New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-01

Activity: Tire Washing Facility

PLANNING CONSIDERATIONS:

Design Life:
1 yr

Acreage Needed:
Minimal

Estimated Unit Cost:
Avg: $3000
Range: $1000-$5000

Annual Maintenance:
Negligible

TW

Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

This application supports a stabilized construction entrance, to prevent or reduce the discharge of pollutants to the storm drain system or watercourses. As a result of vehicular ingress and egress to the construction site, the facility would remove mud and dirt from vehicle tires and the undercarriage to prevent materials from deposit onto public roads.

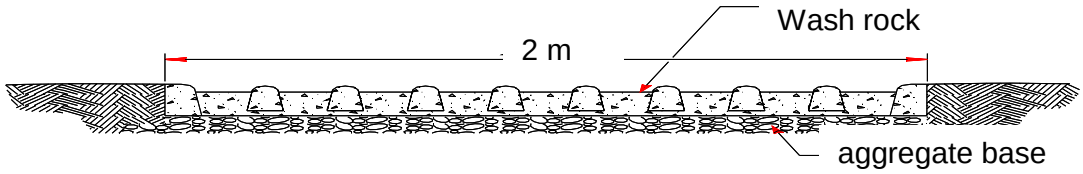
Suitable Applications

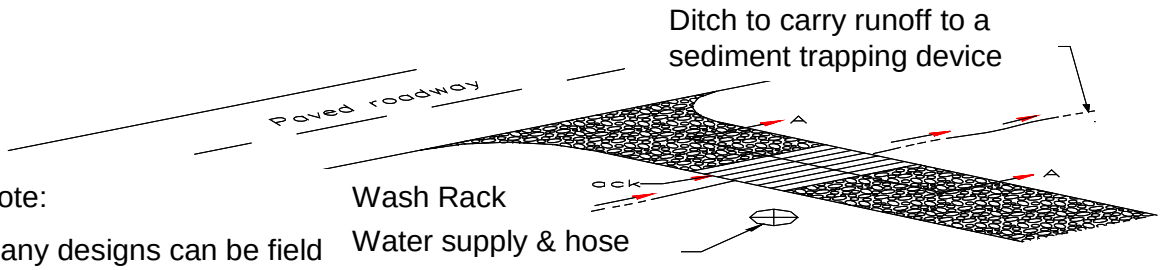
- Temporary construction traffic, phased construction projects and off-site road access.
- Typically used for large construction sites.

Approach

- Incorporate with the stabilized construction entrance, EPP-03.
- Place a layer of 2 to 3 inch stone across the full width of exit/entrance.
- Construct on level ground when possible, on a pad of course aggregate.
- Design tire rock to withstand anticipated traffic loads and drain to a detention pond or swale.
- If a swale is required, then it shall provide sufficient grade, width, and depth to carry wash off.
- The swale shall carry runoff from the wash area to a sediment-trapping device.
- All employees, contractors, subcontractors, and others that leave the site with mud caked tires and/or undercarriages shall use construction entrance.
- Limit egress to the designated construction exit(s) by encouraging perimeter fencing around the construction entrance.

Activity: Tire Washing Facility	EPP-01





Note:

Many designs can be field fabricated or fabricated units may be used.

TYPICAL TIRE WASH

NOT TO SCALE

Installation Procedures for Tire Washing Facility

- Incorporate with a stabilized construction entrance.
- Place a layer of 2- to 3-inch stone across the full width of the exit and construct on level ground.
- If a wash rack is necessary, it shall be designed for anticipated traffic loads and drain to a detention pond or swale.
- If a swale is required, then it shall meet specific requirements needed to carry the wash runoff.
- The swale shall convey the runoff from the wash area to a sediment-trapping device.
- Require that all employees, subcontractors, and others that leave the site with mud-caked tires and/or undercarriages use the construction entrance.

Maintenance

- In the wash rack and/or sediment trap, remove accumulated to maintain system performance.
- Inspect routinely for damage ad repair as needed.

Inspection Checklist

- ❑ Vehicles are leaving the site through designated construction exit(s).
- ❑ Mud, dust or dirt is removed prior to exit onto the adjacent road.
- ❑ The construction exit is sufficiently maintained to prevent mud, dirt, and dust from being tracked off-site.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-02

Activity: Construction Road Stabilization

PLANNING CONSIDERATIONS:

Design Life:
2 yrs

Acreage Needed:
Variable

Estimated Unit Cost:
Avg: $2000
Range: $1000-$4000

Monthly Maintenance:
Negligible

CRS

Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

Significant reduction in sediment will be created by stabilizing access roads, subdivision roads, parking areas, and other on-site vehicle transportation immediately after grading. Frequent preventative maintenance practices will help to control dust and erosion.

Suitable Applications

- Temporary construction traffic, phased construction projects and off-site road access.
- Detour roads for local or temporary construction traffic.
- Construction during wet weather.
- Construction roads utilizing a temporary stream crossing must be indicated and approved.

Approach

- Road should follow topographic contours to reduce erosion of the roadway. The roadway slope should not exceed 15 percent.
- Gravel roads should be a minimum 6-in. thick, 2-3 in. coarse aggregate base applied immediately after grading, or as recommended by a soils engineer or erosion control specialist.
- Chemical stabilizers or water are usually required on gravel or dirt roads to prevent dust. No additional costs for dust control on construction roads should be required above that needed to meet local air quality requirements.

Activity: Construction Road Stabilization	EPP-02

Installation Procedures for Construction Road Stabilization

- The implementation of this BMP depends largely on climate and weather conditions. Alternative routes should be established to incorporate these measures to account for conditions such as dry areas, wet conditions and other circumstances that would inhabit a safe and stable route for construction traffic. Permanent roads and parking areas should be paved as soon as possible after grading. The early application of gravel or chemical stabilization may solve potential erosion and stability problems where construction will be phased. Temporary gravel roadway should be considered during the rainy season and/or on slopes greater than 5 percent.
- When gravel roads are needed, a minimum 4-in. course of 2 to 4-in. crushed rock, gravel base, or crushed surfacing base course should be applied immediately after grading or the completion of utility installation within the right-of-way. Chemical stabilization may also be used upon compacted native sub-grade. These chemical controls should be applied per the manufacturer's directions.
- Roadways should be carefully graded to drain transversely. Provide drainage swales on each side of the roadway in the case of a crowned section, or one side in the case of super-elevated section. Simple gravel berms without a trench can also be used.
- Installed inlets should be protected to prevent sediment-laden water from entering the storm sewer system.

