Maintaining existing vegetation or placing vegetative buffer strips can have numerous benefits for stormwater quality, erosion and sediment control, as well as landscape beautification, dust control, noise reduction, shade and watershed protection.

**Construction Specifications:**

**Preservation of Existing Vegetation:**

**Timing**

- Preservation of existing vegetation shall be provided prior to the commencement of clearing and grubbing operations or other soil-disturbing activities in areas identified on the plans to be preserved, especially on areas designated as Environmentally Sensitive Areas (ESAs) or where no construction activity is planned or will occur at a later date.
- Limits of clearing and grubbing should be clearly marked prior to any grading or clearing activities.
- Preservation of existing vegetation shall conform to scheduling requirements and local permitting agency requirements.

**Design and Layout**

- Mark areas to be preserved with temporary fencing made of orange polypropylene that is stabilized against ultraviolet light. The temporary fencing shall be at least 3.2 ft (1 meter) tall and shall have openings not larger than 2 in by 2 in (50 mm by 50 mm).
- Fence posts shall be either wood or metal as appropriate for the intended purpose. The post spacing and depth shall be adequate to completely support the fence in an upright position.
- Minimize the disturbed areas by locating temporary roadways to avoid stands of trees and shrubs and to follow existing contours to reduce cutting and filling.
- Consider the impact of grade changes to existing vegetation and the root zone.
- Construction materials, equipment storage, and parking areas shall be located where they will not cause root compaction.
- Keep equipment away from trees to prevent trunk and root damage at least to drip line.
- Maintain existing irrigation systems.
- Employees and subcontractors shall be instructed to honor protective devices. No heavy equipment, vehicular traffic, or storage piles of any construction materials shall be permitted within the drip line of any tree to be retained. Removed trees shall not be felled, pushed, or pulled into any retained trees. Fires shall not be permitted within 100 ft (30 m) of the drip line of any retained trees. No toxic or construction materials (including paint, acid, nails, gypsum board, chemicals, fuels, and lubricants) shall be stored within 50 ft (15 m) of the drip line of any retained trees, nor disposed of in any way which would injure vegetation.

**Trenching and Tunneling**

- Trenching shall be as far away from tree trunks as possible, usually outside of the tree drip line or canopy. Curve trenches around trees to avoid large roots or root concentrations. If roots are encountered, consider tunneling under them. When trenching and/or tunneling near or under trees to be retained, tunnels shall be at least 18 in (450 mm) below the ground surface, and not below the tree center to minimize impact on the roots.
- Tree roots shall not be left exposed to air; they shall be covered with soil as soon as possible, protected, and kept moistened with wet burlap or peat moss until the tunnel and/or trench can be completed.
The ends of damaged or cut roots shall be cut off smoothly.

Trenches and tunnels shall be filled as soon as possible or in accordance with local requirements. Careful filling and tamping will eliminate air spaces in the soil which can damage roots.

Remove any trees intended for retention if those trees are damaged seriously enough to affect their survival.

After all other work is complete, fences and barriers shall be removed last. This is because protected trees may be destroyed by carelessness during the final cleanup and landscaping.

**Vegetative Buffer Strips:**

Vegetated buffer strips (vegetated filter strips, filter strips, and grassed filters) are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces. Filter strips function by slowing runoff velocities and allowing sediment and other pollutants (e.g., total and dissolved metals) to settle and partially infiltrate into underlying soils. With proper design and maintenance, filter strips can provide relatively high pollutant removal.

Designate watercourse buffer-filter strips on the site design plan.

The width of a buffer strip (i.e., flow path length) shall be maximized to the extent feasible with a 15 foot suggested minimum width. Buffer strips shall be sized in accordance with site conditions and local requirements.
TEMPORARY SEEDING AND PLANTING EP-5

Temporary seeding and planting consists of the establishment of temporary vegetative cover on disturbed areas to reduce erosion by seeding with appropriate and rapidly growing annual grasses and forbs.

**Construction Specifications**

**Conditions Where Practice Applies**

- Cleared or graded areas that are exposed and subject to erosion for extended periods (e.g., 14 to 30 days depending on local requirements).
- Cleared or graded areas exposed to seasonal rains.
- Areas that will not be subjected to heavy wear by construction equipment.
- Temporary seeding is encouraged whenever possible to aid in reducing erosion on construction sites. Temporary seeding is an important component of "phased" construction activities. Permanent seeding shall be applied to areas intended to be left dormant for a year or more.

The following chart shows recorded shear stress and velocities withstood by grass mixtures and applications.

<table>
<thead>
<tr>
<th>Bank Material/Protection</th>
<th>Shear Velocity</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shear</td>
<td>Velocity</td>
</tr>
<tr>
<td></td>
<td>lb/ft²</td>
<td>N/m²</td>
</tr>
<tr>
<td>Sandy Loam</td>
<td>0.0167</td>
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<tr>
<td>Silt Loam</td>
<td>0.0218</td>
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<tr>
<td>Alluvial silts</td>
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<td>2</td>
</tr>
<tr>
<td>Ordinary firm loam</td>
<td>0.0341</td>
<td>2.5</td>
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<tr>
<td>Very light loose sand, no vegetation or protection</td>
<td>1-1.5</td>
<td>0.61-0.76</td>
</tr>
<tr>
<td>Average sandy soil</td>
<td>2-2.5</td>
<td>0.61-0.76</td>
</tr>
<tr>
<td>Stiff clay, ordinary gravel soil</td>
<td>4-5</td>
<td>1.2-1.5</td>
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<tr>
<td>Bermuda grass, erosion resistant soils, 0-5% slope</td>
<td>8</td>
<td>2.4</td>
</tr>
<tr>
<td>Bermuda grass, erosion resistant soils, 5-19% slope</td>
<td>7</td>
<td>2.1</td>
</tr>
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<td>Bermuda grass, erosion resistant soils, over 10% slope</td>
<td>6</td>
<td>1.8</td>
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<td>Bermuda grass, easily eroded soils, 0-5% slope</td>
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<td>1.8</td>
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<tr>
<td>Bermuda grass, easily eroded soils, 5-10% slope</td>
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<td>Bermuda grass, easily eroded soils, over 10% slope</td>
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<td>Grass mixture, erosion resistant soils, 0-5% slope</td>
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<td>Grass mixture, erosion resistant soils, 5-10% slope</td>
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<td>1.2</td>
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<tr>
<td>Grass mixture, easily eroded soils, 0-5% slope</td>
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<tr>
<td>Grass mixture, easily eroded soils, 5-10% slope</td>
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<td>0.91</td>
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<tr>
<td>Material/Species</td>
<td>Limit</td>
<td>Source</td>
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<tr>
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<td>-------</td>
<td>--------</td>
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<tr>
<td>1” riprap</td>
<td>0.33</td>
<td>16</td>
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<tr>
<td>2” riprap</td>
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<td>6” riprap</td>
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<td>12” riprap</td>
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<td>Dense sod, fair condition (class D/E), moderately cohesive soil</td>
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<tr>
<td>Bermuda grass, fair stand &lt;12 cm tall, dormant</td>
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<td>Bermuda grass, good stand &lt;12 cm tall, dormant</td>
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<td>Bermuda grass, excellent stand 20 cm tall, dormant</td>
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<td>Bermuda grass, excellent stand 20 cm tall, green</td>
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<td>Bermuda grass, excellent stand &gt;20 cm tall, green</td>
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<tr>
<td>12.5 cm of excellent growth of grass/woody veg on outside bend</td>
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</tr>
<tr>
<td>Flume trials, fabric reinforced vegetation – failed after 50 hours</td>
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<td>244</td>
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<tr>
<td>Flume trials, fabric reinforced vegetation – failed after 8 hours</td>
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<td>391</td>
</tr>
<tr>
<td>Sod revetment, short period of attack</td>
<td>0.41</td>
<td>20.09</td>
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<tr>
<td>Wattle (coarse sand between)</td>
<td>0.2</td>
<td>9.8</td>
</tr>
<tr>
<td>Wattles (gravel between)</td>
<td>0.31</td>
<td>15.19</td>
</tr>
<tr>
<td>Wattles (parallel or oblique to current)</td>
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<tr>
<td>Fascine revetment</td>
<td>1.4</td>
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<td>Cribs with stone</td>
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<td>1470</td>
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<tr>
<td>Turf (immediately after construction)</td>
<td>0.2</td>
<td>10</td>
</tr>
<tr>
<td>Turf (after 3-4 seasons)</td>
<td>2.04</td>
<td>100</td>
</tr>
</tbody>
</table>

**Site Considerations**

- Prior to seeding, install necessary erosion control practices such as temporary continuous berms, diversion dikes, channels, and sediment basins.
- Proper seedbed preparation and the use of quality seed are important in this practice just as in permanent seeding. Failure to carefully follow sound agronomic recommendations will often result in an inadequate stand of vegetation that provides little or no erosion control.
- Annual plants which sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover. Consider mixes because they are more adaptable than single species.
- Check with local municipalities for local specifications and requirements prior to seeding and planting.
Mulching is commonly used with seeding practices for temporary cover and to aid in the establishment of vegetation.

Temporary seeding also prevents costly maintenance operations on other erosion control systems. For example, sediment basin maintenance (clean-out) will be reduced if the drainage area has temporary vegetative cover when grading and construction are not taking place. (Temporary seeding is essential to preserve the integrity of earthen structures used to control sediment, such as diversion dikes, and sediment basins)

To reduce the amount of fertilizer, pesticides and other inputs needed, choose adapted varieties based on environmental conditions, management level desired, and the intended use. Check with local municipalities prior to use of fertilizer or pesticides.

Timing

The proper time to seed is dependent upon the climate of the area and the species of seed selected. To determine seeding dates for temporary cover, consult the seed supplier.

Seed Mixes

- All seed should be selected in accordance with local municipality requirements.
- Select plants appropriate to the season and site conditions.
- The seeding rates are based on a minimum acceptable pure live seed (PLS) of 80%. When PLS is below 80% adjust rates accordingly.
- Legumes should be inoculated with the proper rhizobium bacteria before planting. Pellet inoculated seed can be purchased or inoculation can be done in the field. Use only fresh, age dated inoculate specifically labeled for use with the legume you are using.

