for seedbed preparation, seed application, and/or planting for fabric or mat designed for use with seeding or re-vegetation.

Seeding:

- Seed the area before blanket installation for erosion control and revegetation.

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

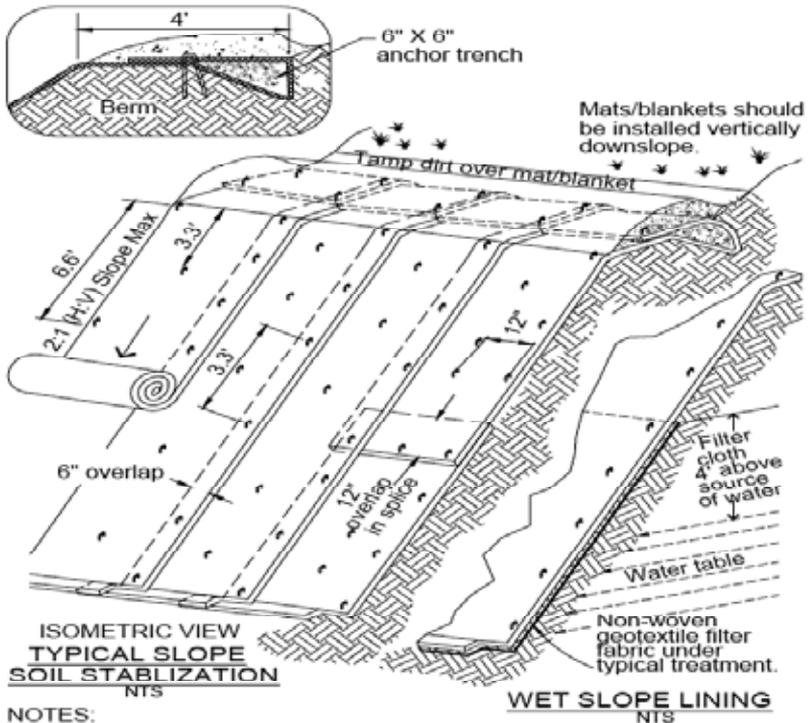
Anchoring:

- U-shaped wire staples, metal geotextile stake pins or triangular wooden stakes can be used to anchor mats and blankets to the ground surface.
- Staples shall be made of 0.12 in. steel wire and shall be U-shaped with 8 in. legs and 2 in. crown. Wire staples shall be a minimum of 11 gauge.
- Metal stake pins shall be 0.188 in. diameter steel with a 1.5 in. steel washer at the head of the pin.
- Wire staples and metal stakes shall be driven flush to the soil surface.
- Anchors shall be a minimum of 6 in. long and have sufficient penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes:

- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 6 in. and staple every 3 ft.
- When blankets must be spliced, place blankets end over end (shingle style) with 6 in. overlap. Staple through overlapped area approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil. Do not stretch.
- Staple blankets to maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes (1:1 to 2:1) - minimum of 2 staples/yd². Moderate slopes (2:1 to 3:1) - minimum of 1½ staples/yd², placing 1 staple/yd² on centers. Gentle slopes - minimum of 1 staple/yd².

Installation on Slopes:



NOTES:

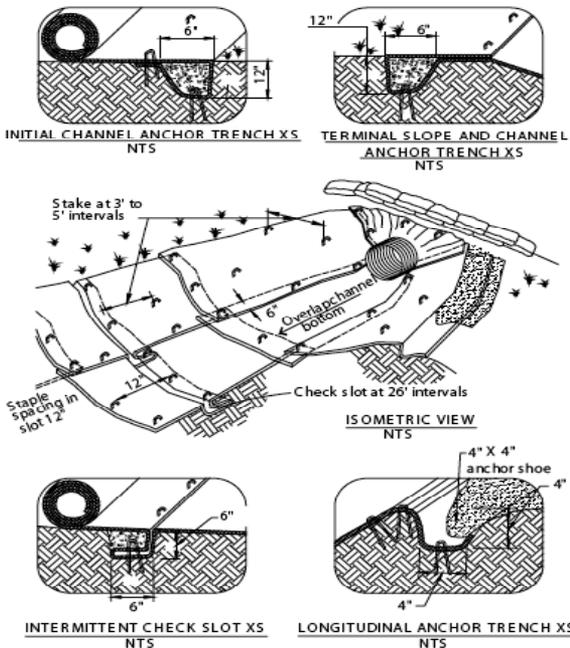
1. Slope surface shall be free of rocks, clods, sticks and grass. Mats/blankets shall have good soil contact.
 2. Lay blankets loosely and stake or staple to maintain direct contact with the soil. Do not stretch.
 3. Install per manufacturer's recommendations
- Begin at the top of the slope and anchor the blanket in a 6 in. deep by 6 in. wide trench. Backfill trench and tamp earth firmly.
 - Unroll blanket down slope in the direction of water flow.

Installation in Channels:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 to 30 ft. intervals.
- Cut longitudinal channel anchor slots 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible extend matting 2 in. to 3 in. above the crest of the channel side slopes.

- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12 in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 6 in.
- Secure these initial ends of mats with anchors at 12 in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench. Unroll adjacent mats upstream in similar fashion, maintaining a 6 in. overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12 in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.

Installation in Channels:



NOTES:

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

-
- Alternate method for non-critical installations: Place two rows of anchors on 6 in. centers at 25 ft. to 30 ft. intervals in lieu of excavated check slots.
 - Shingle lap ends by overlapping uphill fabric on top of downhill fabric a minimum of 12 in. to prevent water from flowing underneath fabric at splice locations.
 - Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soil.
 - Anchor, fill and compact upstream end of mat in a 6 in. by 12 in. terminal trench.
 - Secure mat to ground surface using U-shaped wire staples, geotextile pins, or wooden stakes.
 - Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement):

- Do not drive tracked or heavy equipment over mat.
- Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes or brooms for fine grading and touch up.
- Smooth out soil filling; just exposing top netting of mat.

Blanket Removal:

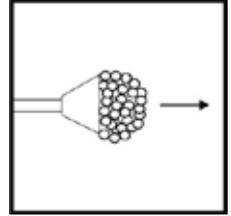
- When no longer required for work, remove non-degradable temporary blankets from the site and dispose.

Inspection:

- Inspect blankets and mats periodically after installation.
- Inspect after installation and after significant rainstorms to check for erosion, undermining, and anchorage failure. Any failures shall be repaired immediately.

SS-10 Outlet Protection/Velocity Dissipation Devices

Outlet protection/velocity dissipation devices are placed at pipe outlets to prevent scour and reduce the velocity and energy of exiting storm water flows. Riprap is the most common energy dissipater.



Outlet protection/velocity dissipation devices are designed for:

- Outlets of pipes, drains, culverts, slope drains, diversion ditches, swales, conveyances or channels.
- Outlets located at the bottom of mild to steep slopes.
- Discharge outlets that carry continuous flows of water.
- Outlets subject to short, intense flows of water, such as flash floods.
- Points where lined conveyances discharge to unlined conveyances.

Limitations:

- Riprap may washout during high flows unless designed properly.

Installation:

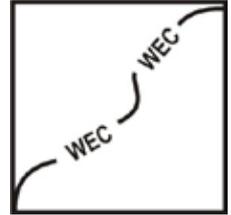
- Riprap aprons are best suited for temporary use during construction.
- Place riprap to avoid damaging the filter fabric.
- For proper operation of apron:
 - Align apron with receiving stream and keep straight throughout its length. If a curve is needed, place it in upper section of apron.
 - Protect the underlying erosion control fabric with the corresponding class of riprap bedding.
- Outlets on slopes steeper than 10 percent shall have additional protection.
- Construct per Standard Drawing R-3.1.4, Riprap Apron.

Inspection:

- Inspect temporary measures prior to the rainy season, after rainfall events, and weekly during the rainy season.
- Inspect for scour beneath the riprap and around the outlet. Repair damage to slopes or underlying erosion control fabric.
- Temporary devices shall be completely removed after the surrounding drainage area is stabilized or at completion of construction.

SS-13 Wind Erosion Control

Dust or wind erosion control consists of applying water, soil stabilizers, dust palliatives, or other soil stabilization BMPs to prevent dust nuisance.



Wind Erosion Control is implemented:

- On all exposed soils subject to wind erosion.

Limitations:

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

Installation:

- Water shall be applied by means of pressure-type distributors or pipelines equipped with a spray system or hoses and nozzles that will ensure even distribution.
- All distribution equipment shall be equipped with a positive means of shutoff.
- Unless water is applied by means of pipelines, at least one mobile unit shall be available at all times to apply water or dust palliative to the project.
- Sources and discharge use of reclaimed wastewater must meet NDEP requirements.
- There shall be no connection between potable and non-potable supplies, tanks, or drainpipes.
- Non-potable tanks, pipes and conveyances shall be marked "NON-POTABLE WATER - DO NOT DRINK."
- Materials applied as temporary soil stabilizers will also provide wind erosion control benefits.
- Monitoring is only required in Clark County and is performed visually.
- In Clark County, cease construction activity if wind is causing fugitive dust in excess of 20% (Time Average Method) or 50%

opacity (Intermittent Emission Method), or if wind is causing a plume of 100 yards or more.

- In Clark County, contractor must document and retain records of dust palliatives used on the Dust Control Permit Forms.
- In Clark County, dust palliatives are subject to sampling and testing for compliance with the Interim Policy On Dust Palliative Use In Clark County.
- In Washoe County, cease construction activity if dust generation cannot be satisfactorily controlled (i.e., under high wind conditions).

Inspection:

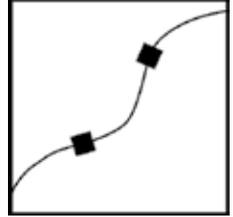
- Check areas protected to ensure coverage.

SC-1 Silt Fence

A silt fence is a temporary linear sediment barrier.

Silt Fences are placed:

- Below the toe of exposed and erodible slopes.
- Along slope contours for longer slope lengths.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Along streams and channels.



Limitations:

- Not effective unless trenched and keyed in.
- The maximum length of slope draining to any point along the silt fence shall be 200 ft.
- Slope of area draining to fence shall be less than 1:1.
- Limit to locations suitable for temporary ponding or deposition of sediment.
- Silt fences shall not be used in concentrated flow areas.
- Must be maintained by removing sediment accumulations and repairing damaged areas.