Maintenance

- Periodically apply additional aggregate on gravel roads.
- Active dirt construction roads are commonly watered three or more times per day during the dry season.
- Inspect weekly, and after each rain event. Repair any eroded areas immediately.

Inspection Checklist

- ❑ Gravel roads are preventing mud and dirt from leaving project area.
- ❑ Dirt and gravel roads do not show signs of erosion, including but not limited to, rill and gully erosion.
- ❑ All stream crossings are maintained as mandated by the appropriate general or individual permit.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-03

Activity: Stabilized Construction Entrance

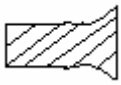
PLANNING CONSIDERATIONS:

Design Life:
1 yr

Acreage Needed:
Minimal

Estimated Unit Cost:
Avg: $100
Range: $50-$150

Monthly Maintenance:
60% of Installation



SCE

Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ◊ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

The construction entrance practice receives all incoming and outgoing traffic of the construction site. By stabilizing the construction entrance there will be a significant reduction in the amount of sediment to and from public right-of-ways, streets, alleys, sidewalks or parking areas. The construction entrance practice is a stabilized pad of aggregate underlain with filter cloth located at any point where traffic will be entering or leaving. This management practice is likely to create a significant reduction in sediment, nutrients, toxic materials, and oil and grease.

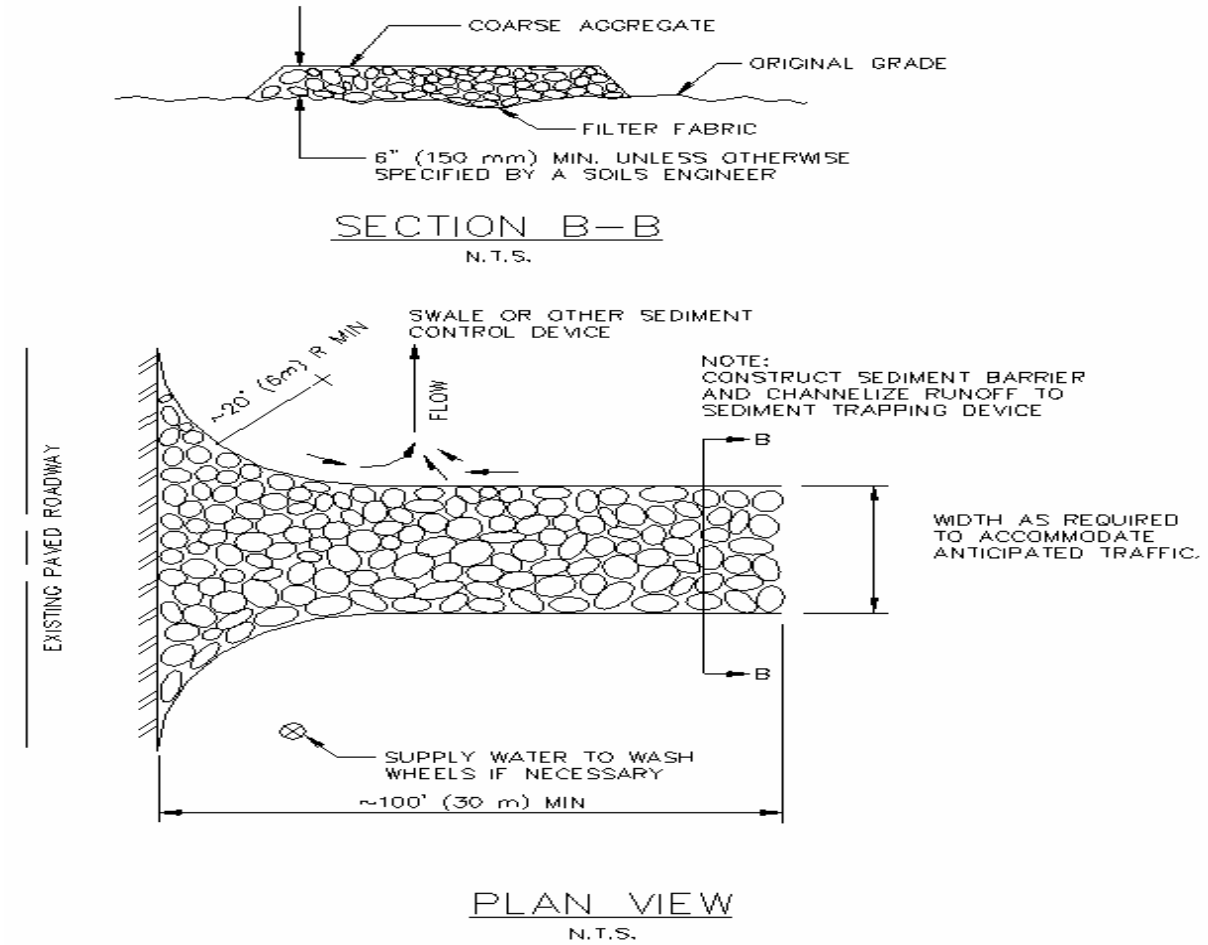
Suitable Applications

- All points of construction ingress and egress.
- Unpaved areas where sediment tracking occurs from site onto paved or public roads.

Approach

- Construct on level ground where possible.
- Stones should be 2-3 inch crushed, washed, and well graded rock to at least a 6-inch depth. Length should be 100-foot minimum, and 20-foot minimum width.
- Provide ample turning radii as part of entrance.
- Should be used in conjunction with street sweeping on adjacent public right-of-way.
- Limit egress to the designated construction exit(s) by installing perimeter fencing.

Activity: Stabilized Construction Entrance	EPP-03



Installation Procedures

- A stabilized construction entrance is a pad of aggregate that may be enhanced with an underlain filter cloth.
- Wash rack may be included (depending on the type of tire washing facility to be constructed) to increase efficiency.
- Institute a sediment trap to collect wash water runoff.
- Sediment barriers, such as sames with check dams, must be provided to prevent sediments from entering into the stormwater sewer system, ditch, or waterway.

Maintenance

- Inspect weekly and after each rainfall.
- Periodically requires addition of stones for top; add gravel material when soil sub grade becomes visible.
- Remove all sediment deposited on paved roadways at the end of the work day.
- Remove gravel and filter fabric at completion of construction.

