Stormwater Best Management Practice

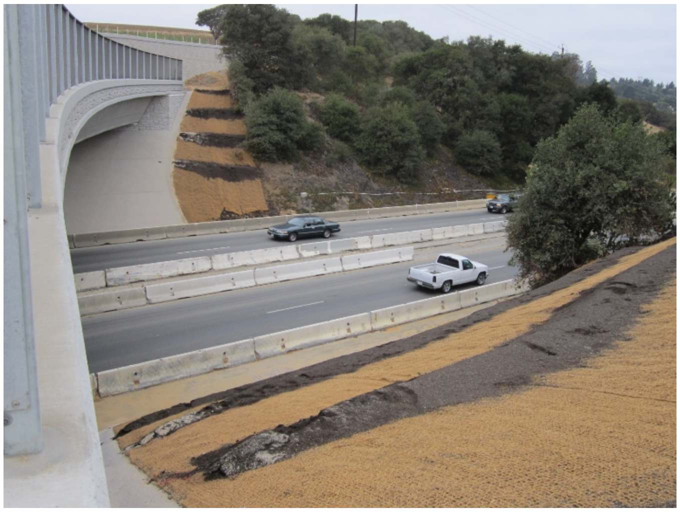
Compost Filter Berms

Minimum Measure: Construction Site Stormwater Runoff Control
Subcategory: Sediment Control

Description

A compost filter berm consists of compost or a compost product placed perpendicular to sheet flow to control erosion in disturbed areas and retain sediment. It can replace a traditional erosion and sediment control practice such as a silt fence. It provides a three-dimensional filter that retains sediment and other pollutants (e.g., suspended solids, metals, oil and grease) while allowing the cleaned water to flow through the berm. Composts in filter berms come from a variety of feedstocks, including yard trimmings, food residuals, separated municipal solid waste, biosolids and manure.

The berms can be vegetated or unvegetated. Vegetated filter berms normally remain in place and provide long-term stormwater filtration as a post-construction stormwater control. Construction staff often break down unvegetated berms once construction is complete and spread the compost around the site as a soil amendment or mulch.



Compost filter berms placed perpendicular to the slope along the side of a highway.
Credit: Anthony D'Angelo for USEPA, 2012

Applicability

Construction staff generally use compost filter berms along the perimeter of a construction site with relatively small drainage areas, or at intervals along a slope, to capture and treat stormwater sheet flow. Construction staff can use compost filter berms on steeper slopes with faster flows if they place the berms closer together or use them in combination with other erosion and sediment control practices, such as compost blankets or compost filter socks, to slow stormwater flow velocities. Compost filter berms can also be particularly useful in areas where ground penetration is not desirable.

Compost Quality Considerations

Compost is the product of controlled biological decomposition of organic material that has undergone sanitization through heat generation and stabilization to the point that it benefits plant growth. The metabolic processes of microorganisms decompose organic material. These microbes require oxygen, moisture and food to grow and multiply. Maintaining these three factors at optimal levels greatly accelerates the natural process of decomposition. Many organic materials, such as leaves, food scraps, manure and biosolids, can produce compost.

Compost quality is an important consideration when designing a compost filter berm. Use of sanitized, mature, biologically stable compost ensures that the compost filter berm performs according to design, has no identifiable feedstock constituents or offensive odors, and minimizes soluble nutrient loss.

Factors that determine the quality of compost are:

- **Maturity:** Maturity indicates how well the compost will support plant growth. One maturity test compares the percentage of seeds that germinate in compost compared to a potting soil mix. The difference in germination rates marks the maturity of the compost.
- **Stability:** Stability indicates microbial activity in the compost and can directly correlate to carbon dioxide production from the compost due to microbe respiration during the decay process. A stable

EPA-832-F-21-028O
December 2021

compost has no offensive odors, does not resemble the original material and has low rates of carbon dioxide off-gassing.

- **Absence of pathogens:** The pathogen count indicates how sanitary the compost is. In 40 CFR Part 503, EPA has defined processes for composting that reduce the number of pathogenic organisms to nondetectable levels and ensure the resulting compost is sufficiently heat-treated and sanitary.

