# Preferred List of Stormwater Best Management Practices (BMP) for Construction Activities in Utah

***Prepared to Support Compliance with:***

**Utah Construction General Permit (CGP)**

**Utah Common Plan Permit (CPP)**

**Utah Code § 19-5-108.3 (Amended by SB220)**

**40 CFR Part 450 – Effluent Limitations Guidelines for Construction and Development**

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# 1. Introduction

Construction activities can significantly impact water quality if not properly managed. Soil disturbance, materials storage, and heavy equipment use all pose risks of sediment and pollutants washing into Utah's rivers and lakes during storm events. Best Management Practices (BMPs) are the front-line tools to control these impacts. This manual provides guidance on selecting, installing, and maintaining effective BMPs on construction sites in Utah. It is written for contractors, municipal inspectors, engineers, Storm Water Pollution Prevention Plan (SWPPP) developers, and anyone with a role in keeping sediment and contaminants out of stormwater. By following this manual, project teams will better protect water quality and comply with stormwater regulations in a practical and effective way.

# 2. Purpose

This BMP manual is designed to help users meet Utah's stormwater requirements and implement industry best practices on construction sites. The guidance provided in this manual supports compliance with Utah's construction stormwater permits and aligns with the intent of Utah Code § 19-5-108.3 by detailing the proper use of BMPs to prevent pollution. According to Utah Code § 19-5-108.3, each municipal system authority is responsible for determining and publishing its preferred BMPs on a publicly accessible website. This manual serves as a comprehensive resource, explaining how to effectively implement these BMPs to meet regulatory requirements and protect water quality on construction sites with State and Municipal Separate Storm Sewer (MS4) authority oversight. Overall, the manual's goal is to improve water-quality outcomes by helping users choose the right BMPs, install and maintain them correctly, and thus meet the performance criteria expected by regulators.

# 3. Regulatory Overview

Construction sites that disturb one acre or more (or less than one acre of land but will be part of a common plan of development or sale that will ultimately disturb one or more acre of land) require stormwater discharge permit under the Clean Water Act. In Utah, this takes the form of a state-issued UPDES Construction General Permit (CGP) or the Common Plan Permit (CPP), which is issued under Utah Code Title 19, Chapter 5 with EPA oversight. Federal regulations set baseline effluent limitation guidelines for construction activities in 40 CFR Part 450, which outline required BMP-based controls known as *Construction and Development Effluent Guidelines*.

Regulations mandate that operators at permitted sites implement controls to minimize erosion and sediment runoff, stabilize disturbed soils promptly, manage dewatering and wash water, and prevent exposure of pollutants or debris to stormwater. Federal rules require effective erosion and sediment controls to be designed, installed, and maintained to minimize pollutant discharges. They also require contractors to implement pollution prevention measures for equipment washing and material storage, and prohibit the discharge of concrete washout, fuels, oils, or other toxic substances. All federal requirements are built into Utah's permits and expectations for BMPs on construction sites.

Utah has adopted state-specific provisions to ensure compliance with these federal standards and to streamline enforcement. Utah Code §19-5-108.3 (2025) amended the Utah Water Quality Act to streamline and unify the implementation of construction stormwater controls. This legislation explicitly defines a "best management practice" as any method or measure that complies with *40 C.F.R. Part 450*. In other words, Utah law aligns its BMP definition and expectations directly with the federal effluent guidelines. This preferred list of BMPs for construction sites ensures that contractors have clear guidance on which BMPs are considered effective and acceptable.

Utah's construction storm water permits (CGP/CPP) further implement these rules by requiring owners/operators of construction projects to develop a SWPPP that incorporates appropriate BMPs and meet specific effluent limitations and inspection routines. The CGP/CPP applies from the commencement of earth-disturbance until final stabilization of the site. Permits mandate regular self-inspections, maintenance of BMPs, and record-keeping to demonstrate that selected BMPs are effectively controlling stormwater pollution. As of May 7, 2025, Utah Code §19-5-108.3, requires oversight authorities to complete oversight inspections via Electronic Site Inspection (ESI). The ESI consists of geo-located, time-stamped photos of on-site BMPs which are taken, evaluated, and sent to the authority by the operator as proof of compliance. Together, the federal and state regulations set the framework that this manual supports: establishing why BMPs are needed, which BMPs are recommended, and how those must be implemented and monitored to stay in compliance.

# 4. Stormwater Pollution Prevention

BMPs are the core tools used in a SWPPP to prevent polluted runoff from leaving a construction site. When implemented properly, BMPs address the main ways construction can impact water quality: erosion control BMPs keep soil in place, sediment control BMPs capture mobilized sediments, and pollution prevention BMPs prevent spills, trash, and chemicals from entering stormwater. Utah's stormwater approach emphasizes proactive, year-round pollution control. BMPs must be installed before storm events, maintained consistently, and remain in place outside the traditional "rainy season," as both rain and snowmelt can generate runoff throughout the year. In many cases, BMPs are most effective when used in combination. For instance, hydromulch alone may not prevent erosion on large slopes, but when paired with wattles or silt fences at the base, overall control improves. By selecting and maintaining a designed series of BMPs, operators can reduce the risk of stormwater violations and help protect Utah's water quality.

# 5. BMP Selection, Installation, and Compliance

Choosing the right BMPs, and installing them correctly, is crucial for both effective pollution prevention and legal compliance. The Utah construction storm water permits require that BMPs be selected based on site-specific conditions and that they achieve the permit's performance standards. In practice, the operator is responsible for selecting effective, site-specific BMPs for erosion control, sediment control, and pollution prevention, considering the site's unique conditions throughout all phases of construction. A "qualified person," as defined in the permit, should assess the site and help choose BMPs that will work for that terrain, soil type, slope, proximity to waterways, and the planned construction activities. Factors like steep grades, highly

erodible soils, or sensitive nearby waters will influence which BMPs are appropriate.

Proper installation according to the specifications in this manual (and manufacturer guidelines for proprietary products) is essential. BMPs that are installed poorly or used in the wrong context/setting can fail, leading to polluted runoff leaving the site. BMPs that do not meet their performance criteria can result in notices of violation and potential enforcement actions by the regulatory authority. The enforcement framework is outlined in Utah Code 19-5-108.3. If a site is found out of compliance, the oversight authority will issue a written notice of violation and require the operator to fix the problem within a specified timeframe. Failure to correct issues can lead to escalating responses, including fines. Utah Code (19-5-108.3) allows fines up to $500 per violation (occurrence), for each day that BMP requirements are not met (after 3 written warnings of non-compliance).

Utah Code 19-5-108.3 provides an incentive for proper BMP selection and implementation: an authority generally may not issue a stop-work order solely for a runoff violation if the operator had correctly implemented the jurisdiction's "preferred" BMPs for the site and the problem resulted from an unexpected BMP failure. This underscores the importance of following the recommended BMP standards in this manual, particularly maintenance standards to stay compliant. This manual offers standard details and criteria for each BMP to ensure that when installed as described, they will perform effectively and meet the required standards. Always verify that the BMPs chosen match the site needs and regulatory expectations; when in doubt, consult with the permitting authority or a qualified stormwater professional.

# 6. Responsibilities of Site Operators, Designers, and Inspectors

Effective stormwater management during construction is a shared responsibility. Different parties have distinct roles to play in implementing and overseeing BMPs:

- **Site Operators (Contractors/Permittees):** The on-site operator (which can be the general contractor and/or owner) has the primary responsibility for executing the SWPPP. This includes installing all required BMPs, conducting routine site inspections, and maintaining BMPs in good working order throughout the project. Under the Utah CGP/CPP, operators must inspect their stormwater controls at regular intervals and keep records of these inspections.

- **SWPPP Designers/Engineers:** Long before construction begins, the project designer or SWPPP developer is responsible for planning appropriate BMPs. They must understand the project scope and site conditions to propose a suite of BMPs in the SWPPP that will meet regulatory requirements. Designers should use this manual during project planning to select BMPs that are from the State's preferred list and suited to the site. They should ensure the construction drawings or SWPPP documentation clearly show where and how each BMP will be implemented. Good design also means accounting for the sequencing of BMP installation and including provisions for maintenance.

Collaboration between the designer and contractor is encouraged; if site conditions change, the SWPPP should be updated with new BMPs or modifications as needed, using the templates provided for alternative BMPs, if necessary (See Part 11). Ultimately, a well-prepared SWPPP and BMP plan make it easier for the operator to do their job and for inspectors to verify compliance.

- **Oversight Authority:** Local MS4 inspectors and Division of Water Quality inspectors provide oversight to ensure that BMPs are implemented as required. Their responsibility is to conduct oversight inspections of construction sites to assess compliance with the CGP and local stormwater ordinances. Inspectors will compare site conditions against the SWPPP and this BMP manual's standards. If violations are observed (such as missing BMPs, improperly maintained controls, or evidence of polluted runoff), regulatory inspectors are empowered by Utah Code to take enforcement actions. Typically, an inspector will issue a written notice detailing the specific violation and requiring corrective action within a set time frame. Inspectors may follow up to verify that problems are fixed, and if not, additional steps can be taken, including warnings of fines or stop-work orders in severe cases. The ultimate responsibility of inspectors is to ensure protection of water quality and that all parties adhere to permit requirements. They also serve as a resource; many inspectors will provide guidance or references (such as this manual) to help the operator correct violations.

# 7. Using this Manual Throughout the Project Lifecycle

- **During project design and planning:**
  Use this manual to identify which BMPs will effectively manage stormwater on site. Planners and engineers should reference the recommended practices here when writing the SWPPP and drawing erosion control plans, ensuring that chosen BMPs meet Utah's preferred criteria.

- **Before construction starts:**
  Review the installation guidelines for each BMP you will deploy. For example, if silt fence is the chosen perimeter control, consult the manual for the correct trenching depth, stake spacing, and maintenance triggers. Contractor training can be conducted using the illustrations and instructions in this manual.

- **During active construction**:
  The manual should be on hand to troubleshoot and adapt. Site conditions often change, you might encounter unexpected drainage patterns or soil conditions, and the manual can guide you in modifying BMPs or selecting additional measures (see template for adding alternative BMPs not originally in the plan). After major weather events or as different subcontractors come and go, consult the manual to ensure BMPs remain effective. The manual's alignment with regulatory requirements means it can also be used as a reference during inspections; if a question arises about what a proper installation entails, this document provides a common point of understanding for both operators and inspectors.

- **At project completion**:

The manual can guide final stabilization steps (like criteria for seeding and mulching) to ensure permit termination requirements are met.

Consistently referring to the manual helps maintain compliance momentum throughout the project lifecycle, rather than treating stormwater control as a one-time task, it becomes an integrated process. By using the manual proactively, project teams can catch and fix issues early (often preventing formal violations) and ensure that the construction site has minimal environmental impact.

# 8. Erosion Controls

## 8.1. BMP 1: Erosion Control Blankets

### Purpose & Applicability

Erosion control blankets are used to reduce the impact of rainfall, hold soil in place, and absorb moisture near the soil surface. It is designed to protect disturbed areas during the establishment of vegetative cover and may be used alone or in conjunction with mulch.

- **Appropriate Applications:**
    - Steep slopes (generally steeper than 1:3 vertical to horizontal).
    - Newly vegetated slopes or areas with high erosion potential.
    - Disturbed soils where mulch must be anchored and where plants are slow to develop.
    - Channels with flows exceeding 3 to 7 ft/sec, stockpiles, and slopes adjacent to water bodies.
- **Limitations:**
    - Matting and blankets (e.g., jute, straw, excelsior, glass fiber) have maximum flow rate limitations - consult manufacturer specifications.
    - Blankets and mats are generally more expensive and may not be suitable for excessively rocky sites or areas where final vegetation will be mowed (staples/netting may catch on mowers).
    - Plastic sheeting is vulnerable to vandalism, tearing, photodegradation, and produces 100% runoff; its use should be limited to temporary applications (e.g., covering stockpiles) until seeding and mulching are established.

### Installation & Use Procedures

To ensure effective erosion control and facilitate vegetation establishment, follow these steps (See figures 1 and 2):

- **Site Preparation:**
    - After the site has been shaped and graded per approved design, prepare a friable seed bed free of clods, rocks greater than 1.5 inches, and other debris that could inhibit direct contact between the matting and the soil.
- **Planting & Application:**
    - Fertilize and seed according to the approved planting plan.
    - When using jute matting on seeded areas, apply approximately half the seed before laying the mat and the remainder after; matting may also be laid over sprigged areas once grass is planted.
    - For areas where vines or ground covers will be planted, install the matting first and then plant through the mat.
- **Laying and Securing the Matting:**

    - Unroll the matting starting at the upper end of the slope or channel, ensuring a minimum 4-inch overlap.
    - Bury the top edge of the matting in a narrow trench at least 6 inches deep, backfill, and tamp firmly to conform to the cross-section.
    - Secure the matting with staples (minimum 6 inches in length, 1 inch wide, using Number 11-gauge wire or equivalent) placed approximately 12 inches down-slope from the trench.
    - Where matting segments overlap (including at erosion stops), use a double row of staples (staggered pattern) with a minimum 3-foot overlap at ends and a 4-inch overlap at the sides.
- **Final Check:**
    - Verify that the matting is uniformly in contact with the soil.
    - Ensure all lap joints are secure, and all staples are flush with the ground.
    - Confirm that all disturbed areas have been seeded.
- **Recommended Types:**
    - **Jute Mat:** Uniform plain weave of undyed, unbleached jute yarn.
    - **Straw Mat:** Composed of ~70% agricultural straw and 30% coconut fiber, with polypropylene netting overlays.
    - **Excelsior Mat:** Wood excelsior with a reinforcing netting.
    - **Glass Fiber Matting:** Bonded textile glass fibers.
    - **Other Mulch Nettings:** Follow manufacturer recommendations and provide specific specifications in the SWPPP.

## Maintenance & Management

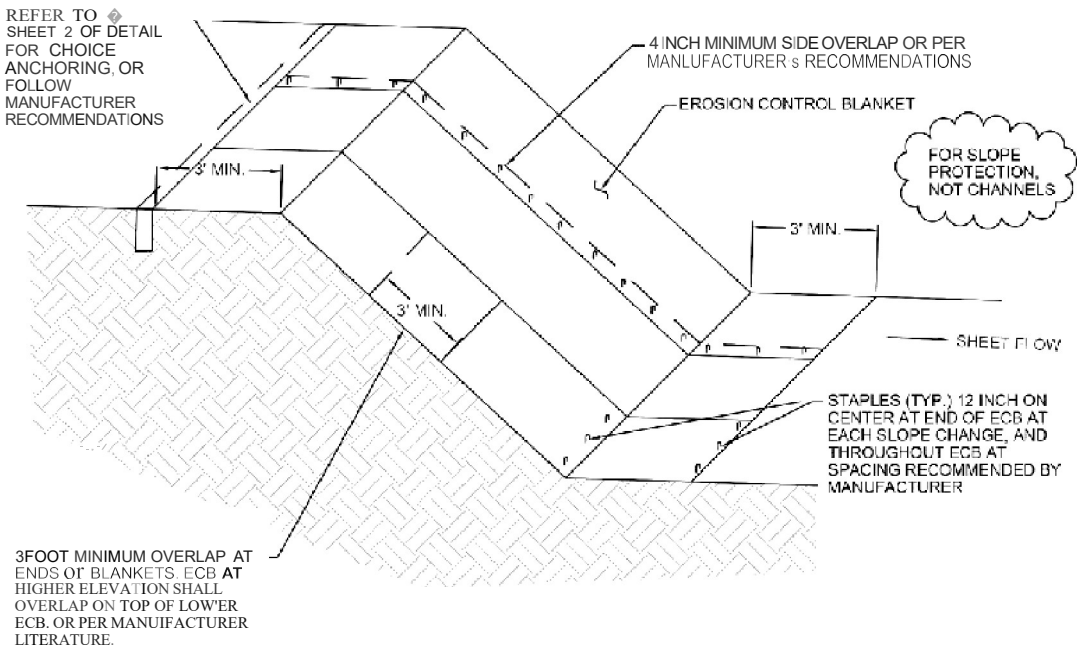
Regular inspection and prompt maintenance are critical to ensure continued performance of the erosion control matting:

- **Inspection Schedule:**
    - Inspect the installed matting during each routine inspection period and after any storm events, to check for erosion, washout, or undermining.
- **Maintenance Actions:**
    - Repair or re-install the matting if it has been damaged or if there are bare spots.
    - Re-anchor loosened nettings, and replace any lost netting or staples as required.
    - Reapply or replace temporary soil stabilization measures if the protected area becomes exposed or exhibits visible erosion.

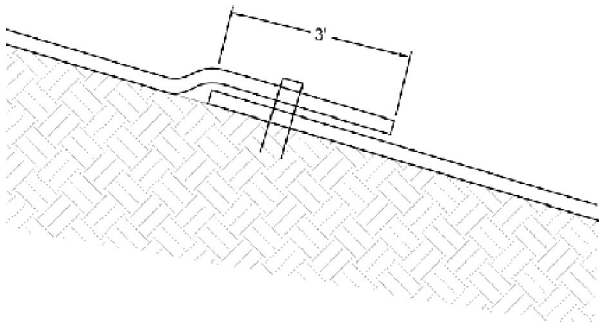
## Performance Criteria

This BMP is considered successful when:

- Erosion control matting effectively reduces soil erosion and assists in the establishment of protective vegetative cover.
- The matting remains in full contact with the soil, with secure lap joints and properly anchored edges.
- There is minimal erosion or washout beneath the matting, and the protected area remains stable until vegetation is established.

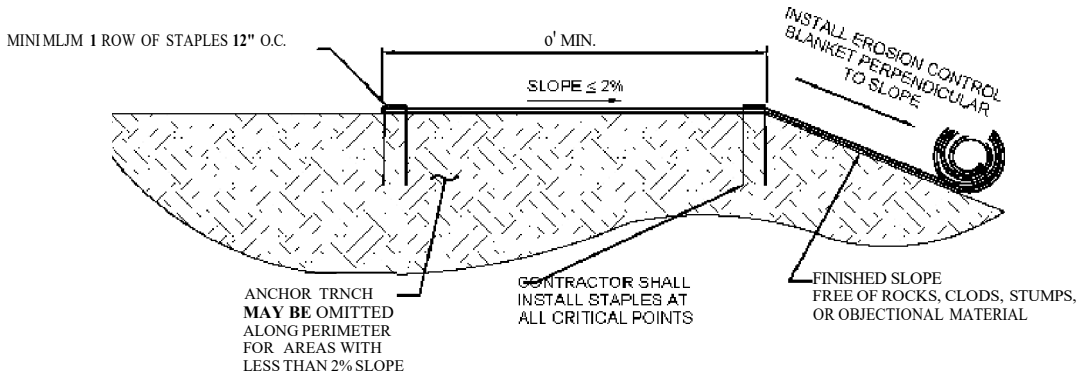



ECB ISOMETRIC PLAN VIEW

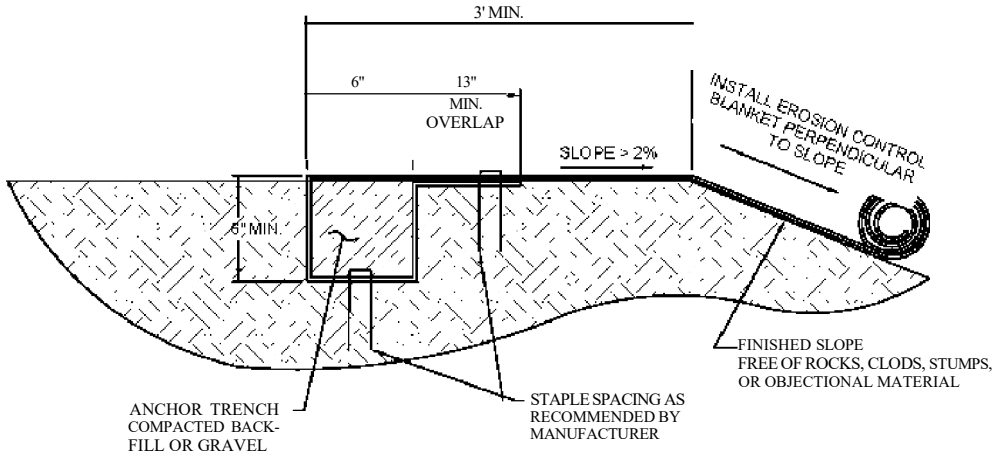



ECB OVERLAP EXAMPLE

**Figure 1: Schematic diagram for erosion control blanket installation**




**TOP OF SLOPE ANCHOR EXAMPLE 1**




**TOP OF SLOPE ANCHOR TRENCH EXAMPLE 2**

**Figure 2: Schematic diagram for anchoring erosion control blankets**

## 8.2. BMP 2: Soil Treatments (Roughening)

### Purpose & Applicability

This BMP is designed to reduce wind and water erosion by providing temporary stabilization of bare soil through surface treatments, including roughening. It is primarily used for short-term stabilization (less than 30 days) on disturbed sites where dust control and erosion reduction are needed.

- **Applicability:**
  - Use on construction sites where dust is generated and there is potential for air and water pollution from disturbed soils.
  - Applicable to bare soil areas, temporary soil berms, stockpiles, earth-moving activities, and demolition sites.
  - Particularly effective for soils in groups 1 through 4 and 4L; if the soil type is unknown, consult the NRCS Web Soil Survey.

### Installation & Use Procedures

To achieve effective erosion and dust control, implement the following procedures:

- **General Design Criteria:**
  - Minimize the area of disturbed soil by limiting clearing and grading to areas required for the immediate construction phase. For larger sites, phase work to keep disturbed areas below 10 acres at any time.
  - Select the surface treatment based on the length of time stabilization is needed.
- **Water Treatments for Dust Control:**
  - Apply water 15–20 minutes before work begins and reapply as needed during the day to moisten the top two inches of soil without generating runoff.
  - For areas with frequent grading, consider installing portable piping and sprinklers to achieve adequate soil moisture.
- **Palliative Treatments (Soil Binders):**
  - Use palliatives (e.g., polyacrylamide, guar-based compounds, or polyvinyl acetates) to bond soil particles and create a cohesive crust.
  - Develop a site-specific palliative mix in consultation with the supplier; avoid "off the shelf" mixes.
  - Apply palliatives only after minimizing soil compaction; loosen compacted surfaces if necessary.
  - Do not apply palliatives during rainy conditions or when the soil is excessively moist; pre-wet excessively dry soils to prevent premature curing.
  - Follow precise dilution and application rates based on soil type, climate, and anticipated traffic.
- **Vegetation Treatments:**
  - For areas undisturbed for one year or longer, establish vegetation as a cost-effective permanent stabilization measure.
  - Refer to established vegetation criteria (see Section 8.5 Vegetation) for temporary stabilization with vegetation.
- **Other Treatments & Roughening Methods:**

    - Apply gravel, recycled concrete, or asphalt to temporary roads and staging areas to prevent dust and erosion.
    - Employ soil roughening techniques (See Figure 3) by driving tracked vehicles, creating irregular patterns to disrupt runoff flow. Methods include:
        - **Stair-step Grading:** Appropriate for steep slopes or soils with soft rock, creating levels that catch eroded materials.
        - **Grooving or Track Walking:** Suitable for less steep slopes to create cleat imprints along contour lines.
        - **Deep Tillage (6-12 inches):** For large open areas to reduce runoff velocity
    - Roughening should be performed immediately after vegetation removal and grading to maximize effectiveness.
- **Installation Documentation:**
    - Provide detailed contractor illustrations and specifications for the selected surface treatment method.
    - Record installation details on the SWPPP BMP map along with any engineering calculations or design criteria.

## Maintenance & Management

Regular inspection and timely maintenance are critical to ensuring the continued effectiveness of soil treatments:

- **Inspection:**
    - Inspect treated areas during each routine inspection period and after any storm events.
    - Visually monitor the adequacy of water applications for dust control; if dust is observed, adjust water treatments or implement additional measures.
- **Maintenance Actions:**
    - For areas treated with palliatives, inspect for breaks or eroded spots in the surface crust; re-treat affected areas immediately.
    - If rill erosion (small water channels) is detected, implement additional erosion control measures such as diversion dikes.
    - Re-rough or re-treat areas if heavy storms wash away the treatment, then re-seed or revegetate as necessary.
    - Ensure all equipment and personnel follow established maintenance protocols to prevent re-compaction or disturbance of the treated surface.

## Performance Criteria

This BMP is considered effective when:

- Surface treatments successfully reduce runoff velocity, increase infiltration, and trap sediment.
- Dust emissions are minimized, and the soil remains sufficiently stabilized to allow for seed germination and vegetation establishment.
- The treatment maintains its integrity for the required stabilization period, with any rill erosion or treatment breaks addressed promptly.

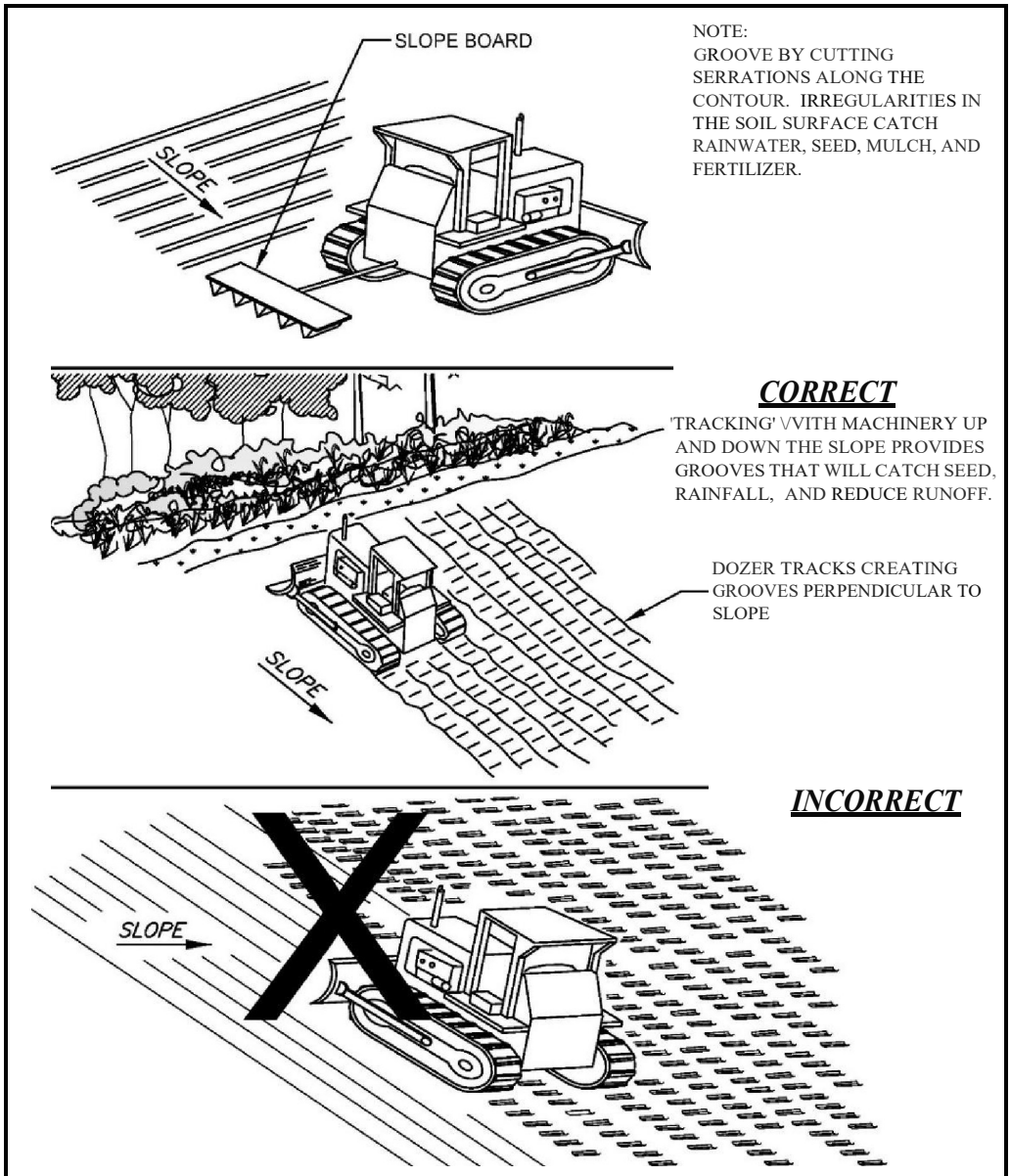



**Figure 3: Graphic showing proper implementation of soil roughening**

## 8.3. BMP 3: Mulching

### Purpose & Applicability

Mulching is used to temporarily stabilize bare soil areas and promote vegetation establishment by protecting the soil surface from erosive forces and moisture loss. Mulch reduces the velocity of sheet flow, minimizes sediment-laden runoff, and promotes vegetative growth by reducing raindrop impact, conserving soil moisture, and moderating soil temperatures.