Activity: Stabilized Construction Entrance	EPP-03

Inspection Checklist

- ❑ Vehicles are leaving the site in designated as construction exit(s).
- ❑ Mud, dust and dirt are not being tracked onto the roads adjacent to the construction entrance.
- ❑ The construction exit is sufficiently maintained to prevent mud, dirt, and dust from being tracked off-site.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-04

Activity: Buffer Zones

PLANNING CONSIDERATIONS:

Design Life:
Permanent

Acreage Needed:
Minimal

Estimated Unit Cost:
Est. from Existing Vegetation: $0
Est. from Sod:
Avg: $11,000 Acre
Range: $4500 - $48000/Acre

Monthly Maintenance:
60% of Installation

BZ

BZ

Target Pollutants

Significant ♦ Partial ◈ Low or Unknown ◊

Sediment ♦ Heavy Metals ♦ Nutrients ♦ Oxygen Demanding Substances ♦ Toxic Materials ◊
Oil& Grease ♦ Bacteria & Viruses ◊ Floatable Materials ◈ Construction Waste ◊

Description

Buffer Zones allow the utilization of vegetation to protect soils from erosion as well as decelerate the velocity of sediment runoff. This BMP allows the removal of sediment through filtering and settling. Temporary relief, permanent placement or buffer requirements may be needed for a no construction activity site to warrant the need for this BMP. This management practice is likely to create a significant reduction in sediment by reducing erosion and retaining plant vegetation along waterways.

Suitable Applications

- A buffer must at least include the floodway plus 50 feet perpendicular to the floodway. If a floodway has not been determined, the buffer must be at least 25 feet perpendicular from each side of the stream bank, creek, or unnamed waterway under "bank-full conditions."
- Utilization or reinforcement of existing vegetation is preferred. However, where improvements are required; sodding, plugging, use of stockpiled vegetation or seeding is acceptable.
- Sodding is appropriate if it is part of the no construction activity area required by the Public Works Agency for areas that contained turf prior to construction, or for any graded or cleared areas that might erode and where a robust plant cover is needed immediately.

Activity: Buffer Zones

Approach

Sodding and Grass Plugging

- Sod shall be protected with tarps or other protective covers during delivery and shall not be allowed to dry out between harvesting and placement.
- All weeds and debris shall be removed before cultivation of the area to be planted and shall be disposed in accordance with local waste management ordinances.
- After cultivation, installation of irrigation systems, and excavation and backfilling of plant holes are completed, areas to be planted with sod shall be fine graded and rolled. Topsoil may be needed in areas where the soil textures are inadequate. Areas to be planted with sod shall be smooth and uniform prior to placing sod. Areas to be planted with sod adjacent to sidewalks, concrete headers, header boards, and other paved borders and surface areas shall be 1.5 in.-0.25 in. below the top grade of such facilities after fine grading, rolling, and settlement of the soil. Sod shall be placed so that ends of adjacent strips of sod are staggered by half the width. All edges and ends of sod shall be placed firmly against adjacent sod and against sidewalks, concrete headers, header boards, and other paved borders and surfaced areas.
- After placement of the sod, the entire sodded area shall be lightly rolled to eliminate air pockets and to ensure close contact with the soil. After rolling, the sodded areas shall be watered so that the soil is moistened to a minimum depth of 4 in. Sod shall not be allowed to dry out. Sod should not be planted during very hot or wet weather. Sod should not be placed on slopes that are greater than 3:1 (H:V) if they are to be mowed.
- If irregular or uneven areas appear before or during the plant establishment period, such areas shall be restored to a smooth and even appearance.
- Sod shall be healthy, field-grown sod containing not more than 0.5-in. thick thatch. The sod shall be free from disease, weeds, insects, and undesirable types of grasses and clovers. Sod shall be machine cut at a uniform soil thickness of 0.625 in.-0.25 in., not including top growth and thatch.

Vegetative Buffer Strips

For development of a vegetative buffer strip from new vegetation, the following steps shall be followed:

- Strip and stockpile good topsoil during construction. Use stockpiled topsoil for surface preparation prior to seeding operations.
- Prepare a good, firm seedbed by adding soil amendments such as fertilizer as needed. After seeding, apply mulch (straw layer, etc.) to protect the vegetation during establishment. Select a seed mixture appropriate to the site conditions, remembering that dense grasses are the most effective in slowing flow velocities and removing pollutants such as sediment. A thick root structure is needed to control erosion.

Activity: Buffer Zones

Approach (cont'd)

- Plant during the best time for the particular grass or vegetation selected.
- Use planting equipment and methods that provide uniform distribution and proper placement of seed.
- Water or irrigate the vegetation as needed to supplement rainfall until established.
- Fertilize in accordance with label instructions and the needs of the grass and soil as indicated by soil tests.
- Overseed, repair bare spots, or apply additional mulch as necessary.
- Avoid using the buffer strip for vehicular traffic as it will damage the vegetation and reduce its effectiveness as a buffer.

Maintenance

- Inspect sod installations weekly and after significant storm events, until the turf is established, and routinely thereafter.
- Maintenance shall consist of mowing, weeding, and ensuring that the irrigation system is operating properly and as designed to sustain growth.
- Inspect buffer strips weekly and after significant storm events until vegetation is established, and routinely thereafter. Repair eroded or damaged areas as needed to maintain original purpose and effectiveness of the buffer strip.

Inspection Checklist

- ❑ Flagging and fencing are kept in repair as needed.
- ❑ Sod is properly maintained and watered.
- ❑ Buffer strips are properly maintained.
- ❑ Significant rainstorm events have not deteriorated buffer zone.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-05

Activity: Temporary Seeding

PLANNING CONSIDERATIONS:

Design Life:
1 yr

Acreage Needed:
As Needed

Estimated Unit Cost:
Avg: $100/acre
Range: $200-$1000/acre

Annual Maintenance:
20% of Capital Costs

TS

TS

Target Pollutants		
Significant ♦	Partial ◈	Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◈ Oxygen Demanding Substances ◊ Toxic Materials ◈
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

For disturbed areas not suitable for seeding and areas with rapidly growing annual plants used to prevent erosion, this BMP helps to temporarily stabilize the soil. This management practice is likely to create a significant reduction in sediment and a partial reduction in nutrients and toxic materials. Temporary seeding may also prevent costly maintenance operations on other erosion control systems.

Suitable Applications

- Apply where final grading of exposed surfaces are to be completed within 15 days to a year.
- Apply to bare areas, soil stockpiles, dikes, dams, sides of sediment basins and temporary diversions.