Site Preparation

- Grade as needed and feasible to permit the use of equipment for seedbed preparation.
- Install needed erosion control practices, such as sediment basins, diversion dikes and channels, prior to seeding. Divert concentrated flows away from seeded areas.
- Soil tests should be done to determine the nutrient and pH content of soil. Depending on the results of soil tests, soil management may be necessary to adjust the pH to between 6.5 and 7.0 (for most conditions). All lime, fertilizer and other soil amendments should be added following sound soil management practices.
- Surface roughening: If the area has been recently loosened or disturbed, no further roughening is required. When the area is compacted, crustied or hardened the soil should be loosened with discing, raking or harrowing. Tracking with bulldozer cleats is very effective on sandy soils.
- Hydroteacting and hydraulic planting generally require less seedbed preparation.
- Generally, slopes steeper than 2:1 that cannot have good seedbed preparations with equipment will require hydraulic planting techniques.
- Seed to soil contact is the key to good germination. Prepare a 3-5 inch (76-127 mm) deep seedbed, with the top 3-4 inches (76-102 mm) consisting of topsoil. Note that the earth bed upon which the topsoil is to be placed should be at the required grade.
- The seedbed should be firm but not compact. The top 3 inches (76 mm) of soil should be loose, moist and free of large clods and stones. For most applications, all stones larger than 2 inches (51 mm) in diameter, roots, litter and any foreign matter should be raked and removed. The topsoil surface should be in reasonably close conformity to the lines, grades and cross sections shown on the grading plans.
Planting:

- Seed should be applied as soon after seedbed preparation as possible, when the soil is loose and moist.
- Always apply seed before mulch, unless seed is applied with a hydraulic matrix or bonded fiber matrix (See BMP EP-8, Mulches).
- Apply seed at the rates specified using calibrated spreaders, cyclone seeders, mechanical drills, or hydroseeders so the seed is applied uniformly on the site.
- If seed is applied with a bonded fiber matrix, apply BFM from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage, and failure of the BFM.
- Apply fertilizer if required. Seed and fertilizer should be incorporated into the soil by raking or chain dragging, or otherwise floated, then lightly compacted to provide good seed-soil contact.
- Straw mulch, erosion control blankets or mulch and tackifiers/soil binders should be applied over the seeded areas.

**Inspection and Maintenance:**

- Newly seeded areas need to be inspected frequently to ensure the grass is growing. Areas that fail to establish cover adequate to prevent sheet and rill erosion will be reseeded as soon as such areas are identified. Spot seeding can be done on small areas to fill in bare spots where grass did not grow properly.
- If the seeded area is damaged due to concentrated runoff, additional practices may be needed.
- Temporary vegetated areas will be maintained until permanent vegetation or other erosion control practices can be established.
Mulching is the process of applying bulk materials to the soil surface to reduce rainfall impact, increase infiltration and in some cases, aid in revegetation. Common types of mulch include vegetable fibers, green material, hydraulic mulches from recycled paper or wood fibers, hydraulic matrices, and straw mulch. Mulches may include a tackifier to increase the longevity of the application.

**Construction Specifications:**

- Mulch should be used for temporary applications only; permanent erosion control measures should also be applied.
- Prior to application, roughen embankment and fill areas by rolling with a crimping or punching type roller or by track walking. Track walking shall only be used where other methods are impractical.
- Avoid mulch over-spray onto the traveled way, sidewalks, lined drainage channels, and existing vegetation.

**Wood Fiber Mulch – Materials and Application Procedures**

- Wood fiber mulch is a component of hydraulic applications. It is usually used in combination with seed and fertilizer. It is typically applied at the rate of 2,000 to 4,000 lb/ac (2,250 to 4,500 kg/ha) with 0-5% by weight of a stabilizing emulsion or tackifier (e.g., guar, psyllium, acrylic copolymer) and applied as a slurry. This type of mulch is manufactured from wood or wood waste from lumber mills or from urban sources.
- Wood fiber mulch can be specified with or without a tackifier; previous work has shown that wood fiber mulches with tackifiers have better erosion control performances.
- Materials for wood fiber based hydraulic mulches and hydraulic matrices shall conform to Oregon DOT Standard Specifications Sections 01030.15 and 01030.16 and local municipality requirements and specifications.

**Recycled Paper Mulch – Materials and Application Procedures**

- Recycled paper mulch contains fibers of shorter length than wood fiber mulches and is typically made from recycled newsprint, magazine, or other waste paper sources. It is a component of hydraulic applications and is usually used in combination with seed and fertilizer. It is typically applied at the rate of 1 to 2 tons/ac (2,250 to 4,500 kg/Ha). It can be specified with or without a tackifier.

**Green Material – Materials and Application Procedures**

- This type of mulch is produced by recycling vegetation trimmings such as grass, shredded shrubs and trees. Methods of application are generally by hand, although pneumatic methods are available. Mulch shall be composted to kill weed seeds.
- It may be used as a temporary ground cover with or without seeding.
- The green material shall be evenly distributed on site to a depth of not more than 2 in (50 mm).

**Hydraulic Matrix – Materials and Application Procedures**

- Hydraulic matrix is a combination of wood fiber mulch and a tackifier applied as a slurry. It is typically applied at the rate of 2,000 to 4,000 lb/ac (2,250 to 4,500 kg/ha) with 5-10% by weight of a stabilizing emulsion or tackifier (e.g., guar, psyllium, acrylic copolymer).
- Materials for wood fiber based hydraulic mulches and hydraulic matrices shall conform to Oregon DOT Standard Specifications Sections 01030.15 and 01030.16 and local municipality requirements and specifications.
- Hydraulic matrices require 24 hours to dry before rainfall occurs to be effective unless approved by Oregon DEQ.

**Bonded Fiber Matrix – Materials and Application Procedures**
Bonded fiber matrix (BFM) is a hydraulically-applied system of fibers and adhesives that upon drying forms an erosion-resistant blanket that promotes vegetation, and prevents soil erosion. BFM are typically applied at rates from 3,000 to 4,000 lb/ac (3,400 to 4,500 kg/ha) based on the manufacturer’s recommendation. The biodegradable BFM is composed of materials that are 100% biodegradable. The binder in the BFM shall also be biodegradable and shall not dissolve or disperse upon re-wetting. Typically, biodegradable BFM should not be applied immediately before, during or immediately after rainfall if the soil is saturated. Depending on the product, BFM require 12 to 24 hours to dry to become effective.

BFM should be selected and used in accordance with local municipality requirements and specifications.

Apply bonded fiber matrices from multiple directions to adequately cover the soil. Application from a single direction can result in shadowing, uneven coverage, and failure of the BFM.

Straw Mulch - Materials

All materials shall conform to Oregon DOT Standard Specifications Sections 01030.15(b) and any local municipality requirements.

Straw shall be derived from wheat, rice, or barley. The straw mulch contractor shall furnish evidence that clearance has been obtained from the County Agricultural Commissioner, as required by law, before straw obtained from outside the county in which it is to be used is delivered to the site of the work. Straw that has been used for stable bedding shall not be used.

Straw Mulch – Application Procedures

Apply loose straw at a minimum rate of 4,000 lb/ac (3,570 kg/ha), or as indicated in the project’s Erosion and Sediment Control Plan, either by machine or by hand distribution.

The straw mulch must be evenly distributed on the soil surface.

Avoid placing straw onto the traveled way, sidewalks, lined drainage channels, walls, and existing vegetation.

Anchor the mulch in place by using a tackifier (preferred) or by “punching” it into the soil mechanically (incorporating).

If using a tackifier to anchor the straw mulch in lieu of incorporation, roughen embankment or fill areas by rolling with a crimping or punching-type roller or by track walking before placing the straw mulch. Track walking should only be used where rolling is impractical.

A tackifier acts to glue the straw fibers together and to the soil surface. The tackifier shall be selected based on longevity and ability to hold the fibers in place (see Oregon DOT Standard Specifications Section 01030.16).

A tackifier is typically applied at a rate of 125 lb/ac (140 kg/ha). In windy conditions, the rate is typically 178 lb/ac (200 kg/ha).

Straw mulch with tackifier shall not be applied during or immediately before rainfall.

Methods for holding the straw mulch in place depend upon the slope steepness, accessibility, soil conditions and longevity. If the selected method is incorporation of straw mulch into the soil, then do as follows:

Applying and incorporating straw shall follow the requirements in Oregon DOT Standard Specifications Section 01030.48(b) and any local municipality’s specifications and requirements.

On small areas, a spade or shovel can be used.

On slopes with soils, which are stable enough and of sufficient gradient to safely support construction equipment without contributing to compaction and instability problems, straw may be “punched” into the ground using a knife-blade roller or a straight bladed coulter, known commercially as a “crimper.”

On small areas and/or steep slopes, straw may also be held in place using plastic netting or jute. The netting shall be held in place using 11 gauge wire staples, geotextile pins or wooden stakes. Refer to EP-10, “Erosion Control Blankets and Mats.”
**Inspection and Maintenance:**

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

- The key consideration in maintenance and inspection is that the mulch needs to last long enough to achieve erosion control objectives. Mulch is a temporary ground cover and not suitable for long-term erosion control.

- Maintain an unbroken, temporary mulched ground cover while disturbed soil areas are non-active. Repair any damaged ground cover and re-mulch exposed areas.

- Reapplication of mulch and tackifier may be required by Oregon DEQ and local municipalities to maintain effective soil stabilization over disturbed areas and slopes.

- After any rainfall event, maintain all slopes to reduce or prevent erosion.
Erosion control blankets and mats (a.k.a., rolled erosion control products - RECPs) provide erosion control by protecting the bare soil from rainfall impact, increasing infiltration and promoting vegetation by protecting seeds from predators and moderating soil temperature. Erosion control blankets and mats can be biodegradable or synthetic and can be temporary or permanent erosion control applications.

**Construction Specifications:**

**Site Preparation:**
- Proper site preparation is essential to ensure complete contact of the protection matting with the soil.
- Site preparation should be performed in accordance with any local municipality requirements and specifications.
- Grade and shape area of installation.
- Remove all rocks, clods, vegetative or other obstructions so that the installed blankets, or mats will have direct contact with the soil.
- Prepare seedbed by loosening 2-3 inches (50.8-76.2 mm) of topsoil above final grade.
- Incorporate amendments, such as lime and fertilizer, into soil according to soil test and the seeding plan.

**Materials:**

Erosion control blankets are grouped into three types: biodegradable, non-biodegradable, and a combination of synthetic and biodegradable.