- **Applicability:**
    - Use on areas disturbed by construction that require surface protection, including freshly seeded or planted areas, disturbed zones unsuitable for immediate vegetation, or areas needing temporary stabilization.
    - Applicable on steep slopes (up to 2:1 or, with proper anchoring, slopes between 3:1 and 1.5:1) when mulch is anchored using soil stabilizers, netting, or crimping.
    - Mulching may be used alone or with seeding for final stabilization. When used with commercially available polymers for soil surface treatment, it is especially useful on steep slopes.
    - Note: Hay is not acceptable as mulch.

### Installation & Use Procedures

Proper design and installation are critical to achieve the desired erosion control and vegetation establishment. The following procedures must be followed:

- **Design Criteria:**
    - The designer shall specify the type of mulch to be used, the application rate (or thickness), and the anchoring method (if required) based on site conditions (slope, soil type, and material availability).
    - Choice of mulch is based on factors including slope, soil type, and availability (See Table 1). Organic mulches (straw, wood fiber, chipped vegetation) are commonly used for temporary stabilization, while permanent controls in arid areas may use gravel or decomposed granite.
    - When applied on slopes steeper than 2:1, additional anchoring methods (e.g., netting, adhesive polymers, crimping) are required. Do not apply mulch on slopes steeper than 1.5:1 unless proper anchoring is provided.
- **Application Methods:**
    - Organic mulches may be applied by hand or mechanically (e.g., mulch-blowing equipment) ensuring an even and uniform layer.
    - For straw mulch:
        - Straw must be free of weed and grass seed, air-dried, and free of mold or rot
        - Straw fibers must be between 4 and 8 inches in length.
        - Anchor straw mulch using a tractor-drawn crimper, degradable netting, or appropriate soil stabilizer.

| **Table 1: Mulch Standards and Guidelines** | | | |
|---|---|---|---|
| Mulch Material | Quality Standards | Application Rates | Notes |
| Straw | Air-dried, free of mold and not rotten.<br><br>Certified Weed Free. | 1.5 to 2 tons per acre | Cost-effective when applied with adequate thickness. Straw must be held in place by crimping, netting, or soil stabilizer. |
| Chipped Site Vegetation | Should include gradation from fine to coarse to promote interlocking properties.<br><br>Must be free of waste materials such as plastic bags, metal debris, etc. | 10 to 12 tons per acre | Cost-effective method to dispose of vegetative debris from site. Best application is for temporary stabilization where construction will resume. Use cautiously on areas where vegetation will be established, as wood chips will deplete soil nitrogen. |
| Erosion Control Compost<br><br>(Wood Chip and Compost Mixture) | Shall not contain materials that can contaminate stormwater. | Approx. 10 tons per acre | Special caution is advised regarding the source and composition of wood mulches. Ensure compost is free of herbicides. Ensure wood chips are from unpainted and untreated wood. |
| Hydraulic Mulch | Must not contain sawdust, cardboard, paper, paper byproducts, plastics, or synthetics. No petroleum-based tackifiers. | Follow the manufacturer's recommendations. Application rate increases with slope steepness. | May be particularly effective on slopes steeper than 3:1. Ensure wood fibers are from unpainted and untreated wood. |

    - For chipped vegetation:
        - Ensure vegetation is free of trash, litter, and debris before spreading.
        - Chipped pieces should range from 2 to 6 inches in length.
    - For hydraulic mulch:
        - Use a mixture of shredded wood fiber and a stabilizing binder (non-petroleum-based) applied according to manufacturer recommendations.
        - Protect hydraulically mulched areas from traffic for at least 24-48 hours until the mulch cures.
- **Documentation:**
    - Attach detailed contractor illustrations, design calculations (if applicable), and manufacturer specifications to the SWPPP BMP documentation.
    - Record all mulching application rates and anchoring methods in the SWPPP.

## Maintenance & Management

Regular inspection and maintenance are essential to ensure continued erosion control and vegetation establishment:

- **Inspection Schedule:**
    - Inspect mulched areas during each routine inspection period and after any storm events for thinning or bare spots due to natural decomposition or weather-related events.
    - In high-traffic areas, inspect more frequently and replace mulch on a scheduled basis to maintain uniform protection.
- **Maintenance Actions:**
    - Reapply or replenish mulch where needed and use stockpiled excess mulch to dress problem areas.
    - For mulched areas used with seeding for final stabilization, ensure fertilization and soil treatment have been completed prior to mulching (except for hydroseeding or winter straw mulch applications).
    - Repair any areas where mulch has been washed away or where anchoring has failed.
- **Additional Considerations:**
    - Monitor mulch performance and, if necessary, supplement with additional erosion control measures such as geotextile mats or netting on steep slopes.
    - Document maintenance activities and schedule reapplications as required to ensure consistent soil protection.

## Performance Criteria

This BMP is considered effective when:

- Mulch is applied uniformly and remains intact during rainfall events, protecting the soil from raindrop impact and reducing overland flow velocity.
- Soil moisture is conserved, and conditions are favorable for vegetation establishment.
- The mulch layer reduces sediment transport by increasing infiltration and providing a protective barrier against erosion.

- Mulch remains in place until vegetation is established; any significant washout, bare spots, or failure of anchoring methods indicates BMP failure and requires corrective action.
- Performance is enhanced when used in conjunction with additional erosion control practices (e.g., seeding, netting, or diversion dikes).

## 8.4. BMP 4: Preservation of Vegetation

### Purpose & Applicability

This BMP is designed to preserve and protect existing natural vegetation, including trees, vines, bushes, and grasses, during construction activities. Preserving vegetation provides multiple benefits such as erosion control, stormwater detention, biofiltration, and enhanced aesthetic value both during and after construction.

- **Applicability:**
  - Applicable to all construction sites where vegetation exists in the predevelopment condition.
  - Particularly beneficial in environmentally sensitive areas such as floodplains, wetlands, stream banks, and steep slopes where erosion controls are difficult to establish.
  - Employed when only the land necessary for building activities and vehicle traffic is cleared, preserving as much natural vegetation as possible.

### Installation & Use Procedures (Planning Considerations)

Proper planning and installation are critical to effectively protect existing trees and vegetation (See figure 4):

- **Preconstruction Planning:**
  - Conduct a vegetation inventory and delineate the limits of existing trees, vines, bushes, and grasses on the site.
  - Identify environmentally sensitive areas.
  - Limit clearing to only the areas required for building and vehicle traffic.
- **Protective Measures:**
  - Stake off root system limits (e.g., the drip line of each tree) to prevent inadvertent damage.
  - Fence or mark trees meant to remain in place using barriers or flagging systems.
  - Apply protective mulching (e.g., rock mulch) in accordance with applicable specifications to minimize soil compaction and erosion.
  - Where applicable, incorporate preplanned revegetation measures to enhance existing vegetation during and after construction.
- **Design Considerations:**
  - Ensure that construction operations are coordinated to avoid improper grading that could alter hydrology and lead to vegetation die-off.
  - Consider site hydrology to maintain adequate water supply for preserved vegetation.

- Attach detailed site plans and design drawings illustrating protective measures and vegetation preservation zones on the SWPPP site map.

## Maintenance & Management

Ongoing maintenance is essential to ensure that protected vegetation remains healthy and intact during construction:

- **Routine Inspections:**
  - Clearly mark the limits of disturbance and conduct regular inspections to ensure that protective measures (e.g., exclusion fencing) remain intact.
  - Inspect vegetation regularly and immediately repair or replace any damaged trees or plants if applicable to site plans.
- **Irrigation & Care:**
  - Implement irrigation or maintenance programs in accordance with the landscaping plan to support the health of preserved vegetation.
  - Remove any construction debris that may interfere with the growth and health of protected vegetation.
- **Postconstruction Integration:**
  - Incorporate both protected and newly planted vegetation into final landscaping plans to form buffer zones, especially in environmentally sensitive areas.
  - In areas such as streams or natural washes, ensure that buffer zones are a minimum of 50 feet wide and include vegetated ground cover to contain stormwater runoff.

## Performance Criteria

This BMP is considered effective when:

- Most natural vegetation remains intact and healthy throughout construction.
- Protective measures (e.g., staking, fencing, tree wells) are in place and maintained, preventing damage to key vegetation.
- Erosion control and stormwater management are enhanced by the preserved vegetation, contributing to improved water quality and site aesthetics.
- Buffer zones are successfully protected, and the preserved vegetation functions by providing additional stormwater filtration.

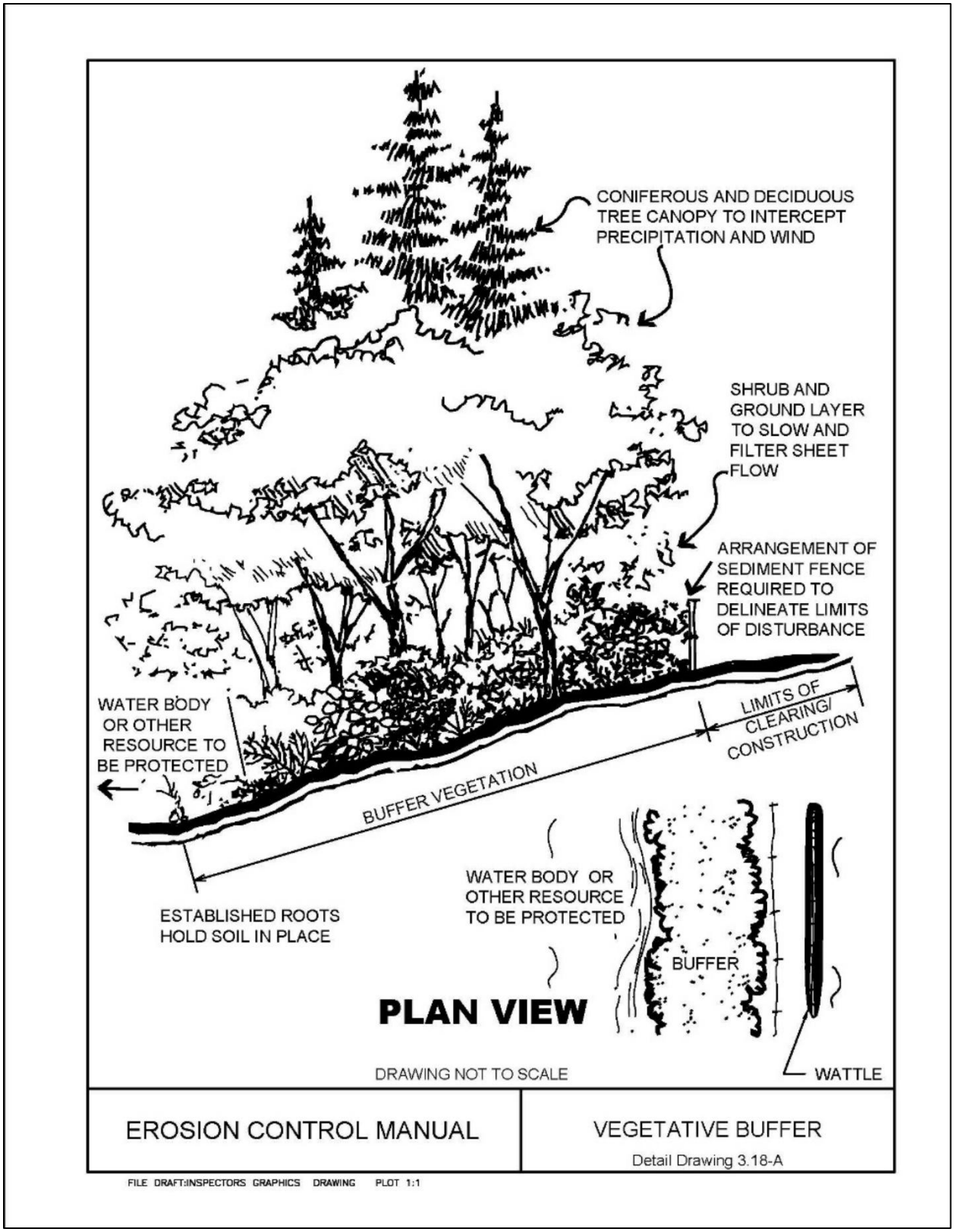



**Figure 4: Schematic diagram of a vegetation buffer zone**

## 8.5. BMP 5: Vegetation and Stabilization

### Purpose & Applicability

Vegetation is used as both a temporary and final stabilization measure to control erosion on construction-disturbed areas. As a temporary control, vegetation stabilizes stockpiles, earthen dikes, and barren areas inactive for more than 30 days. As a final control, grasses and other plants protect against erosion and filter overland runoff while enhancing site aesthetics.

- **Applicability:**
    - Use for temporary stabilization of stockpiles, earthen dikes, and barren areas until vegetation is established.
    - Use for final stabilization of construction areas by achieving vegetative cover that is at least 70% of the native background.
    - Applicable to channels, swales, mild to medium slopes, and as perimeter protection for utility and site development areas.
    - May be used in conjunction with additional erosion control measures (e.g., erosion control blankets, mulching, diversion dikes, proper grading) to direct flow around newly seeded areas.

### Installation & Use Procedures

- **Design Criteria:**
    - Vegetation becomes highly effective once fully established; until then, supplemental controls are needed, and existing sediment controls should not be removed until vegetation is secure.
    - On slopes steeper than 20:1 (5%), use anchored mulch or erosion control blankets to protect seeded areas until establishment.
    - Vegetation alone may stabilize channels if channel grade is less than 2% and runoff velocities (under a 2-year, 24-hour storm) are below 6 ft/s; if velocities exceed 2 ft/s, incorporate erosion control blankets, and if above 6 ft/s, use turf reinforcement mats.
    - Stabilization of channels with vegetation is limited to those with side slopes of 3:1 or flatter.
    - Initiate vegetation establishment (seeding or sodding) immediately after grading, and no later than 30 days following completion of grading on highly erodible areas.
- **Surface Preparation:**
    - Remove and stockpile existing topsoil at the start of grading.
    - Complete interim or final grading before seeding or sodding; limit vehicle and equipment traffic to minimize soil compaction.
    - Install necessary erosion structures (e.g., dikes, swales, diversions) prior to seeding.
    - Spread stockpiled topsoil evenly over disturbed areas to a minimum depth of 4 inches (6 inches over rock or unsuitable material; if needed, amend with compost in a ratio of 3 parts topsoil to 1 part compost.

    - Prepare a uniform seed bed by pulverizing and loosening the soil to at least 3 inches depth; on slopes steeper than 3:1, groove or furrow along the contour.
- **Plant Selection, Fertilization, and Seeding/Sodding:**
    - Use high-quality USDA-certified seed or sod adapted to the local climate and soil conditions. Consult local NRCS or extension services for species recommendations and planting schedule (Also see table 2).
    - Follow prescribed seeding rates or use appropriate seeding equipment (seed drills, cultipackers, hydroseeders).
    - For immediate stabilization, sodding may be employed and planted under optimal moisture conditions.
    - After planting, water seeded or sodded areas immediately at a rate that moistens the top 6 inches without causing runoff; provide adequate watering for the first 14 days, then as needed.
    - Use mulching techniques (avoid chipped vegetation mulch if high wood content could deplete nitrogen) to enhance seed protection, moisture retention, and erosion control.

| **Table 2: Optimal Seeding Window Timeline Guide** | |
|---|---|
| Elevation | Date |
| Below 4,000 ft | October 15 to December 31 |
| 4,000 to 6,000 ft | September 15 to November 30 |
| Above 6,000 ft | September 1 to November 15 |

## Maintenance & Management

Proper maintenance is essential to ensure long-term vegetation establishment and erosion control:

- **Inspection & Early Maintenance:**
    - Protect newly seeded areas from excessive runoff and vehicle traffic until vegetation is well established.
    - Follow a detailed watering and fertilizing schedule in the construction plan to facilitate plant establishment.
    - Inspect vegetated areas during each routine inspection period and after any storm events; reseed bare spots and apply mulch or other erosion control measures as necessary.
    - Remove accumulated sediment from the vegetation to prevent smothering and determine the source of excessive sediment to implement further erosion controls.

## Performance Criteria

This BMP is considered successful when:

- The established vegetation effectively stabilizes the soil, reduces erosion, and filters stormwater runoff.
- Temporary vegetation (via seeding) supports stabilization until final vegetation reaches at least 70% cover of the native background.

- Supplemental erosion controls (mulching, erosion control blankets, diversion dikes) remain in place until the vegetation is fully established.
- Vegetative cover is maintained according to design criteria, and any bare spots are promptly reseeded.

## 8.6. BMP 6: Check Dam

### Purpose & Applicability

Check dams are installed in swales, drainage ditches, or constructed channels to reduce erosive velocities, provide a barrier to sediment transport, and help disperse concentrated flows. They are used in combination with other channel protection measures (such as vegetation lining and turf reinforcement mats) and may be paired with outlet sediment traps to enhance sediment capture.

- **Applicability:**
    - Use in long drainage swales or ditches along linear projects (e.g., roadways) to mitigate increased runoff and control erosive velocities.
    - Suitable for short swales down steep slopes (e.g., highway embankments) to reduce flow velocities.
    - Do not install check dams in actively flowing stream channels.
    - Install before the contributing drainage area is disturbed; if the swale is graded during construction, install check dams immediately after grading to control velocities until stabilization is complete.
    - It is appropriate for temporary sediment control and energy dissipation and can be used in conjunction with other sediment reduction techniques.

### Installation & Use Procedures

Follow these procedures to properly install check dams (See figure 5):

- **General Design Criteria:**
    - **Dimensions & Spacing:**
        - Dam height should generally be between 9 and 36 inches, always less than one-third the channel depth.
        - Space dams so the top of the downstream dam aligns with the toe of the upstream dam; allow spacing to form small pools between dams.
        - The top of the dam's side must be at least 6 inches higher than the center, and the sides must be embedded at least 18 inches into the channel to minimize bypass erosion.
    - **Materials & Construction:**
        - Do not use loose soil, wood chips, compost, or other floatable materials for construction.
    - **Flow Considerations:**
        - Design dams so that larger flows (exceeding a 2-year, 24-hour storm) pass without causing excessive upstream flooding.
        - Use in conjunction with additional sediment reduction measures prior to releasing flow off-site.

- **Alternative Check Dam Options:**
    - **Rock Check Dams:**
        - For dams <24 inches in height, use well-graded stone sized 3-6 inches; for dams >24 inches, use stone sized 4-8 inches.
        - Typical cross-sectional design is triangular, with a minimum top width of 2 feet and side slopes of 2:1 (or flatter).
    - **Rock Bag Check Dams:**
        - Construct with a minimum top width of 16 inches, using bags (24–30 inches long, 16–18 inches wide, 6–8 inches thick, ~40 lbs each) filled with pea gravel or filter stone.
        - Assemble in a pyramid stack (one row on top of two rows) with the dan always one row wider than it is high.
        - Bag material must meet specified strength and durability criteria.
    - **Sack Gabion Check Dams:**
        - Suitable for channels with a drainage area of ≤ 5 acres.
        - Construct using well-graded stone (3-6 inches) contained in sack gabions wrapped in 20-gauge, 1-inch hexagonal woven wire mesh and staked with ¾-inch rebar at ≤ 3-foot spacing.
    - **Organic Filter Tube Check Dams (See BMP 8.8):**
        - Use tubes with a minimum diameter of 12 inches filled with organic material (e.g., coir, straw, aspen fiber) that is slow to decay.
        - Stake tubes at a maximum spacing of 4 feet, alternating stakes through the tube and on the downstream face.
- **Documentation:**
    - Include detailed manufacturer illustrations and specifications for any applicable proprietary products.
    - Record installation locations on the SWPPP site map.

## Maintenance & Management

Routine inspection and maintenance are essential for long-term effectiveness:

- **Inspection Schedule:**
    - Inspect the check dam system during each routine inspection period and after any storm events.
- **Maintenance Actions:**
    - Remove accumulated sediment from the upstream side when it reaches approximately one-third the dam height.
    - Inspect for erosion along dam edges, especially where the dam meets the channel, and repair as needed.
    - If erosion persists or dam performance degrades, modify the dam design or add additional controls.

- Exercise caution during removal to avoid leaving loose rock, which can create hazards during subsequent site operations (e.g., mowing).

## Performance Criteria

The check dam BMP is considered effective when:

- The system reduces flow velocities to levels that prevent deep erosive gullies and excessive sediment bypass.
- Sediment accumulates primarily on the upstream side of the dam, within acceptable maintenance tolerances.
- The check dams remain in place, conform to design specifications, and are not compromised by erosion or construction operations.

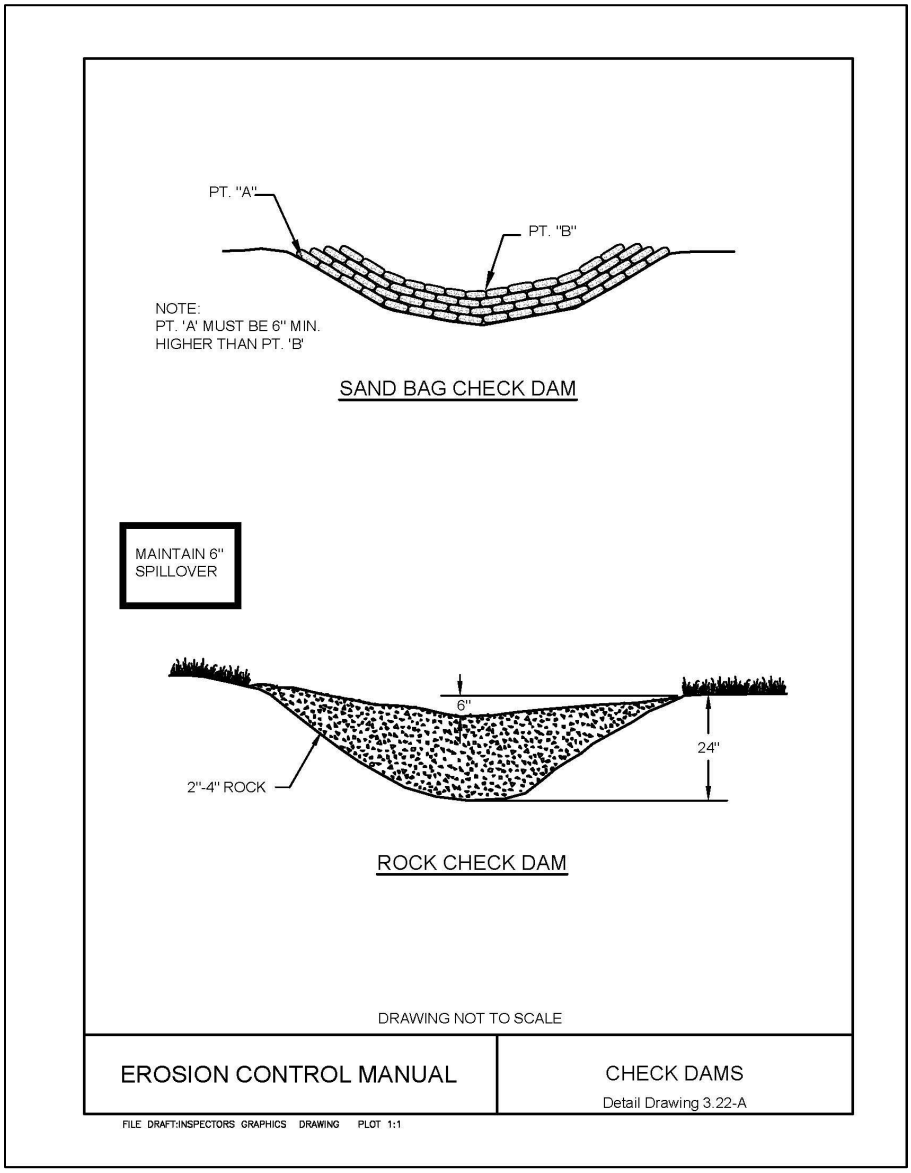



**Figure 5: Schematic diagram for check dam installation**

## 8.7. BMP 7: Velocity Dissipation Devices

### Purpose & Applicability

This BMP is designed to reduce the velocity and energy of concentrated stormwater flows at discharge points, thereby preventing erosion in downstream vegetated or natural drainage channels. By dispersing flow and encouraging sediment settlement, velocity dissipation devices help protect channel integrity.

- **Applicability:**
  - Use at outlets of constructed conveyance systems (e.g., storm drain pipes, concrete flumes, roadside ditches, culverts) that discharge to unlined or natural channels.
  - Suitable for locations where concentrated flows can cause erosion in unlined channels or where channel protection is pending installation.
  - Can be designed as temporary measures or, when constructed permanently, must meet the municipality's drainage design criteria.

### Installation & Use Procedures

To ensure effective operation of velocity dissipation devices, follow these procedures:

- **General Installation Guidelines:**
  - Install temporary velocity dissipation devices at all discharge points where the design storm velocity exceeds 4 feet per second and the flow is directed to an unlined or natural channel.
  - Ensure that temporary devices do not block flow or cause flooding during larger storm events.
  - Coordinate the design and installation of temporary devices with the overall stormwater infrastructure design; permanent devices should be constructed early in the first phase of construction when feasible.
- **Rock Riprap Systems (Primary Option) (See figure 6):**
  - Use well-graded rock (natural stone or recycled concrete) for temporary velocity dissipation.
  - Follow storm water design calculations, including drainage computations, discharge velocity, stone size, and apron dimensions.
  - Select stone with sizes that are a minimum of 6 inches, with a maximum diameter not exceeding 9 inches. The rock surface should be homogeneous with no voids larger than 1½ inches.
  - Construct a riprap apron with a minimum depth of 1.5 times the max stone diameter, a length of at least 4.5 times the outlet pipe diameter (or equivalent for other outlets), and a width of at least 4.0 times the outlet pipe diameter.
  - Place the riprap on a filter fabric lining keyed into the ground at least 6 inches to prevent soil intrusion.
  - Align the riprap apron with the flow direction, ensuring that it does not cause undue blockage or flooding.
  - Note: Riprap systems should not be used where there is a significant elevation difference between the outlet and the receiving channel.

- **Other Devices (Alternative Options):**
    - Alternative devices (e.g., articulating concrete blocks, gabions, stilling basins, manufactured velocity dissipaters) may be used if the designer provides calculations to document the appropriate size and dimensions for the design storm flow.
    - Temporary baffled chutes, gabion drop structures, or stabilized grade breaks may be installed where an elevation difference exists at the outlet until permanent structures are installed.
- **Documentation:**
    - Attach all design calculations, manufacturer illustrations, and product specifications to the SWPPP, and indicate their locations on the site map.
    - Reference additional design guidance if necessary.

## Maintenance & Management

Regular inspection and maintenance are critical to ensuring that velocity dissipation devices continue to function effectively:

- **Inspection Schedule:**
    - Inspect discharge points during each routine inspection period and after any storm events.
- **Maintenance Actions:**
    - Repair or replace dislodged or missing rock riprap as necessary.
    - Monitor for the development of head-cuts, channel deepening, or widening, which indicate that additional velocity dissipation measures are needed.
    - Inspect the underlying filter fabric and rekey or repair as required.
    - Remove any debris that may block flow or interfere with the functioning of the velocity dissipater.
    - If temporary devices are used, ensure they are removed once the surrounding drainage area is stabilized or at the completion of construction.

## Performance Criteria

This BMP is considered effective when:

- The velocity dissipation device reduces discharge energy and flow velocity sufficiently to prevent erosion in the receiving channel.
- Suspended sediments are allowed to settle within the device, thereby reducing sediment transport downstream.
- The device maintains its structural integrity and does not block flow or cause flooding during larger storm events.
- There is minimal evidence of downstream erosion (e.g., head-cuts, channel widening) attributable to the discharge.