Approach

- Protect area against seed wash-out using surface roughening diversions or terraces.
- Soil should be analyzed for fertilizer and lime requirements.
- Apply fertilizer at a rate of 800 lbs. per acre with commercial grade 6-12-12 or apply fertilizer and lime per soil requirements.
- Weather conditions should be taken into account when seeding areas. Seeding should not take place during traverse weather conditions.
- Sod if required, should follow requirements for the State of Indiana.
- Sod should be Kentucky 31 Fescue, Bluegrass, or Bermuda grass.
- Sod shall be set or reset only when the soil is mist and favorable to growth. Setting will be as follows unless permission is granted by the engineer.
- Kentucky 31 Fescue – Anytime weather permits
- Bermuda grass – April 15 through August 14
- Bluegrass – March 1 through April 30; September 1 through October 31

Activity: Temporary Seeding	EPP-05

Maintenance

- Inspect frequently within the first six weeks of planting to assure that appropriate moisture levels are maintained and determine if stands are uniform and dense.
- Make provisions to water as needed to penetrate to a depth of 6 inches.
- Check for damage caused by equipment or heavy rains. Damaged areas should be repaired, fertilized, seeded, and mulched. Tack or tie down mulch as necessary.

Installation

- The chart below displays the recommended blend for seeding by season.

Recommended Seed Blend for Indiana.

Species or Mixture	Seeding Rates (lbs/ac)	Seeding Dates (without mulch)
General mix		
white clover Perennial rye grass Annual rye grass Creeping red fescue	8 5 8 10	Aug. 1-Sept. 1 Aug. 15-Sept. 15 Mar.1-May 1
Sun and Partial Shade Mix		
Kentucky 31 fescue and one of the following: spring oats, buckwheat creeping red fescue Appalow sericea lespedeza: red top birdsfoot trefoil flatpea cereal rye, wheat, barley	 20 30 20 10 2 10 30 30	 Mar.1-May 1 and Aug.1-Oct. 1 Mar. 1-May 1 Mar. 1-May 1 Mar. 1-June 1 Mar. 1-Sept. 15 Mar. 1-Sept.15 Aug. 1-Sept. 15 Sept. 15-Oct.1
Full and Partial Shade Mix		
creeping red fescue & white clover	20 2	Mar. 1-May 1 Aug. 1-Sept. 1

Inspection Checklist

- ❑ Area is watered daily.
- ❑ Area is watered at the end of the day.
- ❑ Heavy equipment has not been used within area.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-06

Activity: Surface Roughening

PLANNING CONSIDERATIONS:

Design Life:
1 yr

Acreage Needed:
Minimal

Estimated Unit Cost:
Avg: $100
Range: $50-$150

Monthly Maintenance:
60% of Installation

SR

SR

Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

This BMP corrects the affects of runoff velocities, sediment trapping and sheet flow length by constructing furrows across a slope, and utilizing construction equipment to track soil surface. This corrective measure is referred to as surface roughing, which corrects uneven bare soil. The primary function of surface roughening is to prepare a slope to receive permanent vegetation.

Suitable Applications

- On all construction slopes.
- On exposed soils where seeding, planting, and mulching will benefit from surface roughening.
- Areas that have the potential for erosion of clay (smooth, hard surfaces), silt or sand sized particles.
- Where the slope length needs to be shortened by terracing. Terracing is usually permanent and should be designed under the direction of and approved by a licensed professional civil engineer based on site conditions. Terraces must be designed with adequate drainage and stabilized outlets for the flow.

Approach

Roughening methods include:
- stair-step grading
- furrowing

This must be done across the slope and along the contour. Tracking must be done up and down the slope.

Factors to be considered in choosing a method are
- slope steepness
- mowing requirements
- soil type
- whether the slope is formed by cutting or filling

Activity: Surface Roughening	EPP-06

Installation Procedures

Cut Slope Roughening

- Use stair-step grading or furrows on slopes that are steeper than 3:1 (H:V).
- Use stair-step grading on erodible material that is soft enough to be ripped by a bulldozer. Slopes consisting of soft rock with some subsoil are particularly suited to stair-step grading.
- Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the step in towards the slope.
- Do not make individual vertical cuts more than 24 in. high in soft materials or more than 3 ft. high in rocky materials.
- Groove the slope using machinery to create a series of ridges and depressions that run across the slope and on the contour.

Fill Slope Roughening

- Place fill slopes with a gradient steeper than 3:1 (H:V) in lifts not to exceed 8 in., and make sure each lift is properly compacted.
- The face of the slope should consist of loose, uncompacted fill 4 in. to 6 in. deep.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer and mulch then track or punch in the mulch. See Permanent Grass, Vines and Other Vegetation, Temporary Seeding, and Mulching BMPs.
- Do not blade or scrape the final slope face.

Cuts, Fills, and Graded Areas

- Slopes that will be maintained by mowing should be no steeper than 3:1 (H:V).
- To roughen these areas, create shallow grooves by normal tilling, disking, harrowing, or use a cultipacker-seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 10 in. apart and not less than 1 in. deep.
- Excessive roughness is undesirable where mowing is planned.

Roughening with Tracked Machinery

- Limit roughening with tracked machinery to soils with a sandy textural component to avoid undue compaction of the soil surface.
- Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back blade during the final grading operation.
- Seed and mulch roughened areas to obtain optimum seed germination and growth.

Maintenance

- Periodically check the seeded or planted slopes for rills and washes, particularly after significant storm events, greater than 0.5 in.
- Fill these areas slightly above the original grade, then reseed and mulch as soon as possible.

Inspection Checklist

- ❑ Surface roughened are inspected after recent wet weather events.
- ❑ Rills and washed have been re-roughened and re-seeded.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-07

Activity: Top Soiling

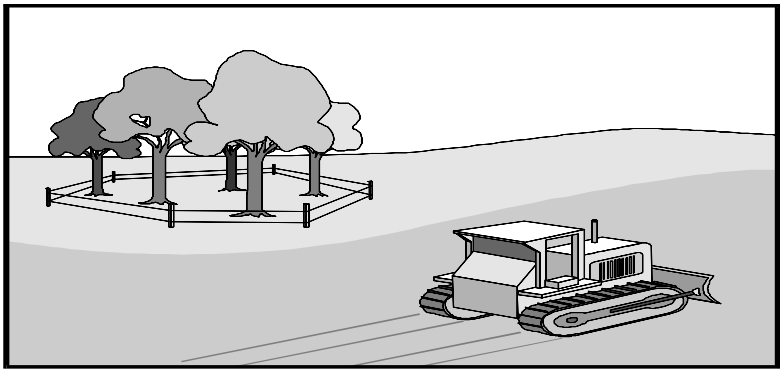
PLANNING CONSIDERATIONS:

Design Life:
Permanent

Acreage Needed:
Varies

Estimated Unit Cost:
Avg: $6/cy
Range: $5-$8/cy

Monthly Maintenance:
10% of Capital Cost



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Target Pollutants		
Significant ♦	Partial ◈	Low or Unknown ◊

Sediment ♦ Heavy Metals ♦ Nutrients ♦ Oxygen Demanding Substances ♦ Toxic Materials ◊
Oil& Grease ♦ Bacteria & Viruses ◊ Floatable Materials ◈ Construction Waste ◊

Description

Topsoil is used to enhance the final product of a construction site area. This act is done to support temporary and permanent seeding, as well as aiding in erosion control methods. By implementing this BMP a reduction in construction waste and some reduction in sediment will occur.