*Biodegradable RECPs*

Biodegradable RECPs are typically composed of jute fibers, curled wood fibers, straw, coconut fiber, or a combination of these materials.
- **Jute Mesh:** Jute is a natural fiber that is made into a yarn which is loosely woven into a biodegradable mesh. It is designed to be used in conjunction with vegetation and has longevity of approximately one year. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers’ recommendations.
- **Curled Wood Fiber:** Excelsior (curled wood fiber) blanket material should consist of machine produced mats of curled wood excelsior with 80 percent of the fiber 6 inches (15 cm) or longer. The excelsior blanket should be of consistent thickness. The wood fiber should be evenly distributed over the entire area of the blanket. The top surface of the blanket should be covered with a photodegradable extruded plastic mesh. The blanket should be smolder resistant without the use of chemical additives and shall be non-toxic and non-injurious to plant and animal life. Excelsior blanket should be furnished in rolled strips a minimum of 4 feet (122 cm) wide, and should have an average weight of 0.1 lb/ft² (0.5 kg/m²), ±10 percent, at the time of manufacture. Excelsior blankets should be secured in place with wire staples. Staples should be made of 0.12 inches (3.05-mm) steel wire and should be U-shaped with 8 inches (20 cm) legs and 2 inches (5 cm) crown. Always follow the manufacturer’s recommendation on staple types, patterns and the number to use per square yard or meter.
- **Straw:** Straw blanket should be machine-produced mats of straw with a lightweight biodegradable netting top layer. The straw should be attached to the netting with biodegradable thread or glue strips. The straw blanket should be of consistent thickness. The straw should be evenly distributed over the entire area of the blanket. Straw blanket should be furnished in rolled strips a minimum of 6.5 feet (2 meters) wide, a minimum of 80 feet (25 meters) long and a minimum of 0.05 lbs/ft² (0.27 kg/m²). Straw blankets should be secured in place with wire staples. Staples should be made of...
0.12 inches (3.05-mm) steel wire and should be U-shaped with 8 inches (20 cm) legs and 2 inches (5 cm) crown.

- **Wood Fiber:** Wood fiber blanket is comprised of biodegradable fiber mulch with extruded plastic netting held together with adhesives. The material is designed to enhance revegetation. The material is furnished in rolled strips, which should be secured to the ground with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

- **Coconut Fiber:** Coconut fiber blanket should be machine-produced mats of 100 percent coconut fiber with biodegradable netting on the top and bottom. The coconut fiber should be attached to the netting with biodegradable thread or glue strips. The coconut fiber blanket should be of consistent thickness. The coconut fiber should be evenly distributed over the entire area of the blanket. Coconut fiber blankets should be secured in place with wire staples. Staples should be made of 0.12 inches (3.05-mm) steel wire and should be U-shaped with 8 inches (20 cm) legs and 2 inches (5 cm) crown.

- **Coconut Fiber Mesh:** Coconut fiber mesh is a thin permeable membrane made from coconut or corn fiber that is spun into a yarn and woven into a biodegradable mat. It is designed to be used in conjunction with vegetation and typically has longevity of several years. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

- **Straw Coconut Fiber:** Straw coconut fiber blanket should be machine-produced mats of 70 percent straw and 30 percent coconut fiber with a biodegradable netting top layer and a biodegradable bottom net. The straw and coconut fiber should be attached to the netting with biodegradable thread or glue strips. The straw coconut fiber blanket should be of consistent thickness. The straw and coconut fiber should be evenly distributed over the entire area of the blanket. Straw coconut fiber blanket should be furnished in rolled strips with a minimum of 6.5 feet (2 meters) wide, a minimum of 80 feet (25 meters) long and a minimum of 0.05 lbs/ft² (0.27 kg/m²). Straw coconut fiber blankets should be secured in place with wire staples. Staples should be made of 0.12 inches (3.05-mm) steel wire and should be U-shaped with 8 inches (20 cm) legs and 2 inches (5 cm) crown.

**Non-Biodegradable RECPs**

Non-biodegradable RECPs are typically composed of polypropylene, polyethylene, nylon or other synthetic fibers. In some cases, a combination of biodegradable and synthetic fibers is used to construct the RECP. Netting used to hold these fibers together is typically non-biodegradable as well.

- **Plastic Netting:** Plastic netting is a lightweight biaxially-oriented netting designed for securing loose mulches like straw or paper to soil surfaces to establish vegetation. The netting is photodegradable. The netting is supplied in rolled strips, which should be secured with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

- **Plastic Mesh:** Plastic mesh is an open-weave geotextile that is comprised of an extruded synthetic fiber woven into a mesh with an opening size of less than 0.2 inches (0.5 cm). It is used with revegetation or may be used to secure loose fiber such as straw to the ground. The material is supplied in rolled strips, which should be secured to the soil with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

- **Synthetic Fiber with Netting:** Synthetic fiber with netting is a mat that is comprised of durable synthetic fibers treated to resist chemicals and ultraviolet light. The mat is a dense, three-dimensional mesh of synthetic (typically polyolefin) fibers stitched between two polypropylene nets. The mats are designed to be revegetated and provide a permanent composite system of soil, roots, and geomatrix. The material is furnished in rolled strips, which should be secured with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

- **Bonded Synthetic Fiber:** This type of product consists of three-dimensional geomatrix nylon (or other synthetic) matting. Typically it has more than ninety percent open area, which facilitates root growth. Its tough root-reinforcing system anchors vegetation and protects against hydraulic lift and shear.
forces created by high volume discharges. It can be installed over prepared soil, followed by seeding into the mat. Once vegetated, it becomes an invisible composite system of soil, roots, and geomatrix. The material is furnished in rolled strips that should be secured with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

Combination Synthetic and Biodegradable RECPs

Combination synthetic and biodegradable RECPs consist of biodegradable fibers, such as wood fiber or coconut fiber, with a heavy polypropylene net stitched to the top and a high-strength continuous-filament geomatrix or net stitched to the bottom. The material is designed to enhance revegetation. The material is furnished in rolled strips, which should be secured with U-shaped staples or stakes in accordance with manufacturers’ recommendations.

Seeding:

- Seed 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:

- Anchoring of RECPs is the most critical element of installation. Anchoring devices must be selected to be compatible with site soil conditions.
- Where soil conditions are suitable (i.e., topsoil without substantial rocks or cobbles), biodegradable stakes, staples, or pins are preferred. Although biodegradable anchoring devices are preferred they must be compatible with soil conditions to ensure proper blanket installation.
- U-shaped wire staples, metal geotextile stake pins, or triangular wooden stakes can be used to anchor mats to the ground surface. Wire staples shall be a minimum of 11 gauge. Metal stake pins shall be 3/16 inch (4.8 mm) diameter steel with a 1-1/2 inch (38.1 mm) steel washer at the head of the pin. Wire staples and metal stakes shall be driven flush to the soil surface. Two inches of wood staking shall remain above the soil surface. All anchors shall be 6-18 inches (0.2-0.5 m) long and have sufficient ground penetration to resist pullout. Longer anchors may be required for loose soils.

Installation on Slopes:

- Dig initial anchor trench 12 inches (0.3 m) deep and 6 inches (0.2 m) wide across the channel at the lower end of the project area.
- Begin at the top of the slope and anchor its blanket in a 6 inch (0.2 m) deep x 6 inch (0.2 m) wide trench. Backfill trench and tamp earth firmly.
- Unroll blanket down slope in the direction of the water flow.
- The edges of adjacent parallel rolls must be overlapped 2-3 inches (51-76 mm) and be stapled every 3 feet (0.9 m).
- When blankets must be spliced, place blankets end over end (shingle style) with 6 inch (0.2 m) overlap. Staple through overlapped area, approximately 12 inches (0.3 m) apart.
- Lay blankets loosely and maintain direct contact with the soil - do not stretch.
- Blankets shall be stapled sufficiently to anchor blanket and maintain contact with the soil in accordance with manufacturer’s and local requirements. Guidelines for installation are as follows: Staples shall be placed down the center and staggered with the staples placed along the edges. Steep
slopes, 1:1 to 2:1, require 2 staples per square yard. Moderate slopes, 2:1 to 3:1, require 1-2 staples per square yard (1 staple, 3 feet on center). Gentle slopes require 1 staple per square yard.

**Installation in Channels:**
- Dig initial anchor trench 12 inches (0.3 m) deep and 6 inches (0.2 m) wide across the channel at the lower end of the project area.
- Excavate intermittent check slots, 6 inches (0.2 m) deep and 6 inches (0.2 m) wide across the channel at 25-30 foot (7.6-9.1 m) intervals along the channel.
- Cut longitudinal channel anchor slots 4 inches (101 mm) deep and 4 inches (101 mm) wide along each side of the installation to bury edges of matting. Whenever possible extend matting 2-3 inches (51-76 mm) above the crest of 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 1 foot (0.3 m) 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 inches (7.6 cm).
- Secure these initial ends of mats with anchors at 1 foot (0.3 m) 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 inch (76 mm) 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 1 inch (25.4 mm) intervals, then backfill and compact soil. Continue rolling all mat widths upstream to the next check slot or terminal anchor trench.

**Alternate Installation Method for Slopes <4:1:**
- Place two rows of anchors on 6 inch (0.2 m) centers at 25-30 feet (7.6-9.1 m) intervals in lieu of excavated check slots.
- Shingle-lap spliced ends by a minimum of 1 foot (0.3 m) with upstream mat on top to prevent uplifting by water or begin new rolls in a check slot. Anchor overlapped area by placing two rows of anchors, 1 foot (0.3 m) apart on 1 foot (0.3 m) intervals.
- Place edges of outside mats in previously excavated longitudinal slots, anchor using prescribed staple pattern, backfill and compact soil.
- Anchor, fill and compact upstream end of mat in a 12 inch (0.3 m) x 6 inch (0.2 m) terminal trench.
- Secure mat to ground surface using U-shaped wire staples geotextile pins or wooden stakes.
- Seed and fill turf reinforcement matting with soil, if specified.

**Soil Filling (if specified for turf reinforcement):**
- After seeding, spread and lightly rake 1/2-3/4 inches (12.7-19.1 mm) 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 matrix.

Minimum BMP standards are provided on the following detail.

**Inspection and Maintenance:**

• All blanket and mats shall be inspected following installation and in accordance with permit requirements.
• Inspect installation before, during, and after storm events to check for erosion and undermining. Any failure shall be repaired immediately.
• If washout or breakage occurs, re-install the material after repairing the damage to the slope or drainage way.
Daily dust control shall be provided as needed to stabilize soil from wind erosion and to reduce dust generated by construction activities. Special attention shall be paid to stockpiled materials. Covering of small stockpiles or areas is an alternative to applying water or other dust palliatives.