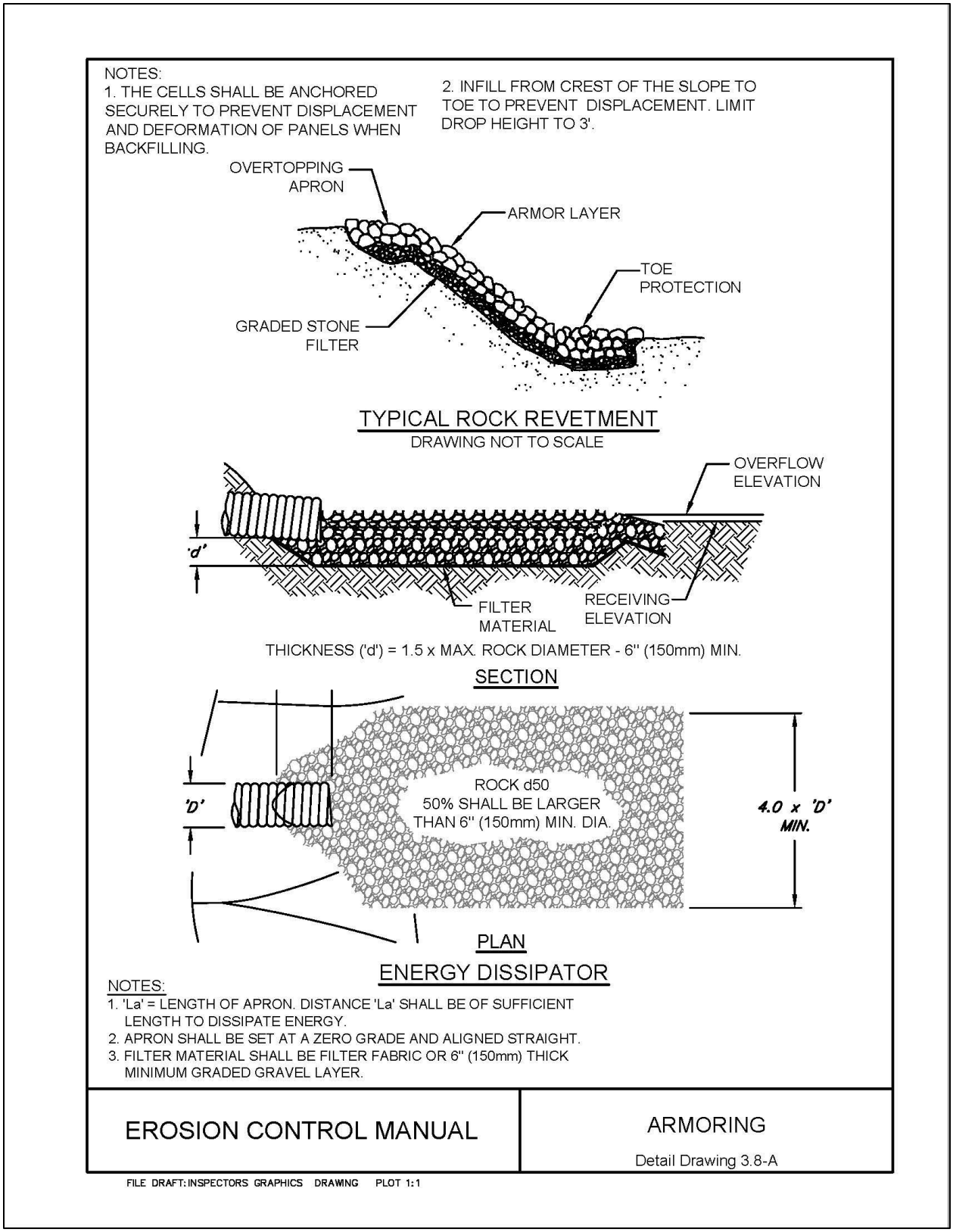



**Figure 6: Schematic diagram for velocity energy dissipater installation**

## 8.8. BMP 8: Straw Wattle Check Dam

### Purpose & Applicability

This BMP is designed to reduce flow velocities and control sediment in swales and drainage ditches, including those along linear projects such as roadways, using straw wattle check dams. Straw wattle check dams are a temporary measure used during construction, particularly prior to final stabilization, and are not intended for use in live (flowing) stream channels.

- **Applicability:**
  - Use in swales and drainage ditches to mitigate increased runoff effects and reduce velocities.
  - Suitable for short swales down steep slopes to control flow.
  - Must not be installed in in actively flowing stream channels.
  - Install before disturbing the contributing drainage area, or immediately after grading a swale, to control velocities until final stabilization is achieved.

### Installation & Use Procedures

Follow these procedures to properly install and operate straw wattle check dams (See figure 7):

- **Design & Dimensions:**
  - The dam height should be between 9 and 36 inches and less than one-third the depth of the channel.
  - Dams should be spaced so that the top of the downstream dam is at the same elevation as the toe of the upstream dam.
  - The top of the side of the check dam shall be at least 6 inches higher than the middle of the dam.
  - Embed the sides of the dam a minimum of 18 inches into the channel, swale, or drainage ditch to minimize the potential for erosive flows around the dam.
  - Stake tubes at a maximum spacing of 4 feet, alternating stakes through the tube and on the downstream face.
- **Supporting Measures:**
  - Use straw wattles in conjunction with other sediment reduction techniques before releasing flow off-site.
  - Do not use loose soil, wood chips, compost, or other floatable materials that may be transported during runoff for the construction of the check dam.
- **Documentation:**
  - Refer to the BMP 6 for alternative design options.
  - Attach contractor illustrations and manufacturer recommendations if necessary and mark the installation location on the SWPPP site map.

### Maintenance & Management

Regular maintenance and inspections are critical to ensure the check dam system performs as intended:

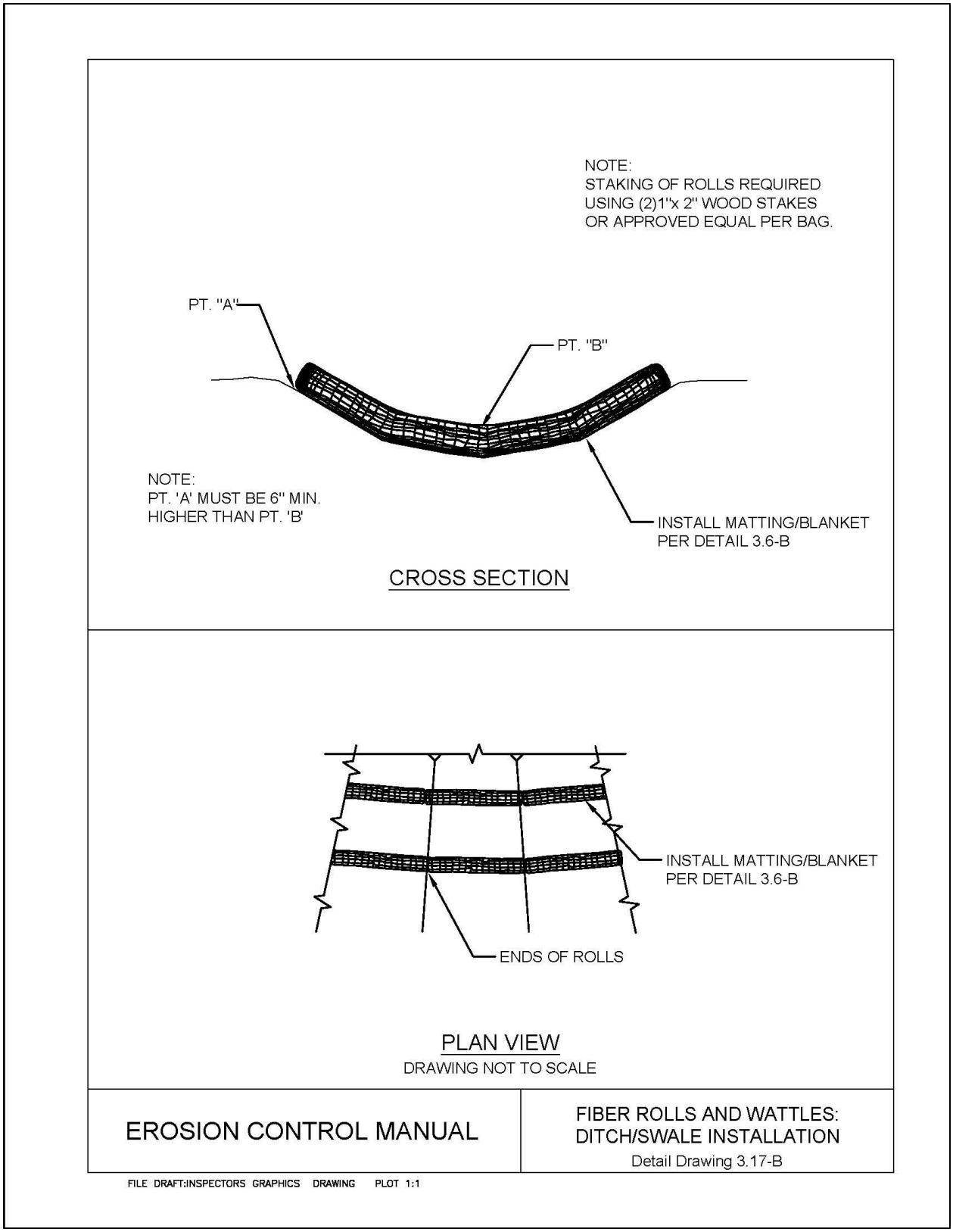



**Figure 7: Schematic drawing for installation of straw wattle check dams**

- **Inspection Schedule:**
    - Inspect the check dam system during each routine inspection period and after any storm events.
- **Sediment and Erosion Management:**
    - Remove accumulated silt when sediment buildup reaches approximately one-third the height of the dam.
    - Inspect for erosion beneath and around the check dam, particularly where the dam meets the side of the channel and restore or reinforce as needed during each reporting period.
    - If erosion persists, engineer modifications to the check dam or implement additional controls.

## Performance Criteria

This BMP is considered effective when:

- The drainage channel protected by the check dams does not develop deep erosive gullies between dams.
- The dam itself remains intact, is not undercut by erosion, and maintains its design dimensions.
- Sediment accumulation on the upstream side of the dam is within acceptable maintenance tolerances.

## 8.9. BMP 9: Straw Wattle on Slopes

### Purpose & Applicability

This BMP utilizes straw wattle, also known as fiber rolls, fiber logs, filter tubes, mulch socks, or coir rolls, as a temporary sediment and erosion control measure on slopes. These tubes can be filled with organic materials (compost, wood chips, straw, coir, aspen fiber, or a mixture) or geosynthetic material. This BMP focuses on managing sheet flow on slopes and controlling sediment discharge.

- **Applicability:**
    - Use on slopes to treat sheet flow over a short distance, functioning as both sediment and erosion control.
    - Can be installed along the contours of a slope as a linear barrier or as a perimeter control downslope of a disturbed area.
    - When filter tubes are intended to remain on-site as part of final stabilization (especially in arid and semi-arid areas with extended stabilization timelines), they must be constructed of 100% biodegradable natural fibers (jute, coir, sisal, etc.) or 100% UV photodegradable plastic, polyester, or geosynthetic material.
    - Most effective in coarse to silty soil types; additional controls may be needed for fine silts and clays.

### Installation & Use Procedures

Follow these procedures to properly install and deploy straw wattles on slopes (See figure 8):

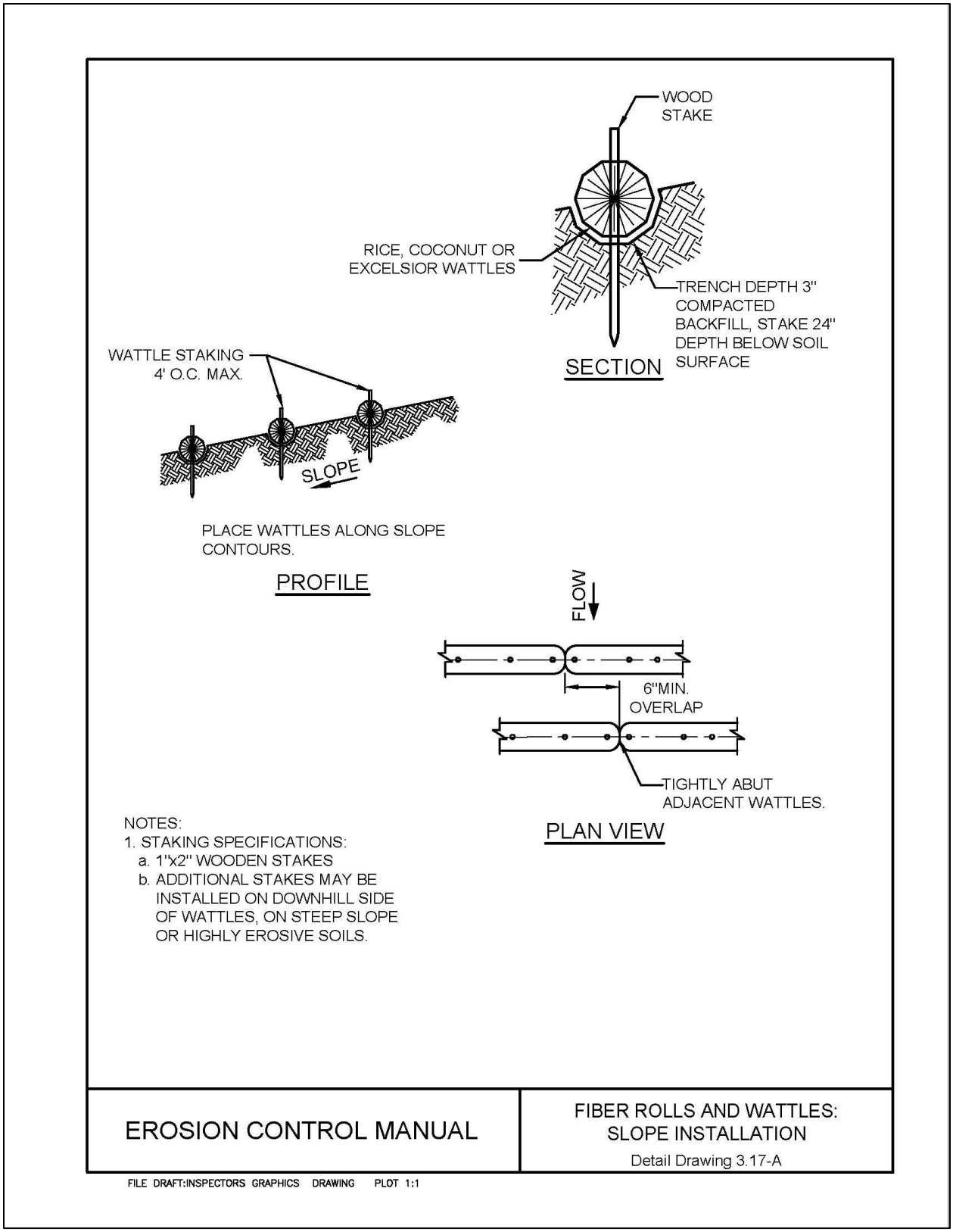



**Figure 8: Schematic diagram of straw wattle slope installation**

- **Placement and Alignment:**
  - Install filter tubes along the contour of the slope to maximize sediment capture and flow detention.
  - When using manufactured wattles, follow the manufacturer's recommendations for tube diameter, spacing, and installation based on slope, flow velocity, and other site-specific conditions; document these in the SWPPP.
  - Use Table 3 for spacing unless otherwise specified in manufacturer's recommendations.
- **Staking and Embedding:**
  - Stake tubes using 2-inch by 2-inch wooden stakes (or equivalent rebar/metal stakes) at a maximum spacing of 4 feet.
  - When placed on soil, embed filter tubes a minimum of 3 inches to ensure stability.
- **Connection and Overlap:**
  - When multiple tubes are connected to form a continuous linear barrier, overlap adjacent tubes by at least 6 inches.
- **Upstream Protection and Bypass Prevention:**
  - If necessary, place loose sediment or mulch material against the upstream side of the tubes to promote continuous contact with the soil.
  - At the ends of a line of tubes, turn the last 10 feet (or more) upslope to prevent runoff bypass. On longer installations, additional upslope turns may be required every 200–400 linear feet, depending on the slope traverse.
- **Size Considerations:**
  - Common tube diameters range from 6 to 24 inches; tubes as small as 4 inches or as large as 36 inches are available.
  - Tubes less than 8 inches in diameter, when filled, will require more frequent maintenance.

**Table 3: Maximum Spacing for Slope Protection**

| | Tube Diameter (minimum) | | | |
|---|---|---|---|---|
| Slope (H:V) | 9 inches | 12 inches | 18 inches | 24 inches |
| 10:1 to 5:1 | 35 feet | 40 feet | 55 feet | 60 feet |
| 4:1 | 30 feet | 40 feet | 50 feet | 50 feet |
| 3:1 | 25 feet | 35 feet | 40 feet | 40 feet |
| 2:1 | 20 feet | 25 feet | 30 feet | 30 feet |
| 1:1 | 10 feet | 15 feet | 20 feet | 20 feet |

## Maintenance & Management

Regular maintenance and inspections are critical to ensure the wattle system performs as intended:

- **Inspection Schedule:**
  - Inspect organic filter tubes during each routine inspection period and after any storm events.
  - Verify that the tubes remain in continuous contact with the soil at the bottom of the embedment trench.
- **Maintenance Actions:**

- Check for the development of rill erosion under the filter tubes; repair eroded spots immediately and monitor for recurrence. If erosion persists, implement additional controls.
- Inspect staking to ensure filter tubes remain secure and are not shifting due to stormwater runoff, repair and re-stake any slumping tubes.
- Replace or repair any tubes that are split, torn, or unraveling.
- Remove accumulated sediment from behind the filter tubes before the sediment reaches half the height of the exposed portion.

## Performance Criteria

This BMP is considered effective when:

- The filter tube barrier effectively detains flow and captures sediment as runoff passes over or through it, with minimal bypass.
- The barrier minimizes off-site sediment discharge and prevents the development of erosive rills or gullies between tubes.
- Tubes are not undercut or eroded on either side, maintaining structural integrity throughout the storm event.

## 8.10. BMP 10: Diversion Dikes

### Purpose & Applicability

Diversion Dikes are temporary, earthen structures constructed to intercept and divert runoff, thereby reducing erosion from disturbed areas. Depending on their location and design, they can prevent surface sheet flow runoff from entering a disturbed construction site when located upslope or divert sediment-laden runoff from a disturbed area toward sediment trapping devices when installed downslope.

- **Appropriate Applications:**
  - Intercept and divert runoff to avoid sheet flow over sloped surfaces.
  - Direct runoff toward sediment basins, drainage pipes, or channels.
  - Divert runoff from paved surfaces.
- **Installation Locations:**
  - Below steep grades where runoff begins to concentrate.
  - Along roadways and facility improvements subject to flood drainage.
  - At the top of slopes to divert run-on from adjacent undisturbed areas.
  - At mid- to bottom-slope locations to intercept sheet flow and convey concentrated flows.
- **Limitations:**
  - Best suited for upstream drainage areas of 10 acres or less and slopes less than 5%; larger areas require more permanent structures.
  - Must comply with hydraulic design standards set by the local municipality or Flood Control District.
  - Earth dikes may create additional disturbed areas and can impede construction equipment; stabilization and immediate maintenance are required.
  - Diverted stormwater flow may cause flood damage to adjacent areas if not properly managed.
  - Diversion dikes are not intended as sediment trapping devices on their own.

### Installation & Use Procedures

To construct effective diversion dikes, follow these design and installation guidelines (See figure 9):

- **Design Considerations:**
  - Determine the primary function: to prevent erosion by diverting runoff away from steep slopes or to direct runoff into a sediment control device.
  - Use diversion dikes as upslope perimeter controls for sites with significant off-site flow or as downslope controls to convey runoff to a sediment basin or protected inlet.
  - An interceptor swale may be installed on the upslope side to enhance performance; refer to applicable swale design criteria (See BMP 11).
- **Design Criteria:**
  - Maximum contributing drainage area should be 5 acres or less, depending on site conditions.
  - Maximum depth of flow at the dike shall be 1 foot based on a 2-year, 24-hour design storm.
  - Side slopes of the diversion dike shall be 3:1 or flatter (2:1 acceptable for

installations under 3 months duration).
    - Minimum width at the top of the dike shall be 2 feet.
    - Minimum embankment height shall be 18 inches (measured from the toe on the upgrade side).
    - For slopes less than 2% and flow velocities below 6 feet per second, stabilization may include grass, erosion control blankets, or anchored mulch; for steeper slopes or higher velocities, turf reinforcement mats or riprap are required.
    - Use on-site soil that is free of rocks larger than three inches in diameter and has adequate plasticity (soil stickiness) or provide armoring if working with loose soils.
    - Ensure the flow line at the dike has a positive grade draining to a controlled outlet.
- **Construction Timing & Location:**
    - Construct diversion dikes prior to clearing and grading, or immediately after grading if the swale is part of the project, to intercept runoff before it impacts disturbed soils.
    - Situate the dike so that diverted runoff is conveyed to a sediment control device (e.g., sediment basin, interceptor swale) without collecting water from wetlands or high groundwater areas.
    - Attach contractor illustrations, design calculations, and referenced topography within the SWPPP and site map.
- **Safety & Coordination:**
    - Ensure that dikes are installed only within property limits where failure would not result in loss of life, property damage, or interruption of public services.
    - Comply with local ordinances and specifications.

## Maintenance & Management

Regular inspection and timely maintenance are critical to ensuring the diversion dike remains effective:

- **Inspection Schedule:**
    - Inspect the diversion dike during each routine inspection period and after any storm events.
- **Maintenance Actions:**
    - Check for sediment build up behind the dike and remove sediment in a timely manner.
    - Inspect the face of the dike for erosion; if erosion occurs, stabilize the slopes with mulch, seeding, or by flattening the slope.
    - Ensure that all structural components (e.g., berms, outlets) remain in compliance with the design criteria.
    - Repair any damage immediately to prevent runoff from bypassing the dike.

## Performance Criteria

The diversion dike is considered effective when:

- It successfully intercepts and diverts runoff away from disturbed areas, preventing erosion on steep slopes.
- Diverted runoff is conveyed to a designated sediment control (e.g., sediment basin or

interceptor swale) without causing flood damage to adjacent areas.

- The dike maintains its structural integrity under the design storm conditions (up to a 2-year, 24-hour event) with minimal sediment buildup and erosion.

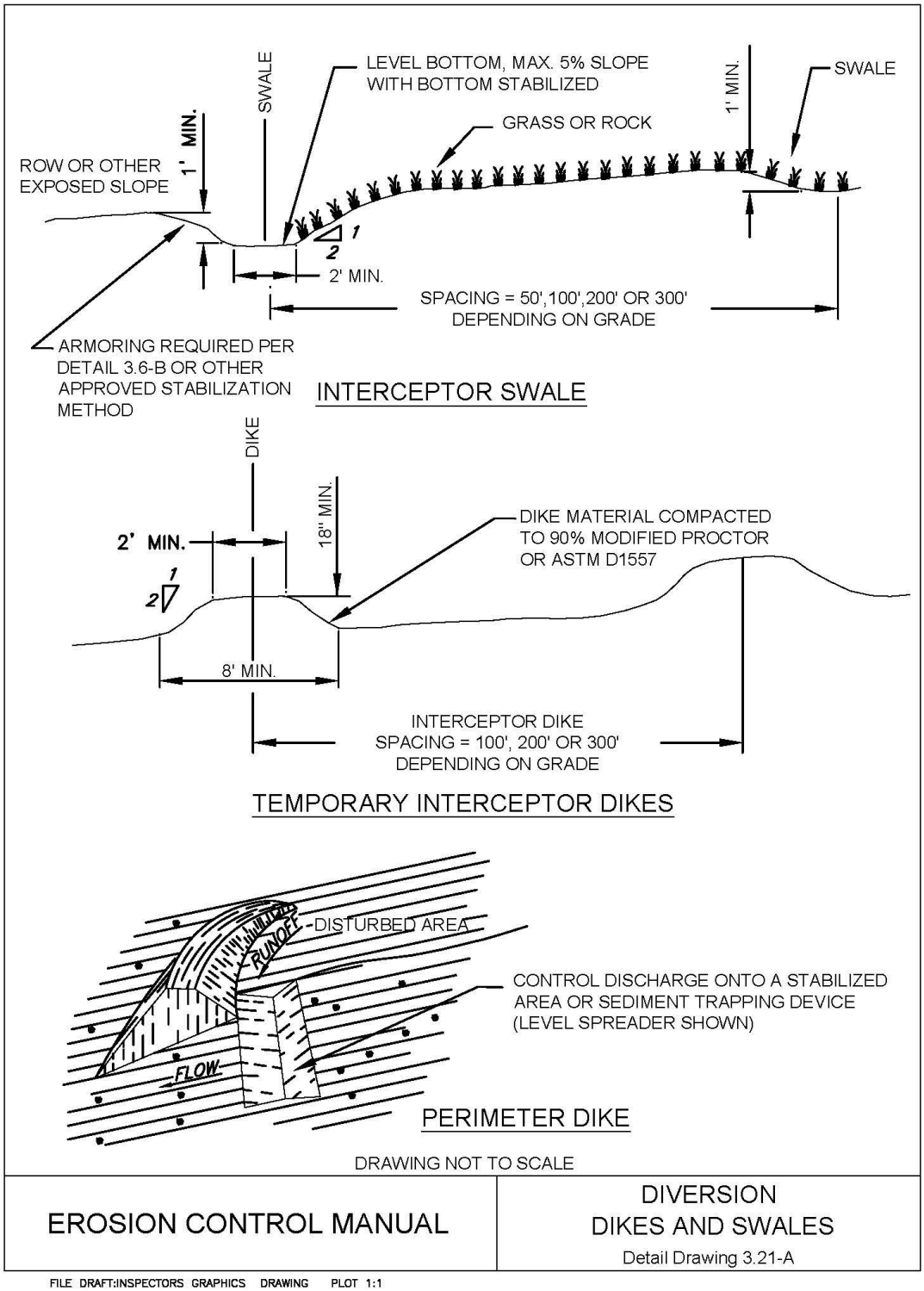



**Figure 9: Schematic diagram of diversion dike and drainage swale installation**

## 8.11. BMP 11: Drainage Swales

### Purpose & Applicability

Drainage swales are designed to intercept and divert runoff from disturbed areas without causing erosion. They act as a first line of defense by reducing runoff volumes, slowing flow velocities, and directing flows to sediment control devices. Swales can be used either to convey sediment-laden flows to a sediment basin or to divert relatively "clean" runoff around disturbed areas.

- **Applicability:**
  - Convey surface runoff down sloping land while minimizing erosion.
  - Intercept and divert runoff from steep or disturbed slopes, paved surfaces, and concentrated flows.
  - Serve as temporary or permanent controls (e.g., vegetated swales for final stabilization).
  - Can be used in conjunction with diversion dikes, check dams, velocity dissipation devices, and other erosion controls.

### Installation & Use Procedures

Proper design and installation of drainage swales require engineered calculations and careful construction practices (See figure 9):

- **Design & Calculations:**
  - Prepare drainage computations to determine channel shape, dimensions, slopes, and freeboard.
  - Design the swale to convey the calculated runoff volume from a 2-year, 24-hour storm.
  - The maximum contributing drainage area should generally be 5 acres or less, depending on site conditions.
  - Set the maximum flow depth to 1.5 feet (with provisions for overflow during larger storms); permanent swales if designed to local municipal standards.
- **Channel Geometry:**
  - Channels may be trapezoidal, parabolic, or V-shaped; note that V-shaped channels are generally used only where flow volumes and velocities are low.
  - For interceptor swales, side slopes should be 3:1 or flatter; temporary swales (less than 3 months) may use slopes of 2:1.
  - Provide a minimum freeboard of 6 inches.
- **Stabilization & Vegetation:**
  - For grades less than 2% and velocities under 6 feet per second, stabilize with grass, erosion control blankets, or anchored mulch.
  - For grades above 2% or velocities exceeding 6 feet per second, use turf reinforcement mats or riprap as appropriate.
  - Vegetated swales should be established to filter sediment and pollutants while reducing erosion.
- **Outlet & Integration:**

    - Design the outlet (discharge point) to ensure non-erosive velocities or incorporate velocity dissipation devices.
    - Ensure diverted runoff from disturbed areas is conveyed to a sediment control (e.g., sediment basin) or treatment facility.
    - Where applicable, integrate diversion dikes with the swale.
- **Documentation:**
    - Attach contractor illustrations, design calculations, and references to applicable standards.
    - Mark swale locations and outlet points on the SWPPP site map.