Suitable Applications

- Where construction activities expose subsoil layers that may not be able to support vegetative growth.
- Areas where reusing and preserving topsoil increases the success rate of new vegetation.

Approach

- Compost used on site as a recycled aspect of construction clearing.
- Verify proper placement of down slope sediment control practices prior to removing topsoil.
- Strip topsoil only from those areas that will be disturbed by excavation, filling, road building, or compaction by equipment. Normally, 4 to 6 inches are stripped for topsoil use.
- Position topsoil stockpiles where they will not erode, block drainage, or interfere with site work.
- Before topsoil is applied to the site, disk the subsoil to insure topsoil bonding. Apply a minimum of 4 inches of topsoil evenly.
- If site is excavated down to rock, such as sandstone or shale, 8 to 12 inches of topsoil is recommended for good plant growth.

Activity: Top Soiling	EPP-07

Installation Procedure

- Strip topsoil from areas to be disturbed by excavation, filling, road building or compaction by equipment and preserve for later use.
- Disk the subsoil to insure topsoil bonding before applying to site. Applying a minimum of 4 in. of topsoil evenly.

Maintenance

- Maintain areas where vegetation has been reestablished to remedy erosion and damage or vegetation failure by frequently checking the newly applied topsoil.

Inspection Checklist

- ❑ Effective management practices such as netting, temporary seeding, mulch and other traditional methods are used to ensure correct storage of the soil. If these practices are not available, other equivalent practices are to be enforced.
- ❑ Appropriate layer of topsoil has been established.
- ❑ Storage piles do not interfere with site drainage.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-08

Activity: Mulching

PLANNING CONSIDERATIONS:

Design Life:
6-8 Months

Acreage Needed:
None

Estimated Unit Cost:
Straw Mulch:
Avg: $1700/acre
Range: $500-$5000/acre
Wood Fiber:
Avg: $1000
Range: $500-$2300
Per acre

Monthly Maintenance:
60% of Installation

M M M
M M

M

Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

To secure temporary or permanent freshly seeded areas, mulching is used as a stabilizer. There are several types of mulches to be utilized, some of which include organic materials, straw, wood chips, and bark or other wood fibers. This management practice has the possibility to significantly reduce sediment and partial reduction of nutrients.

Suitable Applications

- Temporary stabilization of freshly seeded and planted areas, sometimes during periods of unsuitable vegetative growth.
- Temporary stabilization of areas that cannot be seeded or planted (e.g., insufficient rain, steep slope, non-growth season).
- Areas that have been permanently seeded to assist in retaining moisture, and to hold seeding.
- On areas to increase the survival of temporary and/or permanent vegetative cover.
- As short term, non-vegetative ground cover on steepened slopes to reduce rainfall impact, decrease the velocity of sheet flow, and settle out sediment.
- As ground cover around established plants, such as trees or shrubs, and on unprotected flat to minor slopes.
- Apply to planting areas where slopes are 2:1 (H: V) or less steep. Tacking agents or devices may be necessary for steeper slopes.
- Areas where climatic conditions require soil moisture retention aid to avoid cracking.

Approach

The term “mulch” is commonly used to describe a variety of materials, such as:
Shredded tree bark and other woody materials, to protect trees and shrubs
Straw or hay, scattered across a slope or disturbed area
Peat mulch, used in planting trees and shrubs.

Approach (Continued)

Vegetative Fibers
Loose hay or straw are the most common mulch materials used in conjunction with direct seeding of soil. Straw mulch is preferable over hay mulch, which may contain weeds and other objectable material. Straw mulch is the short-term protection most commonly used with seeding. Wheat or oat straw is recommended from the current season's crop (less than 12 months old). Average fiber length should exceed 6 in. Straw mulch is applied immediately after seeding, wither by machine or by hand distribution. Anchor the mulch in place using a tacking agent, plastic netting, or punching into the soil mechanically. Plastic netting requires wire staples, widen stakes, or plastic stakes. If the slopes are too steep for netting, then tacking agents should be selected based on longevity and the ability to hold the fibers in place.

Shredded Vegetation
"Green" mulch is produced by recycling of vegetation trimmings such as grass, shrubs, and trees. Methods of application are generally by hand, although pneumatic methods are currently being developed. It can be used as a temporary ground cover with or without seeding. The green mulch in place with a tacking agent on steep slopes and in areas where overland sheet flow is anticipated. The quality of green mulch may vary, and there is a strong potential for establishing unwanted weeds and plants.

Wood and Bark Chips
Wood and bark chips are suitable for landscaped areas that will not be closely mowed. Wood and bark chips may require nitrogen treatment (12 lbs/ton typical rate) to prevent nutrient deficiency. Bark chips do not require additional nitrogen fertilizer.

If there is a wood source near the project site, wood and bark chips can be very inexpensive. Caution must be used on steep slopes, since both wood and bark chips tend to wash down slopes exceeding 6 percent. Wood and bark chips are also used around trees and shrubs, or in ornamental or landscape gardens. A typical depth is 2 to 3 in.

Hydraulic Mulch
Hydraulic mulch can be made from virgin wood fibers or from recycled waste paper sources (newsprint, magazine). There are also mulches available that are a combination. In general, virgin wood fibers contain a linger fiber length than recycled paper mulch.

Hydraulic mulch is mixed in a hydraulic application machine (such as a hydroseeder or a mulch blower) and then applied as a liquid slurry. The hydroseeder slurry contains recommended rates of seed and fertilizer for the site, usually specified with a tacking agent. Slurry must be constantly agitated to keep the proper application rate and achieve uniform effective coverage.

General Description
Mulch is basically defined as a layer of material spread uniformly over a ground surface to prevent weeds and/or retain soil moisture. Mulch is usually an organic material such as shredded tree bark, hay, straw sawdust or leaves. Mulch prevents erosion by protecting the soil surface from rain and runoff impact and fostering growth of new seeds or seedlings. The choice of mulch should be based on the size of the

Activity: Mulching

Approach (Continued)

Area, site slopes, amount of sunlight or shade, proximity to drainage features and natural streams, soil hardness and moisture, weed potential, and availability of mulch materials. Organic materials may also decompose and aid the soil in providing nutrients for vegetation.