Installation:

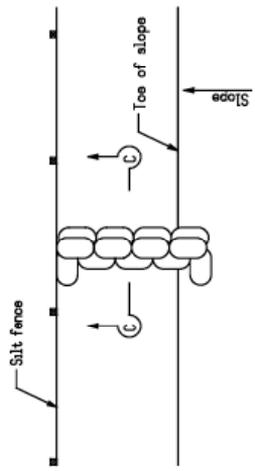
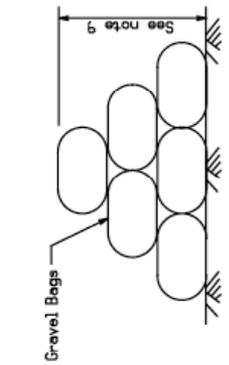
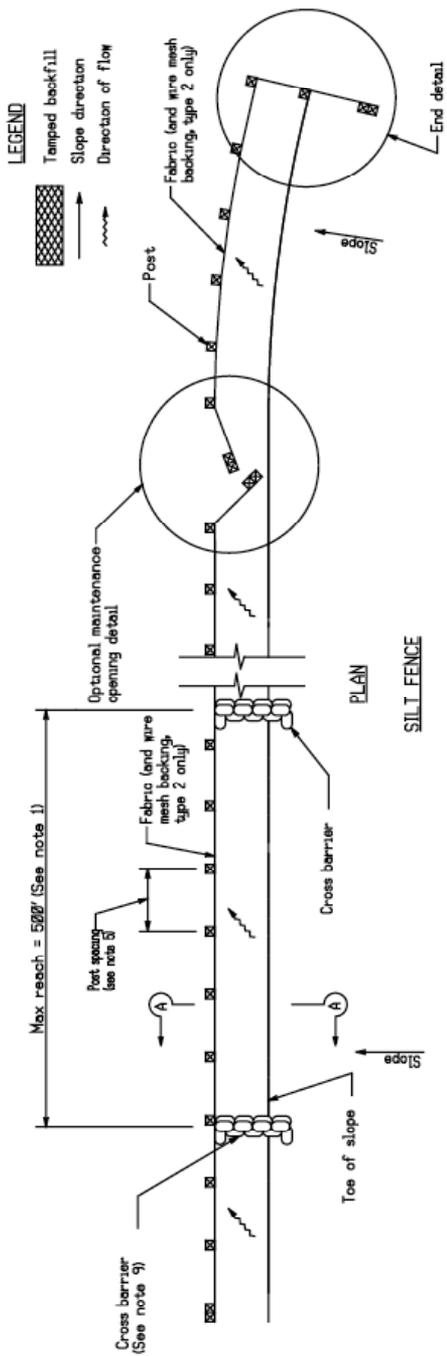
- Silt fences shall be used in conjunction with soil stabilization source controls, and have at least a 10 ft. setback from the toe of slope.
- Excavation of the trenches shall be performed immediately before installation of the fence (see illustrations for more guidelines).
- Type 1 silt fence shall be constructed of silt fence fabric and wood posts spaced at 6', and is intended for 2-week or shorter duration activities in low wind areas.
- Type 2 silt fence shall be constructed of wire backed silt fence fabric and steel T-posts spaced at 8', and is better suited for longer duration activities and wind prone areas.

Inspection:

- Inspect for undercut, split, torn, slumping or weathered fabric and sediment accumulation (remove when accumulation reaches $\frac{1}{3}$ the fence height).
- Inspect prior to and after rainfall events.

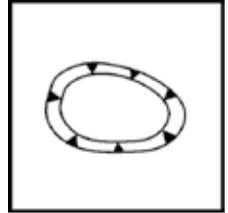
Notes for Details:

1. Construct length of each reach so that the change in base elevation along the reach does not exceed $\frac{1}{3}$ the height of the silt fence, in no case shall the reach exceed 500'.
2. The end of the silt fence shall be turned up slope (see end detail).
3. Post dimensions are nominal.
4. Dimension may vary to fit field conditions.
5. Posts shall be spaced at 6' maximum for Type 1, and 8' maximum for Type 2, and shall be positioned on downstream side of fence.
6. Posts to overlap and fence fabric to fold around each post one full turn. Secure fabric to post with 4 staples or wire rings.
7. Posts shall be driven tightly together to prevent potential flow-through of sediment at joint. The tops of the posts shall be secured with wire.
8. For end post, fence fabric shall be folded around two posts one full turn and secured with 4 staples or wire rings.
9. Cross barriers shall be 9"-12" in height.
10. Construct maintenance openings such that sediment remains behind fence.
11. Joining sections shall not be placed at sump locations.
12. Gravel bag rows and layers shall be offset to eliminate gaps (see SC-6).



SC-2 Sediment Basin

A sediment basin is a temporary basin formed by excavation or constructing an embankment for sediment to settle out before the runoff is discharged.



Sediment basins are placed:

- Where sediment-laden water may enter the drainage system or watercourses.
- At outlets of disturbed soil areas with areas between 5 and 10 acres.
- In the Lake Tahoe Basin as needed to retain and treat the 20-year, 1-hour storm.

Limitations:

- Requires large surface areas to settle sediment.
- Recommended for a 5-10 acre drainage area with a maximum of 75 acres.
- Multiple basins necessary for drainage areas greater than 75 acres.
- Not to be located in live streams.
- Size may be limited by availability of right-of-way.

Installation:

- Divert runoff from undisturbed areas away from the sediment basin.
- Sediment basins shall be designed to 3,600 ft³ of storage capacity per acre of contributory area.
- Sediment basins should be used in combination with soil stabilization controls.
- The length of the basin shall be more than twice the width of the basin and can be between 3 ft. and 5 ft. deep.
- Basins with an impounding levee greater than 5 ft. tall or impounding more than 36,000 ft³ shall be designed by a Nevada registered engineer.
- A Nevada Division of Water Resources permit is required to

construct, reconstruct, or alter a dam with a crest height 20 feet or higher or impounds 20 acre-feet or more.

- Include a spillway for overflow or bypass flows exceeding the design storm event of a 20-year, 1-hour event for Lake Tahoe Basin. For the remainder of Nevada, use a 2-year, 24-hour event.
- Design basin to drain within 72 hours following storm events to control mosquito breeding. Apply a 7-day maximum dewatering time during summer months (April-September). Basins should have a low flow channel in the bottom so water is concentrated as the basin nears empty.
- The outflow from the sediment basin shall have outlet protection.
- Basin shall be located: (1) by excavating an area or constructing an embankment across a swale, (2) where permanent detention basins will be constructed, (3) where failure would not cause loss of life or property damage, and (4) provides year-round maintenance access.
- Areas under embankments, structural works, and sediment basins must be cleared and stripped of vegetation.
- Basin inlets shall be located to maximize travel distance to the basin outlet.
- Rock or vegetation shall be used to protect the basin inlet and slopes against erosion.
- A forebay constructed at the basin inlet may be used to remove debris and larger particles.
- Outlet shall consist of corrugated metal, high density polyethylene (HDPE), or reinforced concrete riser pipe with dewatering holes with anti-vortex device and trash rack attached to the top of the riser. The outlet shall be designed for storm inflow and placed on a firm, smooth foundation with the base securely anchored.
- Attach riser pipe (watertight connection) to a horizontal pipe (barrel) that extends through the embankment to toe of fill.
- Provide anti-seep collars on the barrel designed to increase the effective length along the outside of the barrel by 10%. Collars should project a minimum of 1.5 ft. radially outward from the outside of the pipe. Ensure that adequate cover is provided for the anti-seep collars. Cleanout level shall be clearly marked on the riser pipe.

-
- Avoid dewatering of groundwater to the sediment basin during the rainy season.
 - Barbed wire shall be provided around each sediment basin.
 - One of the dewatering configurations shown below for the principal outlet may be used:

Outlet #1

- Perforate the top one-third of the riser with 0.5 in. diameter holes spaced 8 in. vertically and 10 in. to 12 in. horizontally.
- Place 0.75 in. gravel over perforated holes to approximately 2 in. minimum thickness. Gravel will naturally settle into a cone surrounding the riser pipe.

Outlet #2

- Perforate the lower one-half of the riser pipe with 0.5 in. diameter holes spaced 3 in. apart in each outside valley (corrugated metal pipe).
- Place 0.75 in. gravel over perforated holes to approximately 2 in. minimum thickness. Gravel will naturally settle into a cone surrounding the riser pipe.

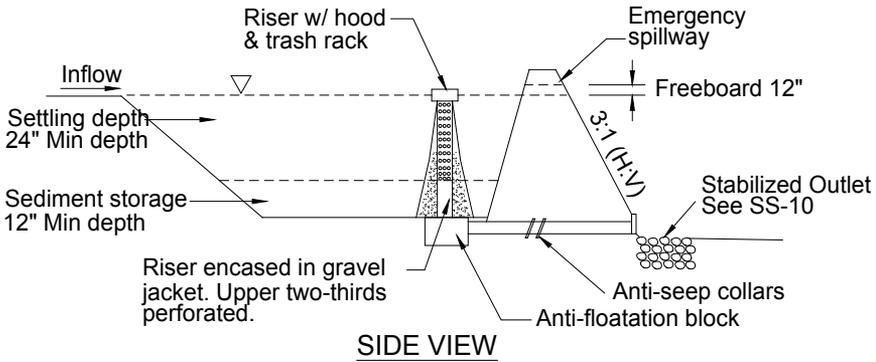
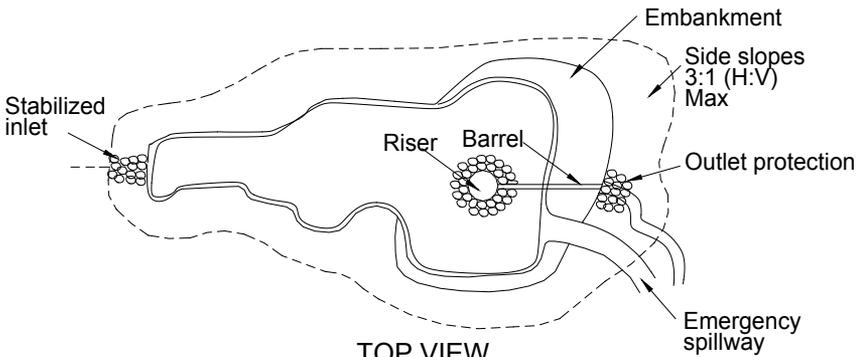
Outlet #3

- Provide two 1 in. diameter holes above the sediment storage volume on opposite sides of the non-perforated riser pipe. This will typically provide sufficient detention time for basins to drain approximately 10 acres.
- Construct an emergency spillway for flows not carried by the principal spillway. Spillway shall consist of an open channel (earthen or vegetated) over undisturbed material (not fill) or constructed of a non-erodible riprap.
- Spillway control section shall be a minimum of 20 ft. in length.
- Use outlet protection at the pipe outlet. See BMP SS-10.