**Construction Specifications:**

- Dust control shall be provided daily or more often (as deemed necessary based on wind conditions, time of year, and physical conditions of the site) by application of water alone or with addition of magnesium chloride or calcium chloride in accordance with manufacturer’s specifications.
- Acrylic co-polymers or other biodegradable products (soil stabilizers/tackifiers) may be used for daily dust control if approved by the project engineer and local regulators.
- Water applied for dust control should be applied evenly and without over-watering which generates runoff and may result in erosion.
- Oil or other petroleum-based products shall not be used for dust control because the oil may migrate into drainage ways or seep into the soil.
- Dust control must be implemented in accordance with local air quality requirements.
- Non-potable water should not be conveyed in tanks or drainpipes that will be used to convey potable water and there should be no connection between potable and non-potable supplies. Non-potable tanks, pipes and other conveyances should be marked “NON-POTABLE WATER – DO NOT DRINK.”

**Inspection and Maintenance**

- Check areas protected to ensure appropriate coverage.
- Reapply water or maintain covers, as necessary to maintain their effectiveness.
Dewatering and ponded water management applies to areas where storm water has collected in low spots, trenches or other depressions and needs to be removed to proceed with construction activities or for vector control. All dewatering discharge activities must be conducted in accordance with local agency (i.e., local sewerage agency or other applicable agency) permit requirements.

**Construction Specifications:**

- Ponded storm water shall be settled or filtered for sediment removal prior to discharge.
- Water from trench or excavation dewatering shall be tested if required by applicable permits and discharged in accordance with permit provisions.
- For clean ponded storm water, dewatering discharges (without permit requirements), and authorized non-storm water discharges, use one of the following methods for discharge / disposal as allowable by local requirements / agencies and approved by the Project Superintendent. Water shall be clean and free of significant sediment, surfactants, or other pollutants.
  - Reduce sediment discharge by pumping water from the top of ponded areas using a floating or raised hose.
  - Use water where possible for construction activities such as compaction and dust control and landscape irrigation. If used for these applications, ensure that the water will infiltrate and not run-off from the land to storm drain systems, to creek beds (even if dry) or to receiving waters.
  - Infiltrate to an appropriate landscaped, vegetated or soil area. Note: Infiltration may be prohibited in accordance with local requirements.
  - Discharge to an on-site temporary sediment pond.
  - Discharge to the storm drain system. Water from dewatering must not contain significant sediments or other pollutants and discharge must be in accordance with local permits.
- Alternatively, a vacuum truck may be used to remove the water and haul it to an authorized discharge location.
- If a permit is required, provide temporary onsite storage (Baker tanks, etc.) of water removed from trenches, excavations, etc., until a permit to discharge is obtained.
- If a permit is obtained for discharge to a storm drain or sanitary sewer system, conduct all dewatering discharge activities in accordance with permit requirements.

**Inspection and Maintenance:**

- Inspect pumps, hoses and all equipment before use. Monitor dewatering operations to ensure it does not cause offsite discharge or erosion.
- Inspect routinely, when applicable activities are under way.
Stockpile management procedures and practices are designed to reduce or eliminate air and storm water pollution from stockpiles of soil, sand, and paving materials such as Portland cement concrete (PCC) rubble, asphalt concrete (AC), asphalt concrete rubble, aggregate base, aggregate sub-base or pre-mixed aggregate, asphalt binder (so called “cold mix” asphalt) and pressure treated wood.

**Construction Specifications:**

**All Stockpiles**
- If feasible, locate stockpiles a minimum of 50 feet away from inlets, drainage courses, or water bodies.
- Keep stockpiles organized and surrounding areas clean.
- Protect storm drain inlets, drainage courses, and receiving waters from stockpiles, using drain inlet protection and perimeter sediment controls as appropriate.
- Implement dust control practices as appropriate to prevent wind erosion of stockpiled material.
- Temporary stockpiles not removed or used by the end of one workday must be managed in accordance with this BMP and in all cases protected prior to rainfall.

**Stockpiles of soil, Portland cement, sand, mulch, concrete rubble, asphalt concrete, asphalt concrete rubble, aggregate base, or aggregate sub-base**
- Protect stockpiles with a perimeter sediment barrier such as berms, sediment fences, fiber rolls, sand/gravel bags, or straw bale barriers year round.
- Stockpiles should additionally be covered or stabilized as necessary during significant forecasted storm events (> 0.25 inches), prolonged periods of rain, and to protect from wind erosion.
- Soil stockpiles may be returned to the excavation if rain is forecast.
- Topsoil stockpiles should be low in height (ideally <1 meter) and flat and be used within 6 months to promote healthy soil organisms and microbes. Stockpiles not used within 6 months should be reseeded with a species that is mycorrhizal dependent to avoid the development of anaerobic conditions in the stockpile. In addition, topsoil stockpiles can be turned periodically to keep organisms alive for larger stockpiles and during extremely hot weather.

**Stockpiles of “cold mix” or other pollutants easily transported in storm water (cement, lime, and other caustic amendments):**
- Stockpiles shall be placed on plastic or comparable material at all times.
- Stockpiles shall be covered with plastic or comparable material prior to the onset of significant rain (> 0.10 inches).

**Bagged Materials**
- Bagged materials shall be placed on pallets at all times and under cover (plastic sheeting, indoors, etc.) prior to the onset of significant rain (>0.10 inches).

**Stockpiles/Storage of pressure treated wood with copper, chromium, and arsenic or ammoniacal copper, zinc, and arsenate:**
- “Stockpiles” of treated wood shall be covered with plastic or comparable material prior to the onset of significant rain (>0.25 inches).

**Inspection and Maintenance:**
- Inspect stockpiles regularly and repair and/or replace covers, and perimeter controls as needed.
Concrete trucks and transfer chutes will be washed-out on-site utilizing a concrete washout to collect all wash water and concrete waste. The washout area will be located away from storm drains, open ditches or water bodies. Signs will be posted throughout the jobsite, directing crews and concrete trucks to concrete washouts. Upon completion of the concrete work, the Contractor shall break up, remove, and haul away or reuse on-site solid concrete that has accumulated in the washout.

**Construction Specifications:**

**Material Use:**

- Install storm drain protection at any down-gradient inlets that may be impacted by the activity. See the BMP on “Storm Drain Inlet Protection.”
- Do not place concrete during rain (precipitation that is sufficient to cause local runoff) or within 18 hours of forecasted rain.
- Place stoppers on concrete truck chutes during travel onsite to manage potential dribbling of concrete material.
- Minimize amount of curing compound and form oil used and do not overspray onto a non-target surface.
- Sandblasting: Use shrouds where necessary to contain waste from sandblasting. Conduct work in accordance with applicable air quality standards. Collected debris for proper disposal ASAP and prior to rain events.
- Minimize the amount of water used during coring/drilling or saw cutting. During wet coring or saw cutting, use a shovel or wet vacuum to lift the cooling water/slurry from the pavement. Additionally, if wet vacuuming is not adequate to capture wastewater from the activity, sand bag barriers or other containment shall be used.
- If concrete residue remains after drying, the area shall be swept up and residue removed to avoid contact with storm water or entering a storm drain or water body via the wind.
- The sweepings shall be collected and returned to the aggregate stockpile or disposed in the trash and not washed into the street or storm drain.
- Washing of fresh concrete shall be avoided, unless runoff can be drained to a bermed or level area, away from storm drain inlets and channels.
- Acid washing of concrete shall be minimized. Where required, acid wash shall be directed into a collection area lined with visqueen. Residuals shall be collected and properly disposed of as hazardous waste.
- Handling of wet concrete, such as moving a pumper chute or transporting material in a wheelbarrow from the delivery truck, must be performed in a controlled manner to prevent drips and spills outside the target pour area. Minimize water use.
- Concrete drips, spills, over pours, and equipment rinse water landing on rain-exposed outside of any BMP device must be collected and have the surface cleaned and waste disposed of properly prior to the end of the workday or before the next rain event. Concrete-laden equipment implements (e.g., crane buckets) must be stored on top of heavy mil plastic until dry. Used forms that are not immediately placed into a haul truck when removed from foundations must also be temporarily staged over plastic sheeting or an equivalent until rinsed, wiped, or dried or until hauled off-site.

**Waste Management:**

- Do not discharge concrete residue or particulate matter into a storm drain inlet or watercourse.
- Excess concrete shall not be dumped on-site.
- The following options shall be used for concrete truck chute and/or pump and hose washout:
  - **Concrete Washouts:** Washout stations can be a plastic lined temporary pit or bermed area designed with sufficient volume to completely contain all liquid and waste concrete materials plus enough capacity for rainwater. The designated area shall be located away from storm drain inlets, or watercourses. New washouts shall be constructed as needed to provide sufficient
washout capacity on-site. Wastes other than concrete (i.e., trash, paint wastes etc.) shall not be disposed of in the washout.

- **Washout in Trench:** Manually rinse the concrete truck chute into the trench itself.
- **Bucket Washout:** Manually rinse the chute into a wheelbarrow, plastic bucket or pail, and then empty the bucket into the concrete truck barrel or on top of the placed concrete.

**Inspection and Maintenance:**

- Responsible personnel shall ensure that all concrete truck drivers are instructed about project practices when the trucks arrive on site.
- Clean out designated washout areas as needed or at a minimum when the washout is 75 percent full to maintain sufficient capacity throughout the project duration.
- Any designated onsite washout areas shall be cleaned out and all debris removed upon project completion. Dispose of concrete waste according to the BMP on “Solid Waste Management.”
- Inspect routinely, when applicable activities are underway to ensure that concrete washout does not overflow and that freeboard is adequate to contain concrete and rain.
This BMP provides specifications for riprap type energy dissipators. Alternative energy dissipation methods such as mats, plates, or other stabilization techniques may be used in the project ESCP as approved by DEQ or a local agency acting as DEQ’s agent.

**Construction Specifications:**

- Ensure that the subgrade for the filter and riprap follows the required lines and grades shown on the plans. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.

- The riprap and gravel filter must conform to the specified grading limits shown on the plans.

- Filter fabric, when used, must meet design requirements and be properly protected from punching or tearing during installation. Repair any damaged fabric by removing the riprap and placing another piece of filter fabric over the damaged area. All connecting joints should overlap a minimum of 1 foot (0.3 m). If the damage is extensive, replace the entire filter cloth.