Inorganic materials such as inert black plastic or manufactured landscaping fabric can also be used to prevent weeds and retain moisture, but are not considered as mulch. Newspaper is also commonly used to control weeds, but is subject to leaching of ink and chemicals. The use of newspaper within soil for weed control is discouraged.

Grass Vegetation

Mulch helps establish temporary or permanent grass vegetation for disturbed soils after a construction project or land-use reclamation project. Straw and hay mulch are often selected due to the ease of application and good results. Alternatively, hydroseeding (including hydraulic application of mulch) is often performed, especially on steep slopes and locations that require quick establishment of grass.

Applying straw or hay mulch to a slope or hillside will require wither physical measures (crimping, erosion control mats) or chemical binders (special asphalt emulsions) to keep the mulch from washing away or blowing away. The binder is also called a tacking agent or tackifier. A typical application rate might be 100 lbs pf straw or hay mulch per 100 square feet.

Hydraulic application of seeding and other materials (hydroseeding) can be done quickly and efficiently with the correct equipment and ingredients. Also, hydraulic application must be done when no rainfall is expected, preferably within a 24-hour time period.

Virgin wood fiber mulch consists of specially prepared wood fiber that does not contain any growth-inhibiting factors. The mulch is manufactured and processed so the fibers will remain in uniform suspension in water under agitation to form a homogeneous slurry. The fiber lengths should be as long as possible to increase the effectiveness for erosion control. Wood fiber mulching should not be used in areas if extremely hot summer and late fall seasons because of fire danger. When used as a tacking agent with straw mulch, wood fiber mulches are good for steep slopes and severe climates.

A wood mulch can be manufactured containing a tacking agent in each bag or specified without a tacking agent. A typical construction specification for wood fiber mulch is as follows:

- Composed of 100% wood fiber.
- Moisture content (total weight basis) not to exceed 12%.
- Organic matter content (dry weight) = 99.3% minimum.
- Inorganic matter (ash) content (dry weight) =0.7% maximum.
- Controlled pH values.
- Water-holding capacity (dry weight) = minimum 1.2 gallons per pound.

Activity: Mulching

Approach (Continued)

A high quality type of hydraulic matrix known as a Bonded Fiber Matrix (BFM) is generally manufactured for easy application by the appropriate equipment. It generally contains a tacking agent mixed with the wood fibers.

A combination mulch may include wood fiber and paper fiber, with a tacking agent. A hydraulic matrix can be formulated using varying quantities of these components. A typical mixture is as follows

- 12 lbs per 1000 square feet wood fiber mulch.
- 24 lbs per 1000 square feet recycled paper mulch.
- 2 gallons per 1000 square feet acrylic copolymer (55% solids content).

Maintenance

- Must be inspected weekly and after rain for damage or deterioration.
- Maintain an unbroken, temporary mulched ground cover throughout the period of construction that the soils are not being reworked. Inspect before expected rainstorms, repair any damaged ground cover, and remulch exposed areas of bare soil.

Inspection Checklist

- ❑ Organic mulches are not permanent erosion control measures.
- ❑ Check soil surface temperatures to ensure no germination delays.
- ❑ Intensive practices require specific mulching measures, determine if straw or hay is needed.
- ❑ Large ground surface areas can use recycled paper hydraulic mulches and wood fiber based hydraulic mulches.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-09

Activity: Nets and Mats

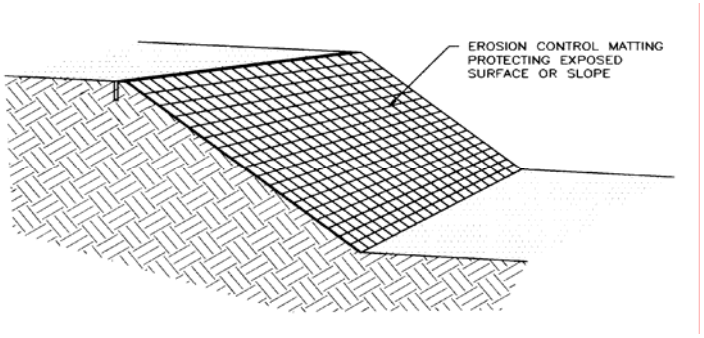
PLANNING CONSIDERATIONS:

Design Life:
1 yr

Acreage Needed:
None

Estimated Unit Cost:
Avg: $2/ ft (20 ft Roll)
Range: $5/ft (20 ft Roll)

Monthly Maintenance:
60% of Installation



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Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

The security measures ensured by jute mesh, excelsior matting, erosion control fabric and other matting materials help to prevent and reduce erosion on preceding shaped and seeded swales, channels and slopes. The implementation of this BMP will create a significant reduction in sediment.

Suitable Applications

Matting, such as erosion control matting, can be applied to several areas that require actions against attrition. Matting aids in effectively protecting areas such as steep slopes and ditches where design flow may exceed 3.5 feet per second and areas with potential high soil erosion.

Approach

Areas that are to receive erosion control matting should be prepared to the specification of the Engineer prior to any initial matting. The area is to be shaped, fertilized, and seeded. A smooth surface free of depressions and eroded areas is required.

Activity: Nets and Mats

Installation

Erosion control matting may apply to many different soil types; therefore there are several different matting controls in existence that are applicable for the eroding area. There are a few matting controls that are commonly used, however it is recommended that erosion control products should always be installed with the manufacture's instructions.

A few of the commonly known matting controls are as follows:

Erosion Control Fabrics

- Matting should be unrolled in the direction of flow with edges and ends butted snugly against each other. Anchor ditches should be required on the upgrade side of the fabric when directed by the Engineer. When unrolled, the netting should be on top and fibers should be in contact with the soil.

- Staples should be driven vertically into the ground, anchoring the mat firmly to the soil, and driven flush with the surface of the mat. Slopes flatter than 4:1 (H:V) should be stapled no more than 5 feet apart on all edges and 1 foot (0.3 m) apart at all joints and ends. On all slopes steeper than 4:1 (H:V) and in all ditches, three staggered rows of staples should be spaced 2.5 to 3 feet apart. Additionally, all joints and ends should be spaced not more than 6 inches apart. The spacing of staples may be modified to fit the conditions as directed by the Engineer.