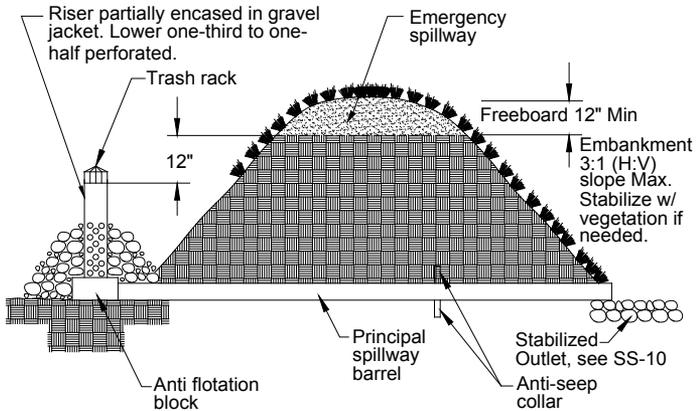
Inspection:

- Inspect prior to and after rainfall events and weekly during the rest of the rainy season. Inspect at least every 24 hours during extended rainfall events.
- Examine basin banks for seepage and structural soundness.
- Check inlet and outlet structures and spillway for any damage or obstructions.
- Check inlet and outlet area for erosion and stabilize if required.
- Sediment must be removed when the design capacity has been reduced by 50%.

- Check fencing for damage.
- If there is potential for dam failure, a competent geotechnical engineer shall design or review embankment details or specifications.
- All design standards/guidelines should match the AASHTO Model Drainage Manual. Exceptions must be approved by Chief Hydraulics Engineer.

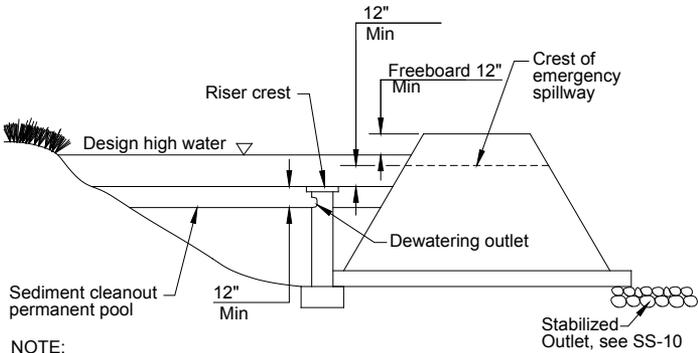


TYPICAL TEMPORARY SEDIMENT BASIN - OUTLET #1
NOT TO SCALE



NOTE:
This outlet provides complete draining of pool.

TYPICAL TEMPORARY SEDIMENT BASIN - OUTLET #2
NOT TO SCALE



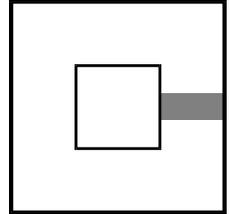
NOTE:
This outlet provides no drainage for permanent pool.

TYPICAL TEMPORARY SEDIMENT BASIN - OUTLET #3
NOT TO SCALE

NOTE:
DIMENSIONS REPRESENT A SIZE RANGE FOR MOST TYPICAL INSTALLATIONS. DESIGNER SHALL VERIFY THAT THE OUTLET IS PROPERLY DESIGNED TO HANDLE THE DESIGN AND PEAK FLOWS.

SC-3 Sediment Trap

A sediment trap is a temporary containment area formed by excavation or constructing an embankment for sediment to settle out before the runoff is discharged.



Sediment traps are placed:

- As a supplemental control to soil stabilization BMPs, sediment traps provide additional protection for a water body or for reducing sediment before it enters a drainage system.

Limitations:

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

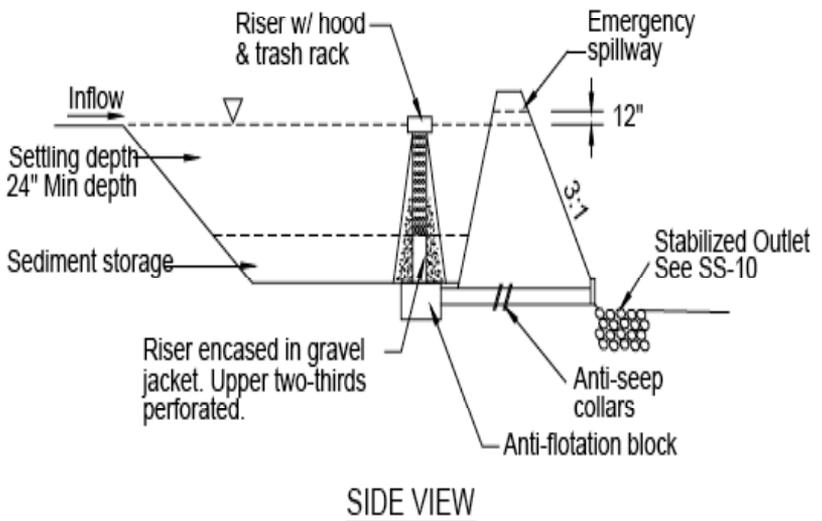
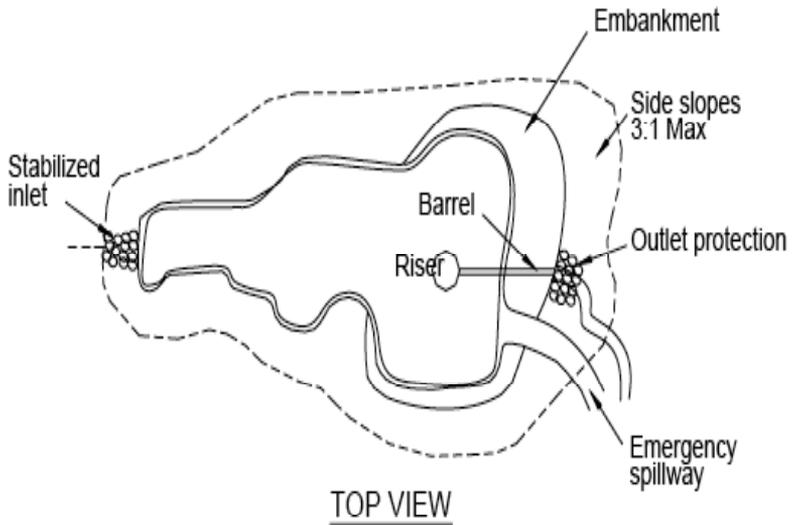
Installation:

- Construct sediment traps prior to rainy season and soil disturbing activities.
- Traps shall be sized with a settling zone and sediment storage zone with the design storm event of 20-year, 1-hour event for Lake Tahoe Basin. For the remainder of Nevada, use a 2-year, 24-hour event.
- The minimum recommended volumes for settling and sediment storage are 67 yd³/acre and 33 yd³/acre of contributing drainage area, respectively. These minimum volumes are based on 0.5 in. over a 24-hr period.
- Multiple traps and/or additional volume may be required to accommodate site-specific rainfall and soil conditions.

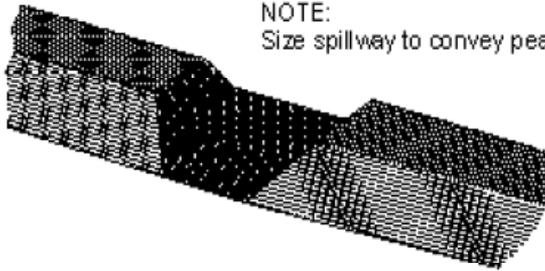
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- Basins with an impounding levee greater than 5 ft. tall or impounding more than 36,000 ft³ shall be designed by a Nevada registered engineer.
 - The design shall include maintenance requirements, including sediment and vegetation removal, to ensure continuous function of the trap outlet and bypass structures.
 - Areas under embankments, structural works, and sediment basin must be cleared and stripped of vegetation.
 - Use rock or vegetation to protect the trap outlets against erosion.
 - Fencing shall be provided to prevent unauthorized entry.

Inspection:

- Inspect prior to and after rainfall events and weekly during the rest of the rainy season. Inspect at least every 24 hours during extended rainfall events.
- If captured runoff has not completely infiltrated within 72 hours, the sediment trap should be dewatered to control mosquito breeding. Apply a 7-day maximum dewatering time during summer months (April-September). Basins should also have a low flow channel in the bottom so water is concentrated rather than spread.
- Inspect trap banks for seepage and structural soundness.
- Inspect outlet structure and spillway for any damage or obstructions.
- Inspect outlet area for erosion and stabilize if required.
- Properly dispose of sediment and debris removed from the trap.
- Sediment must be removed when the design capacity has been reduced by 50%.
- Check fencing for damage.

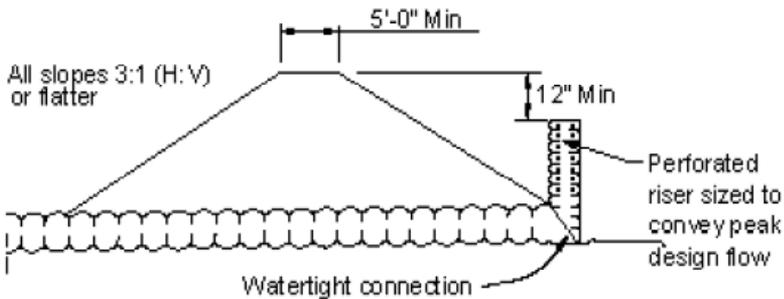
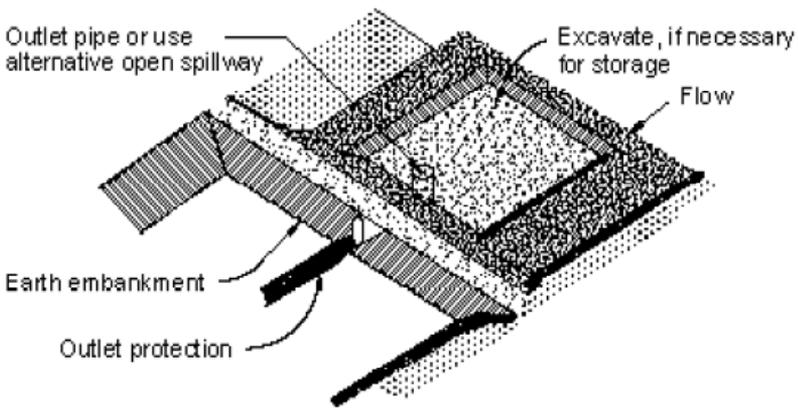


TYPICAL SEDIMENT TRAP
NOT TO SCALE



NOTE:
Size spillway to convey peak design flow.

TYPICAL OPEN SPILLWAY

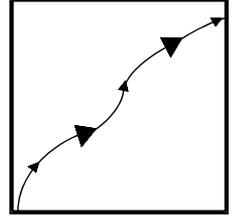


EMBANKMENT SECTION THRU RISER

TYPICAL SEDIMENT TRAP
NOT TO SCALE

SC-4 Check Dam

A check dam is a device constructed of rock, gravel bags, sediment logs, or reusable products placed across a natural or man-made channel or drainage ditch.



Check dams are placed:

- In small open channels that drain 10 acres or less.
- In steep channels where storm water runoff velocities exceed 3 ft/s.
- During the establishment of grass linings in drainage ditches or channels.
- In temporary ditches where the short length of service does not warrant establishment of erosion-resistant linings.
- Sediment logs are appropriate for low flow channels. Gravel bags are more appropriate in moderate flow channels.
- This BMP may be implemented with other BMPs.