The compost in filter berms should meet all local, state and federal quality requirements and meet the guidelines outlined in Table 1. All compost should comply with 40 CFR Part 503, which establishes safe standards for pathogen reduction and presence of heavy metals.

Table 1. Quality guidelines for compost in filter berms.

Parameters	Units of Measure	Acceptable Range
pH	N/A	5.0–8.5
Soluble salt concentration (electrical conductivity)	dS/m (millimhos/cm)	Maximum 5 dS/m
Moisture content	Percent, wet weight basis	30–60%
Organic matter content	Percent, dry weight basis	25–100%
Particle size	Percentage passing a selected mesh size, dry weight basis	2 inches, 100% passing; 3/8 inches, 50% passing
Biological stability/maturity (carbon dioxide evolution rate)	mg CO_2-C per gram of organic matter per day	Less than 8 mg
Physical contaminants (human-made inert products; e.g., glass, metal, plastic)	Percent, dry weight basis	Less than 1%

Source: AASHTO 2017, USDA 2011

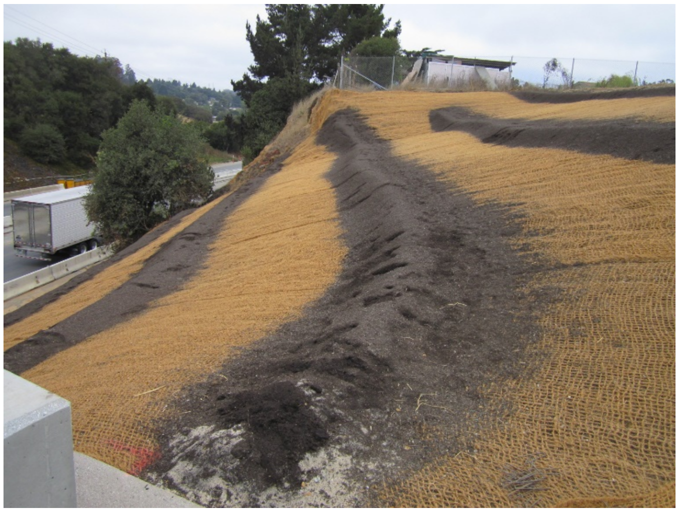
The U.S. Composting Council (USCC) certifies compost products under its Seal of Testing Assurance Program. Compost producers with Seal of Testing Assurance-certified products provide a standard product label that customers can use to compare compost products. The USCC website (updated daily) contains current Seal of Testing Assurance Program participants.

Construction staff should choose a biologically stable, mature compost that meets the particle size distribution specifications in Table 1 above. This ensures that the nutrients in the composted material are in organic form, less soluble and less likely to migrate into receiving waters.

The American Association of State Highway Transportation Officials (AASHTO) and many individual state departments of transportation have issued specifications for filter berms (AASHTO, 2017; USCC, 2001). These specifications describe the quality and particle size distribution of compost for filter berms, as well as the size and shape of the berm for different scenarios. Although these specifications still serve as common references, research on these parameters continues to evolve. Therefore, before designing the filter berm, design engineers should contact the environmental agency of the state where they will install the filter berm to obtain any applicable specifications or compost-testing recommendations.

Siting and Design Considerations

Filter berm design dimensions should reflect site-specific conditions. The height and width of the berm will vary depending on the precipitation, rainfall erosivity index and slope length of the site (MDE, NRCS, & MASCD, 2011). AASHTO has published compost filter berm dimensions for various rainfall scenarios in R 51-13. The Oregon Department of Transportation (ODOT) has also published example filter berm dimensions based on the site grade and slope length. The ODOT specification states that, where possible, compost berms should be at least 5 feet away from the toes of slopes to allow for energy dissipation and reduce the chance of undermining or washout (ODOT, 2017).



Compost filter berms placed perpendicular to slopes control stormwater velocity and provide filtration.

Credit: Anthony D'Angelo for USEPA, 2012

Sites in high-rainfall areas or with severe grades or long slopes should use larger berms or a series of berms. Design engineers should base sizing and spacing on local rainfall conditions and follow design criteria. Combining filter berms with compost blankets can increase the effectiveness of both practices and promote vegetation growth. Design engineers should not place compost in areas where it can easily transport into waterways (UDFCD, 2010).