Jute Mesh

- When jute mesh is to be used, the upslope end should be in a trench at least 6 inches (15.2 cm) deep with the soil firmly tamped against it and unrolled in the direction of the water flow. It should be anchored around the edges as well. The matting should not be stretched but should be spread evenly and smoothly so that it is in close contact with the ground at all points.

- Successive strips of matting should overlap at least 6 inches at the ends, with the upgrade strip on top. Parallel strips of matting should overlap at least 4 inches.

- Check slots should be spaced not more than 50 feet from an end slot or another check slot. Check slots should be placed with a tight fold of matting anchored at least 6 inches vertically into the ground and tamped firmly.

- After the matting is stapled into place, it should then be pressed into the ground with a light lawn roller or by similar means.

Staples

- Staples should be No. 11 gauge new steel wire formed into a "U" shape. Staples should be 6 to 10 inches long, with the longer staples used on loose, unstable soils. Staples should be spaced not more than 4 feet apart in three rows for each strip, with one row along each edge and one row alternately spaced in the center. On overlapping edges of parallel strips, staples should be spaced not more than 2 feet apart. All anchor, junction, and check slot staples should be spaced not more than 6 inches apart.

Activity: Nets and Mats	EPP-09

Maintenance

- Inspect erosion control matting after rainfall events to check for movement of topsoil, mulch or erosion. Continue checking until vegetation is firmly established.
- Repair or replace netting that has been washed out, broken, eroded, and/or needing surface repair, reseeding, resoding, remulching or topsoil replacement.

Inspection Checklist

- ❑ Channel grades are adequately managing runoff velocity.
- ❑ Staples are appropriately spaced to avoid loss of seed, topsoil and mulch to stormwater runoff and winds.
- ❑ Nets are adequately covered or anchored to prevent erosion, washout, and poor plant establishment.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-10

Activity: Geotextiles

PLANNING CONSIDERATIONS:

Design Life:
N/A

Acreage Needed:
None

Estimated Unit Cost:
Avg: N/A
Range: N/A

Monthly Maintenance:
N/A

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Target Pollutants		
Significant ♦	Partial ◊	Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

Runoff and pollution caused by construction activities can be prevented or reduced with this BMP. By utilizing rolled and bound fiber material, erosive impacts from rain, intercept runoff and pollutants to the storm drain system or to watercourses can be lessened. Geotextiles provides reduced flow velocity, releases runoff as sheet flow, removes some sediment from runoff and is likely to create a significant reduction in sediment.

Suitable Applications

- Construction sites desiring stability for disturbed soils.
- Sloppy area where anchoring must take place.
- Slopes steeper than 3:1 (H:V) and/or where erosion hazard is high.
- Slow growing vegetated areas.
- Critical slopes adjacent to sensitive areas (streams, wetlands, etc.).

Activity: Geotextiles

Installation Procedures

Material Selection

There are many types of erosion control blankets and mats, and selection of the appropriate type should be based on the type of application and site conditions. The following criteria should be considered in the selection of the appropriate material:

- Cost
  - Material cost
  - Preparation cost
  - Installation cost
  - Add-ons
- Effectiveness
  - Reduction of erosion
  - Reduction of flow velocity
  - Reduction of runoff
- Acceptability
  - Environmental compatibility
  - Institutional/regulatory acceptability
  - Visual impact
- Vegetation Enhancement
  - Native plant compatibility
  - Germination rate
  - Growth rate
  - Moisture retention
  - Temperature modification
  - Open space/coverage
  - Nutrient uptake
- Installation
  - Durability
  - Longevity
  - Ease of installation
  - Safety
- Operation and Maintenance
  - Maintenance frequency

Site Preparation

- Proper site preparation is essential to ensure complete contact of the blanket or matting with the soil.

- Grade and shape the installation area.

- Remove all rocks, clods, vegetation or other obstructions so that the installed blankets or mats will have complete, direct contact with the soil.

Installation Procedures (Continued)

- Prepare seedbed by loosening 2 in. to 3 in. of topsoil.
- Incorporate amendments, such as lime and fertilizer, into the soil according to soil tests, the seeding plan, and manufacturer's recommendations.

Seeding

Seed the area before blanket installation for erosion control and revegetation. Seeding after mat installation is often specified for turf reinforcement application. When seeding prior to blanket installation, all check slots and other areas disturbed during installation must be reseeded. Where soil filling is specified, seed the matting and the entire disturbed area after installation and prior to filling the mat with soil.

Anchoring

U-shaped wire staples, metal geotextile stake pins or wooden stakes can be used to anchor mats and blankets to the ground surface. Organic stakes may be used for temporary erosion prevention and sediment control blankets and mats. Wire staples should be minimum of 11 gauges. Metal stake pins should be 0.188-in. diameter steel with a 1.5-in. steel washer at the head of the pin. Wire staples and metal stakes should be driven flush to the soil surface. All anchors should be 6 in. to 18 in. long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes

- Always consult the manufacturer's recommendations for installation. In general, these will be as follows:
- Begin at the top of the slope and anchor the blanket in a 6-in. deep by 6-in. wide anchor trench. Backfill anchor trench and tamp earth firmly.
- Unroll blanket down slope in the direction of water flow.
- Overlap the edges of adjacent parallel rolls 2 in. to 3 in. and staple every 3 ft.
- When blankets must be spliced, place blankets end over end (shingle style) with 6-in. overlap. Staple through overlapped area, approximately 12 in. apart.
- Lay blankets loosely and maintain direct contact with the soil do not stretch.
- Staple blankets sufficiently to anchor blanket and maintain contact with the soil. Staples shall be placed down the center and staggered with the staples placed along the edges. Steep slopes, 1:1 (H: V) to 2:1 (H: V), require a minimum of 2 staples/yd^2. Moderate slopes, 2:1 (H:V) to 3:1 (H:V), require a minimum of 12 staples/yd^2, placing 1 staple/yd on centers. Gentle slopes require a minimum of 1 staple/yd^2.

Installation in Channels

Always consult the manufacturer's recommendations for installation. In general, these will be as follows:

- Dig initial anchor trench 12 in. deep and 6 in. wide across the channel at the lower end of the project area.