Limitations:

- Not to be used in live streams.
- Not appropriate in channels that drain areas greater than 10 acres.
- Not to be placed in channels that are already grass lined unless erosion is expected, as installation may damage vegetation.
- Can require extensive maintenance following high velocity flows.
- Promotes sediment trapping which can be re-suspended during subsequent storms or removal of the check dam.
- Not to be constructed from a silt fence.

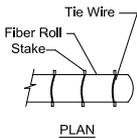
Installation:

- Install the first check dam approximately 16 ft. from the outfall device and at regular intervals.
- Steeper slopes and more erosive soils (e.g., loose sand or silt) will require shorter spacing between check dams.
- Install along a level contour.
- Tightly abut bags and stack according to detail shown in figure. Gravel bags shall not be stacked any higher than 3 ft.

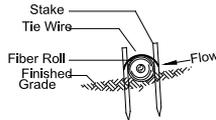
- For permanent or long-term rock check dams (over one year), key stone into the channel banks and extend it beyond the abutments a minimum of 18 in. to prevent flow around the dam.

Inspection:

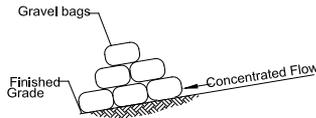
- Inspect check dams after each significant rainfall event. Repair damage as needed.
- Remove sediments when depth reaches 50% of the check dam height.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.
- Accumulated sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way.



PLAN



ELEVATION



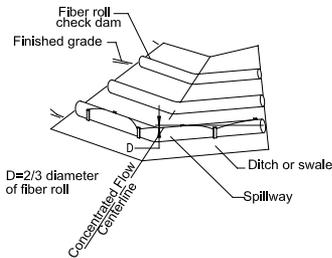
SECTION

STACKING AND LASHING DETAIL

TEMPORARY CHECK DAM (TYPE 2)

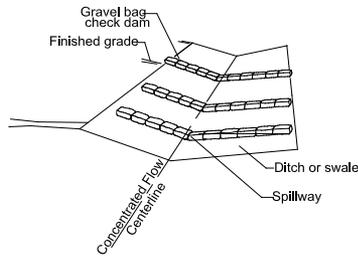
NOTE

Spillway depth "d" shall be maintained by removing accumulated sediment.



PERSPECTIVE

TEMPORARY CHECK DAM (TYPE I)



PERSPECTIVE

TEMPORARY CHECK DAM (TYPE II)

SC-5 Sediment Logs

A sediment log is placed on the toe and face of slopes to intercept runoff and reduce its flow velocity.



Sediment Logs are placed:

- Along the toe, top, face, and at grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.
- Below the toe of exposed and erodible slopes.
- May be used as check dams in unlined ditches.
- Down-slope of exposed soil areas.
- Around temporary stockpiles.
- Shall not be used for inlet protection.

Limitations:

- Runoff and erosion may occur if sediment log is not adequately trenched in.
- Sediment logs at the toe of slopes greater than 2:1 shall be a minimum of 20-in. diameter or installations achieving the same protection (e.g., properly secured stacked smaller diameter sediment logs, etc.).
- Difficult to move once saturated.
- Sediment logs have limited sediment capture zone.
- Do not use sediment logs on slopes subject to creep, slumping, or landslide.

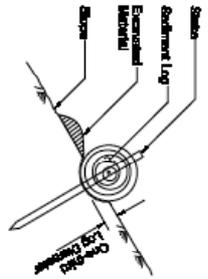
Installation:

- Slope inclination of 4:1 or flatter: sediment logs shall be placed on slopes 20 ft. apart.
- Slope inclination of 4:1 to 1:2: sediment logs shall be placed on slopes 15 ft. apart.
- Slope inclination 2:1 or greater: sediment logs shall be placed on slopes 10 ft. apart.
- Key-in sediment logs into the ground a minimum of one-third of their diameter.

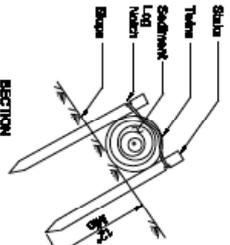
-
- Anchor sediment logs with stakes at the ends and spaced 4 ft. maximum on center.
 - Use wood stakes with a nominal classification of 3/4 by 3/4 in. (Type 1), or 1 by 2 in. (Type 2), and minimum length of 24 in.
 - If more than one sediment log is placed in a row, the logs shall be overlapped, not abutted.
 - Sediment logs are typically left in place.
 - If sediment logs are removed, collect and dispose of sediment accumulation, and fill and compact holes, trenches, depressions or any other ground disturbance to blend with adjacent ground.

Inspection:

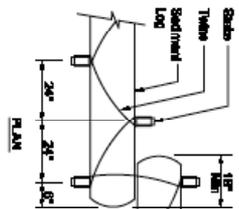
- Repair or replace split, torn, unraveling, or slumping sediment logs.
- Inspect sediment logs when rain is forecast, following rainfall events and at least daily during prolonged rainfall.
- Maintain sediment logs to provide an adequate sediment holding capacity.
- Sediment shall be removed when the sediment accumulation reaches 3/4 of the barrier height. Removed sediment shall be incorporated in the project or disposed of outside the highway right-of-way.



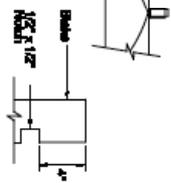
SECTION
TEMPORARY SEDIMENT LOG
(TYPE 1)



SECTION
TEMPORARY SEDIMENT LOG
(TYPE 2)



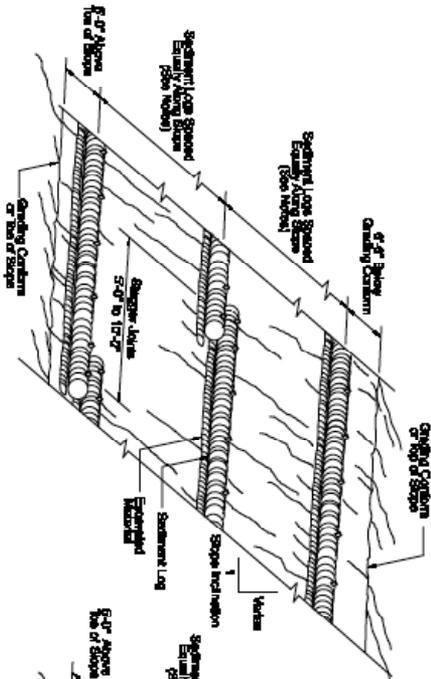
PLAN



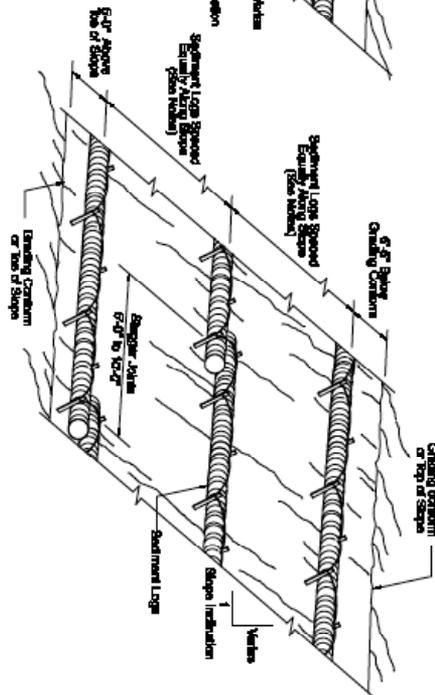
ELEVATION

STAKE NOTCH DETAIL

- NOTE**
1. Temporary sediment log spacing will depend on project specific conditions.
 2. Installation should be in the perpendicular to the slope (maximum of 1:1) and dependent.



PERSPECTIVE
TEMPORARY SEDIMENT LOG (TYPE 1)



PERSPECTIVE
TEMPORARY SEDIMENT LOG (TYPE 2)

SC-6 Gravel Bag Berm

A gravel bag berm forms a barrier across a slope to intercept runoff, reduce its flow velocity, release the runoff as sheet flow, and provide some sediment removal.

Gravel bag berms are used:

- Along the perimeter of a site.
- Along streams and channels.
- Below the toe of exposed and erodible slopes.
- Down slope of exposed soil areas.
- Around stockpiles.
- Where flows are moderately concentrated, such as ditches, swales, and storm drain inlets.
- Across channels as check dams or diversions.
- Parallel to a roadway to keep sediment off paved areas.
- At the top of slopes to divert runoff away from disturbed slopes.
- To divert or direct flow or create a temporary sediment basin.
- At grade breaks of exposed and erodible slopes to shorten slope length and spread runoff as sheet flow.

Limitations:

- Degraded gravel bags may rupture when removed.
- Installation can be labor intensive.
- Burlap bags have limited durability for long-term projects.
- When used to detain concentrated flows, maintenance requirements increase.

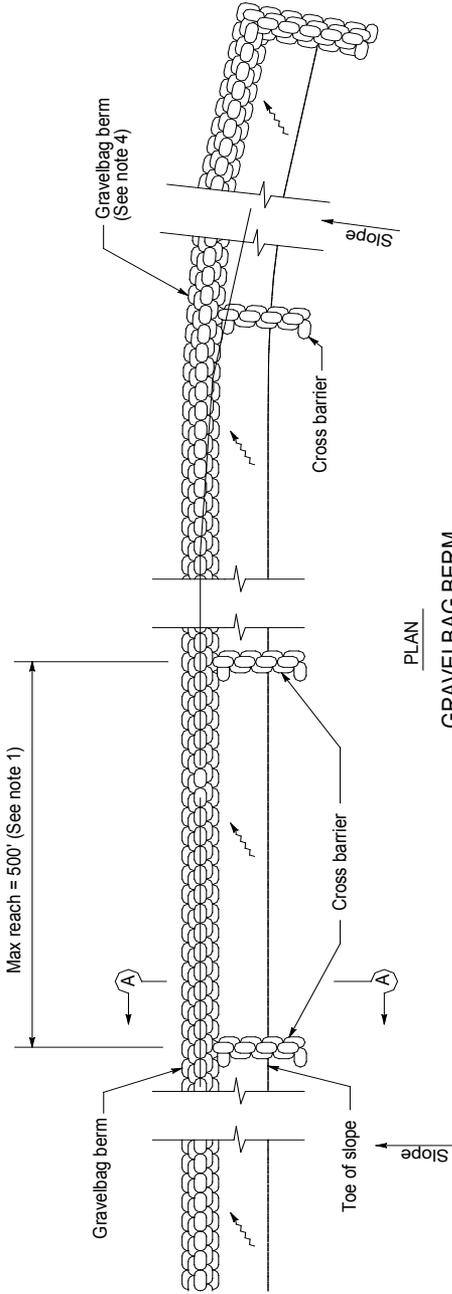
Installation:

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

-
- When used for concentrated flows:
 - Stack gravel bags to a maximum height of 3 ft. and maximum side slopes of 1:1, using a pyramid approach.
 - Upper rows of gravel bags shall overlap joints in lower rows.
 - Construct gravel bag barriers with a setback of at least 3 ft. from the toe of a slope.
 - Trenching or keying-in of bags is not necessary.