## Maintenance & Management

Regular inspections and timely maintenance are essential to maintain hydraulic capacity and performance:

- **Inspection Schedule:**
    - Inspect temporary swales prior to the rainy season, after rainfall events, and regularly throughout the rainy season.
    - Check channel linings, embankments, and outlets for erosion, washouts, debris, or sediment accumulation.
- **Maintenance Actions:**
    - Remove accumulated sediment to maintain channel capacity.
    - Repair any damage to berms, sidewalls, or outlet structures promptly.
    - Replace lost riprap, damaged linings, or soil stabilizers as needed.
    - Temporary swales should be completely removed once the drainage area is stabilized or at project completion.

## Performance Criteria

The effectiveness of the drainage swale BMP is determined by:

- The swale's ability to convey runoff at non-erosive velocities while reducing overall flow volume across disturbed areas.
- Effective interception and diversion of sediment-laden runoff into designated sediment control devices (e.g., sediment basins) without significant bypass.
- For vegetated swales, successful establishment of vegetation that filters sediment and pollutants while reducing erosion.
- Maintenance of hydraulic capacity and proper channel geometry as verified by regular inspections.
- No adverse impacts on upstream or downstream conditions, with all overflows managed safely.

## 8.12. BMP 12: Dust Control

### Purpose & Applicability

This BMP is designed to mitigate wind erosion and control dust emissions from construction sites. Fugitive dust generated from bare earth surfaces, whether by stormwater runoff, wind, erosion, or vehicle track-out, can negatively affect air quality and water quality if transported into storm drains. Effective dust control reduces particulate matter in the air, protecting worker health and nearby residents.

Note: *For certain counties in Utah, construction projects disturbing more than ¼ acre are required to submit a Fugitive Dust Control Plan (FDCP) to the Utah Division of Air Quality (UDAQ) before beginning work. Where required, this plan must outline measures to minimize dust emissions, ensuring compliance with opacity limits of 20% on-site and 10% at the property boundary.*

- **Applicability:**
  - Use on all bare earth areas where vegetation has been removed, such as during grading, earthmoving, or demolition operations.
  - Applicable to areas experiencing high vehicle traffic on unpaved surfaces, soil and debris storage piles, blasting, and wrecking ball operations.
  - Essential for preventing dust from being re-entrained by subsequent vehicular traffic and carried into public storm sewer systems.
  - To be used in conjunction with other erosion control and stormwater BMPs (e.g., revegetation, seeding, mulching).

### Installation & Use Procedures

To effectively control fugitive dust, implement the following procedures:

- **Control Methods:**
  - **Mechanical Methods:** Install geotextiles, mats, plastic covers, or other physical barriers over bare soil.
  - **Dust Palliatives:** Apply soil binders or chemical dust suppressants as prescribed by the manufacturer; note that all dust suppressants are temporary and require curing time (often 24 hours or longer) and may need reapplication after storm events.
  - **Revegetation:** Establish vegetation in disturbed areas to provide long-term stabilization and reduce dust generation.
  - **Water Application:** Apply water using a pressurized spray to moisten exposed soils and unpaved surfaces, preventing dust without causing runoff.
- **Documentation & Planning:**
  - Attach a copy of the Fugitive Dust Control Plan and applicable UDAQ permit information.
  - Include detailed descriptions of dust control tools, equipment, and suppression methods.
  - Document the specific locations and extents of treated areas on the SWPPP site map.

## Maintenance & Management

Effective dust control is an ongoing process requiring regular monitoring and reapplication as necessary:

- **Implementation:**
  - Implement the Fugitive Dust Control Plan as outlined in the UDAQ permit.
  - Establish and maintain a schedule for reapplication of dust control measures throughout the construction project.
- **Monitoring:**
  - Periodically inspect treated areas to assess the effectiveness of dust control measures.
  - Adjust suppression methods and maintenance schedules based on field performance and weather conditions.
- **Maintenance Actions:**
  - Reapply dust suppressants following a storm event or when visible failures (e.g., spot failures, undercut stabilized soil) occur.
  - Record maintenance activities and any corrective actions taken.

## Performance Criteria

This BMP is considered effective when:

- Dust emissions at property boundaries do not exceed established opacity limits (e.g., 10% opacity as per applicable regulations).
- No significant dust-related complaints are received from neighbors, and inspections confirm that dust control measures are in place and effective.
- All dust-generating operations are managed according to the Fugitive Dust Control Plan, with consistent adherence to established procedures.

# 9. Sediment Controls

## 9.1. BMP 13: Sub-Grade Sediment Trap (Curb Cut-Back)

### Purpose & Applicability

This BMP is designed to capture sediment by creating a depressed grade sediment trap along the back of a curb. It intercepts and retains runoff from very small drainage areas (such as parkways, medians, or pavement edges) and is especially useful at construction sites within rights-of-way or single residential lots where the drainage area is limited, and final site stabilization is pending.

- **Applicability:**
  - Use along project boundaries where the slope directs runoff toward the curb.
  - Suitable for controlling sediment from limited drainage areas at the back of curbs, medians, or where pavement sections are removed.
  - Not applicable for sites without overtopping runoff or where final stabilization is complete.

### Installation & Use Procedures

To ensure effective sediment capture, adhere to the following procedures (See figure 10):

- **Excavation Design:**
  - Excavate soil behind the curb to create a depressed area with a minimum width of 4 feet.
  - The longitudinal (along-curb) slope must not exceed 2%, and the transverse (toward-curb) slope must not exceed 3%. Steeper slopes require additional sediment controls.
  - The maximum width of the contributing drainage area should be limited to 12 feet; no other drainage areas should contribute runoff to the trap.
- **Additional Measures:**
  - Install erosion control blankets at low or sag points along the curb where flow may become concentrated.
  - The excavation may be offset up to 5 feet from the curb to avoid utility boxes.
  - Where a curb cut for a driveway is encountered and no driveway is constructed, securely install a wood plank (e.g., 2×4 or 4×4) across the curb to maintain continuity.
- **Documentation:**
  - Clearly identify the location and dimensions of the curb cut-back on the SWPPP site map and attach contractor illustrations detailing the excavation design.

### Maintenance & Management

Regular inspection and maintenance are critical to ensuring continued effectiveness:

- **Inspection Frequency:**
  - Inspect the depressed grade sediment trap during each routine inspection period and after any storm events.
- **Maintenance Actions:**

- Use a shovel or blade to remove accumulated sediment when it reaches at least half of the original excavation depth.
- Re-grade the depression if disturbed by construction traffic.
- Monitor low points, particularly where erosion control blankets are installed, during rain events to ensure they are effectively preventing sediment from flowing onto the pavement.
- Add additional controls as needed if erosion or sediment bypass is observed.

## Performance Criteria

This BMP is considered effective when:

- Runoff is captured within the depressed area, and sediment-laden water does not overtop the curb.
- The sediment trap retains the expected volume of runoff based on the 2-year, 24-hour storm design without significant sediment loss.
- Structural integrity of the curb and depressed area is maintained, with any sediment accumulation managed through regular maintenance.

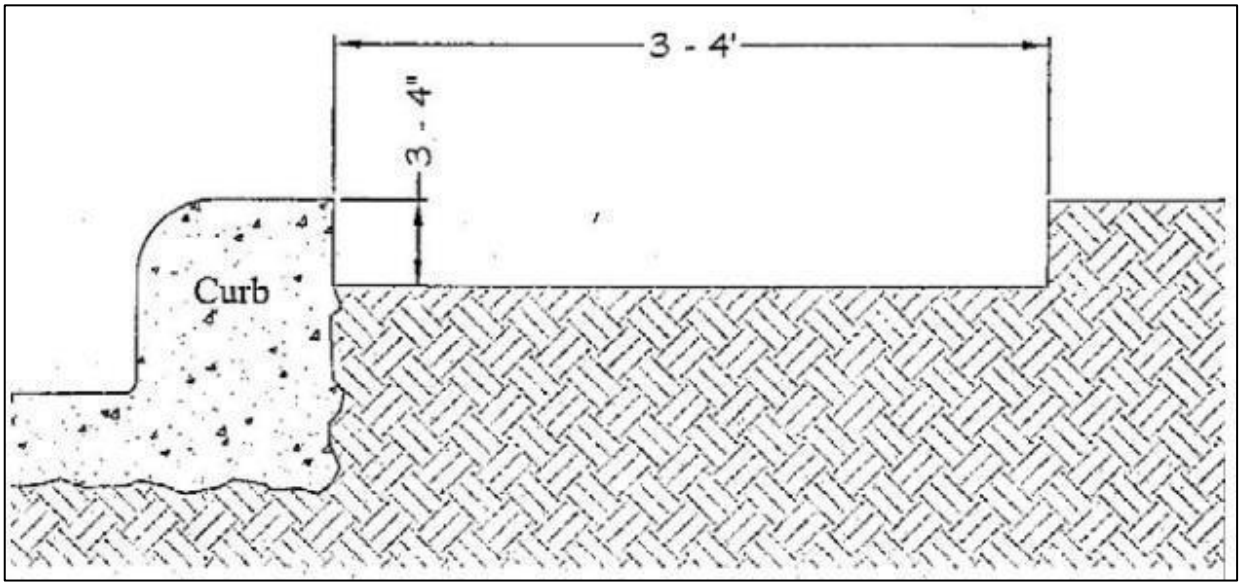



**Figure 10: Schematic diagram for curb cut-back installation**

## 9.2. BMP 14: Vegetated Filter Strips and Buffers

### Purpose & Applicability

Vegetated filter strips and buffers are designed to reduce the velocity of sheet flow and promote infiltration, thereby removing sediment as runoff is filtered through vegetation. They serve as both primary (in select conditions) and secondary sediment controls.

- **Applicability:**
  - Use along development project perimeters, around stockpiles, along streams, and adjacent to roadways to intercept runoff from disturbed areas.
  - Suitable for sites where sheet flow runoff occurs, particularly on small, disturbed drainage areas (maximum contributing drainage area of 2 acres).
  - Effective when installed along contours in areas not subjected to concentrated flows.
  - Not recommended when high groundwater, shallow bedrock, or low soil permeability inhibit infiltration.

### Installation & Use Procedures

To ensure effective sediment control, install vegetated filter strips and buffers following these guidelines (See figure 11):

- **Site Planning & Layout:**
  - Preserve existing vegetation along floodplains, wetlands, and natural waterways whenever possible. When disturbance is necessary, phase development to retain a vegetated buffer until final stabilization.
  - For newly planted strips, establish the filter along a line of constant elevation (contour) to maximize sheet flow interception.
  - Design the width of the vegetated filter strip to be a minimum of 15 feet; increase width based on the slope of the disturbed area, ensuring the maximum slope of the filter is 5% across its width in the direction of flow.
  - Limit the maximum sheet flow path length to 150 feet and ensure that the contributing drainage area is within design limits (e.g., less than 2 acres).
- **Vegetation & Stabilization:**
  - For newly planted areas, immediately establish sod or use erosion control blankets (ECBs) to protect the surface until vegetation is mature.
  - When using established vegetation as a buffer, clearly mark and protect the area using fencing, flagged stakes (maximum spacing 6 feet), or other protective measures to prevent disturbance.
  - If vegetated strips are used for slope protection, plant directly on slopes flatter than 2:1. For slopes of 2:1 or steeper, establish vegetation on terraces (with a transverse slope of about 1% back into the ground).
- **Documentation & Mapping:**
  - Attach contractor illustrations detailing the layout, dimensions, and design criteria (including drainage area, slope limitations, and vegetation specifications) to the SWPPP.
  - Include any engineering calculations or site-specific adjustments based on local conditions and municipal requirements.

## Maintenance & Management

Regular maintenance and monitoring are critical for ensuring continued performance of vegetated filter strips and buffers.

- **Inspection Schedule:**
  - Inspect the vegetated buffer during each routine inspection period and after any storm events.
  - Check for rill erosion, bare spots in vegetation, and accumulation of sediment that could bury the vegetated area.
- **Maintenance Actions:**
  - Rake or lightly remove sediment from the vegetation as needed to prevent clogging while avoiding damage to plant cover.
  - Remove trash and debris from the vegetated area promptly.
  - Inspect the established vegetation for bare areas; re-plant sod or install seeded erosion control blankets as necessary to maintain at least 80% ground cover.
  - Mow or trim vegetation as needed after maturation to maintain the integrity of the buffer.
  - If sediment accumulation is excessive, consider installing additional secondary controls (e.g., organic filter tubes or silt fence) along the upslope edge of the buffer.

## Performance Criteria

This BMP is considered effective when:

- The vegetated filter strip or buffer reduces sheet flow velocity and effectively filters sediment before runoff enters adjacent water bodies.
- The vegetation remains intact and covers at least 80% of the area, with minimal bare soil exposure.
- No significant rill erosion or sediment bypass occurs along the buffer; runoff is adequately slowed, and sediment is deposited within the buffer.
- The buffer remains stable under design storm events and is not overwhelmed by sediment load.

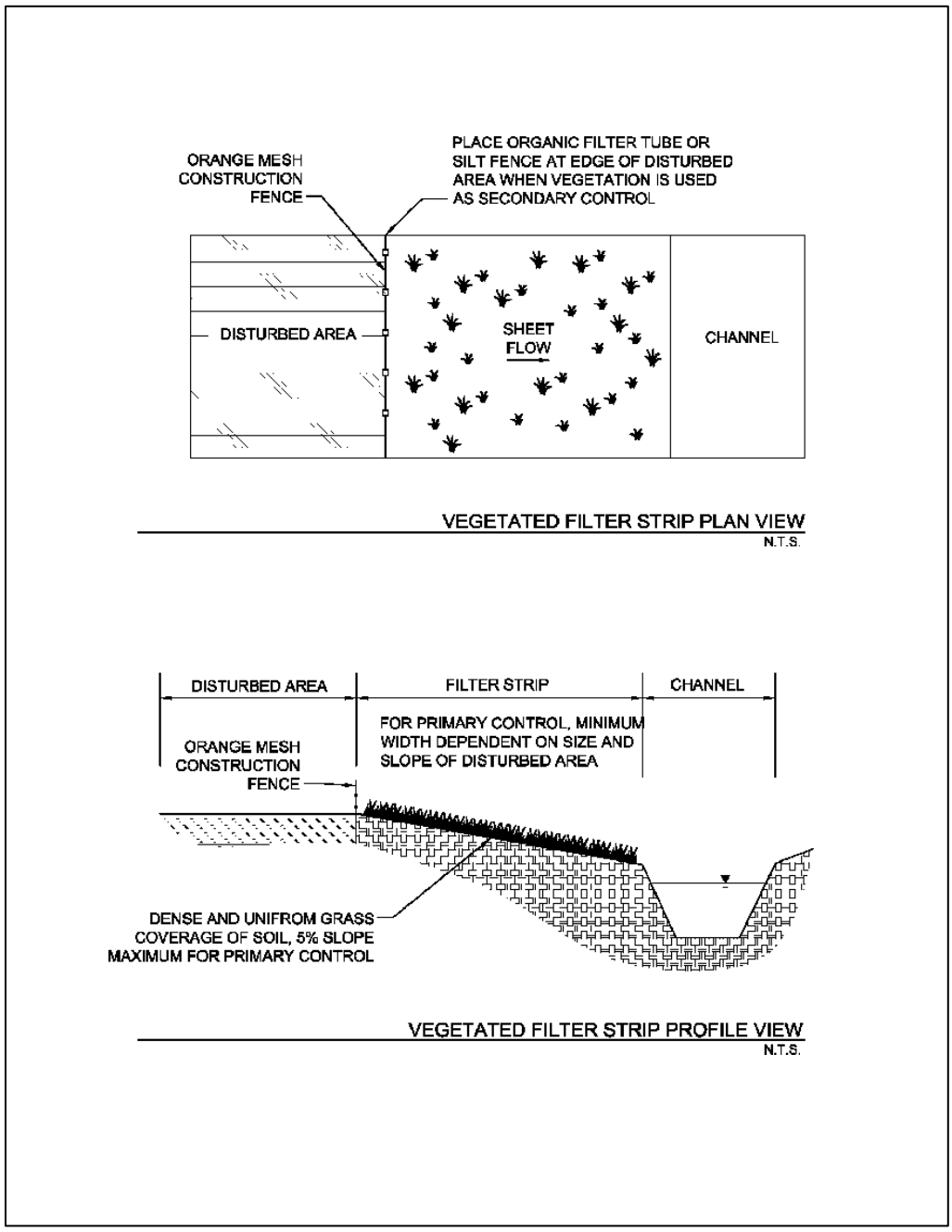



**Figure 11: Schematic diagram for vegetation filter strip applications**

## 9.3. BMP 15: Silt Fence

### Purpose & Applicability

This BMP is designed to intercept and detain sediment from disturbed areas during construction and to decrease the velocity of sheet flows. It is intended to prevent sediment from leaving the site and entering sensitive downstream resources.

- **Appropriate Applications:**
  - Use along the downstream boundaries of disturbed areas, stockpiled materials, or minor channels where runoff occurs as sheet flow.
  - Apply to construction sites with relatively small drainage areas, generally, not exceeding 0.25 acre per 100 feet of fence length, with a maximum flow rate of 0.5 cfs and a maximum flow path of 200 feet (reduced further on steeper slopes).
  - Most effective in sandy or silty soils; for predominately clay soils, consult a soils engineer.
- **Limitations:**
  - Not suitable for controlling large volumes of concentrated runoff.
  - May create a temporary sedimentation pond upstream of the fence, which can cause temporary flooding if not managed.
  - Effectiveness is highly dependent on proper installation, including correct pore size selection and secure anchoring.

### Installation & Use Procedures

To ensure optimal performance, install the silt fence as follows (See figure 12):

- **Installation Requirements:**
  - Construct the fence along a line of constant elevation (contour line).
  - Anchor the filter fabric below the ground surface by excavating a trench (approximately 6 inches wide and 6 inches deep) at the toe of the fence.
  - Silt fence posts shall be set at a minimum depth of 1 foot and spaced no more than 6 feet on center. Position posts on the downslope side of the silt fence.
  - Extend at least 20 inches of filter fabric into the trench and backfill with compacted 3/4-inch washed gravel or native material.
  - Overlap adjacent fabric sections by at least 3 feet and secure joints at support posts to prevent bypass.
  - The ends of the fence should be installed in a “J-hook” configuration, turning upslope for at least the last 10 feet, with additional upslope runs every 200 to 400 feet as required.
- **Design Criteria & Documentation:**
  - Ensure the drainage area contributing to the fence does not exceed the design capacity (0.25 acre per 100 linear feet of fence and maximum flow of 0.5 cfs).
  - Follow manufacturer recommendations for filter fabric selection based on soil type (consider tensile strength, puncture resistance, burst strength, apparent opening size, and UV resistance).

## Maintenance & Management

Regular maintenance and monitoring are essential to ensure the silt fence continues to perform as designed.

- **Inspection Schedule:**
  - Inspect the silt fence during each routine inspection period and after any storm event.
  - Check for signs of undercutting, sags, tears, gaps at the ground interface, or clogging of the fabric.
- **Maintenance Actions:**
  - Remove accumulated sediment from the fence base when sediment buildup reaches one-half of the fence height.
  - Repair or replace damaged fabric promptly to prevent bypass or structural failure.
  - If concentrated flows or excessive sediment buildup occur, implement additional measures such as reinforcement with additional control measures.
  - Provide sufficient room for sediment removal equipment and document maintenance activities.

## Performance Criteria

This BMP is considered effective when:

- The silt fence allows water to pass while effectively trapping and detaining sediment behind it.
- There is no significant bypass of runoff around, under, or over the fence.
- The fence effectively filters sediment during non-concentrated, sheet flow conditions and does not become overwhelmed by runoff from drainage areas exceeding design capacity.
- Structural integrity and installation details (proper anchoring, overlap, and toe embedment) are maintained.

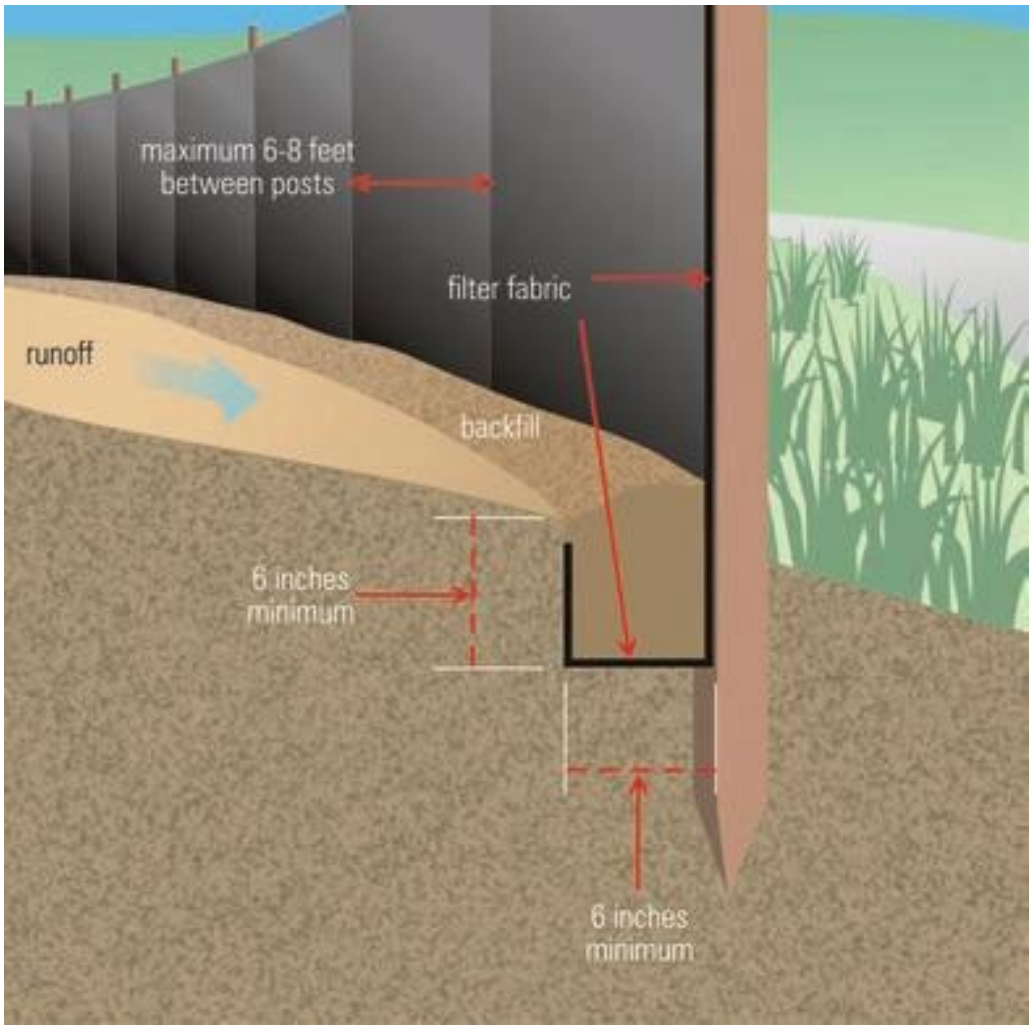



**Figure 12: Image detailing installation specifications for silt fencing**

## 9.4. BMP 16: Organic Filter Tubes (Straw Wattle)

### Purpose & Applicability

Organic filter tubes are long, flexible controls installed along a line of constant elevation (contour) on slopes to intercept and slow runoff, maintain sheet flow, and capture sediment. They serve as perimeter controls downslope of disturbed areas, around temporary stockpiles, and on side slopes.

- **Applicability:**
  - Use as a temporary sediment barrier on development sites, linear projects (e.g., roadways, utilities), and individual residential lots or redevelopment sites with limited space.
  - Effective in coarse to silty soil types; additional controls may be required for fine silts and clay soils.
  - Can serve for inlet protection or, in limited cases, as check dams in small drainage swales when contact with the soil surface can be maintained.
  - When incorporated into final stabilization, tubes must be constructed of 100% biodegradable natural fibers (e.g., jute, coir, sisal) or 100% UV photodegradable plastic, polyester, or geosynthetic material.
  - Not ideal for use on paved surfaces (See BMP 20 Weighted Filter Berm), but if doing so, use gravel bags draped over the wattle at similar spacing stakes

### Installation & Use Procedures

To ensure effective performance of organic filter tubes, follow these installation guidelines (See figure 8):

- **Placement & Alignment:**
  - Install filter tubes along the contour of the slope to maximize sediment capture and maintain sheet flow.
  - Secure tubes using 2-inch by 2-inch wooden stakes (or rebar/metal stakes) spaced no more than 4 feet apart.
- **Embedding & Overlap:**
  - Embed tubes at least three inches into the soil.
  - When connecting multiple tubes to form a continuous barrier, ensure an overlap of at least 6 inches between adjacent tubes.
- **Upstream Edge & Sizing:**
  - Place loose mulch material against the upstream side of the tubes to promote intimate soil contact.
  - Turn the last 10 feet (or more) at the ends of the tube line upslope to prevent bypass by stormwater. Additional upslope turns may be required every 200 to 400 feet depending on the traverse slope.
  - Typical tube diameters range from 6 to 24 inches; tubes may be available from 4 inches up to 36 inches. Note that tubes less than 8 inches in diameter when filled will require more frequent maintenance.
  - Refer to Table 4 for guidance on appropriate sizing and maximum allowable drainage area.
- **Manufacturer Guidance:**
  - When using manufactured organic filter tube products, follow the manufacturer's recommendations for diameter and spacing if they are more stringent than these

design criteria (See Table 4).

- **Material Selection:**
  - **Tube Mesh:** Specify mesh with a rated life of at least one year. The mesh must be open, evenly woven, and have openings sized appropriately for the chosen filter material (generally not exceeding ½ inch).
  - **Filter Material Options:**
    - Straw: Must be Certified Weed Free Forage, in good condition, air-dried, and free of mold.
    - Wood Chips: Use 100% untreated chips, free of inorganic debris, with sizes between 1 and 3 inches and shavings less than 5% of total mass.
    - Coir Fiber: Use natural coconut fiber rolls or mats, free of synthetic additives, suitable for sediment filtration and biodegradable over time.

**Table 4: Perimeter Control Applications**

| Tube Diameter (minimum) | Max Flow Length to the Tube | Drainage Area Max |
|---|---|---|
| 18 inches | 145 feet | 1/3 Acre per 100 feet |
| 15 inches | 110 feet | 1/4 Acre per 100 feet |
| 12 inches | 85 feet | 1/5 Acre per 100 feet |
| 9 inches | 55 feet | 1/8 Acre per 100 feet |

## Maintenance & Management

Routine inspection and prompt maintenance are essential to ensure continued effectiveness of organic filter tubes.

- **Inspection Schedule:**
  - Inspect organic filter tubes during each routine inspection period and after any storm event.
  - Verify that tubes remain in continuous contact with the soil at the bottom of the embedment trench.
- **Maintenance Actions:**
  - Check for rill erosion developing beneath the tubes; repair eroded spots immediately and consider additional controls if erosion persists.
  - Ensure that staking remains secure; re-stake or repair tubes that have shifted due to stormwater runoff.
  - Inspect for signs of splitting, tearing, or unraveling; repair or replace damaged tubes as needed.
  - Remove accumulated sediment from behind the tubes before it reaches half the height of the exposed portion of the tube.
  - When sediment control is no longer required, consider splitting the tubes open and reusing the filter material for mulching during final site stabilization if it meets specified criteria.

## Performance Criteria

This BMP is considered effective when:

- Organic filter tubes maintain their position along the contour with full contact at the bottom of the embedment trench.
- Runoff passes over or through the tubes, with sufficient detention to allow sediment to settle, and minimal bypass occurs.
- The tubes capture at least 75% of the sediment load (as verified by manufacturer documentation or testing), thereby reducing sediment transport off-site.
- Regular maintenance prevents clogging; sediment is removed before it reaches half the exposed tube height.