Activity: Geotextiles

Installation Procedures (Continued)

- Excavate intermittent check slots, 6 in. deep and 6 in. wide across the channel at 25 ft. to 30 ft. intervals along the channels.
- Cut longitudinal channel anchor slots 4 in. deep and 4 in. wide along each side of the installation to bury edges of matting, whenever possible, extend matting 2 in. to 3 in. above the crest of the channel side slopes.
- Beginning at the downstream end and in the center of the channel, place the initial end of the first roll in the anchor trench and secure with fastening devices at 12-in. intervals. Note: matting will initially be upside down in anchor trench.
- In the same manner, position adjacent rolls in anchor trench, overlapping the preceding roll a minimum of 3 in.
- Secure these initial ends of mats with anchors at 12-in. intervals, backfill and compact soil.
- Unroll center strip of matting upstream. Stop at next check slot or terminal anchor trench.
- Unroll adjacent mats upstream in similar fashion, maintaining a 3-in. overlap.
- Fold and secure all rolls of matting snugly into all transverse check slots. Lay mat in the bottom of the slot then fold back against itself. Anchor through both layers of mat at 12-in. intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.
- Anchor, fill, and compact upstream end of mat in a 12-in. by 6-in. terminal trench.
- Secure mat to ground surface using wooden or organic stakes, U-shaped wire staples, or geotextile pins.
- Seed and fill turf reinforcement matting with soil, if specified.

Soil Filling (if specified for turf reinforcement)

- Always consult the manufacturer's recommendations for installation. In general, these will be as follows:
- After seeding, spread and lightly rake 0.25 in. to 0.5 in. of fine topsoil into the mat apertures to completely fill mat thickness. Use backside of rake or other flat implement.
- Spread topsoil using lightweight loader, backhoe, or other power equipment. Avoid sharp turns with equipment.
- Do not drive tracked or heavy equipment over mat.Avoid any traffic over matting if loose or wet soil conditions exist.
- Use shovels, rakes or brooms for fine grading and touch up.
- Smooth out soil filling; just exposing top netting of mat.

Activity: Geotextiles	EPP-10

Maintenance

- Inspection to occur periodically, if any portion of the material is damaged, immediate correction is required.
- Inspection to occur after significant rain storms to check for erosion and undermining. Any failures are to be replaced immediately.
- Repairs to the slope and re-installation should occur as a result of wash-out or breakage.
- Perform required maintenance.

Inspection Checklist

- ❑ Site is adequately prepared (grading or shaping, rocks, vegetation and debris removal, etc.).
- ❑ Seeding meets geotextile requirements.
- ❑ Anchoring is established at an acceptable depth.
- ❑ Anchoring trenches are used at the top and bottom of slopes.
- ❑ Trenches start, join and terminate geotextiles placed in channels.
- ❑ Soil filling is even and flat.

New Albany, Indiana
Stormwater Best Management Practices (BMPs)
Erosion Prevention Practices (EPPs)

EPP-11

Activity: Terracing

PLANNING CONSIDERATIONS:

Design Life:
Life

Acreage Needed:
As Required

Estimated Unit Cost:
Negligible

Monthly Maintenance:
Negligible

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Target Pollutants

Significant ♦ Partial ◊ Low or Unknown ◊

Sediment ♦ Heavy Metals ◊ Nutrients ◊ Oxygen Demanding Substances ◊ Toxic Materials ◊
Oil& Grease ◊ Bacteria & Viruses ◊ Floatable Materials ◊ Construction Waste ◊

Description

This BMP is likely to reduce sediment by creating small areas to establish vegetation to reduce runoff velocity, increase infiltration and trap sediment. This reduces the amount of sediment leaving a site.

Suitable Applications

- Cleared areas prior to temporary or permanent seeding and planting or erodible slopes steeper than 3:1 (H:V) and higher than 5 ft.
- Graded areas with smooth, hard surfaces.
- Areas where slopes need to be shortened. Adequate drainage and stabilized outlets must be a part of the design and should follow the guidelines of a licensed professional civil engineer based on site conditions.

Approach

Slope roughening/terracing is performed in several ways:

- Stair-step grading
- Grooving
- Furrowing
- Tracking
- Rough grading
- No grading

Activity: Terracing	EPP-11

Installation Procedures

Graded areas with smooth, hard surfaces give a false impression of "finished grading" and a job "well done". It is difficult to establish vegetation on such surfaces due to reduced water infiltration and the potential for erosion. Rough slope surfaces with uneven soil and rocks left in place may appear unattractive or unfinished at first, but they encourage water infiltration, speed the establishment of vegetation, and decrease runoff velocity. Rough, loose soil surfaces give lime, fertilizer, and seed some natural coverage. Niches in the surface provide microclimates which generally provide a more favorable moisture level that aids seed germination.

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, and tracking. Factors to be considered in choosing a method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

1. Disturbed areas which will not require mowing may be stair-step graded, grooved, or left rough after filling.
2. Graded areas steeper than 3:1 (H:V) should be stair-stepped with benches. The stair-stepping will help vegetation become attached and also trap soil eroded from the slopes above. Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material which sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment.
3. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the step in towards the slope.
4. Do not make individual vertical cuts more than 24 in. high in soft materials or more than 3 ft. high in rocky materials.
5. Groove the slope using machinery to create a series of ridges and depressions that run across the slope and on the contour.

Fill Slope Roughening

- Place fill slopes with a gradient steeper than 3:1 (H:V) in lifts not to exceed 8 in., and make sure each lift is properly compacted.
- Ensure that the face of the slope consists of loose, uncompacted fill 4 in. to 6 in. This is not to be confused with proper compaction necessary for slope stabilization.
- Use grooving or tracking to roughen the face of the slopes, if necessary.
- Apply seed, fertilizer, and mulch and then track or crimp in the mulch. See EPP-05, EPP-06: Temporary Seeding and Temporary Mulching, respectively.
- Do not blade or scrape the final slope face.

Activity: Terracing

Installation Procedures (Continued)

Cuts, Fills, and Graded Areas

- Slopes that will be maintained by mowing should be no steeper than 3:1 (H:V).
- To roughen these areas, create shallow grooves by normal tilling, disking, harrowing, or use a mechanical seeder. Make the final pass of any such tillage on the contour.
- Make grooves formed by such implements close together, less than 10 in., and not less than 1 in. deep.
- Excessive roughness is undesirable where mowing is planned.

Maintenance

- Periodically check the seeded or planted slopes for rills and washes, particularly after significant storm events greater than 0.5 in. Fill these areas slightly above the original grade, then re-seed and mulch as soon as possible.
- Inspect roughened slopes weekly and after rainfall for excessive erosion.

Inspection Checklist

- ❑ Furrows at least 6 in. deep.
- ❑ Furrows are spaced no more than 50 ft. apart.
- ❑ Horizontal distance is greater than vertical distance on stepped slopes.
- ❑ Stepped slopes or terraced slopes cut so that they drain in on themselves.