Inspection:

- Inspect prior to and after each rainfall event, and weekly throughout the rainy season.
- Remove sediments when accumulation reaches one-third of the berm height.
- Removed sediment shall be incorporated in the project at locations designated by the RE or disposed of outside the highway right-of-way.
- Remove gravel bag berm when no longer needed. Remove sediment accumulation, and clean, regrade, and stabilize the area.



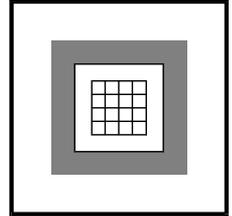
PLAN
GRAVELBAG BERM

NOTES

1. Construct the length of each reach so that the change in base elevation along the reach does not exceed $1/2$ the height of the linear barrier. In no case shall the reach length exceed 500'.
2. Place gravelbags tightly.
3. Dimension may vary to fit field condition.
4. Gravelbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a min of $1/2$ and a max of $2/3$ the height of the linear barrier.
7. Gravelbag rows and layers shall be staggered to eliminate gaps.

SC-8 Storm Drain Inlet Protection

Storm drain inlet protection devices settle and filter sediment prior to discharge into storm water drainage systems or watercourses.



Storm drain inlet protection is used:

- Where sediment laden surface runoff may enter an inlet.
- Where disturbed drainage areas have not yet been permanently stabilized.
- Where the drainage area is 1 acre or less.

Limitations:

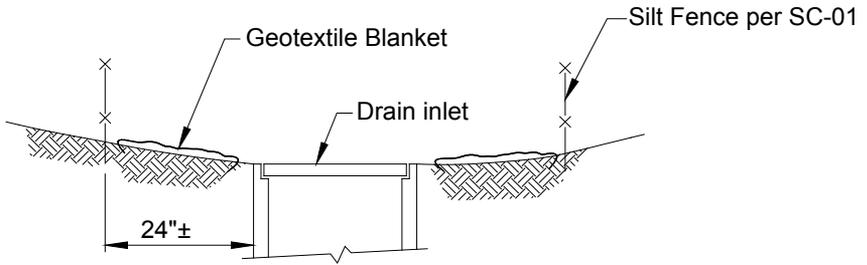
- Requires an adequate area without encroaching upon the traveled portion of the highway.
- Shoulders and paved portions of active highways utilizing inlet protection structures must be closed off from traffic to prevent vehicle accidents.
- May require other temporary BMPs.
- Sediment removal may be difficult in high flow conditions or if runoff is heavily sediment laden.
- Frequent maintenance is required.
- For drainage areas larger than 1 acre, runoff shall be routed to a sediment-trapping device designed for larger flows.
- Filter fabric fence inlet protection appropriate in open areas is subject to sheet flow and for flows not exceeding 0.5 ft³/s.
- Gravel bag barriers for inlet protection are applicable when sheet flows or concentrated flows exceed 0.5 ft³/s, and it is necessary to allow for overtopping to prevent flooding.
- Sediment logs shall not be used as inlet protection.
- Foam barriers shall be properly anchored to surface.
- Excavated drop inlet sediment traps are appropriate where relatively heavy flows are expected and overflow capability is needed.

Installation:

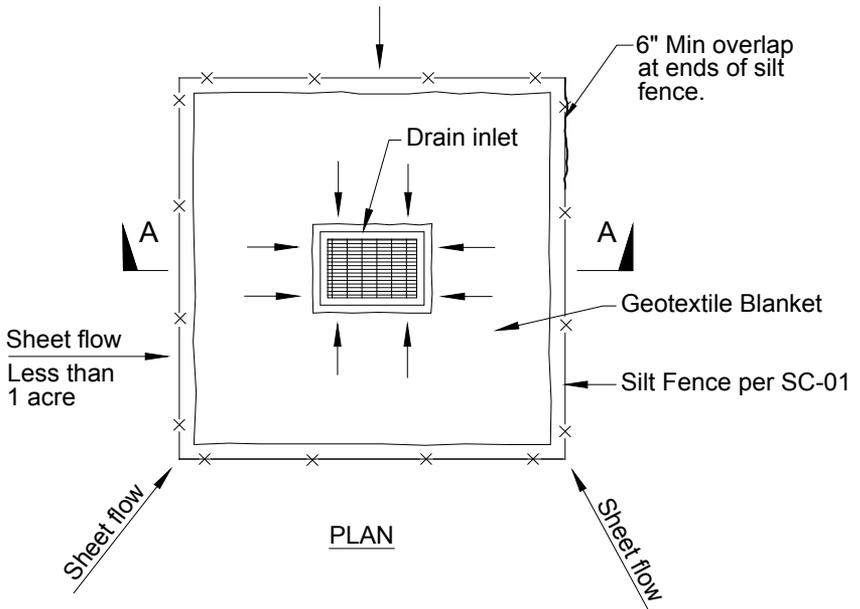
- DI Protection Type 1 - Filter Fabric Fence. Do not place filter fabric underneath the inlet grate. This protection will only work if the inlet is surrounded by unpaved surface.
- DI Protection Type 2 - Excavated Drop Inlet Sediment Trap. Size excavated trap to provide a minimum storage capacity calculated at the rate of 67 yd³/acre of drainage area. This protection will only work if the inlet is surrounded by unpaved surface.
- DI Protection Type 3 - Gravel Bag Barrier. Flow from a severe storm shall not overtop the curb. In areas of high clay and silts, wrap or line the gravel bag structure with silt fence fabric and then cover with gravel to create additional filtering.

Inspection:

- Inspect prior to and after every rainfall event and weekly during the rest of the rainy season. During extended rainfall events, inspect at least once every 24 hours.
- Inspect after severe storms in the rainy season to check for bypassed material.
- Remove all inlet protection devices within 30 days after the site is stabilized, or when the inlet protection is no longer needed.
- Bring the disturbed area to final grade and smooth and compact it. Stabilize all bare areas around the inlet.
- Remove the sediment behind the barrier when it reaches one-third the barrier height for Types 1 and 3.
- Remove sediment from basin when the volume of the basin has been reduced by one-half for Type 2 barrier.



SECTION A-A

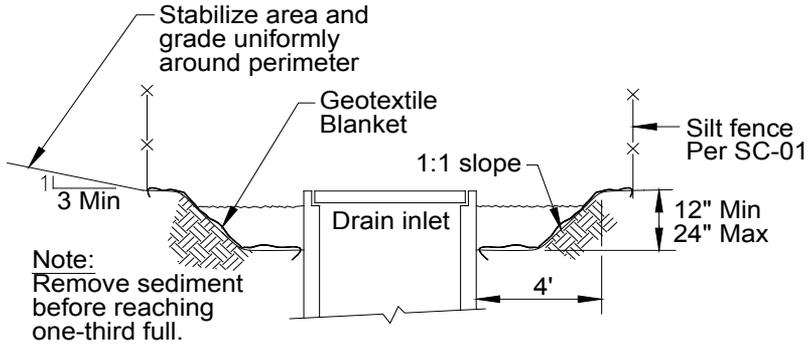


PLAN

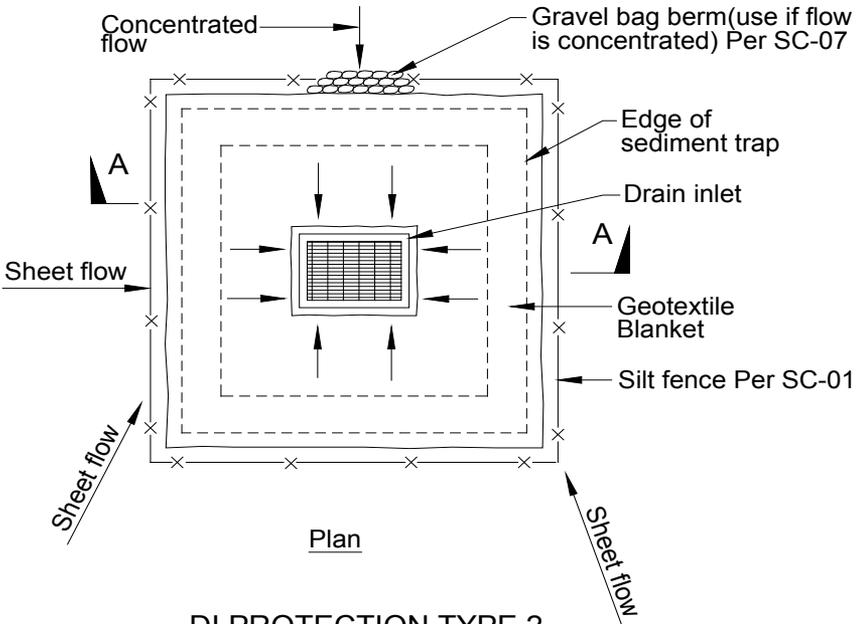
DI PROTECTION TYPE 1
NOT TO SCALE

NOTES:

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



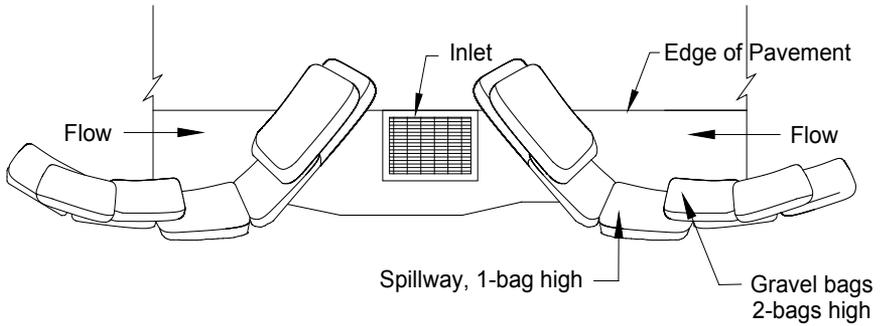
Section A-A



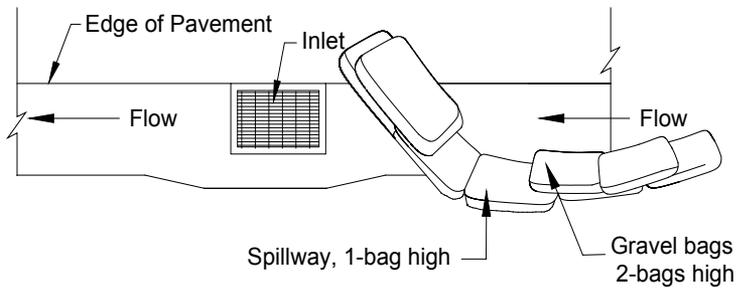
DI PROTECTION TYPE 2
NOT TO SCALE

Notes

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



TYPICAL PROTECTION FOR INLET ON SUMP



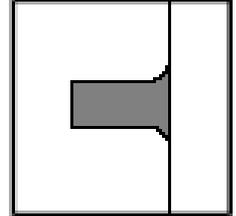
TYPICAL PROTECTION FOR INLET ON GRADE

NOTES:

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

TC-1 Stabilized Construction Approaches

A stabilized construction approach is a construction site ingress/egress point that is stabilized to reduce the tracking of mud and dirt onto public roads by construction vehicles.