## 9.5. BMP 17: Earth Berm Barrier

### Purpose & Applicability

Earth berms (also referred to as filter berms, diversion berms, or earth berm barriers) are constructed from compacted soil or other organic materials to slow, pond, and filter runoff. They are used as perimeter controls downslope of disturbed areas and alongside slopes to divert or intercept sediment-laden runoff. These berms are particularly well suited for sites with small, disturbed drainage areas that are not subject to concentrated flows and that will ultimately be stabilized (seeded, sodded, or landscaped).

- **Applicability:**
    - Use as a temporary sediment control measure to divert runoff from disturbed areas toward a sediment trap or basin.
    - Suitable for both development sites and linear (roadway) projects with small drainage areas.
    - Most effective on coarse to silty soil types; additional controls may be needed for fine silts and clays.
    - Economical due to ease of installation and potential to be tilled into the soil at project completion, thereby enhancing the organic content of the site.

### Installation & Use Procedures

To ensure effective performance of earth berms, follow these detailed procedures (See figure 13):

- **Planning & Site Preparation:**
    - Install berms prior to any major earth-disturbing activities (e.g., clearing, grading) on the downslope boundary of the disturbed area.
    - Plan berm placement along a line of constant elevation (contour line) to maximize the available ponding area and prevent concentration of flow against the berm.
    - Coordinate berm installation with access route planning to minimize interference with construction operations.
- **Design Criteria:**
    - Limit the contributing drainage area to a maximum of 0.25 acre per 100 linear feet of berm.
    - For flow diversion, ensure that the maximum flow to any 20-foot section does not exceed 1 cubic foot per second and that the maximum flow distance to the berm is 200 feet (reduced to less than 50 feet if the slope exceeds 10%).
    - Design berms based on intended shape:
        - **Trapezoidal Berms:** Approximately 1.5 to 3 feet high, with a top width of 2 to 3 feet and a base width of 3 to 6 feet.
        - **Windrow (Triangular) Berms:** Approximately 1 to 2 feet high and 2 to 4 feet wide
    - Berm side slopes should be 2:1 or flatter.
    - Roughen the soil surface before berm placement to improve adherence of the organic filter material.

    - If berms are constructed using organic materials (e.g., compost, wood chips), ensure that the material is free of chemical contamination, trash and debris.
- **Stabilization:**
    - Stabilize berms by seeding for long-term or permanent use.
    - Provide additional erosion control measures (e.g., erosion control blankets or turf reinforcement matting) where necessary.
- **Documentation:**
    - Clearly mark the berm location and dimensions on the SWPPP site map.

## Maintenance & Management

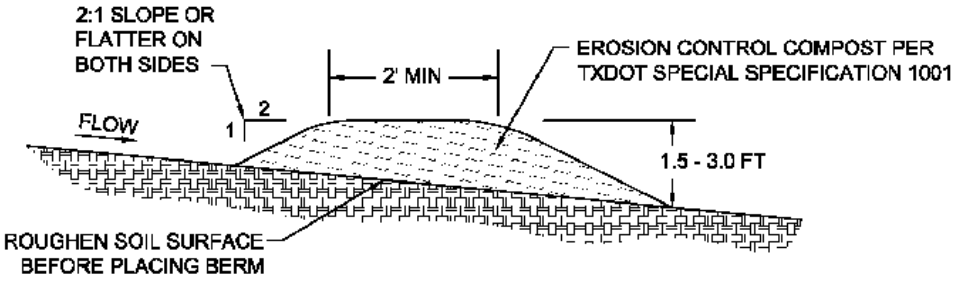
Regular monitoring and prompt maintenance are essential to ensure that earth berms continue to function as intended.

- **Inspection Schedule:**
    - Inspect berms during each routine inspection period and after any storm event.
- **Maintenance Actions:**
    - Remove accumulated sediment from the berm when sediment buildup reaches one-half the height of the berm to prevent overtopping.
    - Rake or redistribute sediment from areas where the berm is becoming clogged, ensuring the berm's dimensions and design are maintained.
    - Repair any signs of erosion, undercutting, or breaches promptly by replacing organic material or adding additional stabilization measures.
    - Stockpile excess organic material on-site for use in repairs to berms disturbed by construction activities.

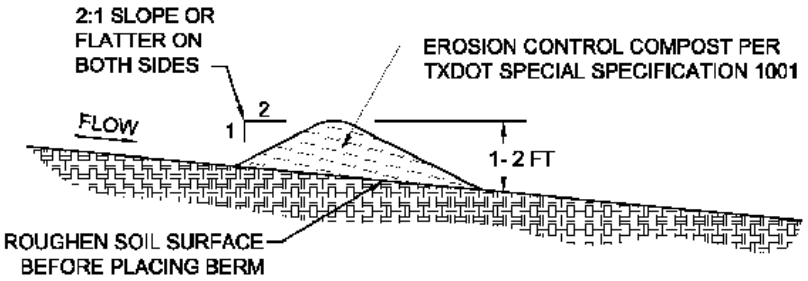
## Performance Criteria

This BMP is considered effective when:

- The earth berm effectively intercepts and retains runoff, preventing sediment-laden water from bypassing and leaving the site.
- Runoff is diverted to designated sediment traps or basins, and the berm maintains its designed dimensions and stability.
- There is no significant erosion, breaching, or undercutting along or under the berm.
- Accumulated sediment is removed in a timely manner to prevent overtopping and maintain effective operation.




TRAPEZOIDAL SHAPED ORGANIC FILTER BERM
N.T.S.




TRIANGULAR SHAPED ORGANIC FILTER BERM
N.T.S.

NOTE: DIMENSIONS OF THE BERM SHALL BE DESIGNED BASED ON FLOW CONDITIONS. PROVIDE CALCULATIONS THAT DOCUMENT THE FOLLOWING PARAMETERS TO DESIGN THE SWALE:

- SIZE OF CONTRIBUTING DRAINAGE AREA
- DESIGN STORM
- FLOW RATE
- BERM HEIGHT AND WIDTH

**Figure 14: Schematic diagram for earth berm barrier specifications**

## 9.6. BMP 18: Gravel Filter Berms

### Purpose & Applicability

Gravel filter berms are designed to intercept and detain sediment-laden water from unprotected areas. They function by slowing runoff, allowing sediments to settle while releasing water in sheet flow.

- **Applicability:**
  - Use as a temporary measure to retain sediments near the toe of slopes and at construction site perimeters.
  - Suitable for areas where runoff from unprotected surfaces (e.g., roadways, unsurfaced rights-of-way) must be treated before discharge.
  - Can be applied as check dams across one or more lanes of temporary construction roads or unsurfaced rights-of-way subject to construction traffic.
- **Limitations:**
  - Limit the contributing drainage area upstream of the barrier to 5 acres and to gently sloping areas.
  - Not recommended for landscaped areas due to cleanup difficulties.
  - Must be routinely maintained because of clogging from mud and soil.

### Installation & Use Procedures

To achieve effective sediment retention, install the gravel filter berm according to the following guidelines (See figure 14):

- **Planning & Design:**
  - Construct the berm along a level contour to intercept sheet flow.
  - Provide an undisturbed or stabilized outlet suitable for sheet flow.
  - Ensure ample room is available between the berm and the toe-of-slope for sediment removal equipment.
  - For installations in stream beds, use large rock, secure with woven wire sheathing (gabions), and plan for daily inspections.
- **Materials & Construction (Open Graded Rock Berms):**
  - Build the berm with open graded rock sized as follows: use 3/4 to 3-inch diameter rock for sheet flow and 3 to 5-inch diameter rock for concentrated flow.
  - For non-traffic areas, construct the berm with a minimum height of 12 inches and a minimum width of 18 inches, with side slopes of 2:1 or flatter.
  - If using gravel bag berms, use bags made of woven polypropylene, polyethylene, or polyamide fabric. Typical bag dimensions are approximately 24–30 inches long, 16–18 inches wide, and 6–8 inches thick, with a fill weight of about 90–125 pounds.
  - When used as a linear control, install the gravel bag berm along a level contour, turning the ends upslope to prevent runoff bypass.
  - For concentrated flows, stack gravel bags in a pyramid configuration with upper rows overlapping joints in lower rows; provide a setback of at least 3 feet from the toe of the slope (or as far back as site conditions allow).
- **Integration with Other BMPs:**

    - Combine gravel filter berms with additional erosion control practices (e.g., seeding, mulching, silt fences) to enhance overall performance.
- **Documentation:**
    - Record the berm location on the SWPPP site map.

## Maintenance & Management

Regular maintenance is essential to ensure the gravel filter berm continues to function effectively.

- **Inspection Schedule:**
    - Inspect the gravel filter berm during each routine inspection period and after any storm event.
- **Maintenance Actions:**
    - Remove retained sediments when accumulation reaches one-third of the berm height or 1 foot (whichever is less) to maintain storage capacity.
    - Reshape or regrade the berm as needed to restore its original dimensions and functionality.
    - Replace or repair any dislodged or degraded materials (e.g., lost rock in gravel bag berms or damaged bag material).
    - Ensure that any additional erosion control measures (e.g., erosion control blankets) remain intact and effective.
- **Debris Management:**
    - Remove any trash or debris from the berm promptly to prevent clogging and reduced performance.
    - Coordinate maintenance with other site BMPs to ensure overall sediment control.

## Performance Criteria

This BMP is considered effective when:

- The gravel filter berm successfully intercepts and detains sediment from runoff while allowing water to pass in sheet flow.
- Sediment is retained within the berm, and any accumulated sediment is removed before reducing the berm's effective storage capacity.
- The berm maintains its structural integrity and proper dimensions over time without significant erosion, undercutting, or bypassing of runoff.
- In traffic areas, the berm functions without posing safety hazards or causing damage to vehicle tires.

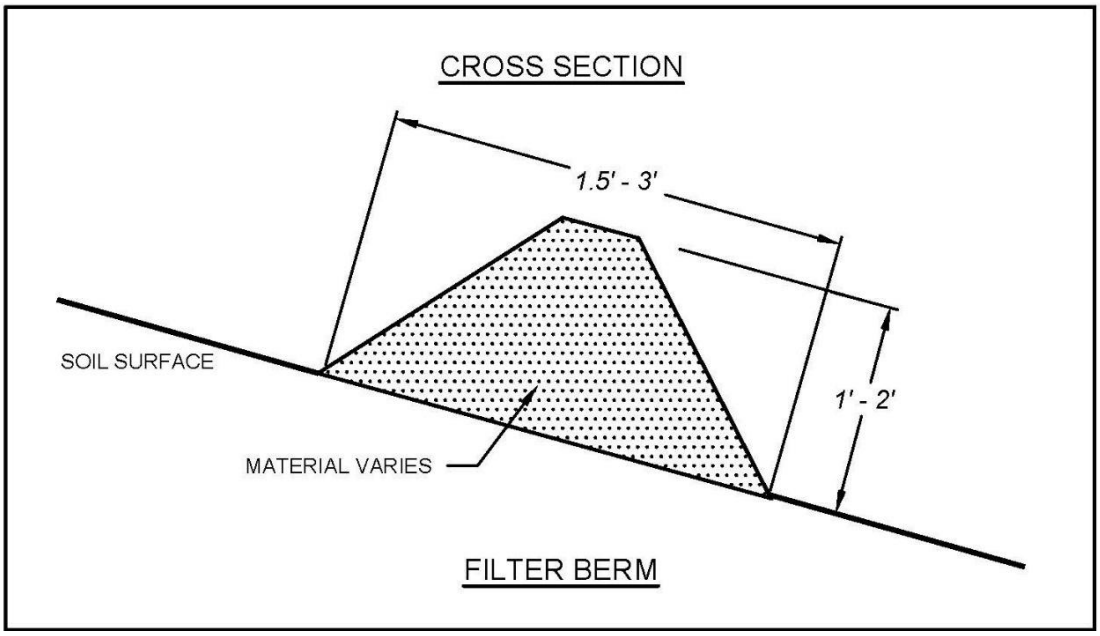



**Figure 14: Schematic diagram of filter berm installation**

## 9.7. BMP 19: Inlet Protection

### Purpose & Applicability

Inlet protection is designed to reduce the amount of sediment, debris, and pollutants entering storm drain systems by acting as a secondary (or, in select cases, primary) sediment control measure. These measures serve as a backup to newly applied erosion controls or other sediment controls that alone may not achieve adequate sediment removal.

- **Primary Use:**
  - Typically used as a secondary sediment barrier at low point (sump) inlets where stormwater runoff will pond behind the protection measure and then either filter through the device or flow over an overflow weir.
  - May be used as a primary control only when all other primary measures are infeasible due to site configuration or construction activity.
- **Appropriate Applications:**
  - Best applied at low point inlets where runoff can pond, allowing sediment to settle or filter through the device.
  - Suitable for new developments with new inlets and roads not yet in public use; limited applications in developed areas (e.g., parking lot inlets during major roadway repairs) where other controls are not viable.
  - Inlet protection must allow the inlet opening to function (e.g., via inlet inserts) and should not completely block the inlet.
- **Limitations:**
  - Special caution is required on publicly traveled streets due to potential flooding, traffic, and pedestrian safety concerns.
  - Effective inlet protection depends on proper design, including a bypass capability to prevent blockage when the device becomes clogged.

### Installation & Use Procedures

To ensure effective inlet protection, follow these procedures, which may be adapted based on site-specific conditions and inlet configurations (See figures 15 and 16):

- **General Installation Requirements:**
  - Evaluate drainage patterns to ensure that the inlet protection does not divert flow or cause flooding of adjacent roadways or properties.
  - Inlet protection devices must never completely block the inlet; they must include a bypass (overflow weir, positive overflow swale, or sufficient storage volume) to handle excess flows during a conveyance storm (typically a 25-year, 24-hour event).
  - Positive overflow drainage is critical; if overflow is not integrated, provide temporary routing of excess flows through established swales, streets, or watercourses.
- **Materials & Methods:**
  - **Filter Fabric and Wire Mesh:** When using fabric-based inlet protection (e.g., filter fabric fences), install according to the material requirements specified for silt fences (see BMP 15).
  - **Block and Gravel (Crushed Stone or Recycled Concrete) Protection:**
    - Use when flows exceed 0.5 cfs, allowing overtopping to prevent flooding.

- **Organic Filter Tube Protection:**
    - Use when contact with soil surface can be maintained.
    - Ensure the tube's diameter is at least 2 inches less than the inlet height and extends to a minimum of 12 inches past the curb opening on each side
- **Bagged Inlet Protection:**
    - Bags used on pavement shall be filled with aggregate, filter stone, or crushed rock (not sand) to minimize washout.
    - Filled bags should be 24-30 inches long, 16-18 inches wide, and 6-8 inches thick
    - Bags must be constructed of polypropylene, polyethylene, or polyamide woven fabric
- **Area Inlet Protection:**
    - Adapt installation methods based on inlet type (drop, "Y," etc.) and surrounding surfaces (parking lot, playground, etc.).
    - For filter fabric protection on area inlets, excavate a 6-inch by 6-inch trench at the toe of the fence, lay the fabric with 32 inches extending out, and backfill with compacted earth or gravel.

- **Documentation & Coordination:**
    - Attach all relevant proprietary illustrations, design calculations, and installation specifications to the SWPPP.
    - Clearly identify the inlet protection system's layout on the site map.
    - Coordinate with local municipalities and oversight authorities regarding any required approvals or modifications.

## Maintenance & Management

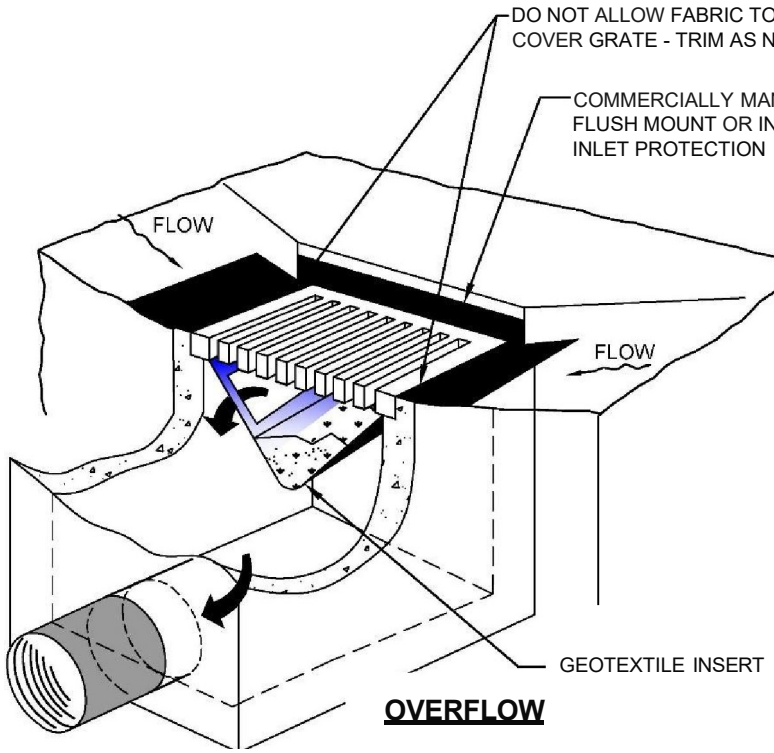
Regular maintenance and monitoring are essential to ensure inlet protection systems continue to perform effectively.

- **Inspection Schedule:**
    - Inspect inlet protection devices during each routine inspection period and after any storm event.
    - For curb inlet protection, check for any blockage, collapse, or damage that might inhibit flow through the inlet.
- **Maintenance Actions:**
    - Remove floatable debris and trash caught by the inlet protection after every storm event.
    - Remove sediment from curb inlet protection after each storm, given the limited storage capacity of curb inlets.
    - For area inlet protection, remove sediment before it reaches half the height of the device (or reduces excavation volume by 50% for impoundment systems).
    - Regularly check and clear weep holes to ensure proper drainage.
    - Inspect all components (filter fabric, organic filter tubes, bags, blocks, and wire mesh) for damage, repairing or replacing items as needed.
    - Remove inlet protection devices as soon as the drainage area contributing runoff is stabilized and permanently vegetated.

## Performance Criteria

This BMP is considered successful when:

- The inlet protection system effectively reduces sediment, debris, and pollutants entering the storm drain without completely blocking the inlet.
- A bypass (overflow weir, positive overflow swale, or sufficient storage volume) is provided and functions properly during design storm events (e.g., 25-year, 24-hour storm) without causing roadway or property flooding.
- For curb inlet protection, a minimum 2-inch overflow gap or weir is maintained, and the system allows safe ponding to a depth not exceeding design limitations.
- The system maintains structural integrity, with no significant damage or clogging that compromises its function.
- Regular maintenance prevents excessive sediment accumulation (e.g., sediment must be removed before reaching half the height of the protection device), ensuring continued effective performance.




NOTE:
RECESSED CURB INLET MUST **BE** PROTECTED WHEN CURB INLET IS PRESENT.
SIZE OF FILTER FABRIC INLET SACK TO BE DETERMINED BY MANUFACTURER.

COMMERCIALLY MANUFACTURED DEVICES RATED AS "HIGH FLOW' REQUIRED IN LOCATIONS WHERE FREQUENT FLOODING OCCURS GRATES THAT ARE NOT REMOVABLE MAY UTILIZE COMMERCIALLY MANUFACTURED "TOP OF GRATE" DEVICE.

DRAVVING NOT TO SCALE

| EROSION CONTROL MANUAL | STORM DRAIN INLET INSERT<br>Detail Drawing 3.19-B |
|---|---|

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**Figure 15: Schematic diagram for storm drain inlet protection (interior protection)**

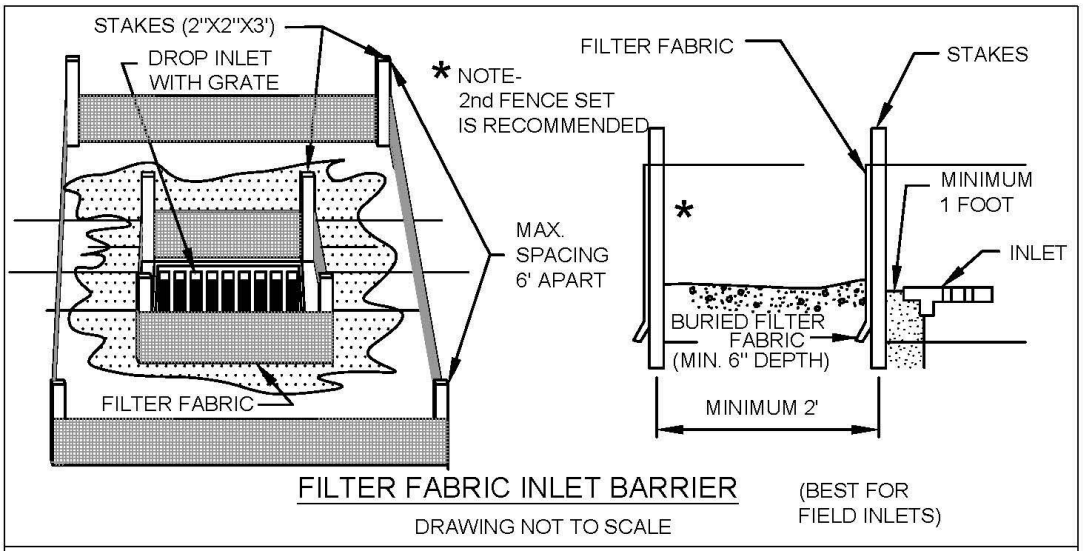



**Figure 16: Schematic drawing for storm drain inlet protection (exterior protection)**

## 9.8. BMP 20: Weighted Filter Berm

### Purpose & Applicability

This BMP is designed to intercept and slow the flow of sediment-laden runoff by creating a temporary barrier using coarse material such as gravel-filled bags. The barrier allows sediment to settle before the water leaves the construction site on paved surfaces.

- **Applicability:**
  - Suitable for creating temporary sediment traps or retention basins and as an alternative to organic filter barriers or silt fences.
  - Effective for storm drain inlet protection because the sandbag barrier does not require anchoring to paved surfaces.
  - Can be used for both perimeter control (e.g., around stockpiles, along site boundaries, adjacent to fueling or chemical storage areas) and as a temporary diversion structure below the toe of exposed slopes.

### Installation & Use Procedures

To ensure effective performance, follow these detailed procedures (See figures 17 and 18):

- **Design and Layout:**
  - Locate the weighted barrier on a level contour so that sheet flow runoff is intercepted and ponded.
  - For slope interruption, determine spacing based on slope steepness:
    - For slope with a 4:1 (H:V) or flatter ration, place sandbags at intervals up to 20 feet (with the first row near the slope toe).
    - For slopes between 4:1 and 2:1, reduce spacing to approximately 15 feet.
    - For slopes steeper than 2:1, use a maximum interval of 10 feet.
  - Turn the ends of the sandbag barrier upslope to prevent runoff from bypassing the barrier.
  - Provide sufficient upslope room for ponding and sediment storage; in some cases, set back the barrier from the slope toe to facilitate cleaning. Where set-back is not feasible, install the barrier at the toe and consider placing cross barriers (bags perpendicular to a berm) to prevent flows behind the barrier.
- **Materials & Construction:**
  - **Sandbag Material:** Use sandbags made of woven polypropylene, polyethylene, or polyamide fabric. Burlap is not acceptable.
  - **Bag Dimensions:** Typical sandbags should be approximately 18 inches long, 12 inches wide, 3 inches thick, and weigh about 33 lbs (nominal dimensions may vary based on locally available materials).
  - **Fill Material:** Use non-cohesive, Class 3 permeable material free from clay and deleterious substances (e.g., recycled concrete or asphalt may be acceptable if properly screened).
  - **Stacking and Layout:**
    - Stack sandbags in a continuous row, at least three bags high, using apyramid approach.
    - Butt the ends of bags tightly; overlap the butt joints of each successive row to create a continuous barrier.
    - Ensure the barrier is constructed to withstand sheet flow without being

overtopped or compromised.

## Maintenance & Management

Regular inspection and timely maintenance are critical to ensure continued performance.

- **Inspection Schedule:**
  - Inspect the sandbag barrier during each routine inspection period and after any storm event.
  - Inspect for physical damage, gaps, or signs of sandbag degradation due to UV exposure or mechanical wear.
- **Maintenance Actions:**
  - Remove accumulated sediment when it reaches one-third of the barrier height (or 1 foot, whichever is less) to maintain effective storage capacity.
  - Reshape or replace sandbags as needed; sandbags exposed to sunlight may need to be replaced every 2–3 months.
  - Repair any washouts, breaches, or damage promptly and re-compact or re-stabilize the area as necessary.
  - Ensure that any disturbed or damaged sections are restored to the original design specifications.

## Performance Criteria

This BMP is considered effective when:

- The sandbag barrier effectively slows runoff, creating a temporary ponding area that allows sediment to settle out before water leaves the site.
- The barrier maintains its structural integrity with no significant gaps, undercutting, or overtopping during runoff events.
- Regular maintenance keeps sediment accumulation below one-third of the barrier height, ensuring continued performance.