- Riprap may be placed by equipment, but take care to avoid damaging the fabric.

- The minimum thickness of the riprap should be 1.5 times the maximum stone diameter.

- Riprap may be field stone or rough quarry stone. It shall be hard, angular, highly weather-resistant and well graded.

- Construct the apron on zero grade with no overflow at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.

- Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.

- Immediately after construction, stabilize all disturbed areas with vegetation.

- Outlets of all water conveyances must be stabilized.

**Minimum BMP standards are provided on the following detail.**

**Inspection and Maintenance:**

- Inspect riprap outlet structures before, during, and after rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

- Clean out energy dissipation as necessary when approximately half of the void space is filled with sediment and debris.
ENERGY DISSIPATOR – RC-2

THICKNESS ('d') = 1.5 x MAX. ROCK DIAMETER – 6" (150mm) MIN.

SECTION

0.5 x 'D' MIN.

L_o = 4.5 x 'D' MIN.

'D' = PIPE DIAMETER

'ROCK d50
50% SHALL BE LARGER
THAN 6" (150mm) MIN. DIA.

PLAN

4.0 x 'D' MIN.

NOTES:
1. 'L_o' = LENGTH OF APRON. DISTANCE 'L_o' SHALL BE OF SUFFICIENT LENGTH TO DISSIPATE ENERGY.
2. APRON SHALL BE SET AT A ZERO GRADE AND ALIGNED STRAIGHT.
3. FILTER MATERIAL SHALL BE FILTER FABRIC OR 6" (150mm) THICK MINIMUM GRANED GRAVEL LAYER.

ENERGY DISSIPATOR
Construction Specifications:

- Check dams shall be placed at a distance and height to allow small pools to form behind them. The maximum spacing between the dams shall be such that the toe of the upstream dam is at the same elevation as the top of the downstream dam.
- High flows (typically a 2-year storm or larger) shall safely flow over the check dam without an increase in upstream flooding or damage to the check dam.
- Where grass is used to line ditches, check dams shall be removed when grass has matured sufficiently to protect the ditch or swale.
- Construct rock dams such that structures are not damaged by vehicles and do not impede travel ways.
- Rock dams shall be constructed of 2 to 15-inch rock.
- Keep the center rock (spillway) section at least 6 inches lower than the outer edges.
- Extend the abutments 18" into the channel bank.
- Only gravel bags may be used as check dams with the following specifications:
  
  Materials
  
  o Bag Material: Bags shall be either polypropylene, polyethylene or polyamide woven fabric, minimum unit weight four ounces per square yard (135 g/m²), mullen burst strength exceeding 300 psi (2,070 kPa) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.
  o Bag Size: Each gravel-filled bag shall have a length of 18 in (450 mm), width of 12 in (300 mm), thickness of 3 in (75 mm), and mass of approximately 33 lb (15 kg). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the engineer for approval prior to deployment.
  o Fill Material: Fill material shall be between 10 mm and 20 mm (0.4 and 0.8 inch) in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be secured such that gravel does not escape. Gravel-filled bags shall be between 28 and 48 lb (13 kg and 22 kg) in mass. Fill material is subject to approval by the engineer.

Installation

  o Install along a level contour.
  o Tightly abut bags and stack gravel bags using a pyramid approach. Gravel bags shall not be stacked any higher than 3.2 ft (1 meter).
  o Upper rows of gravel bags shall overlap joints in lower rows.
  o Local and state requirements shall be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.

Minimum BMP standards are provided on the following illustrations.

Inspection and Maintenance:

- Inspect check dams before, during, and after each rainfall event. Repair damage as needed.
- Remove sediment when depth reaches one-third of the check dam height.
- Remove accumulated sediment prior to permanent seeding or soil stabilization.
- Remove check dam and accumulated sediment when check dams are no longer needed.
- Removed sediment shall be incorporated in the project or disposed of properly.
NOTE:
KEY STONE INTO THE CHANNEL BANKS AND EXTEND CHECK DAM A MINIMUM OF 18" TO PREVENT FLOW AROUND DAM.

SECTION A - A

'\textit{L}' = THE DISTANCE SUCH THAT POINTS A AND B ARE OF EQUAL ELEVATION.
CHECK DAMS –RC-11

PLAN VIEW

VIEW LOOKING UPSTREAM

'L' = THE DISTANCE SUCH THAT POINTS 'A' AND 'B' ARE OF EQUAL ELEVATION

SPACING BETWEEN CHECK DAMS

NOTE:
KEY THE ENDS OF THE CHECK DAM INTO THE CHANNEL BANK.
LOGS SHALL BE PRESSURE TREATED IF GRADE STABILIZATION STRUCTURE IS INTENDED TO BE PERMANENT.
Construction Specifications:

Local municipality requirements should be checked to determine if local requirements differ from this BMP with respect to specific types of sediment fence allowed and methods of installation.

Prefabricated Sediment Fence

Prefabricated fence fabric shall consist of material approved by its manufacturer for use in sediment fence applications and shall include pre-fabricated pockets for stake installation. Select standard duty or heavy duty prefabricated sediment fence based on criteria shown below:

Standard Duty Sediment Fence

- Slope of area draining to fence is 4H:1V or less - Use is generally limited to less than five months
- Area draining to fence produces moderate sediment loads
- Use prefabricated standard duty sediment fence.
- Layout in accordance with typical layout - Install in accordance with attached detail.

Heavy Duty Sediment Fence

- Slope of area draining to fence is 1H:1V or less
- Use generally limited to eight months. Longer periods may require fabric replacement
- Area draining to fence produces moderate sediment loads
- Use prefabricated heavy duty sediment fence. Heavy duty sediment fences typically have the following physical characteristics:
  - Fence fabric has greater tensile strength than other fabric types available from manufacturer
  - Fence fabric has a greater permittivity than other fabric types available from manufacturer
  - Fence fabric may be reinforced with a backing or additional support to increase fabric strength
  - Posts may be spaced closer together than other pre-manufactured sediment fence types available from manufacturer.
- Layout in accordance with attached typical layout.
- Install in accordance with attached standard details.

Installation

- Install sediment fence along a level contour, with the last 6 ft of fence turned up slope. Except for the ends, the difference in elevation between the highest and lowest point along the top of the sediment fence shall not exceed one-third the fence height.
- Generally, should be used in conjunction with erosion source controls up slope to provide effective control.

Minimum BMP standards that apply to Prefabricated Sediment Fence are provided on the attached details.

Common Reasons/Circumstances for Failure

- The most common reasons for sediment fence failure are due to improper installation and poor maintenance. In particular, the toe must be securely trenched into the slope and accumulated sediment should be removed when accumulation reaches 1/3 of the fence height.

Inspection and Maintenance:

- Repair undercut sediment fences.
SEDIMENT FENCE – SC-1

- Repair or replace split, torn, slumping, or weathered fabric.
- Inspect sediment fence before, during, and after storm events.
- Any required repairs shall be performed as soon as possible.
- Remove sediment when accumulation reaches 1/3rd the fence height.
- The removed sediment shall be incorporated in the project, disposed of properly, or appropriately stabilized with vegetation.
- Remove sediment fence when no longer needed and upslope area has been stabilized. Fill and compact post holes and anchorage trench, remove sediment accumulation, and grade fence alignment to blend with adjacent ground.
NOTES:
1.) INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY.
2.) REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.
3.) SEDIMENT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
4.) STITCHED POCKETS TO BE INSTALLED ON UPHILL SIDE OF SLOPE.
Construction Specifications:

Sand bag barriers are intended to block and divert flow. They are not intended to be used as filtration devices.

Materials

- Sand bag Material: Sand bag shall be polypropylene, polyethylene or polyamide woven fabric, minimum unit weight four ounces per square yard (135 g/m²), mullen burst strength exceeding 300 psi (2,070 kPa) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355. Use of burlap is not acceptable since it rots and deteriorates easily.

- Sand bag Size: Each sand-filled bag shall have a length of 18 in (450 mm), width of 12 in (300 mm), thickness of 3 in (75 mm), and mass of approximately 33 lb. (15 kg). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the engineer for approval prior to deployment.

- Fill Material: All sand bag fill material shall be non-cohesive, Class 1 or Class 2 permeable material free from clay and deleterious material, conforming to the provisions in Caltrans Standard Specifications Section 68-1.025 “Permeable Material”. The requirements for the Durability Index and Sand Equivalent do not apply. Fill material is subject to approval by the engineer.

- Only use sandbag barriers when diverting runoff or run-on.

Installation

- Install along a level contour.
- Turn ends of sand bag row up slope to prevent flow around the ends.
- Generally, sand bag barriers shall be used in conjunction with temporary soil stabilization controls up slope to provide effective erosion and sediment control.
- Construct sand bag barriers with a set-back of at least 3 ft (1m) from the toe of a slope. Where it is determined to be not practical due to specific site conditions, the sand bag barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

Minimum BMP standards are provided on the following details.

Inspection and Maintenance:

- Inspect sand bag barriers before, during, and after each rainfall event, and weekly throughout the rainy season.
- Reshape or replace sand bags as needed.
- Repair washouts or other damages as needed.
- Inspect sand bag barriers for sediment accumulations and remove sediment when accumulation reaches 1/3rd the barrier height. Removed sediment shall be incorporated in the project at locations designated by the engineer or shall be disposed of properly.
- Remove sand bags when no longer needed. Remove sediment accumulation, and clean, re-grade, and stabilized the area.
TEMPORARY LINEAR SEDIMENT BARRIER (TYPE SANDBAG)

NOTES
1. Construct the length of each reach so that the change in base elevation along the reach does not exceed 1/2 the height of the linear barrier. In no case shall the reach length exceed 150 m.
2. Place sandbags tightly.
3. Dimension may vary to fit field condition.
4. Sandbag barrier shall be a minimum of 3 bags high.
5. The end of the barrier shall be turned up slope.
6. Cross barriers shall be a mix of 1/2 and a max of 2/3 the height of the linear barrier.
7. Sandbag rows and layers shall be staggered to eliminate gaps.
Construction Specifications:

Unlike sand bag barriers that divert flow, gravel bag berms are intended to intercept and filter sediment-laden storm water runoff from disturbed areas, retaining the sediment and releasing the water.

Materials

- Bag Material: Bags shall be woven polypropylene, polyethylene or polyamide fabric, minimum unit weight four ounces per square yard (135 g/m²), mullen burst strength exceeding 300 psi (2,070 kPa) in conformance with the requirements in ASTM designation D3786, and ultraviolet stability exceeding 70% in conformance with the requirements in ASTM designation D4355.