Stabilized construction approaches are used:

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

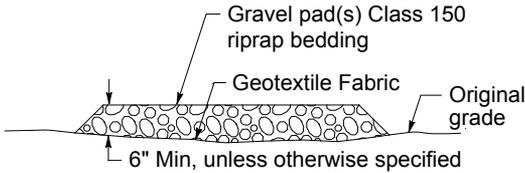
Installation:

- Minimize the points of ingress/egress to the construction site.
- Limit vehicle speeds to 15 mph on all unpaved routes and parking areas.
- Grade each construction ingress/egress to prevent runoff from flowing onto paved roads.
- Route runoff from stabilized ingress/egress points through a sediment-trapping device before discharge.
- Design stabilized ingress/egress points to support the heaviest vehicles and equipment that will use it.
- Install gravel pad(s) about 15 ft. wide by 6 inches deep, and 50 ft. long, or the length of the longest haul truck.
- Use 1 in. rough diameter, clean, well graded gravel and crushed rock.
- Designate combination or single purpose entrances and exits to the construction site.
- Implement sweeping and vacuuming as needed.
- Maintain dust control during working hours and clean trackout from paved surfaces at each work shift/day.
- Install wheel shakers if trackout cannot be controlled with gravel pads. Ribbed or corrugated steel plates must be manufactured to support all expected loads.

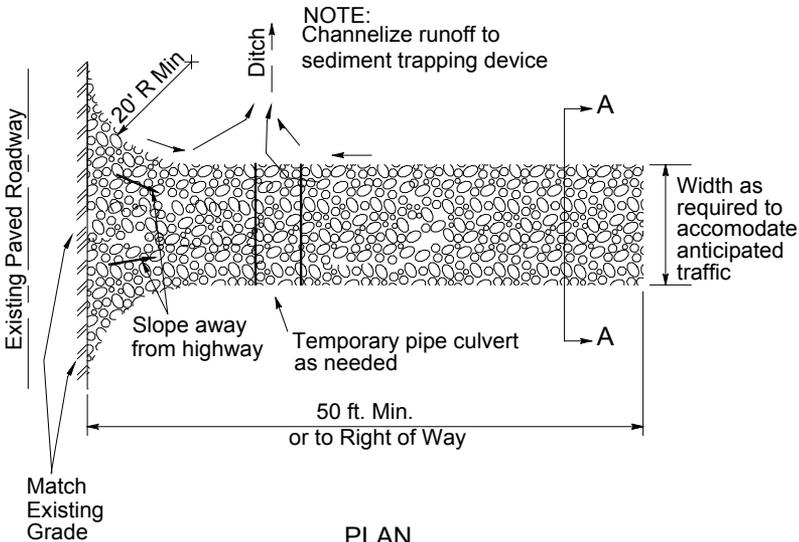
- Install wheel washers if trackout cannot be controlled with gravel pads and wheel shakers.

Inspection:

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

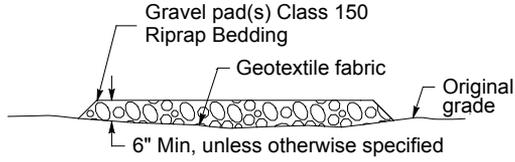


SECTION A-A
 NTS

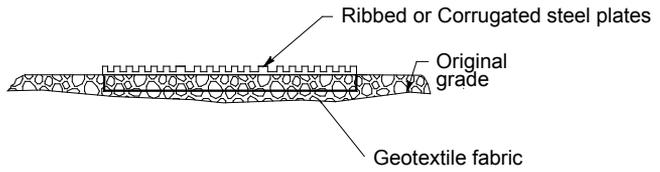


PLAN
 NTS

Stabilized Construction Approach

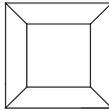


SECTION B-B
NTS

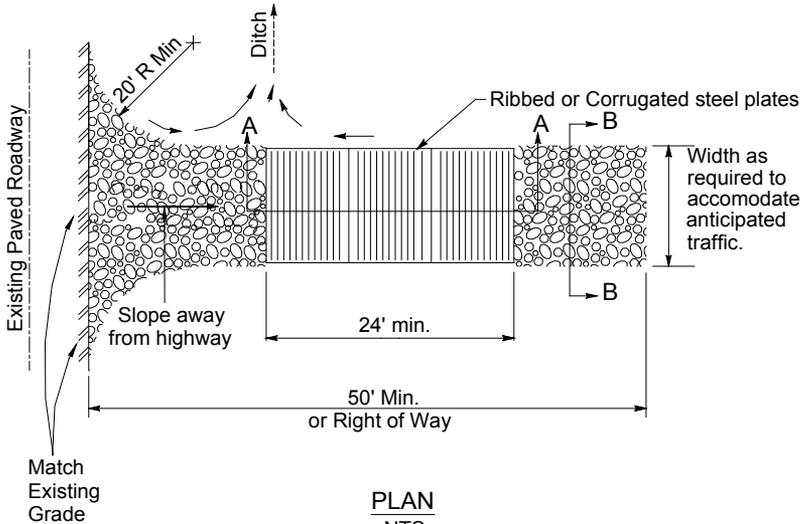


SECTION A-A
NOT TO SCALE

NOTE:
Channelize runoff to
sediment trapping device



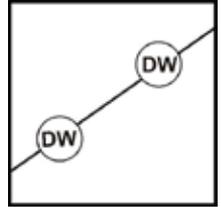
Sediment trapping
device



PLAN
NTS

NS-2 Dewatering Operations

Dewatering Operations are practices that manage pollutants when non-storm water and storm water must be removed from the work site.



Dewatering Operations are used for:

- Discharges of non-storm water and storm water from construction sites
- Groundwater
- Water from cofferdams
- De-watering of piles
- Water diversions

Limitations:

- Dewatering operations for non-storm water may require a separate NPDES Dewatering Permit.
- A dewatering plan shall be submitted as part of the SWPPP and/or Temporary Working in Waterways/Discharge Permit BMP Plan.
- Water containing hazardous substances shall be subject to dewatering pollution controls required by contract documents.
- Dewatering discharges may be used for dust control or discharged by infiltration.
- Sediment control and other appropriate BMPs must be employed for discharge.
- Discharges must comply with regional and watershed-specific discharge requirements.

Category 1 - Constructed Settling Technologies:

Sediment Basin/Sediment Trap

Refer to SC-2 and SC-3 in this BMP Field Manual for a discussion of these methods.

Category 2 - Mobile Settling Technologies:

Weir Tank

A weir tank separates water and waste by using weirs.

Installation:

- Tanks are delivered to the site by the vendor.
- Tank size will depend on flow volume, constituents of concern, and residency period required. Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Dewatering Tank

A dewatering tank removes debris and sediment through a fabric filter that separates the solids from the liquids.

Installation:

- Tanks are delivered to the site by the vendor.
- Tank size will depend on flow volume, constituents of concern, and residency period required.
- Periodic cleaning is required based on visual inspection or reduced flow.
- Oil and grease disposal must be by licensed waste disposal company.

Category 3 - Basic Filtration Technologies:

Gravity Bag Filter

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

Installation:

- Water is pumped into one side of the bag and seeps through the bottom and sides of the bag.
- A secondary barrier, such as a rock filter bed barrier, is placed beneath and beyond the edges of the bag to capture sediments that escape the bag.
- Inspect the flow conditions, bag condition, bag capacity, and the secondary barrier.
- Replace the bag when it no longer filters sediment or passes water at a reasonable rate.

Category 4 - Advanced Filtration Technologies:

Sand Media Particulate Filter

Water is treated by passing it through canisters filled with sand media.

Installation:

- Sand filters provide a final level of treatment.
- Sand filters can be used for standalone treatment or in conjunction with bag and cartridge filtration if further treatment is necessary.
- Sand filters can also be used to provide additional treatment to water treated via settling or basic filtration.
- The filters require delivery to the site and initial set up.
- The filters require monthly service to monitor and maintain the level of the sand media.

Pressurized Bag Filter

A pressurized bag filter is a unit composed of single filter bags made from polyester felt material.

Installation:

- The filters require delivery to the site and initial set up.
- The filter bags require replacement when the pressure differential exceeds the manufacturer's recommendation.

Cartridge Filter

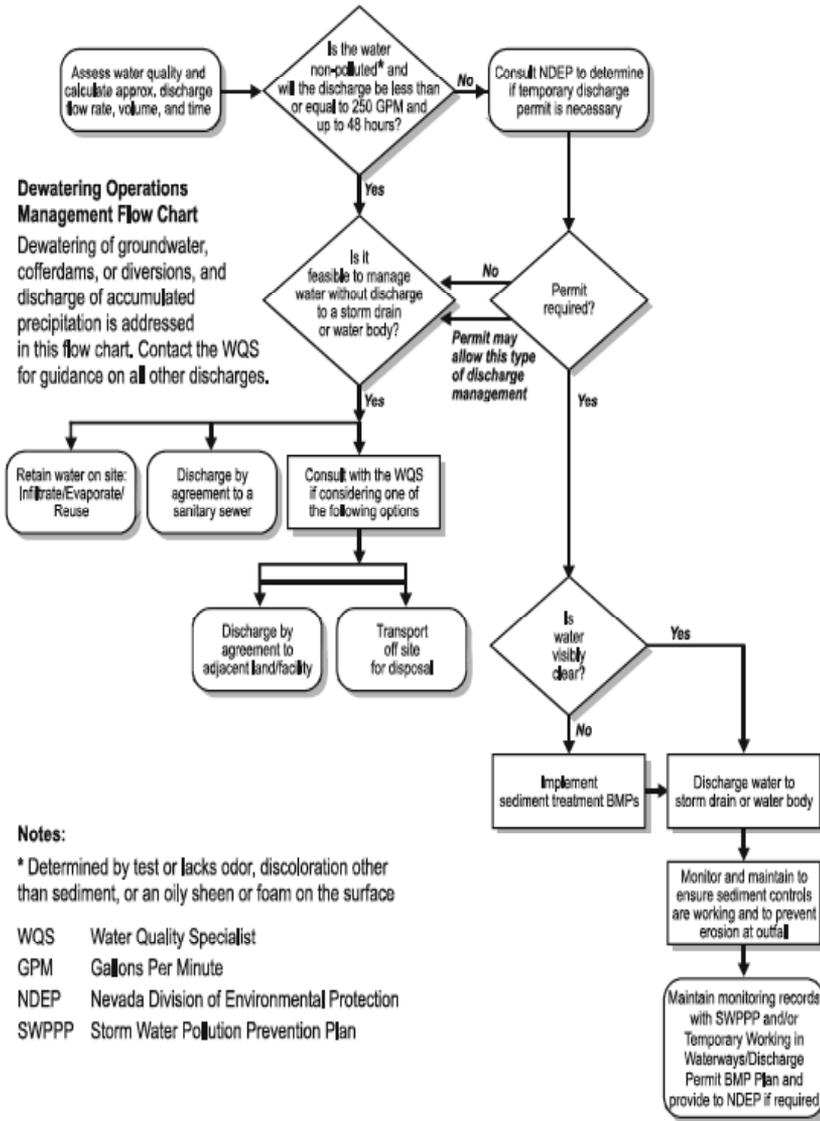
Cartridge filters are pressurized units used as a secondary or higher (polishing) level of treatment after a significant amount of sediment and other pollutants are removed.