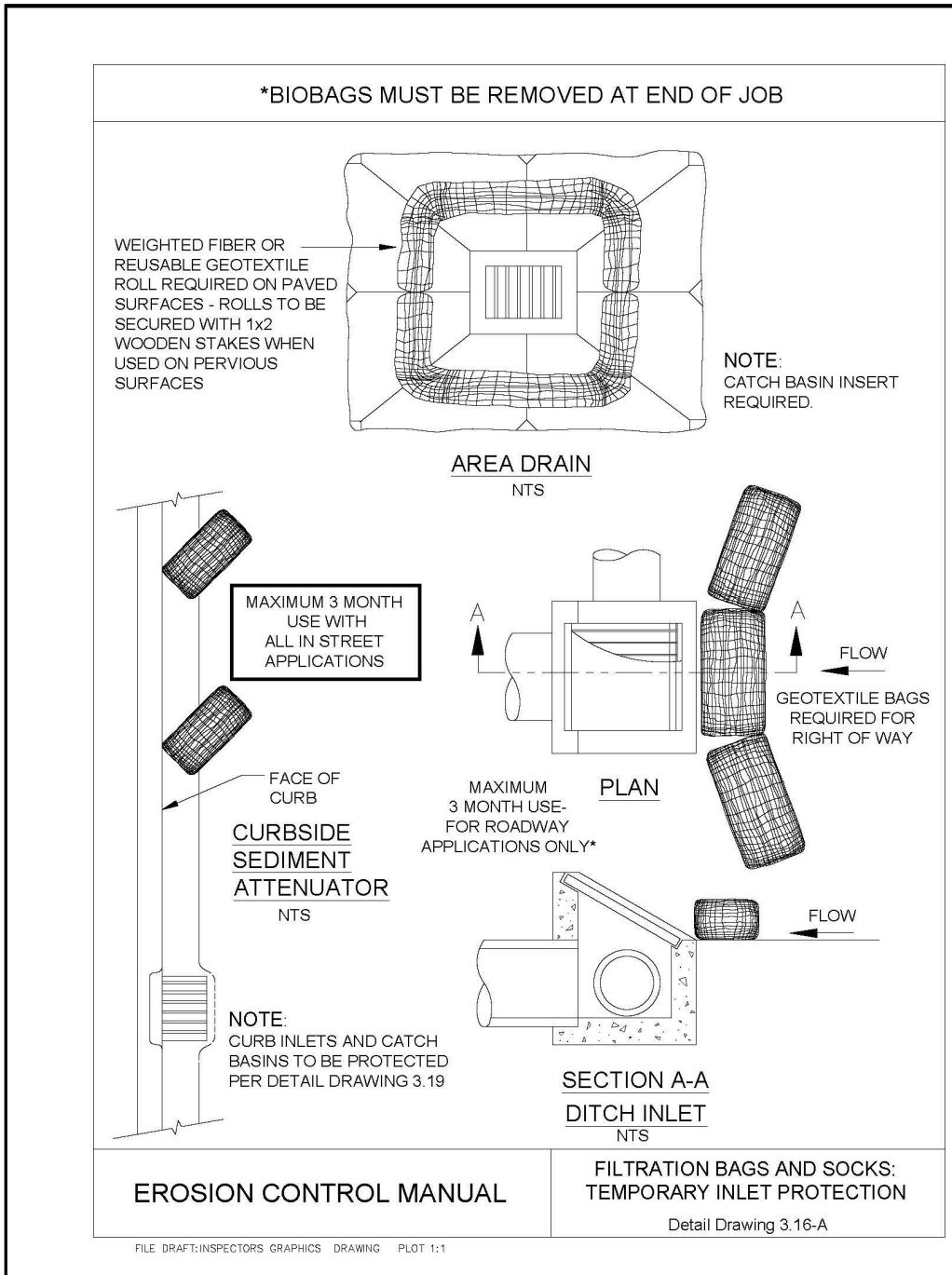



**Figure 17: Schematic diagram of weighted filter berms for inlet protection**

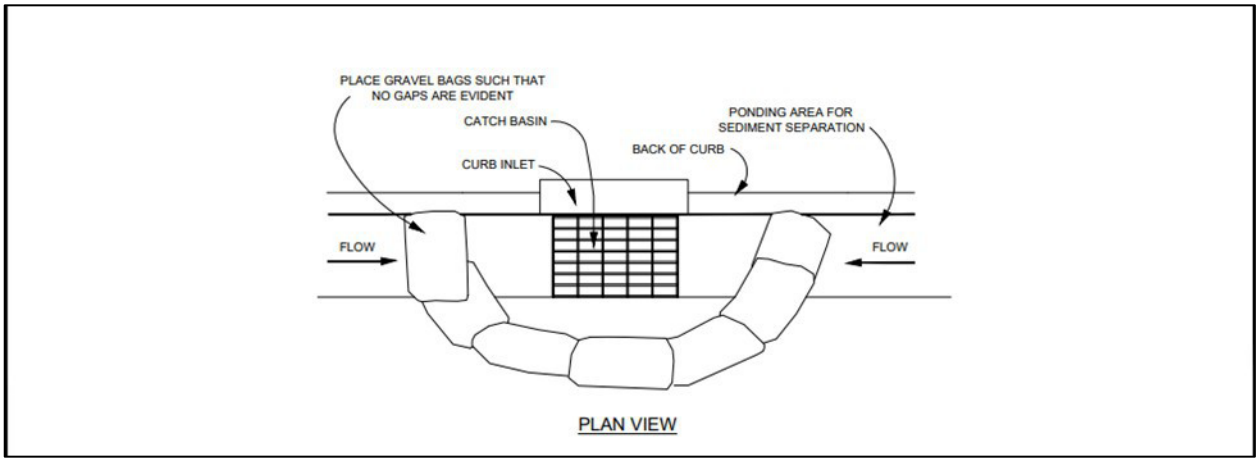



**Figure 18: Schematic diagram of weighted filter berms for curb inlet protection**

## 9.9. BMP 21: Gutter Dam

### Purpose & Applicability

This BMP is designed to filter sediment-laden stormwater by slowing down flow in the gutter, thereby allowing sediment deposition before water reaches downstream inlets. It serves as a secondary control measure to inlet cover-only BMPs, ensuring that sediment bypass is minimized.

- **Applicability:**
  - Use where sediment-laden runoff is expected to be contained from downstream BMPs, such as in subdivisions with multiple builders.
  - Ideal for protecting inlets by slowing flow, particularly when coupled with other erosion control measures.
  - Not intended for high-flow areas without additional support measures.
  - Warning: This BMP is easily damaged by vehicles parked along the curb and gutter and by snow removal operations.

### Installation & Use Procedures

To ensure effective sediment control with a gutter dam system, follow these procedures (See figure 19):

- **Installation Requirements:**
  - Install sand or gravel bags with a minimum diameter of 6 inches; double up bags as necessary.
  - Position the gutter dam upstream of storm drain inlets.
  - Ensure that the system is designed so that the first (upstream) dam holds more sediment than the downstream dams. Equal sediment accumulation among dams indicates system malfunction.

### Maintenance & Management

Regular maintenance and inspections are essential to ensure the gutter dam system remains effective:

- **Inspection Schedule:**
  - Inspect the gutter dam system during each routine inspection period and after any storm event.
- **Maintenance Actions:**
  - Repair any damage and remove sediment deposits before storm events that could scour the sediment from the dam.
  - Ensure that following a storm event, the first (upstream) dam holds more sediment than subsequent dams. If sediment accumulation is equal among dams, additional or alternative BMPs may be necessary.
  - Monitor and repair any damage caused by vehicle parking or snow removal operations.
  - Maintain clear access around the gutter dam to facilitate inspections and to prevent hazardous driving conditions due to surface water.

### Performance Criteria

This BMP is considered successful when:

- The gutter dam system slows the flow of runoff sufficiently to allow for effective sediment deposition.
- The system operates as a secondary control, in conjunction with erosion control measures, to minimize sediment bypass.
- Under rainfall events, the gutter dam does not experience significant scour. If significant scour occurs, an alternative BMP is warranted.
- The upstream dam consistently collects more sediment than downstream dams. If sediment deposits are equal or greater in downstream dams following storm events, the BMP is not performing as intended.
- Regular damage from traffic or snow removal that impairs function is addressed; persistent damage indicates that an alternative BMP should be considered.

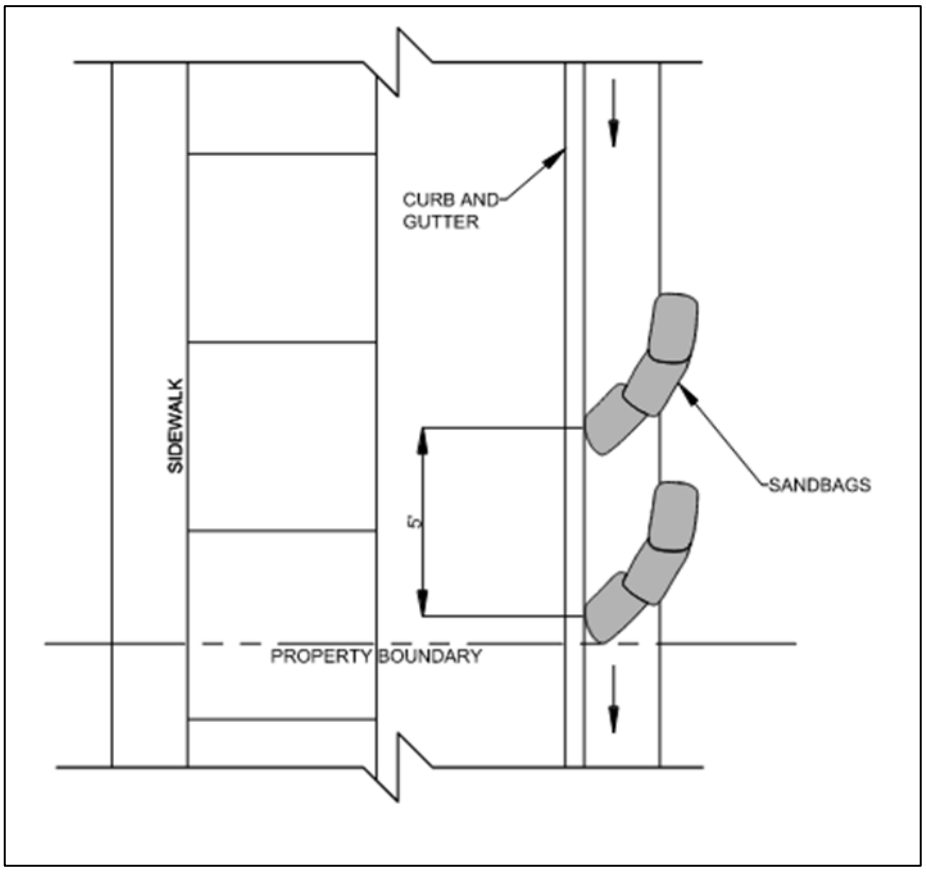



**Figure 19: Schematic diagram of gutter dam installation**

## 9.10. BMP 22: Sediment Basins and Traps

### Purpose & Applicability

Sediment basins and traps are designed to collect and store sediment-laden water generated during construction activities. They act as treatment devices that temporarily impound runoff, allowing sediment to settle before the water is discharged. These measures help control silt-laden runoff until permanent erosion controls or stabilization measures (e.g., vegetation, permanent detention basins) are implemented.

- **Applicability:**
  - Use on construction projects where large drainage areas contribute runoff (e.g., disturbed areas ≥5 acres) or where a minor stream or off-line drainage channel crosses the site.
  - Applicable at sites where sediment-laden water is expected to enter the drainage system and where sediment control is critical prior to final stabilization.
  - Suitable for temporary use (design life <1 year) until the site is permanently protected against erosion.
  - Sediment traps are best for capturing larger particles (e.g., gravel, sand) and may be used in combination with additional treatment systems for finer particles.

### Installation & Use Procedures

To ensure effective sediment capture and storage, install sediment basins and traps according to the following guidelines (See figures 20 and 21):

- **Basin Design & Sizing:**
  - Determine the number and size of basins or traps required based on the contributing drainage area. For smaller drainage areas (≤ 5 acres), multiple smaller basins may be more effective than one large basin.
  - Design the basin to provide for either:
    - The calculated runoff volume from a 2-year, 24-hour storm event, or
    - A volume of approximately 3,600 cubic feet per acre drained.
  - For sediment traps, ensure the structure is designed to capture and temporarily impound runoff from concentrated flows, typically at outlets of diversion structures, channels, or slope drains.
- **Construction Timing & Location:**
  - Construct basins and traps before clearing and grading begin to minimize sediment generation.
  - Locate the basin/impoundment on property limits, away from waters of the state, natural buffers, wetlands, or high groundwater areas.
  - Ensure that the basin is accessible for periodic cleanout and maintenance. Attach relevant topographic maps, grading sheets, and SWPPP site maps showing the basin location.
- **Structural Elements:**
  - **Basin Embankment:** May be formed by partial excavation and/or by constructing a compacted embankment. Embankments should be designed with side slopes of 3:1 or flatter and constructed with clay (meaning with sufficient plasticity) placed in 8-inch lifts and compacted.

- **Outlet & Spillway:**
  - Incorporate a primary outlet (e.g., a solid riser or surface skimmer) with a design dewatering time of at least 36 hours for the 2-year, 24-hour storm.
  - Provide an emergency overflow spillway with a crest elevation approximately 1 foot above the top of the riser.
  - Design the outlet to withdraw water from near the surface, minimizing sediment loss, and to pass the difference between a conveyance storm (e.g., 25-year, 24-hour) and the design storm without damaging the basin.
- **Sediment Trap Specifics:**
  - For excavated sediment traps, maintain a minimum depth of 1 foot (up to 2 feet maximum) and ensure that the volume of the trap is not reduced by more than 50% by sediment accumulation.
  - Install outlet protection (e.g., stone riprap, baffles, or anti-seep collars) to reduce erosion at the discharge point.
- **Emergency Spillway & Safety:**
  - Ensure the basin has a defined emergency spillway and is located such that failure would not result in loss of life or damage to public infrastructure.
  - Install fencing if required by local ordinances to prevent access by children.

- **Integration with Other BMPs:**
  - Use sediment basins and traps in conjunction with upstream erosion controls (e.g., seeding, mulching, diversion dikes) to reduce sediment load and enhance overall effectiveness.

## Maintenance & Management

Regular maintenance and inspections are critical for ensuring sediment basins and traps continue to function as designed.

- **Inspection Schedule:**
  - Inspect the sediment basin/trap before and after each rainfall event and as part of regular scheduled inspections.
  - Monitor embankment integrity, outlet function, and the condition of erosion controls and spillways.
- **Maintenance Actions:**
  - Repair any damage to berms, spillways, sidewalls, or outlet structures promptly.
  - Remove accumulated sediment when it reaches approximately one-third of the basin's designed sediment storage capacity to maintain effectiveness.
  - If using an excavated trap, drain the basin within 36 hours after a rainfall event if runoff has not completely drained.
  - Regularly clear obstructions (trash, debris) from the outlet and spillway to maintain proper flow.
  - Coordinate sediment removal and disposal as per site-specific plans, either redistributing sediment to in-fill areas or removing it to an approved off-site location.
  - After the site is permanently stabilized, convert temporary sediment basins to permanent detention basins if required, ensuring that stabilization measures meet local and UPDES requirements.

## Performance Criteria

This BMP is considered successful when:

- The sediment basin or trap effectively intercepts and retains sediment, achieving a sediment capture efficiency of approximately 70–80%.
- Runoff is detained long enough to allow for significant sediment settling before discharge, without causing excessive ponding or localized flooding.
- Outlet structures function properly, with the basin draining within the design timeframe (preferably less than 72 hours) and providing adequate overflow capacity for extreme events.
- Regular maintenance prevents clogging, embankment deterioration, or loss of storage capacity.

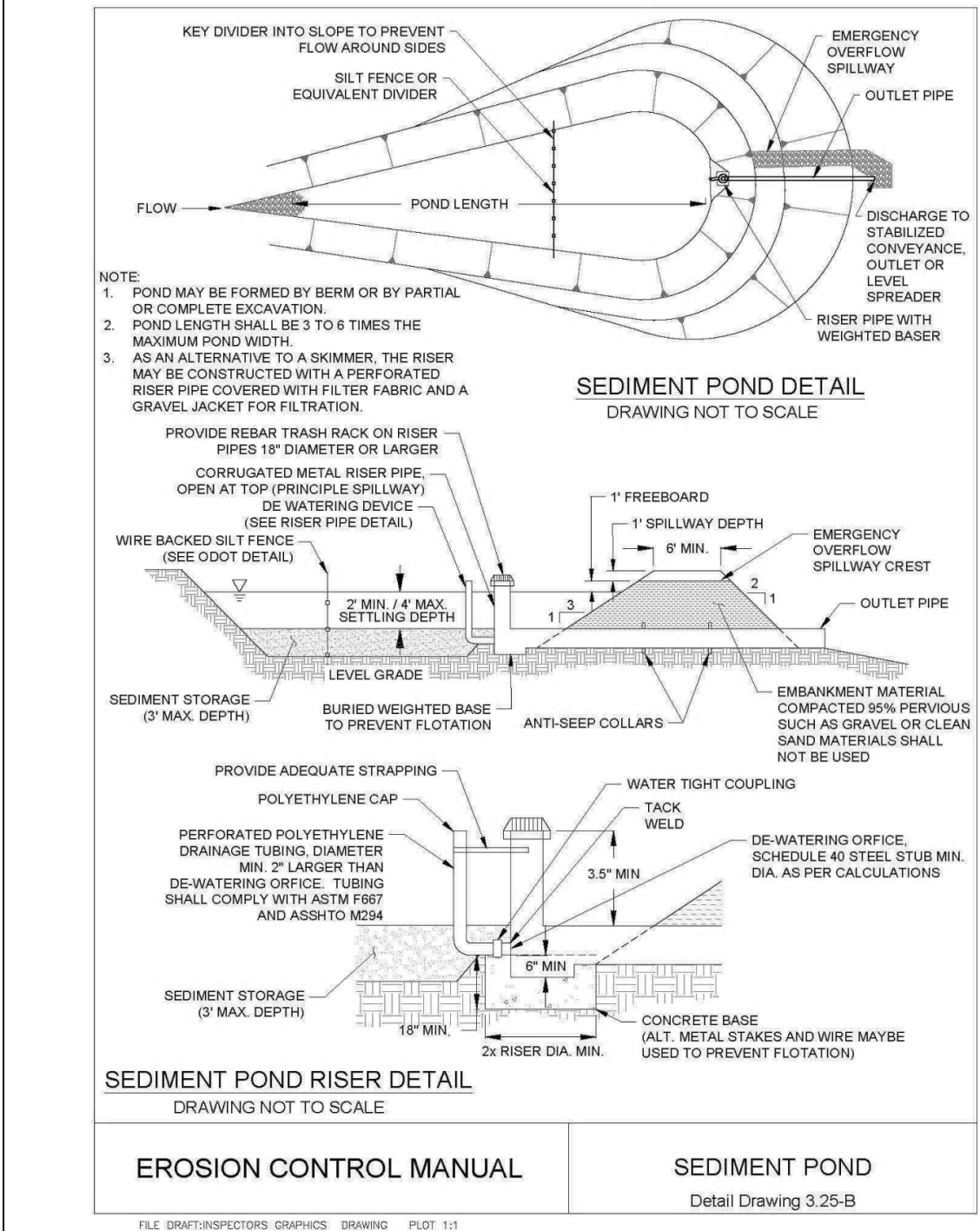



**Figure 20: Schematic diagram of sediment basin installation**

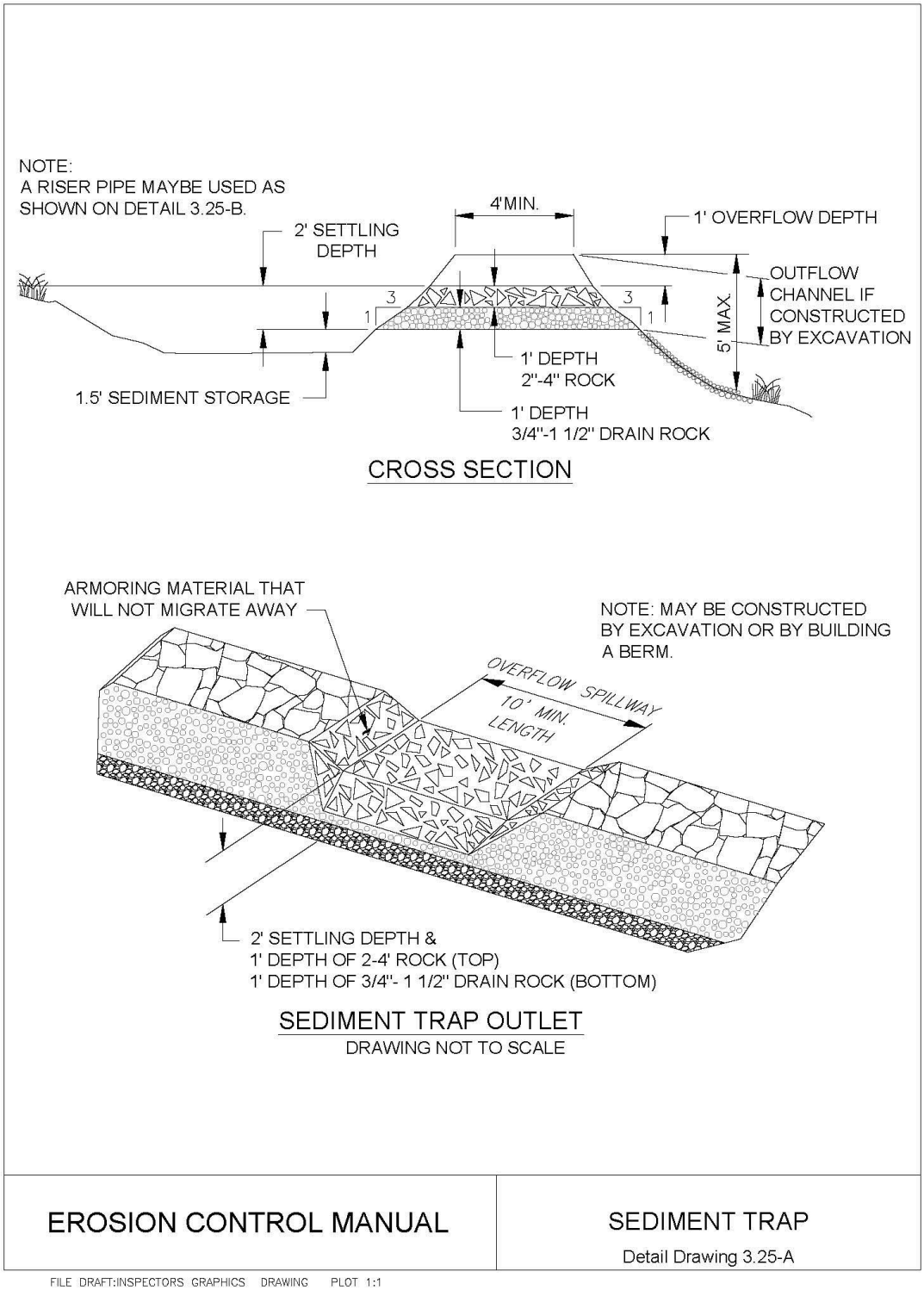



**Figure 22: Schematic diagram of sediment trap installation**

## 9.11. BMP 23: Stabilized Construction Entrance

### Purpose & Applicability

This BMP is designed to reduce or eliminate the tracking of sediment, soil, and other pollutants onto public rights-of-way by providing a designated, stabilized construction exit for vehicles and equipment. By concentrating vehicle movements to a single area, the BMP minimizes disturbed areas, aids traffic control, and reduces the potential for sediment deposition into storm drains and the production of airborne dust.

- **Applicability:**
  - Use at all points of construction egress where vehicles and equipment may track dirt or mud onto public roads.
  - Particularly applicable on sites adjacent to water bodies, in areas with clay or silty soils, or where dust is problematic during dry conditions.
- **Limitations:**
  - Stabilized entrances may not completely prevent sediment deposition on adjacent paved surfaces; supplementary sweeping or wheel cleaning is recommended.

### Installation & Use Procedures

To ensure an effective stabilized construction entrance, follow these guidelines (See figure 22):

- **Planning & Site Design:**
  - Limit construction access to designated, stabilized exits. For larger or linear projects, restrict access to one (or two) defined routes.
  - Design the entrance so that it is located at the upslope side of the construction site, not at the lowest point, to prevent runoff from leaving the site.
  - Incorporate barriers (e.g., silt fence or construction safety fencing) to prevent vehicles from bypassing the full length of the entrance.
- **Design & Construction Requirements:**
  - Construct the entrance apron with washed, well-graded stone or crushed rock having a nominal size of 3 to 5 inches.
  - Ensure the dimensions meet a minimum of 50 feet in length and 20 feet in width (adapted to specific site conditions). The exit should be properly graded to direct runoff away from the site.
  - Install a washrack at ground level to aid in cleaning vehicle tires. If a wheel cleaning system is provided, the entrance width may be reduced to funnel traffic effectively.
  - Construct the stabilized surface to a minimum thickness of 6 inches using stone or recycled concrete with little or no fines.
  - Overlay soil with geotextile fabric beneath the rock as needed in soft soils to prevent rock mixing with underlying soil.
  - When wash areas are provided, ensure that washing is conducted on a stabilized surface that drains into a properly constructed sediment trap or basin.
- **Integration with Other BMPs:**
  - Use in conjunction with other BMPs such as Wheel Washing (BMP 24), Street Sweeping (BMP 25) and Dust Control (BMP 12).

## Maintenance & Management

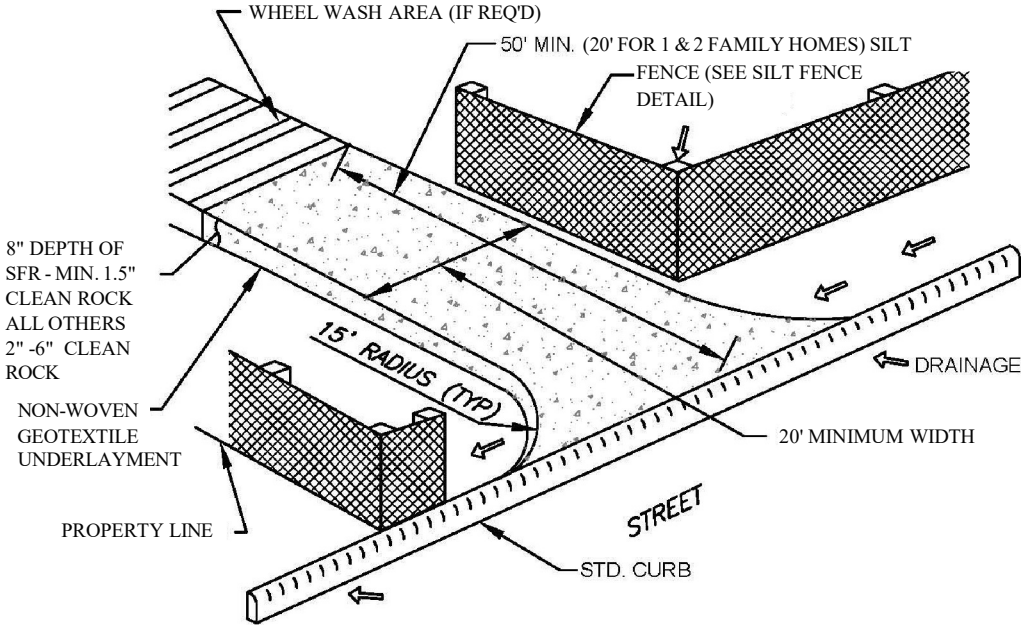
Regular inspections and maintenance are essential to ensure the stabilized entrance continues to function effectively:

- **Inspection Schedule:**
  - Conduct inspections during each routine inspection period and after any storm event.
- **Maintenance Actions:**
  - Periodically re-grade and top dress the entrance with additional stone to maintain a continuous, stable surface.
  - Replace or refresh the gravel mat when surface voids or ruts become evident.
  - Remove any sediments deposited on adjacent paved areas.
  - Upon completion of construction, remove the temporary hardened surface, gravel, and filter fabric and restore the site to blend with the natural ground.

## Performance Criteria

This BMP is considered effective when:

- The stabilized construction exit substantially reduces the tracking of soil, mud, and other pollutants onto public roads.
- Traffic is consistently directed to the designated exit, minimizing the number of disturbed areas.
- The entrance surface effectively removes sediment from equipment and does not allow significant sediment to be tracked onto adjacent paved surfaces.
- When used in conjunction with supplementary BMPs (e.g., wheel cleaning systems or road sweeping), overall track-out is minimized.




**STABILIZED CONSTRUCTION ACCESS**

NOTE
CURB RAMP INSTALLATION SHALL NOT IMPEDED STORMWATER FLOWS, VEHICLE TRAFFIC, AND/OR BICYCLE TRAFFIC.

| EROSION CONTROL MANUAL | STABILIZED CONSTRUCTION ACCESS<br>Detail Drawing 3.12-A |
|---|---|

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**Figure 22: Schematic diagram for stabilized construction access installation**

## 9.12. BMP 24: Wheel Washing

### Purpose & Applicability

Wheel cleaning systems are designed to remove soil, mud, sediment, and debris from the tires and undercarriages of construction vehicles and equipment before they exit the site. These systems serve to minimize the tracking of soil onto public roadways and reduce subsequent sediment-related water quality issues. They are especially critical on sites where a stabilized construction exit alone is insufficient.

- **Applicability:**
  - Use when vehicles and equipment egress from the construction site to ensure tires are thoroughly cleaned before entering paved streets.
  - Particularly beneficial on sites with large, disturbed areas (>10 acres), high vehicle/equipment turnover, clay soils, wet conditions, or potentially contaminated soils.
  - Serve as an additional control measure to reduce the need for extensive street cleaning operations.

### Installation & Use Procedures

To ensure proper operation of wheel cleaning systems, follow these detailed guidelines (See figures 23 and 24):

- **Site Design & Location:**
  - Determine and mark designated egress locations on the SWPPP site map.
  - Position the wheel cleaning system within the stabilized construction exit, maintaining at least 25 feet of stabilized exit between the cleaning system and the adjacent paved road, to prevent vehicles from picking up additional sediment on disturbed areas.
- **System Components & Operation:**
  - **Rumble Racks:**
    - Install a minimum system consisting of steel grate “rumble racks” that are 10 feet wide and 8 feet long.
    - Ensure the length of the rack is at least equal to the circumference of the largest tire on site; typically, two to three consecutive lengths of grates are needed.
    - Place the grates over an excavated pit (minimum 1 foot deep) and design bar spacing and support based on the expected vehicle size and weight.
  - **Wheel Washes:**
    - Provide a hose or pressure washer for manual or automated cleaning of all wheels
    - Instruct drivers to move forward and reverse as needed to dislodge all mud and debris, and check for rocks edged in dual tires.
  - **Wash Water Collection:**
    - Ensure that all wash water is collected in a designated sediment basin or equivalent sediment control system. Document the required retention volume and attach this information to the BMP documentation.