- Bag Size: Each gravel-filled bag shall have a length of 18 in (450 mm), width of 12 in (300 mm), thickness of 3 in (75 mm), and mass of approximately 33 lb (15 kg). Bag dimensions are nominal, and may vary based on locally available materials. Alternative bag sizes shall be submitted to the engineer for approval prior to deployment.

- Fill Material: Gravel shall be between 0.4 and 0.8 inch (10 mm and 20 mm) in diameter, and shall be clean and free from clay balls, organic matter, and other deleterious materials. The opening of gravel-filled bags shall be between 28 and 48 lb (13 kg and 22 kg) in mass. Fill material is subject to approval by the engineer.

Installation

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

- When used for concentrated flows:
  - Stack gravel bags to required height using a pyramid approach.
  - Upper rows of gravel bags shall overlap joints in lower rows.

- Construct gravel bag barriers with a set-back of at least 1m from the toe of a slope. Where it is determined to be not practicable due to specific site conditions, the gravel bag barrier may be constructed at the toe of the slope, but shall be constructed as far from the toe of the slope as practicable.

- A certificate of compliance for the gravel and bags shall be provided.

Inspection and Maintenance:

- Inspect gravel bag berms before, during, and after each rain event, and weekly throughout the rainy season. More frequent inspections may be required by local municipalities.

- Reshape or replace gravel bags as needed.

- Repair washouts or other damages as needed.

- Inspect gravel bag berms for sediment accumulations and remove sediments when accumulation reaches 1/3rd of the berm height. Removed sediment shall be incorporated in the project.

- Remove gravel bag berms when no longer needed. Remove sediment accumulations and clean, re-grade, and stabilize the area.
Construction Specifications

A compost filter berm is a trapezoidal berm applied by a blower and a compost sock is compost material encased in mesh to form a tube/roll. Both techniques intercept sheet flow and pond runoff, allowing sediment to fall out of suspension, and often filtering sediment as well. Compost berms and socks provide an environmentally-sensitive and cost-effective alternative to sediment fence.

Advantages

- Compost berms and compost socks made from biodegradable mesh sometimes offer a better solution than sediment fence and other sediment control methods, because compost does not require any special trenching, construction, or removal, unlike straw bales, sediment fence or coir rolls. This makes the technique very cost-effective.
- Compost is organic, biodegradable, renewable, and can be left onsite. This is particularly important below embankments near streams, as re-entry to remove or maintain the berm can cause additional disturbance. Sediment fence has to be disposed of in landfills and is often left abandoned on jobsites.
- Compost does not leach nutrients. Field tests in Connecticut have shown that run-off from compost treated sites has very low soluble salts, and all metals and nutrients are well within pollution leaching limits.
- Compost berms can be easily and quickly fixed should something happen to them in the course of construction. Compost socks withstand heavy machinery, but frequent disturbance can decrease the effectiveness of the sock.
- Mechanical compost spreaders for compost berms are commercially available and are widely used in the Pacific Northwest.
- When properly made, compost is full of nutrients and micro-organisms that stimulate turf and increase resistance to diseases. Compost binds heavy metals and can break down hydrocarbons into carbon, salts and other innocuous compounds.
Design Considerations

Compost filter berms and socks should be used at the base of slopes 2:1 or less. There are many types of compost, all with different properties, so it is best to determine what application the compost is being used for. For compost berms and socks, compost should have the following specifications:

- Compost needs to be stable and mature.
- Particle size: Compost should consist of both large and small pieces for maximum filtration. Finer grades (screened through 3/8-1/2”) are better for vegetation establishment, long term plant nutrients, and increased infiltration rates. The coarser grades (screened 2-3”) are better for increased filtration, and are less likely to be disturbed by rainfall and runoff. For berms, the ratio of coarse and fine material should be 1:1. No particle should be greater than 3”.
- The recommended moisture content ranges from 20-50%. Compost that is too dry is harder to apply, while that which is too wet is heavier and harder to transport. In drier areas, use compost with a higher moisture content; in wet areas, use the drier compost, as it will absorb water.
- Organic matter content: The percentage of carbon based materials in finished compost should range between 40-70%. However, Texas DOT specifies no less than 70%.
- The pH should be between 5.0 and 8.5.
- Nitrogen Content: 0.5-2.0%.
- Compost should have a minimum of soluble salts, as these can inhibit vegetation establishment. These levels should be between 4.0 and 6.0 mmhos/cm.
- Compost must be weed and pesticide free, with manmade materials comprising less than 1%.

Construction Specifications

- For compost berms on slopes of 3:1 or less, install a compost berm 1-2 ft high and 2-4 ft wide at the base. For maximum filtration properties, install berm in a trapezoidal shape, with a 4-6 ft base, and a 2-3 ft wide top. Larger berms should be used for steeper slopes. The basic rule of thumb is that the base should be twice the height of the berm.
- Typically, compost socks can handle the same water flow or slightly more than sediment fence. However, the installation technique is especially important for them to work effectively. For most applications, standard sediment fence is replaced with 12” compost socks.
  - When placed on level contours sheet flow of water should be perpendicular to the compost sock at impact and un-concentrated.
  - Place compost socks at a 5’ or greater distance away from the toe of slopes to maximize space available for sediment deposition.
  - In order to prevent water flowing around the ends of compost socks, point the ends upslope to place them at a higher elevation.
- Compost Berms and Socks can be placed around the perimeter of affected areas, if the area is flat or the perimeter is on contour. Berms and socks should be placed using ‘smiles’ and j-hooks. Do not place berms and socks where they cannot pond water.
- For steeper slopes, an additional berm or sock can be constructed on the top of the slope.
- Compost berms and socks can be seeded during application. However, field tests indicate that it is best to have only a thin layer of compost over the seed in compost berms. Slopes seeded with 2-4” of compost over the seed had less vegetation establishment than slopes with less compost over the seed.
- Do not use compost berms and socks in areas of concentrated flow, as they are intended to control and filter sheet flow only.
- Tackifiers may be applied to berms if needed to enhance performance.

**Inspection and Maintenance**

- Compost berms and socks shall be inspected after each storm event and reapplied if necessary.
- Sediment retained by the berm or sock shall be removed when it has reached 1/3 of the exposed height of the berm. Alternatively, the sediment and berm or sock can be stabilized with vegetation at the end of construction.
- Berms can be left onsite and seeded, or spread out in place as a soil enhancement.
Incorrect – Do Not layout "perimeter control" compost berms along property lines. All sediment laden runoff will concentrate and overwhelm the system.

Correct – Install J-hooks

Discreet segments of compost berms, installed with J-hooks or "smiles" will be much more effective.

COMPOST BERM PLACEMENT FOR PERIMETER CONTROL
STEP 1 - CONSTRUCT LEG

STEP 2 - CONSTRUCT DAM

STEP 3 - CONSTRUCT LEG 2

INSTALLATION WITH J-HOOKS OR 'SMILES' INCREASE COMPOST BERM EFFICIENCY.

COMPOST BERM
TYPICAL PLACEMENT—ONE SLOPE
COMPOST BERM TYPICAL PLACEMENT—TWO SLOPES

STEP 1 – CONSTRUCT A DAM

STEP 2 – CONSTRUCT SIDE 2

STEP 3 – CONSTRUCT J-HOOKS
AS NEEDED

INSTALLATION WITH J-HOOKS WILL INCREASE COMPOST BERM EFFICIENCY AND REDUCE EROSION-CAUSING FAILURES.
Construction Specifications

Fiber rolls are manufactured from biodegradable fibers (such as weed-free rice straw) that are wrapped in photo degradable netting. They range from approximately 8 to 20 inches in diameter by 25-30 feet (8-9 m) long. Rolls are placed and staked along the contour of newly constructed or disturbed slopes, in shallow trenches. Fiber rolls reduce slope length, and are intended to capture and keep sediment on the slopes. Fiber rolls are useful to temporarily stabilize slopes by reducing soil creep, and sheet and rill erosion until permanent vegetation can be established. Fiber rolls can catch soil that is moved down the slope by the freeze/thaw processes. Organic matter and seeds are trapped behind the rolls, which provide a stable medium for germination. Rolls trap topsoil and retain moisture from rainfall, which aids in growth of seedlings planted upslope of the rolls.

Design Considerations:

- Sites appropriate for fiber rolls are:
  - Slopes susceptible to sheet and rill erosion.
  - Slopes producing dry ravel.
  - Slopes susceptible to freeze/thaw activity.
  - Slopes difficult to vegetate because of soil movement.
- Fiber rolls are not intended for use in concentrated flow situations.
- It is imperative, especially on steeper slopes, that a sufficiently deep trench is constructed in which to place the roll. Without the trench, the roll will not function properly, runoff will scour underneath it, and trees or shrubs planted behind the roll will not have a stable environment in which to become established.
- Fiber rolls last an average of two years, depending on the fiber and mesh used in manufacturing. This is an important factor to consider when planning how long the slope will need to be mechanically stabilized.
- Fiber rolls can be staked with live stakes if site conditions warrant. The moisture retained by the fiber roll will encourage cutting establishment.

Advantages

- Fiber rolls are a relatively low-cost solution to sheet and rill erosion problems.
- They can replace sediment fences or straw bales on steep slopes.
- Rolls are a short-term solution to help establish native vegetation.
- Rolls store moisture for vegetation planted immediately upslope.
- Plastic netting will eventually photo-degrade, eliminating the need for retrieval of materials after the fiber or straw has broken down.
The fibers become incorporated into the soil with time, adding organic material to the soil and retaining moisture for vegetation.

Disadvantages

- Rolls only function for one or two seasons.
- Pilot holes through the rolls must be pre-driven with a metal rod.
- If not installed properly with a sufficient trench, rolls may fail during the first rain event.
- Fiber rolls may require maintenance to ensure that the stakes are holding and the rolls are still in contact with the soil. This is especially true on steep slopes in sandy soil.