Installation:

- Filters can be used to provide secondary treatment to water treated via settling or basic filtration.
- The filters require delivery to the site and initial set up.
- The cartridges require replacement when the pressure differential exceeds the manufacturer's recommendation.
- Inspect all BMPs frequently and repair or replace to ensure the BMPs function as designed.
- Accumulated sediment removed during the maintenance of a

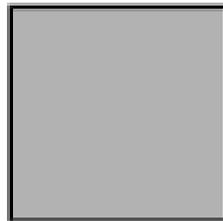
dewatering device may be either spread on site and stabilized or disposed at a disposal site.

- Accumulated sediment commingled with other pollutants must be disposed of in accordance with all applicable laws.



NS-3 Paving and Grinding Operations

Paving, saw cutting, and grinding operation procedures are designed to minimize the transport of pollutants associated with these activities to storm water.



Standards and Specifications:

- Release agents used to coat asphalt transport trucks and asphalt spreading equipment shall be non-foaming and non-toxic.
- Place plastic materials under asphalt concrete (AC) paving equipment while not in use, to catch and/or contain drips and leaks.
- Apply seal coat, tack coat, slurry seal, and/or fog seal by hand sprayer or brush when working adjacent to inlets, or cover drainage inlet structures and manholes with plastic.
- Seal coat, tack coat, slurry seal, or fog seal shall not be applied if rain is predicted during the application or curing period.
- Clean asphalt coated equipment off-site whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt as construction debris.
- If aggregate is washed on-site, allow aggregate rinse to settle. Allow rinse water to dry in a temporary pit.
- Do not allow saw-cut Portland Concrete Cement (PCC) slurry to enter storm drains or watercourses.

AC Paving:

- Prevent sand and gravel from new asphalt from getting into storm drains, streets, and creeks.
- Old or spilled asphalt must be recycled or disposed.
- Keep AC grindings, pieces, or chunks used in embankments or shoulder material out of the storm drains or watercourses by installing silt fence or inlet protection until structure is stabilized or permanent controls are in place.
- Collect and remove all broken asphalt and recycle or dispose of properly.
- Keep petroleum, petroleum-covered aggregate, or fine particulates,

out of the storm drain or water courses during chip seal application and sweeping operation. Apply temporary perimeter controls, such as inlet protection.

Pavement Grinding or Removal

- Collect and contain residue from grinding operations.
- Collect and recycle pavement digout material by mechanical or manual methods.
- If digout material cannot be recycled, dispose of properly.
- Digout activities shall not be conducted in the rain.
- Stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses.
- Disposal or use of AC grindings shall be approved by the RE.

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 shall be loaded with care and not filled to beyond six inches from the top to leave room for splashing.
- 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.

Inspection:

Inspect and maintain machinery regularly to minimize leaks and drips.

NS-6 Illicit Connection/Illegal Discharge Detection and Reporting

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



Illicit connection/illegal discharge detection and reporting is used:

- Anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site.
- At all construction projects.

Standards and Specifications:

- Inspect site before beginning the job for illicit connections or illegal dumping.
- Inspect site regularly during project for illicit connections or illegal dumping.
- Inspect site perimeter for illicit discharge or illegally dumped material that may enter the job site.
- Solids - Look for debris, or rubbish piles.
- Urban Areas - Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes.
 - Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils.
 - Pungent odors coming from the drainage systems.
 - Discoloration or oily substances in the water or stains and residues in ditches, channels or drain boxes.
 - Abnormal water flow during the dry weather season.
 - Excessive sediment deposits, particularly adjacent to or near active off-site construction projects.
- Rural Areas - Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:
 - Abnormal water flow during the dry weather season.
 - Non-standard junction structures.
 - Broken concrete or other disturbances at or near junction structures.

Reporting

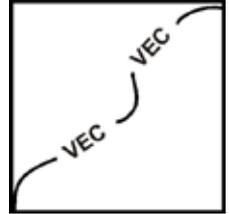
- Notify the RE of any illicit connections and illegal dumping or discharge incidents at the time of discovery. The RE will notify NDOT Environmental Division who will in turn notify the appropriate agency or agencies.

Cleanup and Removal

- The contractor is not responsible for investigation and clean up of illegal dumping or discharges not generated by the contractor. NDOT may direct contractor to clean up non-hazardous dumped or discharged material on the construction site.

NS-8 Vehicle and Equipment Cleaning

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



Vehicle and Equipment Cleaning procedures are applied:

- On all construction sites where vehicle and equipment cleaning is performed.

Standards and Specifications:

- On-site vehicle and equipment washing shall only be performed within contained areas where all wash water can be collected and treated. No washing shall occur over bare soil.
- Cleaning of vehicles and equipment with detergents, solvents or steam shall not occur on the project site unless the RE has been notified in advance and the resulting wastes are fully contained and disposed of outside the highway right-of-way.
- Sediment laden wash water shall be captured for treatment prior to discharge.
- Discharge of treated wash water to infiltration facilities or sewers must receive prior approval from NDOT's WQS.
- Wash water containing solvents or hazardous substances shall be containerized and disposed of in accordance with state and federal regulations. Water containing hazardous materials shall not be percolated or evaporated.
- All vehicles/equipment that regularly enter and leave the construction site must be cleaned off-site.
- If vehicle and equipment washing must occur on-site and cannot be located within a structure or building equipped with appropriate disposal facilities, the outside cleaning area shall be:
 - Located away from storm drain inlets, drainage facilities, or watercourses.
 - Paved with concrete or asphalt and bermed with an impermeable material.
 - Configured with a sump to allow collection and disposal of wash water.
 - Wash waters shall not be discharged to storm drains or watercourses.

-
- When cleaning vehicles/equipment with water:
 - Use high-pressure sprayers.
 - Use positive shutoff valve to minimize water usage.
 - Facility wash racks shall discharge to a sanitary sewer, recycle system or other approved discharge system and shall not discharge to the storm drainage system or watercourses.

Inspection:

- The control measure shall be inspected at a minimum of once a day.
- Monitor employees and subcontractors throughout the duration of the construction project.
- Inspect sump regularly and remove liquids and sediment as needed.

NS-9 Vehicle and Equipment Fueling

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



Standards and Specifications:

- On-site vehicle and equipment fueling shall only be used if off-site fueling is impractical.
- Designate an area to be used.
- Drip pans or absorbent pads shall be used during fueling or fuel over an impermeable containment area in a dedicated fueling area.
- Dedicated fueling areas shall be protected from storm water run-on and runoff and located at least 100 ft. from downstream drainage facilities and watercourses.
- Fueling must be performed on level grade areas.
- Use automatic shut-off nozzles for vehicle and equipment fueling. Fueling operations shall not be left unattended.
- Protect fueling areas with impermeable berms and/or dikes to prevent storm water run-on, runoff, and to contain spills.
- Repair fluid leaks immediately.
- Remove problem vehicles or equipment from the project site.
- Spill kits shall be available in fueling areas and on fueling trucks.
- Use absorbent spill clean-up materials on small spills instead of hosing down or burying techniques.

Inspection:

- Vehicles and equipment shall be inspected on each day of use for leaks.
- Inspect fueling areas and storage tanks daily.
- Immediately clean up spills and properly dispose of contaminated soil and cleanup materials.

NS-10 Vehicle and Equipment Maintenance

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



Standards and Specifications:

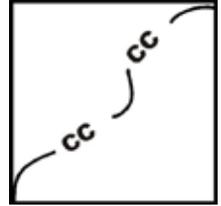
- On on-site yard areas necessary for storage and maintenance of heavy equipment and vehicles.
- Drip pans or absorbent pads shall be used during maintenance or work over an impermeable containment area in a dedicated fueling area.
- Dedicated maintenance areas shall be protected from storm water run-on and runoff and located at least 100 ft. from downstream drainage facilities and watercourses.
- Spill kits shall be available in maintenance areas.
- Use off-site maintenance facilities whenever practical.
- Properly dispose of or recycle tires, batteries, petroleum products and spill cleanup materials.
- Repair fluid leaks immediately.
- Provide impermeable spill containment dikes or secondary containment around stored oil and chemical drums.

Inspection:

- Inspect maintenance area weekly.
- Inspect vehicles, equipment, and storage containers daily. Repair leaks immediately or remove or replace the vehicle, equipment, or container from the project site.

NS-12 Concrete and Pavement Curing

Concrete and pavement curing is used on bridges, retaining walls, and pump houses using both chemical and water methods.



Standards and Specifications:

- Avoid over-spray of curing compounds.
- Minimize the drift of chemical cure. Apply the curing compound close to the concrete surface.
- Do not create any runoff of the compound.
- Use proper storage and handling techniques for concrete curing compounds.
- Protect drain inlets prior to the application of curing compounds.
- Implement spill prevention and control procedures.
- Direct cure water to collection areas for disposal and away from inlets and watercourses.
- When practical, collect cure water and transport or dispose of water in a non-erodible manner.
- Use wet blankets to minimize runoff.

Inspection:

- Inspect temporary diversion devices, lined channels, or swales for washouts, erosion, or debris. Replace lining and remove debris as necessary.
- Inspect cure containers and spraying equipment for leaks.

NS-14 Concrete Finishing

Concrete finishing methods are used for bridge deck rehabilitation; sound walls, paint removal, curing compound removal, and final surface finish appearances and include sand blasting, shot blasting, grinding, or high pressure water blasting.



Standards and Specifications:

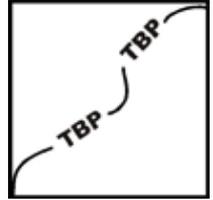
- Follow containment requirements stated in the Special Provisions.
- Collect and properly dispose of water and solid waste from high pressure water blasting operations.
- Collect water from blasting operations and dispose of water in a non-erodible manner.
- Direct water from blasting operations to collection areas and away from inlets and watercourses.
- Protect inlets during sandblasting operations.
- Minimize drift from dust and blast material by keeping the blasting nozzle close to the surface.
- Apply hazardous waste management requirements if blast residue potentially contains hazardous waste.