    - **Safety & Signage:**
        - Post clear signage requiring that all vehicles use the wheel cleaning system before leaving the site.
- **Documentation & Training:**
    - Train the workforce on proper usage, emphasizing that only water (not soap) be used for cleaning and that cleaning must occur in the designated area.

## Maintenance & Management

Regular maintenance and prompt management are essential for ensuring continuous effective operation of wheel cleaning systems.

- **Inspection & Routine Maintenance:**
    - Inspect the wheel cleaning system during each routine inspection period and after any storm event.
    - Rake or wash the surfaces (e.g., rumble racks) as necessary if sediment accumulates.
    - Ensure the wash water retention basin is maintained, with sediment removed when accumulation reaches 50% of its capacity.
    - Expand or adjust the wash water basin if necessary to meet the required retention volume.
    - Enforce that vehicles use the system exclusively at the designated area.
- **Debris Management:**
    - Promptly remove any rock, gravel, or sediment track-out from adjacent roadways following observed BMP failure or misuse.
    - Conduct street clean-up operations as needed, noting these are separate from routine wheel cleaning system maintenance.
- **Training & Communication:**
    - Continuously train employees and subcontractors on proper operation, maintenance, and cleaning procedures for the wheel cleaning system.

## Performance Criteria

This BMP is considered successful when:

- The wheel cleaning system effectively removes soil, mud, and debris from vehicle tires and undercarriages, significantly reducing off-site tracking.
- The sediment retention basin collects wash water effectively, with minimal visible sediment or a petroleum sheen indicating contamination.
- The system maintains proper operational conditions, with rumble racks and wash areas functioning without obstruction, and regular maintenance prevents clogging and excessive sediment buildup.
- Light tracking, defined as minor residual dirt that does not pose a safety hazard, is managed through routine cleaning.

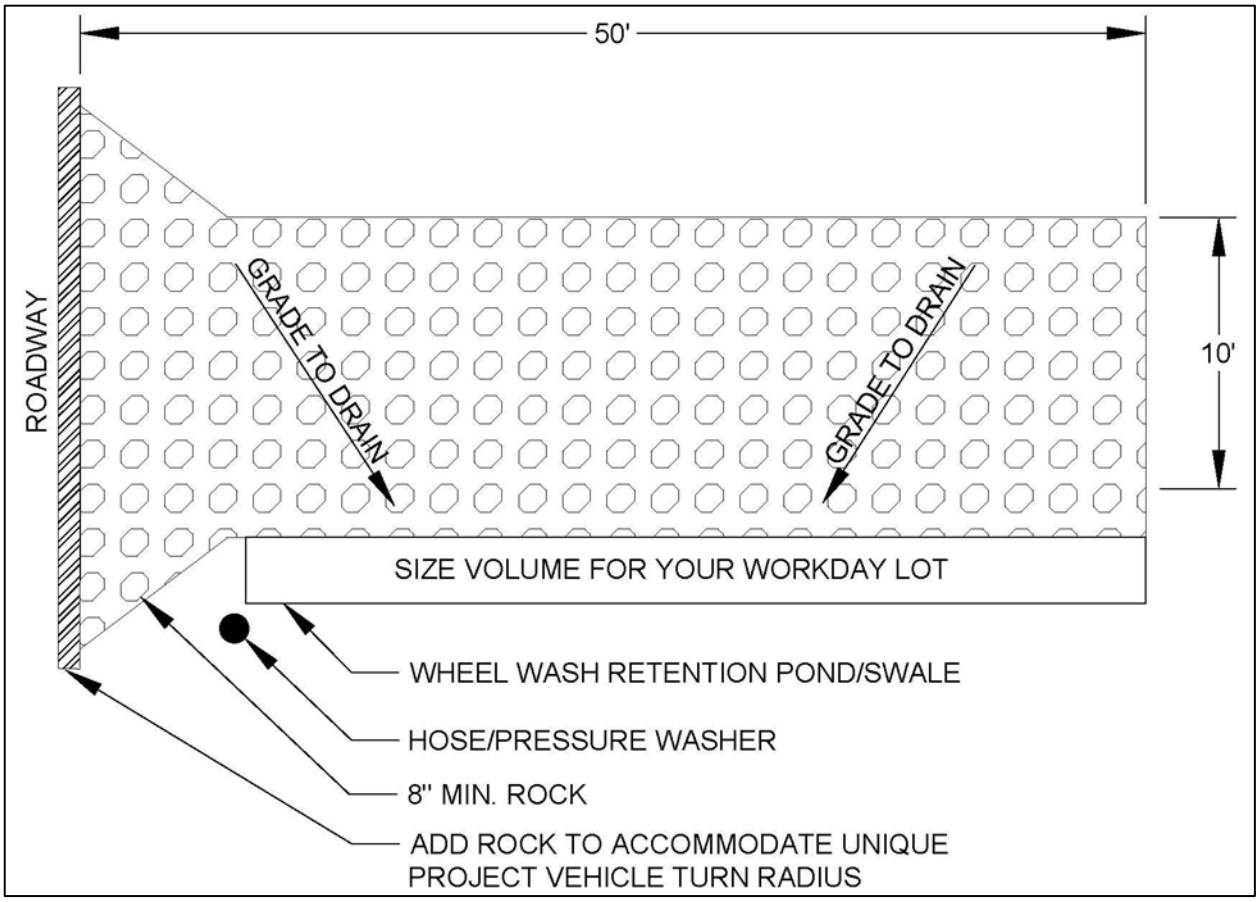
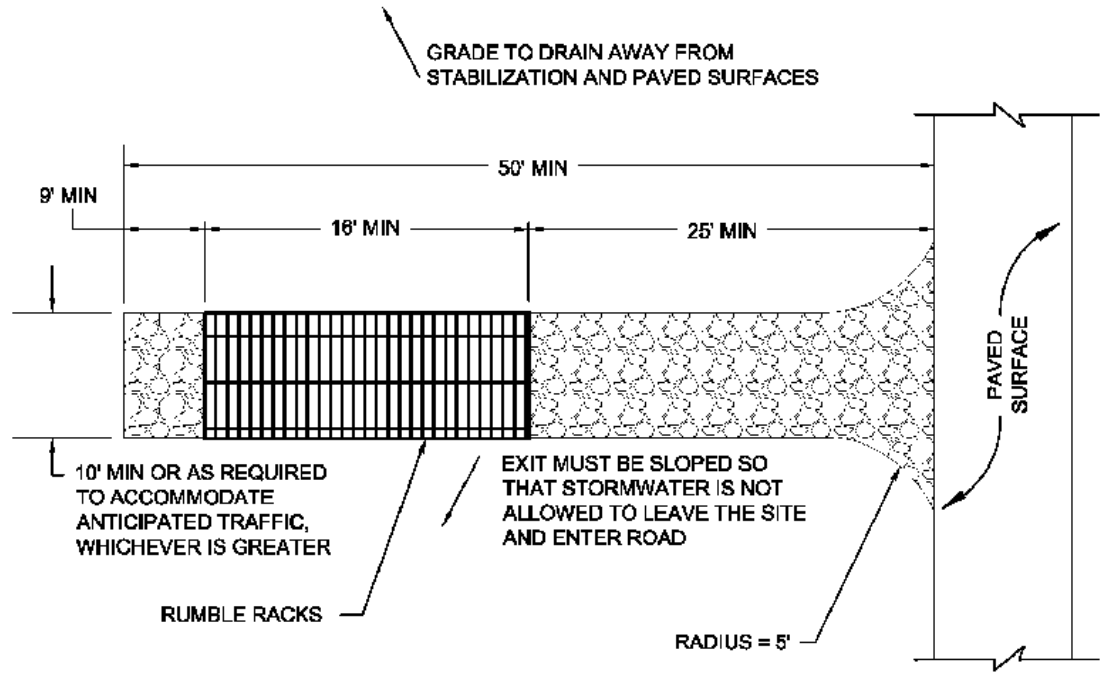
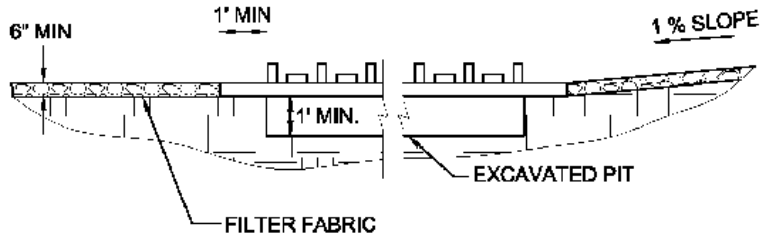



**Figure 23: Schematic grading diagram for wheel wash installation**




RUMBLE RACK PLAN VIEW
N.T.S.




RUMBLE RACK EXAMPLE INSTALLATION
N.T.S.

NOTE: DESIGNER SHALL SPECIFY SIZE AND SPACING OF THE STEEL BARS AND SUPPORT BEAMS BASED ON SIZE AND WEIGHT OF VEHICLES EXPECTED TO BE EXITING THE CONSTRUCTION SITE.

**Figure 24: Schematic diagram of a rumble rack wheel wash installation**

## 9.13. BMP 25: Street Sweeping

### Purpose & Applicability

Street sweeping is implemented to remove sediment, debris, and residual mud from roadways and access areas. Effective cleaning of track-out prevents sediment from entering storm drains or watercourses, thereby protecting water quality and ensuring safety.

- **Applicability:**
  - Use at points of egress where sediment is tracked from the project site onto public or private paved roads.
  - Suitable as a supplemental BMP to address the limitations of designated egress track-out controls.
  - Particularly effective when implemented using vacuum or regenerative air street sweepers, which can remove fine dust particles and provide significant runoff quality benefits.

### Installation & Use Procedures

To ensure effective street sweeping operations, follow these procedures:

- **Equipment & Operation:**
  - Utilize vacuum-type sweeping machinery to efficiently collect road sediment and debris. For smaller areas, kick brooms may be used; for larger areas, mechanical brush or vacuum sweepers are recommended.
  - Plan sweeping operations to occur at the end of each workday and, if needed, additional sweeps during the day based on the extent of track-out.
- **Site Coordination:**
  - Integrate sweeping operations into the overall site maintenance schedule.
- **Workforce Training:**
  - Train the workforce on proper track-out BMP requirements and the correct operation of sweeping equipment.
  - Instruct personnel to adjust brooms frequently and ensure that any unknown substances or potentially hazardous objects are properly disposed of.

### Maintenance & Management

Regular and timely maintenance is critical to ensure the effectiveness of street sweeping operations.

- **Operational Procedures:**
  - Conduct sweeping operations at the end of each workday, and additional sweeps as needed based on site conditions (more frequent during rainy seasons).
  - Inspect ingress/egress access points daily and perform sweeping as needed to remove visible sediment track-out.
  - Adjust sweeping equipment (e.g., brooms) frequently to maximize cleaning efficiency.
- **Debris Management:**

- Properly dispose of any unknown or hazardous substances removed during sweeping.
- After sweeping, ensure that any collected wash water is either reused or disposed of at an approved dump-site in compliance with local regulations.
- The operator is responsible for complying with the Fugitive Dust Control Plan.

## Performance Criteria

This BMP is considered effective when:

- Roadways and access areas are maintained free of significant sediment, debris, and residual mud.
- The sweeping operations consistently remove visible sediment and reduce the risk of sediment entering storm drains or watercourses.
- Slick conditions, slurry, mud chunks, and other track-out materials are minimized, thereby reducing water quality risks and driver hazards.
- Light tracking, defined as minor residual dirt not easily picked up by a square-nose shovel, is limited and addressed through regular maintenance.

## 9.14. BMP 26: Dewatering Practices

### Purpose & Applicability

This BMP is designed to manage and correctly discharge water accumulated on construction sites, including stormwater from excavated areas, non-stormwater discharges (e.g., groundwater, cofferdam water, or water from drilling) and water collected in depressed areas, before work proceeds. It encompasses active treatment systems (ATS) for removal of fine silt and clay particles that traditional sediment controls cannot effectively capture, as well as conventional dewatering methods for non-stormwater.

Note: *In Utah, construction projects that involve discharging groundwater or surface water, such as from excavation dewatering or hydrostatic testing, must obtain a UPDES Construction Dewatering and Hydrostatic Testing General Permit (UTG070000) prior to discharge. Operators are required to develop a Dewatering Control Plan (DCP), implement appropriate BMPs, and submit a Notice of Intent (NOI) through the EPA's NeT system to receive permit coverage. Always contact the local MS4 and/or flood control district prior to discharge from dewatering activities; additional local permitting may be required.*

- **Applicability:**
  - Use on sites where water must be removed from excavated work areas, utility repairs, or depressed areas prior to continuing operations.
  - Applicable when sediment-laden water contains a high percentage of fine silt and clay that require extended detention (days or weeks) to settle, beyond the capability of sediment basins.
  - Particularly useful where sensitive receiving waters (e.g., wetlands, spring-fed systems, or waters with TMDLs) require higher levels of treatment or where turbidity effluent limits are established.
  - Dewatering controls are necessary when discharging non-stormwater that may impact water quality and when an UPDES Construction Dewatering permit is required for off-site discharges.

### Installation & Use Procedures

Implementation of dewatering practices involves proper design and installation of active treatment systems (ATS) and conventional dewatering measures:

- **Active Treatment Systems (ATS):**
  - **Design & Setup:**
    - An ATS is used when traditional sediment controls cannot remove fine silt and clay particles.
    - Provide a source of electricity (or diesel generators until site power is available) to operate the ATS continuously; maintain generators on-site to cover potential outages.
    - Integrate the ATS with a sediment basin, tank, or retention structure designed to capture the temporary control design storm (typically a 2-year, 24-hour event) while also withstanding larger storm events without damage.
    - ATS can be configured as batch flow or continuous flow (flow-through) systems based on site conditions.

- **Design Considerations:**
  - Consult with ATS suppliers and technical experts to tailor the system to the site's runoff characteristics, including turbidity, pH, suspended solids, and soil particle sizes.
  - Ensure the design accounts for available detention space, required discharge concentrations, flow rate, and overall cost.
  - Ensure the design accounts for available detention space, required discharge concentrations, flow rate, and overall cost.
  - Equip the ATS with instrumentation to automatically record influent/effluent turbidity, pH, and flow rate.
  - Incorporate a recirculation or safe shutdown mode that activates upon system upset, power failure, or other emergencies.
  - Install a velocity dissipation device at the ATS discharge point.
- **Filtration & Chemical Treatment:**
  - Filtration is typically achieved by pumping water through vessels filled with granular media (e.g., sand, gravel, anthracite), with bag or cartridge filters used if extremely low turbidity is required.
  - For sites using chemical-aided flocculation, design the ATS with proper chemical injections (using agents such as chitosan, PAM, alum, or polyaluminum chloride) based on jar tests and monitor residual concentrations and toxicity with field tests or daily bioassays.
  - Pre-treat stormwater with a sediment trap or basin before pumping to the filter to extend the filter life.

- **Conventional Dewatering Controls:**
  - For non-stormwater removal (e.g., from excavated areas, cofferdams, or water diversions), install dewatering tanks or similar systems that separate sediment and debris using fabric filters.
  - Ensure that water used for dust control or diverted to infiltration basins is managed per site-specific plans.
  - Where feasible, employ gravity bag filters (dewatering bags) on a slight slope to facilitate water flow and sediment removal (See figure 25).
- **Documentation & Coordination:**
  - Attach detailed engineering drawings, ATS supplier literature, and manufacturer specifications to the SWPPP.
  - Record the layout of sediment basins, dewatering tanks, and any associated drainage structures on the site map.
  - Include a copy of the Construction Dewatering Permit in the SWPPP.

## Maintenance & Management

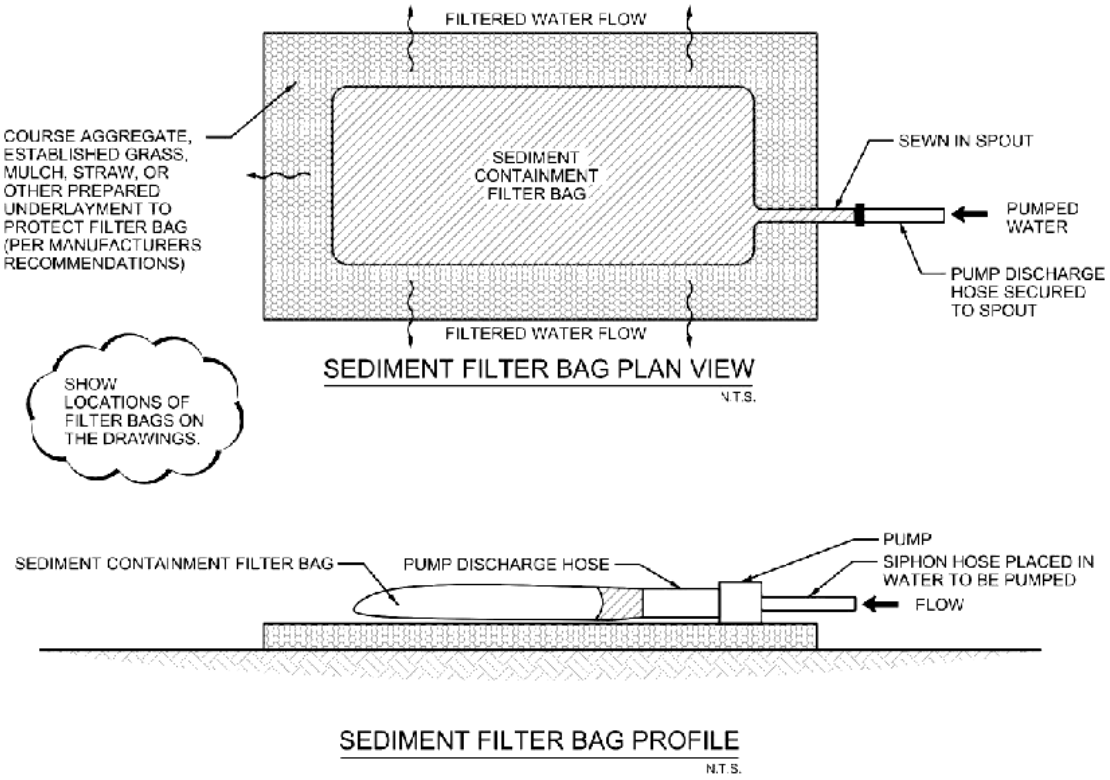
Regular maintenance and monitoring are crucial to the effective operation of dewatering practices and ATS.

- **Inspection Schedule:**
  - Inspect the overall ATS and conventional dewatering system per the DCP.
  - Regularly check sediment basins, dewatering tanks, and associated structures for physical damage, sediment accumulation, and proper function of outlet structures and overflow systems.
- **Maintenance Actions:**
  - For ATS: Monitor as stormwater characteristics change; regularly sample effluent to ensure turbidity and residual chemical levels are acceptable.
  - For filtration systems: Clean or backwash filters when differential pressure indicates loading; replace media or cartridges when necessary.
  - For conventional dewatering: Remove accumulated sediment from basins or traps when it reaches approximately one-third of the designed capacity and ensure that the system drains within the specified time frame (preferably less than 72 hours) to prevent mosquito breeding.
  - Maintain all components (e.g., pumps, instrumentation, electrical systems) per manufacturer recommendations.
  - Train on-site personnel in system operation, routine maintenance, and emergency response procedures.

## Performance Criteria

This BMP is considered effective when:

- The ATS or dewatering system consistently removes fine silt, clay, and other suspended solids to achieve discharge water quality that meets local, state, and federal standards.
- Instrumentation readings (e.g., turbidity, pH, flow rate) indicate that the system operates within the design parameters, with chemical residuals maintained at safe levels.
- The sediment basin or dewatering tank effectively captures the design storm volume (e.g., 2-year, 24-hour event) and drains within the specified time without excessive standing water or clogging.
- Regular maintenance prevents system overload or failures that could result in untreated water discharge.




DEWATERING CONTROL GENERAL NOTES:

1. THE BAG SHOULD BE A NON-WOVEN, NEEDLE-PUNCHED, GEOTEXTILE THAT MEETS ASTM CRITERIA-D4632 , D4833, D-3786, D-4355, D-4491, AND D-4751.

2. CAPACITY, INSTALLATION, MAINTENANCE , AND REMOVAL OF BAGS AND PUMPS SHOULD CONFORM TO PUBLISHED MANUFACTURER LITERATURE.

**Figure 25: Schematic diagram for sediment filter bag installation**

# 10. Pollution Prevention Controls

## 10.1. BMP 27: Sanitary Waste Management (Portable Toilets)

### Purpose & Applicability

Portable sanitary facilities are provided to properly contain and manage human waste generated on-site during construction activities. This BMP minimizes the risk of sanitary waste exposure to stormwater and nearby waters by ensuring that waste is contained, properly maintained, and promptly serviced.

- **Applicability:**
  - Use at construction sites where permanent sanitary facilities are unavailable or are located too far from active work areas.
  - Applicable to sites where temporary sanitary waste management is necessary to prevent pollutant discharges into stormwater systems.
  - Essential for protecting water quality and public health, particularly at sites with high workforce numbers or extended construction durations.

### Installation & Use Procedures

To ensure effective performance and compliance with regulatory requirements, install and operate portable toilets according to the following guidelines (See figures 26-28):

- **Site Selection & Placement:**
  - Locate portable toilets at least 10 feet away from drainage features (i.e., curbs, channels, inlets, etc.). If a 10-foot setback is not feasible due to site configuration, provide secondary containment to manage any spills.
  - Clearly identify and mark the location of portable toilets on the SWPPP site map.
  - Position units in areas accessible to maintenance and service trucks without causing damage to erosion and sediment controls or creating tracking issues.
  - For installations, choose natural, undisturbed ground if feasible.
- **Structural Requirements & Security:**
  - Ensure that portable toilets are fully enclosed to minimize exposure of waste to precipitation and stormwater runoff.
  - Secure portable toilets against tipping using anchoring methods such as stakes or tie-downs.
  - Design facilities to minimize contact between sanitary waste and stormwater, adhering to applicable 40 CFR Part 450 guidelines.
- **Spill Prevention & Response:**
  - Immediately notify the service provider if a toilet is tipped or damaged, potentially resulting in a discharge.
  - In the event of a spill, the responsible company shall vacuum discharged solids and clean contaminated surfaces with a solution of 10 parts water to 1 part bleach.
  - Maintain written spill response procedures and provide training to all relevant personnel.

## Maintenance & Management

Regular inspection and servicing of portable toilets are critical to ensure their proper functioning and to prevent environmental contamination.

- **Routine Maintenance:**
  - Portable toilets must be serviced at the frequency recommended by the supplier, typically daily or as specified based on the number of users (commonly one toilet per 10 workers during a 40–50-hour work week).
  - Inspect units daily for signs of leaks, spills, or structural damage, and ensure they remain secure and stable.
  - Confirm that waste is properly collected and transferred to a sanitary sewer system or an approved treatment facility.
- **Repair & Spill Response:**
  - Immediately repair or replace any damaged units to prevent waste discharge.
  - In the event of a spill, implement the established spill response procedures and document the incident for reporting purposes.
  - Notify the municipal system authority if any discharge from the portable toilets reaches the storm drain system or a natural watercourse.

## Performance Criteria

This BMP is considered effective when:

- Portable toilets contain all sanitary waste with no exposure to stormwater runoff.
- Units remain secure, leak-free, and fully operational throughout the period of use.
- Waste is consistently and properly serviced and transferred to an approved treatment facility.
- Spill response measures are implemented immediately, and any contamination is promptly cleaned, preventing adverse impacts on water quality.

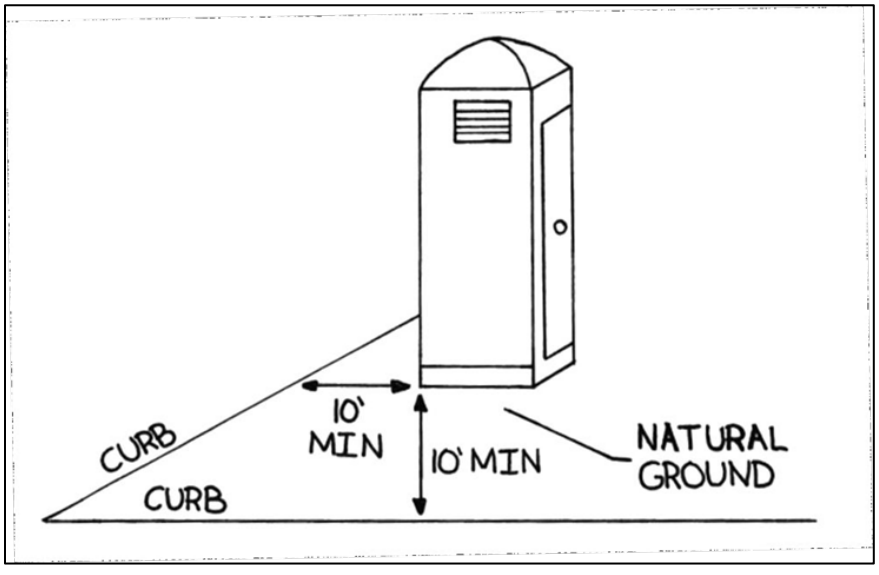



**Figure 26: Schematic diagram showing proper placement of portable toilets**

**Figure 27: Photo showing staking of portable toilets to secure from tipping**

**Figure 28: Photo showing portable toilet secured with tie-down straps**

## 10.2. BMP 28: Washout Areas (Concrete, Stucco, Paint, etc.)

### Purpose & Applicability

Washout areas are designated zones where washout operations for concrete, stucco, paint, and related materials are conducted. These areas are designed to contain and properly manage washout wastewater and solid waste to prevent the discharge of pollutants into storm drains or natural watercourses.

- **Applicability:**
  - Use on construction sites where concrete waste management is required, including operations such as saw cutting, coring, grinding, grooving, or hydro-concrete demolition, as well as at mortar-mixing stations.
  - Applicable when concrete truck drums, chutes, hoses, and other equipment are washed on-site, and complete off-site disposal is not feasible.
  - Can be used for both above-grade and below-grade washout facilities, provided they are designed to contain all liquid and concrete waste generated during washout operations.

### Installation & Use Procedures

To ensure effective washout area performance and environmental protection, implement the following procedures (See figures 29 and 30):

- **Site Location & Setup:**
  - Locate the washout facility at least 50 feet from storm drain inlets, open ditches, water bodies, wetlands, or planned infiltration features. If a 50-foot setback is not practicable due to site constraints, provide secondary containment measures.
  - Clearly mark the washout area with signage to instruct concrete equipment operators to use the designated facility for washout.
- **Structural Requirements:**
  - **Above-Grade Facilities:**
    - Construct the facility with a minimum length and width of 10 feet (or larger as needed to provide sufficient capacity).
    - Use a watertight, impermeable design with a plastic lining (minimum 10- mil polyethylene sheeting) that is free of holes, tears, or defects.
  - **Below-Grade Facilities:**
    - Similarly, ensure a minimum footprint of 10 feet by 10 feet with proper volume to contain all liquid and concrete waste generated.
    - Prepare the soil base free of rocks or debris that could compromise the lining's integrity.
  - **Operational Procedures:**
    - During concrete operations, empty excess concrete onto the ground near the pour site until only liquid cement remains on tools and equipment.
    - Wash cement off chutes pump equipment, and tools directly into the washout facility
    - If concrete washout is collected in an impermeable bag, ensure it is properly sealed for adequate disposal.

- **Documentation & Coordination:**
    - Attach detailed contractor illustrations and design specifications (including dimensions, liner details, and secondary containment if applicable) to the SWPPP.
    - Clearly record the washout facility's location on the site plan.
    - Inform and train the workforce, including concrete suppliers and subcontractors, on proper washout procedures and equipment handling.