Installation

- Prepare the slope before the installation procedure is started.
- Shallow gullies should be smoothed as work progresses.
- Dig small trenches across the slope on contour, to place rolls in. The trench should be deep enough to accommodate half the thickness of the roll. When the soil is loose and uncompacted, the trench should be deep enough to bury the roll 1/3 of its thickness because the ground will settle.
- It is critical that rolls are installed perpendicular to water movement, and parallel to the slope contour.
- Start building trenches and installing rolls from the bottom of the slope and work up.
- Construct trenches at contour intervals 25-30 feet (8-10 m) apart depending on the steepness of the slope. The steeper the slope, the closer together the trenches should be.
- Lay the roll along the trenches fitting it snugly against the soil. Make sure no gaps exist between the soil and the straw wattle.
- Use a straight bar to drive holes through the roll and into the soil for the willow or wooden stakes.
- Drive the stake through the prepared hole, and into the soil. Leave only 1 or 2 inches (25 or 51 mm) of the stake exposed above roll.
- Install stakes at least every 4 feet (1.2 m) apart along the length of the wattle. Additional stakes may be driven on the downslope side of the trenches on highly erosive or very steep slopes.

Inspection and Maintenance

- Inspect the rolls and the slopes after rain events and at the frequencies required by local municipalities. Make sure the rolls are in contact with the soil.
- Repair any rills or gullies promptly.
- Reseed or replant vegetation if necessary until the slope is stabilized.
FIBER ROLLS OR WATTLES SC-7

FIBER ROLLS MUST BE PLACED ALONG SLOPE CONTOURS

ADJACENT ROLLS SHALL TIGHTLY ABUT

10'-25' (3-8m)

SPACING DEPENDS ON SOIL TYPE AND SLOPE STEEPNESS

SEDIMENT, ORGANIC MATTER, AND NATIVE SEEDS ARE CAPTURED BEHIND THE ROLLS

3'-4' (1.2m)

LIVE STAKE

3'-5' (75-125mm)

8'-10' DIA. (200-250mm)

1" X 1" STAKE
(25 x 25mm)

NOTE:
1. FIBER ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3'-5' (75-125mm) DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.

FIBER ROLLS

NOT TO SCALE
Construction Specifications:

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

Methods and Installation

- DI Protection Type 1 - Filter Fabric Fence - The filter fabric fence (Type 1) protection is illustrated on Page 3. Similar to constructing a sediment fence. See BMP SC-1, “Sediment Fence.” Do not place filter fabric underneath the inlet grate since the collected sediment may fall into the drain inlet when the fabric is removed or replaced.

- DI Protection Type 2 - Excavated Drop Inlet Sediment Trap - The excavated drop inlet sediment trap (Type 2) is illustrated in Page 4. Similar to constructing a temporary sediment fence, See BMP SC-1, “Sediment Fence.” Size excavated trap to provide a minimum storage capacity calculated at the rate of 67 yd³/ac (130 m³/ha) of drainage area.

- DI Protection Type 3 – Gravel bag - The gravel bag barrier (Type 3) is illustrated in Page 5. Flow from a severe storm shall not overtop the curb. In areas of high clay and silts, use filter fabric and gravel as additional filter media. Construct gravel bags in accordance with BMP SC-3, “Gravel Bag Berm.” Gravel bags shall be used due to their high permeability.

- DI Protection Type 4 –Fiber Rolls – Fiber roll (Type 4) is placed around the inlet and keyed and anchored to the surface similar to SC-7 (“Fiber Rolls”) installation. Fiber rolls are intended for use as inlet protection where the area around the inlet is unpaved and the fiber roll can be secured to the surface. On impervious surfaces use weighted or gravel-filled fiber rolls in the same configuration as specified above or as specified by the manufacturer. Type 4 DI protection functions similarly to Types 1 and 2.

Minimum BMP standards are provided on the following details. The DI Protection (Types 1-4) as illustrated was not designed to significantly inhibit flow and cause flooding. If flooding problems occur, modify the existing BMP to alleviate flooding. Do not remove the BMP and allow sediment-laden water to discharge to the storm drain.

Alternative methods may be substituted for the methods described/shown herein such as prefabricated inlet insert devices, or gutter protection devices based on review and approval by DEQ or the local agency as submitted in the project ESCP. Typical installation details for Siltsack™ inserts and biofilter bags are included with this BMP.

Inspection and Maintenance:

General

- Inspect all inlet protection devices before and after every rain event, and at the frequencies recommended by local municipalities. During extended rain events, inspect inlet protection devices at least once every 24 hours.

- Inspect the storm drain inlet after severe storms in the rainy season to check for bypassed material.

- Remove all inlet protection devices after the site is stabilized, or when the inlet protection is no longer needed.
  - Bring the disturbed area to final grade and smooth and compact it. Appropriately stabilize all bare areas around the inlet.
  - Clean and re-grade area around the inlet and clean the inside of the storm drain inlet as it must be free of sediment and debris at the time of final inspection.
Requirements by Method

- **Type 1 - Filter Fabric Fence**
  - This method shall be used for drain inlets requiring protection in areas where finished grade is established and erosion control seeding has been applied or is pending.
  - Make sure the stakes are securely driven in the ground and are structurally sound (i.e., not bent, cracked, or splintered, and are reasonably perpendicular to the ground). Replace damaged stakes.
  - Replace or clean the fabric when the fabric becomes clogged with sediment. Make sure the fabric does not have any holes or tears. Repair or replace fabric as needed.
  - At a minimum, remove the sediment behind the fabric fence when accumulation reaches one-third the height of the fence or barrier height. Removed sediment shall be incorporated in the project or disposed of properly.

- **Type 2 – Excavated Drop Inlet Sediment Trap**
  - This method may be used for drain inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas are subject to grading.
  - Remove sediment from basin when the volume of the basin has been reduced by one-half.

- **Type 3 - Gravel Bag Barrier**
  - This method may be used for drain inlets surrounded by asphalt concrete (AC) or paved surfaces.
  - Inspect bags for holes, gashes, and snags.
  - Check gravel bags for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project or disposed of properly.

- **Type 4 Fiber Rolls**
  - This method may be used for drain inlets requiring protection in areas that have been cleared and grubbed, and where exposed soil areas subject to grading.
  - Use weighted or gravel-filled fiber rolls on impervious surfaces. Check that fiber rolls are in good contact with the surface without gaps or preferential flow paths.
  - Check fiber roll for proper arrangement and displacement. Remove the sediment behind the barrier when it reaches one-third the height of the barrier. Removed sediment shall be incorporated in the project or disposed of properly.
DI PROTECTION TYPE 1 AND TYPE 4
Not to scale

NOTES:

1. For use in areas where grading has been completed and final soil stabilization and seeding are pending.
2. Not applicable in paved areas.
3. Not applicable with concentrated flows.
Notes
1. For use in cleared and grubbed and in graded areas.
2. Shape basin so that longest inflow area faces longest length of trap.
3. For concentrated flows, shape basin in 2:1 ratio with length oriented towards direction of flow.
TYPICAL PROTECTION FOR INLET WITH OPPOSING FLOW DIRECTIONS

TYPICAL PROTECTION FOR INLET WITH SINGLE FLOW DIRECTION

NOTES:
1. Intended for short-term use.
2. Use to inhibit non-storm water flow.
3. Allow for proper maintenance and cleanup.
4. Bags must be removed after adjacent operation is completed.
5. Not applicable in areas with high silts and clays without filter fabric.
PLATE ONE ROW OF BIO BAGS IN FRONT OF INLET WITH 1/2 THE BAG PAST THE INLET OPENING ON EACH SIDE.

CATCH BASIN

AREA DRAIN

PLAN

DITCH INLET

Curb Inlet Catch Basin
Bio Bag Inlet Protection

NTS

Page 7 of 7
**Construction Specifications:**

A sediment basin is a temporary basin with a controlled release structure, formed by excavating or constructing an earthen embankment across a waterway or low drainage area. Sediment basins may be placed where sediment laden storm water may enter a storm drain or watercourse, and around and/or upslope from storm drain inlet protection measures. The sediment basin shall follow one of the four design options summarized below:

1. A sediment basin designed pursuant to local ordinance provided that the design efficiency is as protective, or more protective of water quality than Option No. 3.

2. A sediment basin designed with a minimum capacity of 3,600 cubic feet of storage per acre of disturbed land in a watershed equivalent to or more efficient than Option No. 3.

3. A sediment basin designed using the following equation:

\[ (V) = \frac{1.2Q}{V_{SED}} \]

where:

- \( V \) = settling zone volume,
- \( Q \) = flow rate based on peak discharge from a specified design storm (where \( Q = C_iA \); see Section 2.4), and
- \( V_{SED} \) = settling velocity of the design soil particle.

4. A basin designed using an equivalent surface area design equation, equivalent to or more efficient than Option No. 3.

- In accordance with the requirements of the NPDES 1200-C General Permit, all sediment basins must be designed by a professional engineer licensed in Oregon.

- Construct the basin by excavating or building an embankment before any clearing or grading work begins.

- Areas under the embankment and any structural works shall be cleared, grubbed and stripped of any vegetation and rootmat as shown on the grading plan.

- In order to facilitate cleanout and restoration, the basin area shall be cleared, grubbed and stripped of any vegetation.

- A cut-off trench shall be excavated along the centerline of the earth fill embankments. The minimum depth shall be 2 feet (0.6 m). The cut-off trench shall extend up both abutments to the spillway elevation.

- Fill material for the embankment shall be clean mineral soil free of roots, woody vegetation, oversized stones, rocks or other objectionable material, and sufficiently moist for compaction.

- Fill material shall be placed in 6 inch (0.2 m) lifts, continuous layers over the entire length of the fill. Compaction shall be obtained by routing the hauling equipment over the fill so that the entire surface of each layer of the fill is traversed by at least one wheel or tread track of the equipment, or by the use of a compactor.

- The embankment should be constructed to an elevation of 10 percent higher than the design height to allow for settlement if compacting is achieved with hauling equipment. If compactors are used for compacting, the overbuild may be reduced to not less than 5 percent. The basin shall have means for dewatering within 7 days following a storm event.

- The principal spillway riser shall be securely attached to the discharge pipe by welding all around. All connections shall be watertight. A trash rack shall be installed on the top of the riser to prevent clogging of the discharge pipe.
The pipe and riser shall be placed on a firm, smooth soil foundation. The connection between the riser and the riser base shall be watertight. Pervious materials such as sand, gravel or crushed stone shall not be used as backfill around the pipe or anti-seep collars.

The fill material around the pipe spillway shall be placed in 4-inch (101 mm) layers and compacted under the shoulders and around the pipe to at least the same density as the adjacent embankment. A minimum of 2 feet (0.6 m) of compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment.

Steel base plates shall have at least 2 1/2 feet (0.8 m) of compacted earth, stone or gravel over them to prevent flotation.