Inspection:

- Follow inspection procedure as required in the Special Provisions.
- Inspect containment structures for damage or voids prior to use each day and onset of rain.
- Remove the liquid and solid wastes from containment structures and from the general work area after each workshift.

NS-16 Temporary Batch Plants

Temporary Batch Plant procedures are used to designate areas for sand and gravel truck unloading, concrete truck loading, and concrete truck washout and establish control for equipment, materials, and waste products. Temporary concrete, asphalt, and material plants or operations require coverage under the General Permit. If the plant or operation is dedicated to a permitted construction project, the permit covers storm water discharge.



Limitations:

- Clark and Washoe Counties, NDEP, and local noise ordinances may include specific permit requirements in contract documents.

Standards and Specifications:

Planning

- Construct temporary batch plants down-wind of existing urban developments whenever possible.
- Place access roads that minimize water and air quality impacts.

Layout and Design

- Batch plants should be located away from watercourses, drainage courses, and drain inlets.
- Batch plants should be located to minimize potential storm water run-on to the site.
- Temporary batch plant facilities (including associated stationary equipment and stockpiles) should be located at least 300 feet from any off-site buildings.
- Install continuous interior asphalt concrete (AC) or Portland cement concrete (PCC) berms around batch plant equipment (mixing equipment, silos, concrete drop points, conveyor belts, admixture tanks, etc.). Rolled curb or dikes should be placed at ingress/egress points and loading areas.
- Direct storm water and non-storm water runoff from paved or unpaved portions of the batch plant facility to catchment ponds, tanks, or a lined washout area or baker tanks.

Operational Procedures:

- Washout of concrete trucks should be conducted in a concrete washout facility.

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- Do not dispose of concrete into drain inlets, the storm water drainage system, or watercourses.
 - Wash equipment, tools, or vehicles to remove PCC in concrete washout facility.
 - Implement the following controls if visible emissions occur:
 - Duct all dry material transfer points through a cartridge type filter unless there are no visible emissions from the transfer point.
 - Transfer points should be equipped with a wet suppression system unless there are no visible emissions.
 - Use fabric or cartridge type filter(s) at bulk storage silos including auxiliary bulk storage trailers.
 - Maintain silo vent filters.
 - Equip silos and auxiliary bulk storage trailers with a visible and/or audible fill control alarm.
 - Equip silos and auxiliary bulk storage trailers with dust-tight service hatches.
 - Use a fabric dust collection system for particulate matter.
 - Fabric dust collectors (except for vent filters) should be equipped with an operational pressure differential gauge to measure the pressure drop across the filters.
 - Conveyors should be covered or equipped with spray systems, unless the material being transferred results in no visible emissions.
 - Collect dust emissions at the drip point of dry batch plants or dust emissions from the drum feed for central mix plants.
 - Unmixed, unconsolidated, or dry material in open-bodied trucks should be sprayed with water, loaded with a final layer of wet sand or covered with a tarp to reduce emissions.

Tracking Control:

- Plant roads should be stabilized, watered, treated with dust-palliative, or paved and swept.
- Control PCC trackout from plants onto public roads with a Stabilized Construction Entrance/Exit.

Materials Storage:

- Material Delivery and Storage BMP should be implemented at all batch plants using concrete components or compounds. An effective strategy is to cover and contain.
- Stockpiles should be covered and enclosed with perimeter sediment barriers.
- Uncovered stockpiles should be sprinkled with water and/or dust-

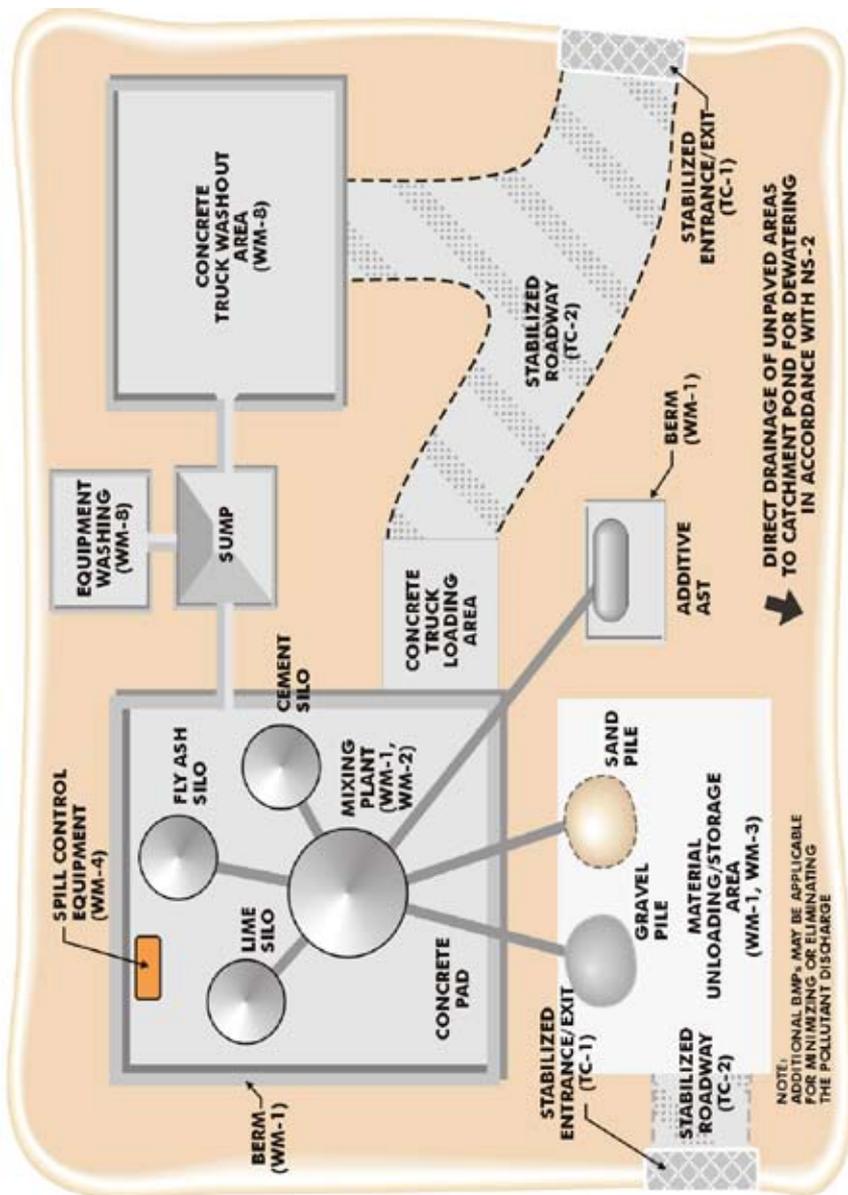
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- palliative unless the stockpiled material results in no visible emissions.
- An operable stockpile water system should be onsite at all times.
 - Store bagged and boxed materials on pallets and cover on nonworking days or prior to rain.
 - Provide secondary containment volume for liquid materials to contain precipitation from a 24-hour 25-year storm plus 10% of the aggregate volume of all containers or plus 100% of the largest container, whichever is greater.
 - Immediately clean up spilled cement and fly ash or suppress dust from wind erosion or vehicle traffic.

Equipment Maintenance:

- Vehicles and equipment should be maintained to prevent fluid leaks and spills.
- Maintain adequate supplies of spill cleanup materials.

Inspection:

- Inspect batch plant components daily during batch plant construction and operation.
- Inspect and repair equipment (for damaged hoses, fittings, and gaskets).
- Inspect and maintain Stabilized Construction Entrance/Exit.



WM-3 Stockpile Management

Stockpile management procedures are designed for stockpiles of soil, and paving materials such as portland cement, aggregate sub-base or pre-mixed aggregate and pressure treated wood.



Standards and Specifications:

- Protection of stockpiles is a year-round requirement.
- Locate stockpiles a minimum of 100 ft. away from concentrated flows of storm water, drainage courses, and inlets.
- Protect stockpiles from storm water run-on using berms, dikes, sediment logs, gravel bag berms or silt fences.

Protection of Non-Active Stockpiles (stockpiles not in use for two or more weeks):

- Soil stockpiles should be covered or protected with soil stabilization measures and a temporary perimeter sediment barrier at all times.
- Stockpiles of Portland cement concrete aggregate, aggregate base, or aggregate subbase should be covered or protected with a temporary perimeter sediment barrier at all times.
- Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammonical, copper, zinc, and arsenate should be placed on and covered with plastic or comparable material at all times.

Protection of Active Stockpiles:

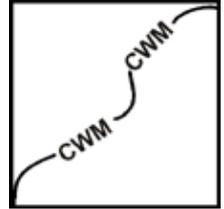
- Active stockpiles should be covered, stabilized, or protected with a temporary linear sediment barrier prior to the onset of precipitation.

Inspections:

- Repair and/or replace perimeter controls and covers as needed.

WM-6 Concrete Waste Management

The Concrete Waste Management procedures and practices are designed to minimize or eliminate the discharge of concrete waste materials.



Concrete Waste Management procedures are applied to:

- Concrete or mortar used as a construction material or where concrete dust and debris result from demolition activities.
- Slurries containing PCC or AC are generated, such as from sawcutting, coring, grinding, grooving, and hydro-concrete demolition.
- Concrete trucks and other concrete-coated equipment are washed on site.
- Mortar-mixing stations.

On-site Temporary Concrete Washout Facility, Transit Truck Washout Procedures:

- Locate facility a minimum of 100 ft. away from concentrated flows of storm water, drainage courses, and inlets. Each facility shall be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign shall be installed adjacent to each temporary concrete washout facility.
- Perform washout of concrete trucks in designated areas only.
- Wash concrete from mixer truck chutes into concrete washout facility. Washout may be collected in an impermeable bag for disposal.
- Pump excess concrete pump bin back into concrete mixer truck.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed of offsite.
- Concrete waste shall be washed into the designated area to harden, removed from the work site, and disposed of outside the highway right-of-way.

Temporary Concrete Washout Facility (Type Above Grade):

- Recommend a minimum length and width of 10 ft., but must

contain all liquid and concrete waste generated by washout operations. The length and width of a facility may be increased, at the Contractor's expense, upon approval of the RE.

- The soil base shall be free of rocks or other debris.
- Plastic lining material shall be a minimum of 10-mil polyethylene sheeting and shall be free of holes and tears.

Removal of Temporary Concrete Washout Facilities:

- PCC slurries or liquid waste shall be disposed of outside the highway right-of-way.
- Materials used to construct temporary concrete washout facilities shall become the property of the Contractor, shall be removed from the site of the work, and disposed of outside the highway right-of-way.
- Remove and backfill temporary concrete washout facilities.

Inspection:

- Inspect temporary washout facility for torn liner and missing gravel bags.
- Clean existing washout facilities when 75% full or construct a new facility.