Case Study

In a study performed by the Snohomish County, Washington, Department of Planning and Development Services (Caine, 2001), compost filter berms reduced turbidity by 67 percent compared to no reduction from silt fences.

Studies examining the use of erosion and sediment control practices utilizing compost in bioretention systems, compost blankets and as soil amendments have shown both reductions in organic nutrients and releases of nutrients (N and P) in leachate and infiltrate. The potential for nutrient discharges from erosion and sediment control practices that utilize compost should be considered to determine whether compost use is appropriate especially in cases where there are receiving waterbodies that are sensitive to or are currently impaired by nutrients. Site conditions, compost type and composition, compost berm placement and management of the compost system also will affect potential nutrient loadings or reductions and pollutant loadings to receiving waters. The use of this practice should be considered when weighing the overall efficacy of the system in terms initial nutrient loadings, mid-life nutrient trapping capacity and the potential for end-of-life nutrient discharges where nutrients are of concern.

Installation

The installation of compost berms can be by hand; by using a backhoe, bulldozer or grading blade; or by using specialized equipment such as a pneumatic blower or side discharge spreader with a berm attachment. Construction staff can install compost filter berms on frozen or rocky ground. They may vegetate compost filter berms by hand, by incorporating seed into the compost before installation or by hydraulic seeding after berm construction.

Limitations

Construction staff can install compost filter berms on any type of soil surface; however, construction staff should ensure that the berm contacts the ground surface. To accomplish this, it may be necessary to remove some heavy vegetation. Filter berms are not suitable for areas where large amounts of concentrated flow is likely, such as streams, ditches or waterways, unless the drainage area is small and the peak flow rate is low. The initial cost can be higher than the cost for other sediment control practices, and maintenance can be difficult (WES, 2008).

Maintenance Considerations

Construction staff should inspect compost filter berms regularly, as well as after each rainfall event, to ensure that they are intact and that silt has not filled the area behind the berm. Construction staff should remove accumulated sediments behind the berm when they reach approximately one-third the height of the berm, and replace any areas that have eroded. If the berm has experienced significant washout, a filter berm alone may not be appropriate for the area. Depending on the site-specific conditions, construction staff could remedy the problem by increasing the size of the filter berm or adding another erosion control practice in the area, such as an additional compost filter berm, a compost filter sock or a compost blanket. Construction staff should inspect the berm for parallel channel formation, which indicates that the berm acts as a flow barrier and needs repositioning (WES, 2008).

Effectiveness

In general, filter berms provide an effective physical barrier in sheet flow conditions; in addition, the use of compost in the filter berm provides the following additional benefits:

- The compost retains a large volume of water, which helps prevent or reduce rill erosion as well as establish vegetation on the berm. The mix of particle sizes in the compost filter material retains at least as much sediment (especially clays and silts) as traditional perimeter controls, such as silt fences or hay bale barriers, while allowing a larger volume of clear water to pass through the berm (Caine, 2001).
- In addition to retaining sediment, compost can retain pollutants—such as heavy metals, nitrogen, phosphorus, oil and grease, fuel, herbicides, pesticides, and other potentially hazardous substances—due to the better chemical adsorption and physical filtration capacity of the compost media (Faucette & Tyler, 2006; Faucette et al., 2008; Faucette et al., 2009).
- Microorganisms in the compost matrix can naturally decompose nutrients and hydrocarbons that the compost filter adsorbs or traps (Faucette et al., 2008).

Cost Considerations

The cost to install a compost filter berm depends on the availability of the required quality of compost in an area. Based on current markets, bulk compost costs anywhere from $15 to $35 per cubic yard. For a typical compost filter berm with a bottom width of 3 feet and height of 1.5 feet (AASHTO, 2017), the cost would be $1.25 to $2.90 per linear foot plus labor costs for installation (RSMeans, 2019). By comparison, silt fences (a common stormwater control substitution) cost around $2 to $3 per linear foot to install (RSMeans, 2019). The Oregon Department of Environmental Quality also reports that compost filter berms cost approximately 30 percent less to install than silt fences (Juries, 2004). These costs do not include the cost to remove and dispose of the silt fence or the cost to disperse the compost berm once construction activities are complete. Compost berms have the distinct advantage of being spreadable on-site to help achieve final stabilization.

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

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Disclaimer

This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.