## Maintenance & Management

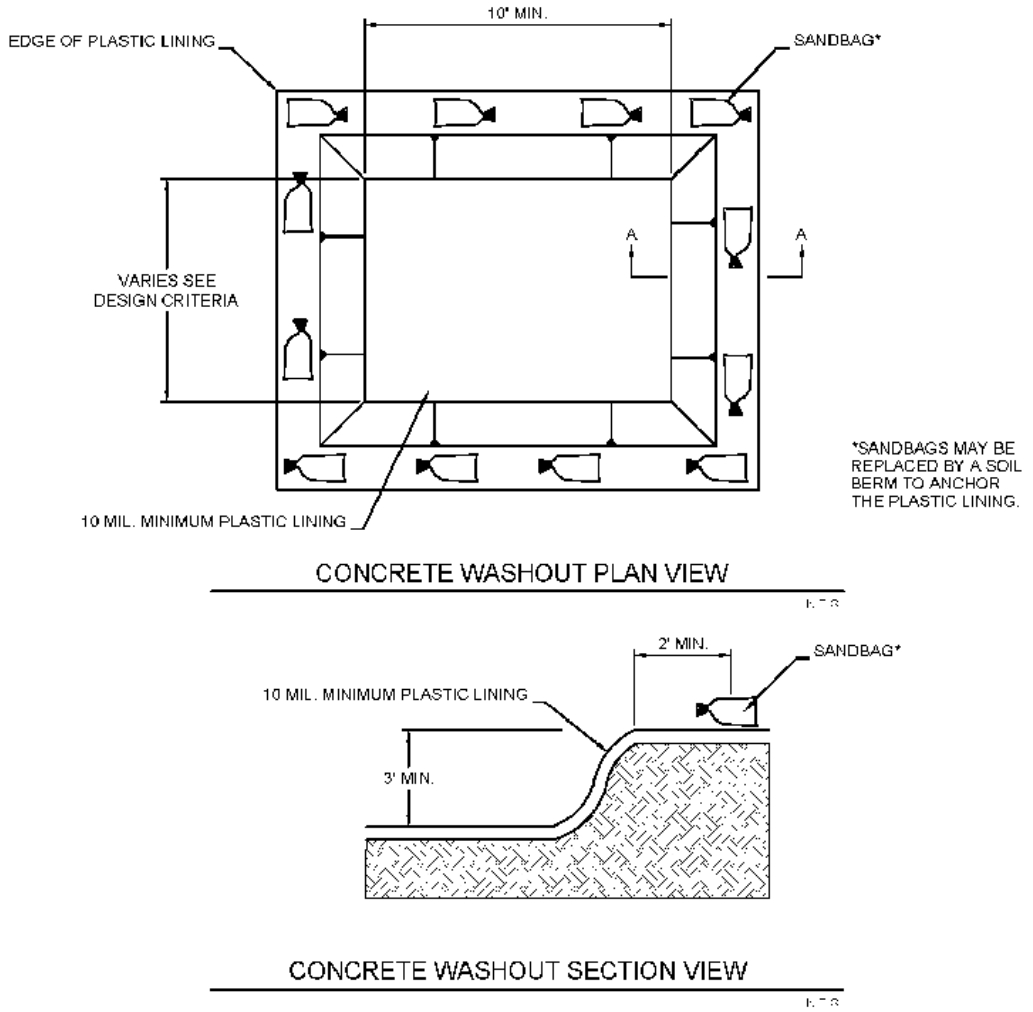
Regular maintenance is essential to ensure that washout areas function as designed and remain compliant with water quality standards.

- **Inspection Schedule:**
    - Inspect washout facilities at least weekly and before and after each concrete operation.
    - During extended wet weather conditions, perform additional inspections to verify that overflow is not occurring.
- **Maintenance Actions:**
    - Maintain a minimum freeboard of at least one foot by removing waste concrete or slurry when the facility reaches 70% capacity.
    - Remove accumulated sediment and debris promptly to prevent overflow or seepage.
    - Repair any damage to the plastic lining or structural components immediately.
    - After the completion of concrete work, if the facility is temporary, remove hardened concrete and debris, then backfill, re-grade, and stabilize the area to prevent erosion.
    - Ensure all waste disposal methods comply with applicable federal, state, and local regulations; discharges to waterways, storm drains, or directly onto the ground are prohibited.

## Performance Criteria

This BMP is considered effective when:

- The washout facility remains watertight and maintains sufficient volume with at least one foot of freeboard throughout operations.
- All concrete waste (liquid and solids) is contained with no discharge of pollutants into storm drains or natural watercourses.
- The facility effectively prevents track-out of concrete waste by directing all washout water and debris into the designated area.
- Regular maintenance ensures that the facility does not overflow, leak, or become compromised.




CONCRETE WAHSOUT NOTES:

1. WASHOUT AREA MUST BE CLEARLY MARKED WITH SIGNAGE NOTING THE WASHOUT AREA.

2. WASHOUT STRUCTURES SHALL BE CLEANED OUT WHEN THE STRUCTURE IS 75% FULL. TEMPORARY CONCRETE WASHOUT FACILITY SHOULD BE MAINTAINED TO PROVIDE ADEQUATE HOLDING CAPACITY.

**Figure 29: Schematic diagram of below-grade concrete washout installation**

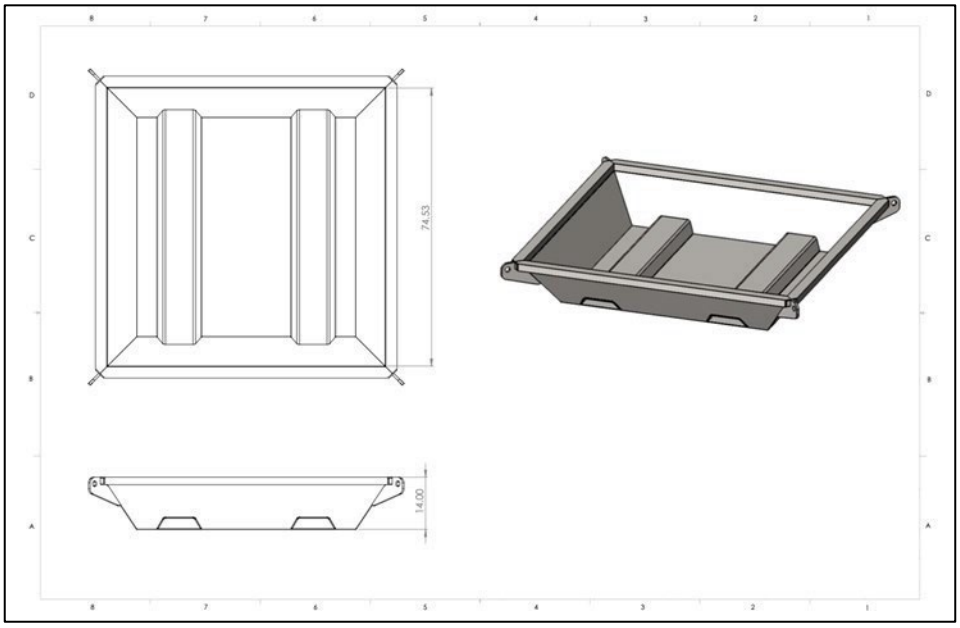



**Figure 30: Image of a small-scale portable concrete washout pan**

## 10.3. BMP 29: Concrete Sawcutting Management

### Purpose & Applicability

Concrete Sawcutting Management is designed to control and manage waste generated during pavement sawcutting operations. This BMP addresses both wet and dry cutting methods to prevent concrete, mortar, and associated slurry from contaminating stormwater or causing dust and debris track-out.

- **Applicability:**
    - Use for pavement sawcutting operations when a wet saw is employed (wet cutting) to control slurry and reduce airborne dust, particularly in curb and gutter applications where dry cutting is not permitted or dust control is critical.
    - Use for dry pavement cutting operations on directly connected pavements or where cutting dust can be safely managed through drainage systems.
    - Applicable for both new construction and repair/maintenance projects where concrete waste (slurry, cuttings, dust) must be collected and disposed of properly to prevent environmental contamination.

### Installation & Use Procedures

- **For Wet Cutting Operations:**
    - Install a series of sand or gravel bags (minimum 6-inch diameter) around the perimeter of the cutting area to intercept and contain slurry moving downslope. Double up bags as needed based on anticipated slurry volume.
    - **Operational Scheduling & Slurry Management:**
        - Schedule cutting operations during dry weather to minimize premature slurry dispersion.
        - Remove accumulated slurry at the end of the day or before forecasted rain events. In wet conditions, mix the slurry with dirt or another absorbent material and immediately remove it:
            - Dump waste into an approved concrete washout containment system.
            - Dry the waste in a contained area and dispose of it in a designated waste management container.
    - **Cleanup Procedures:**
        - Thoroughly sweep the cutting area using a square nose shovel and wire broom until no additional waste is recoverable.
        - Do not sure water for rinsing; employ dry cleanup methods exclusively.
- **For Dry Cutting Operations:**
    - Conduct dry cutting during periods of dry weather to avoid moisture- related complications.
    - **Dust Removal:**
        - Immediately remove cutting dust following the cutting operation by sweeping the area thoroughly with a square-nose shovel until all dust is recovered.
    - **Waste Disposal:**
        - Collect and dispose of the cutting dust in a designated concrete waste

container or approved waste management container.

- **General Concrete Sawcutting Waste Management:**
    - **Slurry Collection & Containment:**
        - For projects where concrete sawcutting generates slurry and cuttings, continuously vacuum or recover waste during operations to prevent discharge from the site.
        - Where pavement is near a storm drain inlet, temporarily block the inlet (e.g., with sandbags) to prevent slurry from entering the system, then remove the blockage promptly after operations (including cleanup).
        - Ensure that slurry and cuttings are not allowed to dry on the pavement.
    - **Disposal Procedures:**
        - Designate safe slurry disposal areas or on-site containment (e.g., excavated or bermed pits lined with plastic, minimum 10-mil thick) and ensure these areas are located at least 50 feet from inlets, swales, or water bodies.
        - If on-site containment is used, remove waste concrete when the containment is half full, maintaining a minimum of one foot freeboard.
        - Alternatively, consider using commercially available portable, prefabricated washout containers.
    - **Integration with Other BMPs:**
        - Coordinate concrete sawcutting waste management with overall concrete waste management practices and ensure employee training and enforcement of proper procedures.

## Maintenance & Management

Regular maintenance and prompt management are critical to ensuring that concrete sawcutting waste management systems perform effectively.

- **Inspection Schedule:**
    - Inspect the cutting area and containment facilities during each routine inspection period and after any storm event.
    - For wet cutting operations, verify that all slurry has been removed from the containment system before the onset of additional rain.
    - For dry cutting operations, inspect the pavement each day after operations to ensure all dust has been adequately removed.
- **Maintenance Actions:**
    - Ensure that sand or gravel bag systems used for wet cutting are reinstalled for each new operation and that any accumulated waste is removed and disposed of.
    - Confirm that designated waste management containers (for dust or slurry) are emptied and cleaned regularly to prevent overflow or contamination.
    - Address any deficiencies (e.g., overflow of containment, incomplete removal of dust) immediately with corrective actions.
    - Maintain records of all maintenance activities and disposal methods for review.

## Performance Criteria

This BMP is considered successful when:

- **Wet Cutting Operations:**
    - The sand or gravel bag containment system holds all generated slurry with no

overflow, and all slurry is removed and disposed of per BMP procedures before the end of the cutting day or prior to rainfall.

- **Dry Cutting Operations:**
  - All cutting dust is promptly removed from the pavement, with no dust entering drainage systems or affecting water quality.
- **General Sawcutting Waste Management:**
  - Waste (slurry, cuttings, and dust) is collected and contained effectively, preventing any discharge into storm drains or natural water bodies.
  - Contractor and site personnel consistently adhere to established procedures, with documentation reflecting proper cleanup and waste disposal.

## 10.4. BMP 30: Solid Waste Management (Trash and Debris)

### Purpose & Applicability

Solid waste management is implemented to properly collect, store, and dispose of construction-related debris and trash, thereby minimizing floatable/dissolvable pollutants in stormwater. By effectively managing solid waste on-site, overall stormwater quality is improved and cleanup efforts at the end of a project are reduced.

- **Applicability:**
    - Use on all construction sites where workers and equipment generate solid waste, including construction and demolition debris (e.g., lumber, metals, insulation, brick, mortar) and domestic waste (e.g., packaging, food containers, paper, plastics, Styrofoam).
    - Applicable when the waste produced poses a potential risk of contaminating stormwater if not managed appropriately.
    - Emphasizes proper segregation of non-hazardous, hazardous, and recyclable waste.

### Installation & Use Procedures

To establish an effective solid waste management system, implement the following procedures:

- **Selection of Waste Containers:**
    - Use durable, watertight containers (e.g., dumpsters, trash receptacles) sized appropriately for the volume of waste generated.
    - Ensure that containers are clearly marked for non-hazardous, hazardous, and recyclable waste, according to site requirements.
- **Placement & Storage:**
    - Position waste storage areas on flat, stabilized surfaces away from storm drains, swales, drainage ways, channels, and watercourses.
    - Locate storage areas a minimum of 50 feet away from sensitive drainage features; if not feasible, maintain at least 20 feet separation and provide secondary containment.
    - Place dumpsters on designated parking or track-out pads to prevent tracking during servicing and to avoid disruption of stormwater controls.
    - Ensure that waste containers are covered to prevent exposure to precipitation, minimize leaching of contaminants, and reduce the risk of wind dispersal.
- **Usage & Handling:**
    - Instruct all personnel to place all construction waste into the designated containers; waste should not extend beyond the sides or top of the container.
    - Segregate hazardous waste from non-hazardous waste by using separately labeled and secured containers.
    - Prohibit on-site disposal methods such as dumping, burning, or burying of waste.
    - Ensure that collected waste is removed at regular intervals (e.g., when containers reach 90% full) by waste haulers approved by the local municipality.
- **Communication & Training:**
    - Clearly communicate waste management procedures through training sessions and regular safety meetings.

- Designate a site supervisor or foreman responsible for monitoring and enforcing waste management protocols.
- Post visible signage indicating proper waste disposal practices and identify container locations on the SWPPP site map.

## Maintenance & Management

Regular and systematic maintenance is essential to ensure the solid waste management system remains effective throughout the project.

- **Inspection & Cleaning:**
  - Inspect waste storage areas and containers daily to ensure that waste is contained properly and that no containers are overflowing.
  - Check for any signs of leaks or damage to waste storage units, and repair or replace them as necessary.
  - Collect and remove scattered debris from around the site, particularly in high-traffic areas and near drainage inlets, to prevent potential contamination.
- **Waste Removal & Recycling:**
  - Arrange for waste removal by licensed waste haulers on a regular schedule (e.g., when containers reach 90% capacity, or more frequently if required).
  - Ensure that recyclable materials are segregated and sent to approved recycling facilities.
  - Follow local municipal requirements for the storage and disposal of solid waste.
- **Worker Training & Enforcement:**
  - Regularly train workers and subcontractors on proper waste handling, segregation, and disposal practices.
  - Monitor compliance and enforce waste management procedures through site inspections and corrective action if necessary.

## Performance Criteria

This BMP is considered successful when:

- All construction and domestic waste generated on-site is fully contained within designated waste storage containers, with no overflow or spillage.
- Waste storage areas are maintained free of visible litter and debris, and waste is segregated appropriately (hazardous vs. non-hazardous).
- Waste is removed and disposed of on a regular schedule, ensuring that stormwater is not contaminated by leachate or spilled materials.
- The system supports proper recycling or re-use of materials where possible.

## 10.5. BMP 31: Chemical/Hazardous Materials Management

### Purpose & Applicability

Proper chemical management is essential to prevent, or at least minimize, the pollution of stormwater runoff through spills, leaks, or improper handling of chemicals and hazardous materials. This BMP is not intended to replace normal site assessment and remediation procedures but serves to provide controls at the point of storage and use.

- **Applicability:**
  - Use at all construction sites where chemicals or hazardous materials are stored or used.
  - Target chemicals include paints, solvents, stains, wood preservatives, fuels, lube oils, grease, cutting oils, roofing tar, pesticides, herbicides, fertilizers, and antifreeze.
  - Chemical management practices should be implemented in accordance with applicable OSHA, UDOT, and EPA guidelines and in conjunction with related BMPs such as Solid Waste Management (BMP 30), Vehicle and Equipment Management (BMP 32), and Spill and Leak Containment (BMP 33).

### Installation & Use Procedures

To ensure that chemicals and hazardous materials are managed properly, the following procedures must be implemented:

- **Storage and Labeling Procedures:**
  - Store chemicals in their original, sealed, and clearly labeled containers.
  - Where possible, cover stockpiled materials indoors or under a temporary roof to prevent water ponding around stored drums.
  - When multiple drums are moved (e.g., on a pallet), secure them with shrink wrap or steel bands; mark any damaged containers.
  - Do not store chemicals, drums, or bagged materials directly on the ground; instead, use secondary containment platforms or wooden pallets.
- **Secondary Containment:**
  - Provide spill containment dikes around chemical and fuel storage tanks, lining the containment with plastic film (or other compatible material) to prevent soil contamination.
  - For containers larger than 55 gallons or when site conditions require, install secondary containment (e.g., drip pans, spill containment pallets, or berms with impermeable liners).
  - Do not drain containment areas that have collected precipitation until it is confirmed by the site supervisor that drainage will not contaminate surrounding soil.
- **Waste Handling and Disposal:**
  - Ensure that adequate hazardous waste storage space and properly labeled hazardous waste collection containers are available on-site.
  - Store hazardous waste in containers that meet EPA, OSHA, and UDOT regulations.
  - Dispose of oil-based paints, solvents, thinners, and mineral spirits regularly through a licensed waste management firm.

    - Follow manufacturer recommendations for disposal of construction chemicals (e.g., curing compounds, form releases) and use proper devices for chemical transfer.
- **Additional Measures:**
    - Keep Safety Data Sheets (SDS) readily accessible for all chemicals stored or used on-site.

## Maintenance & Management

Continual maintenance and proactive management are critical to the effectiveness of chemical management practices:

- **Educating Workers:**
    - Train all employees and subcontractors in safe chemical storage, handling, and spill response procedures.
    - Establish a continuing education program for new and existing workers regarding chemical management risks and procedures.
- **Quality Assurance:**
    - Designated personnel (e.g., foreman or site supervisor) must regularly monitor chemical storage and disposal procedures.
    - Document and, if necessary, discipline workers who violate established procedures.
    - Verify that any hazardous waste disposal contractors are reputable and licensed.
- **Emergency Response:**
    - Maintain an up-to-date Emergency Response Plan for chemical spills.
    - If a spill occurs that equals or exceeds the reportable quantity (as defined by EPA regulations in 40 CFR Parts 110, 117, and 302), report it immediately to the National Response Center (1-800-424-8802), Utah Department of Environmental Quality (1-385-552-0539) and notify local emergency management authorities.

## Performance Criteria

This BMP is considered effective when:

- All chemicals and hazardous materials are securely stored in accordance with manufacturer and regulatory requirements, preventing any pollutants from reaching stormwater systems.
- Secondary containment measures remain intact and are sufficient to contain spills or leaks.
- Regular inspections reveal no evidence of spills, leaks, or improper storage practices.
- Spill response procedures are effectively executed, with any incidents promptly addressed and documented.
- Ongoing training and quality assurance measures ensure continuous compliance with applicable regulations.

## 10.6. BMP 32: Vehicle and Equipment Management

### Purpose & Applicability

Proper vehicle and equipment management is critical to minimizing pollutants entering stormwater from fueling, washing, and maintenance activities. By establishing proper procedures for vehicle washing, fueling, storage, and maintenance, this BMP aims to reduce the discharge of fuels, oils, antifreeze, solvents, and other pollutants.

- **Applicability:**
    - Use on all construction sites where vehicles and equipment are present.
    - Applies to both fueling operations and routine maintenance tasks, including vehicle washing and storage of maintenance fluids.
    - Works in conjunction with spill and leak containment procedures (BMP 33) and supports compliance with relevant OSHA, UDOT, EPA, and DEQ requirements.

### Installation & Use Procedures

To ensure effective management of vehicles and equipment, the following procedures must be implemented:

- **Fueling Operations:**
    - **Location & Setback:**
        - Locate fueling operations at least 50 feet from receiving waters, drainage features, and storm drain inlets.
        - If a 50-foot setback is not feasible, document the reasons in the SWPPP.
    - **Storage & Handling:**
        - Store fuels in sealed, clearly labeled containers.
        - Provide secondary containment for fuel tanks and containers (e.g., curbing, spill berms, or double-walled tanks).
        - Use drip pans or spill containment devices during fueling operations.
    - **Operational Requirements:**
        - Discourage topping-off of tanks.
        - Ensure fueling is performed only in designated areas; if many vehicles are fueled, consider using an off-site fueling station.
        - Train workers on proper fueling procedures and spill response.
- **Vehicle Washing:**
    - **Designated Wash Area:**
        - If vehicle washing is required on-site, designate a specific wash area.
        - Ensure the wash area is graded so that all wash water is directed intoa sediment basin or equivalent sediment control.
    - **Prohibitions:**
        - Do not use soap during vehicle washing, as soaps are not removed by sediment controls and may lead to water quality violations.
        - Use water solely to remove soil and debris from tires and undercarriages.
    - **Additional Controls:**
        - Ensure that any wash water collected is treated by a sediment control (e.g., sediment basin or swale) before discharge.
- **Maintenance Operations:**

    - **On-site Repairs:**
        - Limit on-site maintenance to routine preventive measures.
        - If maintenance is required that involves fluids, ensure these fluids are stored in closed, appropriate containers and under cover.
        - Place drip pans under parked vehicles and equipment to catch leaks.
    - **Vehicle Removal:**
        - Remove vehicles or equipment that consistently leak or drip until repairs are completed.
- **Documentation & Signage:**
    - Clearly mark the locations of fueling and wash areas on the SWPPP site map.
    - Provide contractor illustrations and detailed specifications for fueling, washing, and maintenance setups.

## Maintenance & Management

Regular maintenance and vigilant management are essential to the long-term effectiveness of vehicle and equipment management:

- **Inspection & Monitoring:**
    - Inspect fueling tanks, hoses, and storage areas regularly for signs of leaks or damage.
    - Check vehicle wash areas for proper function and ensure that wash water is directed to the designated sediment control.
    - Monitor maintenance areas for spills or leaks from equipment fluids; use drip pans where necessary.
- **Worker Training & Communication:**
    - Train all workers and subcontractors on proper fueling, washing, and maintenance procedures, including spill response protocols.
    - Conduct regular safety meetings to reinforce proper handling and disposal of vehicle and equipment fluids.
- **Repair & Response:**
    - Immediately repair any damaged equipment or containment systems.
    - Remove vehicles or equipment with persistent leaks from the site until repairs are made.
    - Ensure that any spilled fuels, oils, or other pollutants are promptly cleaned up and disposed of using approved methods.

## Performance Criteria

This BMP is considered effective when:

- No fuel, oil, lubricants, or other maintenance fluids discharge into stormwater or adjacent water resources.
- Fueling and vehicle washing operations are confined to designated areas with appropriate secondary containment.
- Maintenance areas and equipment storage locations remain free of leaks, spills, and improperly managed waste.
- Regular inspections and worker training confirm compliance with established procedures.

## 10.7. BMP 33: Spill and Leak Containment

### Purpose & Applicability

This BMP is designed to prevent and control spills and leaks of chemicals, fuels, hazardous materials, and wastes at construction sites to minimize or prevent pollutant discharges into stormwater drainage systems and watercourses. It provides procedures for immediate spill response and proper containment to protect human health and the environment.

- **Applicability:**
  - Use on all construction sites where chemicals, fuels, or hazardous substances are stored or used.
  - Applicable to emergency spill situations involving soil stabilizers, dust palliatives, herbicides, fertilizers, deicing chemicals, fuels, lubricants, sanitary wastes, and other hazardous materials.
  - Functions as a secondary control to prevent contaminants from entering storm drains and water bodies, complementing primary chemical management practices.

### Installation & Use Procedures

To ensure effective spill and leak containment and response, implement the following procedures:

- **Spill Prevention Setup:**
  - **Material Storage:**
    - Store chemicals and hazardous materials in sealed, clearly labeled containers within designated storage areas.
    - Ensure storage areas are located at least 50 feet from storm drain inlets, swales, and other sensitive water bodies; if not possible, provide secondary containment measures.
  - **Secondary Containment:**
    - For containers larger than 55 gallons or as required by site conditions, install secondary containment systems (e.g., drip pans, spill containment pallets, or spill berms lined with impermeable material).
    - Submit detailed design illustrations of secondary containment systems with the SWPPP.
  - **Spill Kits & Emergency Equipment:**
    - Equip the site with spill containment kits appropriate for the types and quantities of chemical stored.
    - Post emergency contact information and spill response procedures in an open, conspicuous, and accessible location near storage areas.
- **Spill Response Procedures:**
  - **Immediate Actions:**
    - Upon detection of a spill, immediately cease operations in the affected area and clear the area upwind of the spill.
    - Remove ignition sources and notify the designated Spill and Leak Response Coordinator.
    - If the spill poses an immediate danger, contact 911 and then the local emergency response team.

    - **Containment & Cleanup:**
        - For small spills (typically less than 5 gallons), use on-site spill kits and absorbent materials to contain and clean up the spill promptly.
        - For spills that exceed reportable quantities, follow federal and state reporting requirements (e.g., notify the National Response Center at 1-800-424-8802, Utah Department of Environmental Quality at 1-385-552-0539, and local emergency management agencies).
    - **Post-Spill Actions:**
        - Do not bury or wash the spill with water.
        - Collect and properly dispose of all contaminated materials and cleanup residues using a licensed waste hauler.
        - Document the spill incident, including quantity, cleanup actions taken, and corrective measures implemented.
- **Documentation & Training:**
    - Attach a site-specific Spill Response Plan to the SWPPP.
    - Train all employees and subcontractors on spill identification, response procedures, and proper use of spill kits and containment equipment.

## Maintenance & Management

Ongoing maintenance and management are essential for effective spill and leak containment and response:

- **Routine Inspections:**
    - Inspect spill containment materials (spill kits, secondary containment structures, posted procedures, and emergency contact information) at least weekly and after any spill event.
    - Verify that all storage areas and containment systems are intact, properly labeled, and free of leaks or degradation.
- **Replenishment & Repairs:**
    - Immediately replenish or repair any used or damaged spill kits, secondary containment structures, or signage.
    - Update the Spill Response Plan and associated documentation whenever changes occur in the types or quantities of chemicals stored on-site.
- **Employee Training:**
    - Maintain a continuing education program for all employees regarding spill prevention, containment, and response procedures.
    - Ensure that new hires receive training and that regular safety meetings reinforce proper practices.
- **Documentation:**
    - Retain records of all spill incidents, cleanup actions, repairs, and training sessions for regulatory review and internal quality assurance.

## Performance Criteria

This BMP is considered successful when:

- Spill containment materials are readily available, intact, and effective, with emergency contact information and spill response procedures posted visibly on-site.
- All spills or leaks are promptly contained, cleaned up, and documented in accordance with the Spill Response Plan, with no discharge of pollutants into stormwater or nearby watercourses.
- Regular inspections and employee training ensure that spill prevention and response procedures are followed consistently.

# 11. Template for Operator BMP Modification or Replacement

Operators are invited to use an alternative BMP or modify a BMP from the State Preferred List so long as the BMP has the same performance criteria or better as the preferred BMP. Any deviations from the preferred BMP installation and use parameters must be reviewed and accepted by the oversight authority.

Replace all blue text in brackets with BMP specific data. Then delete any remaining unnecessary blue instructional text.

**[BMP Title]**

[Insert the BMP detail drawing specific to the proprietary device you will use. It should illustrate the structure of the BMP, installation requirements, and any typical variances due to site conditions.]

[IMAGE]

## Purpose and Applicability

- [Describe specifically when and where this BMP will be used on site]

## Installation and Use Procedures

- [Describe how this BMP should be installed or how it should be practiced]
- [Describe further so that it is very clear, such as minimum length of structure, etc]

## BMP Replacement or Modification Justification

Use only one of the two following bullets

- This BMP is replacing or augmenting [list the preferred BMP that is being replaced] OR
- This BMP is being added and implemented as the conditions or operations cannot be adequately managed by a BMP from the State Preferred List.

## Maintenance and Management

- [Add maintenance criteria for proper BMP performance]
- [Describe how the BMP should look or function during an inspection]
- [Describe when maintenance is necessary]
- [Describe when replacement is necessary]
- [Describe when no action is needed]

## Performance Criteria

- [Describe performance expectations of the alternative BMP. This includes how it protects water resources, manages hazards, and limits public complaints]