The emergency spillway shall not be installed in fill. Elevations, design width, and entrance and exit channel slopes are critical to the successful operation of the emergency spillway.

If used, baffles shall be constructed of 4 inch (101 mm) by 4 inch (101 mm) posts and of 4 foot (1.2 m) by 8 foot (2.4 m) - 1/2 inch (12.7 mm) exterior plywood. The posts shall be set at least 3 feet (0.9 m) into the ground, no further apart than 8 feet (2.4 m) center to center, and shall reach a height 6 inches (0.2 m) below the riser crest elevation. Alternatively, earthen berms, metal sheeting, or other methods may be used as approved by DEQ or the local agency in the project ESCP.

The embankment and emergency spillway shall be stabilized with vegetation immediately following construction. The outflow shall be provided with outlet protection to prevent erosion and scour of the embankment and channel.

Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized.

Local and state requirements shall be met concerning fencing and signs warning the public of hazards of soft sediment and floodwater.

Minimum BMP standards are provided on the following details.

**Inspection and Maintenance:**

- Inspect before during, and after each rain event.
- All damages caused by soil erosion or construction equipment shall be repaired before the end of each working day.
- Remove sediment when the sediment storage zone is half full. This sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment or in or adjacent to a stream or floodplain.
- When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposit shall be leveled or otherwise disposed of in accordance with the approved erosion and sediment control plan.
Tracking controls reduce offsite tracking of sediment and other pollutants by providing a stabilized entrance at defined construction site entrances and exits and/or providing methods to clean-up sediment or other materials to prevent them from entering a storm drain by sweeping or vacuuming.

**Construction Specifications:**
- Stabilize entrances should be implemented on a project-by-project basis in addition to other BMPs.
- Sweeping or vacuuming should be implemented when sediment is tracked from the project site onto public or private paved roads, typically at points of site exit.
- Use stabilized entrances and/or sweeping at construction sites:
  - Where dirt or mud is tracked onto public roads;
  - Adjacent to water bodies;
  - Where poor soils are encountered, such as soils containing clay;
  - Where dust is a problem during dry weather conditions.

**Stabilized Construction Entrances**
- Limit the points of entrance/exit to the construction site by designating combination or single purpose entrances and exits. Require all employees, subcontractors and others to use them. Limit speed of vehicles to control dust. Clearly mark entrances and exits with appropriate signage.
- Locate construction entrances and exits to limit sediment leaving the site and to provide for maximum utility by all construction vehicles. Avoid entrances which have steep grades and entrances at curves in public roads.
- Grade each construction entrance/exit to prevent runoff from leaving the construction site.
- Design stabilized entrance/exit to support heaviest vehicles and equipment that will use it.
- Select construction access stabilization (aggregate, asphaltic concrete, concrete) based on longevity, required performance, and site conditions.
- Use of constructed or constructed/manufactured steel plates with ribs (e.g., shaker / rumble plates or corrugated steel plates) for entrance/exit access is allowable (See below).
- The aggregate size for construction of the pad shall be 3-6 inch (76-152 mm) stone. Place the gravel to the specific grade and dimensions shown on the plans, and smooth it.
- The thickness of the pad shall not be less than 8 inches (203 mm). Use geotextile fabric, if necessary, to improve stability of the foundation in locations subject to seepage or high water table.
- The width of the pad shall not be less than the full width of all points of ingress or egress and in any case shall not be less than 12 feet (3.6 m) wide.
- The length of the pad is as required, but not less than 50 feet (15.2 m).
- All sediment spilled, dropped, washed or tracked onto public rights-of-way shall be removed as soon as possible by hand sweeping or mechanized sweeper. Washing of sediment from the public right-of-way shall be prohibited.
- Provide drainage to carry water to a sediment trap or other suitable outlet.
- When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public rights-of-way (see SC-11, Entrance / Exit Tire Wash).
- All sediment shall be reduced or prevented from entering any storm drain, ditch or watercourse through use of sediment fence, gravel bags, sediment barriers, or other approved methods.
Minimum BMP standards are provided on the following detail.

**Entrance with Shaker Plates**
- Incorporate with a stabilized construction entrance/exit.
- Construct on level ground when possible, on a pad of coarse aggregate, greater than 3 inches (76 mm) and smaller than 6 inches (150 mm). A geotextile fabric shall be placed below the aggregate.
- Install constructed or manufactured steel plates with ribs (e.g., rumble plates or corrugated steel plates) at the entrance/exit in addition to the aggregate.
- Steel shaker plates shall be designed and constructed/manufactured for anticipated traffic loads.

**Street Sweeping and Vacuum Sweeping**
- Inspect potential sediment tracking locations daily.
- Visible sediment tracking should be swept or vacuumed as needed. Manual sweeping is appropriate for small jobs.
- For larger projects, it is preferred to use mechanical broom or vacuum sweepers that collect and contain removed sediment and material.

If not mixed with debris or trash, incorporate the removed sediment back into the project or dispose of it at an approved disposal site.

**Inspection and Maintenance:**

**Stabilized Construction Entrance**
- Inspect routinely for damage and assess effectiveness. Repair if access is clogged with sediment.
- Where tracking has occurred on roadways sweeping should be conducted the same day. Preferably water should not be used to wash sediment off the streets. If water is used, it should be captured preventing sediment-laden water from running off the site.
- Keep all temporary roadway ditches clear.
- The entrance shall be maintained in a condition that will reduce or prevent tracking or flowing of sediment onto public rights-of-way. This may require periodic top dressing with additional stone as conditions demand, and repair and/or maintenance of any measures used to trap sediment.
- Maintain the gravel pad in a condition to prevent mud or sediment from leaving the construction site. Replace gravel material when surface voids are visible.
- After each rainfall, inspect all gravel construction entrances and clean it out as necessary.
- As soon as possible remove all objectionable materials spilled, washed, or tracked onto public roadways. Remove all sediment deposited on paved roadways immediately.

**Street Sweeping and Vacuuming**
- Inspect entrance and exit points daily and sweep tracked sediment as needed.
- Be careful not to sweep up any unknown substance or any object that may be potentially hazardous.
- After sweeping is finished, properly dispose of sweeper wastes.
DIVERSION RIDGE REQUIRED WHERE GRADE EXCEEDS 2% OR GREATER

ROADWAY

FILTER FABRIC

SECTION A - A

STRAW BALES, SANDBAGS, OR CONTINUOUS BERM OF EQUIVALENT HEIGHT

SUPPLY WATER TO WASH WHEELS IF NECESSARY

SPILLWAY

NOTE:
USE SANDBAGS, STRAW BALES OR OTHER APPROVED METHODS TO CHANNELIZE RUNOFF TO BASIN AS REQUIRED.

FLOW

ROADWAY

3" - 6" (76 - 152mm) COARSE AGGREGATE
MIN. 8" (152mm) THICK

12' MIN. (3.6m)

50' (15m) MIN.

NOTES:
1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE TOP DRESSING, REPAIR AND/OR CLEAN OUT OF ANY MEASURES USED TO TRAP SEDIMENT.

2. WHEN NECESSARY, WHEELS SHALL BE CLEANED PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAY.

3. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH CRUSHED STONE THAT DRAINS INTO AN APPROVED SEDIMENT TRAP OR SEDIMENT BASIN.

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/EXIT
**Construction Specifications:**

- Incorporate with a stabilized construction entrance/exit. See BMP SC-10, “Entrance / Exit Tracking Controls.”

**Manual/Hose Tire Wash**

- Construct on level ground when possible, on a pad of coarse aggregate, greater than 3 inches (75 mm) and smaller than 6 inches (150 mm). A geotextile fabric shall be placed below the aggregate.
- Tire wash shall be designed and constructed/manufactured for anticipated traffic loads.
- Provide a drainage conveyance that will convey the runoff from the wash area to a sediment trapping device. The drainage ditch shall be of sufficient grade, width, and depth to carry the wash runoff.
- Require that all employees, subcontractors, and others that leave the site with mud-caked tires and/or under-carriages use the wash facility.

**Temporary Drive-Through Tire Wash**

- Minimum dimensions: 40 feet by 12 feet by 1.5 feet (length, width, and sump depth; 12.2 m by 3.7 m by 0.46 m). The minimum length includes ingress and egress from the sump.
- The aggregate size for construction of the pad shall be 4-6 inch (101-152 mm) stone. Place the gravel to the specific grade and dimensions shown on the plans, and smooth it.
- The thickness of the pad shall not be less than 8 inches (203 mm). Use geotextile fabric under the gravel to improve stability of the foundation.
- Alternatively, install a 3 in. asphalt lift over a stable roadway base with the same dimensions identified above.
- The run out pad should extend 50 feet (15.2 m) past the egress ramp and drain back into the sump or to a suitable collection and treatment facility.
- Install fencing, as necessary, to manage vehicle traffic.

**Minimum BMP standards are provided on the following illustrations.**

**Inspection and Maintenance:**

**Manual/Hose Tire Wash**

- Remove accumulated sediment in tire wash and/or sediment trap to maintain system performance.
- Inspect routinely for damage and repair as needed.

**Temporary Drive-Through Tire Wash**

- Inspect routinely to assess the water levels within the sump, the depth of accumulated sediment, and identify any areas that require maintenance.
- Remove accumulated sediment from the tire wash facility to maintain tire wash sump depth. Sediment may be pumped, piped or vacuumed to a suitable collection and treatment facility.
- Clean or replace rock when clogged with sediment and re-grade as needed.
- Maintain the run-out pad as necessary to prevent sediment accumulation.
- Immediately remove any rock that is carried from the pad to the roadway.
- Ensure that wash water drainage, collection and treatment system is functioning.
Crushed aggregate greater than 75 mm (3 in) but smaller than 150 mm (6 in)

Corrugated steel panels

Filter fabric

Original grade

300 mm (12 in) Min, unless otherwise specified by a soils engineer

SECTION A—A
NOT TO SCALE

Crushed aggregate greater than 75 mm (3 in) but smaller than 150 mm (6 in)

Filter fabric

Original grade

300 mm (12 in) Min, unless otherwise specified by a soils engineer

SECTION B—B
NTS

Ditch to carry runoff to a sediment trapping device

Paved roadway

Match existing grade

A

Wash Rack

B

NOTE:
Many designs can be field fabricated, or fabricated units may be used.

Water supply & hose

TYPICAL TIRE WASH
NOT TO SCALE

MANUAL / HOSE TIRE WASH
TEMPORARY DRIVE THROUGH TIRE WASH