South Carolina Department of Transportation

SCDOT Stormwater Quality Field Manual

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LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
AC	Asphalt Concrete
AMD	Acrylamide Monomer
BMP	Best Management Practice
CFS	Cubic Feet per Second
CFR	Code of Federal Regulations
CGP	Construction General Permit
CMP	Corrugated Metal Pipe
DHEC	South Carolina Department of Health and Environmental Control
ECB	Erosion Control Blanket
EPA	United States Environmental Protection Agency
EPSC	Erosion Prevention and Sediment Control
FDA	United States Food and Drug Administration
HBSA	Hydraulic Biotic Soil Amendment
HDPE	High Density Polyethylene
HECP	Hydraulic Erosion Control Product
MSDS	Material Safety Data Sheet
MTD	Manufactured Treatment Device
NPDES	National Pollutant Discharge Elimination System
OSHA	Occupational Safety and Health Administration
P2	Pollution Prevention
PAM	Polyacrylamide
PCC	Portland Cement Concrete
PVC	Polyvinyl Chloride
QPL	Qualified Product List
RCE	Resident Construction Engineer
RCP	Reinforced Concrete Pipe
RECP	Rolled Erosion Control Product
ROW	Right Of Way
SCDOT	South Carolina Department of Transportation
SPCC	Spill Prevention, Control and Countermeasures
SWPPP	Stormwater Pollution Prevention Plan
TRM	Turf Reinforcement Matting
VFS	Vegetated Filter Strip

1.0 INTRODUCTION

This Stormwater Quality Field Manual (Field Manual) gives instructions for installation, inspection and maintenance of commonly used during construction and post-construction water quality protection Best Management Practices (BMPs) for use on South Carolina Department of Transportation (SCDOT) construction sites.

This Field Manual presents BMPs related to erosion prevention and sediment control (EPSC) with a list of minimum requirements for proper installation, required inspection, and maintenance. A preventive measure and troubleshooting guide is also provided for each EPSC BMP. This Field Manual includes post-construction water quality BMPs and also includes pollution prevention (P2) BMPs for special construction operations and ancillary activities that take place on construction sites. Additional information on the BMPs presented in this Field Manual, as well as other BMPs, can be found in the most recent edition of the *SCDOT Standard Specifications for Highway Construction*, *SCDOT Standard Drawings for Road Construction*, *SCDOT Supplemental Technical Specifications,* and *SCDOT Stormwater Quality Design Manual*. Water quality protection BMPs for post-construction maintenance activities are discussed in the *SCDOT Stormwater Quality Field Manual.*

Contractors are encouraged to install and maintain BMPs carefully. Minor site-specific adjustments should be anticipated for proper performance. Intensive maintenance and extensive use of vegetation and other ground covers may be required to achieve the performance required. The cost of field adjustments, maintenance, and ground covers can be substantial. It is recommended that EPSC efforts be specified clearly in the general construction contract and that any unexpected expenses be approved before they are incurred. Any modification to the approved erosion and sedimentation control plan must be approved by the RCE before it is implemented.

The following categories of water quality protection BMPs are discussed in this Field Manual in the indicated Sections:

Erosion Prevention and Sediment Control (EPSC):

- Section 2 – Erosion Prevention BMPs
- Section 3 – Sediment Control BMPs
- Section 4 – Stormwater Runoff Control BMPs

Post-Construction Water Quality:

- Section 5 – Post-Construction Water Quality Controls

Special Construction and Ancillary Operations:

- Section 6 – Non-Stormwater Discharge Controls
- Section 7 – Special Construction Operation BMPs
- Section 8 – Waste Management BMPs
- Section 9 – Inspection and Reporting Requirements

2.0 EROSION PREVENTION BMPs

The following Erosion Prevention BMPs are discussed in this Field Manual in the indicated Sections. Drawings and details for these BMPs are located at the end of the Field Manual in Section 11.0.

2.1 Surface Roughening

2.2 Temporary Stabilization

2.3 Hydraulic Erosion Control Products (HECPs)

2.4 Compost

2.5 Erosion Control Blankets (ECBs)

2.6 Turf Reinforcement Matting (TRM)

2.7 Final Stabilization

2.8 Riprap Channel Stabilization

2.9 Outlet Protection

2.10 Dust Control

2.11 Slope Interruption Devices

2.12 Level Spreader for Pipe Outlets

2.13 Hydraulic Biotic Soil Amendments (HBSAs)

2.1 SURFACE ROUGHENING

Surface roughening is the creation of horizontal grooves, depressions, or steps that run parallel to the contour of the land. Several methods can be used for surface roughening. The most commonly used method is tracking.

Installation (Tracking):

Perform tracking as soon as possible after vegetation is removed and immediately after grading activities have ceased.

Perform tracking by moving equipment up and down the slope.

Avoid excessive compacting of the soil surface when tracking; **use as few passes as possible with the machinery in order to minimize compaction.**

Seed and mulch surface roughened areas within 14 days.

Inspection and Maintenance:

If rills (small watercourses that have steep sides and are usually only a few inches deep) appear, re-grade and re-seed the area immediately.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Rills appear	Re-grade and re-seed area immediately

Surface Roughening with HECP

Surface Roughening

2.2 TEMPORARY STABILIZATION

The purpose of temporary stabilization is to reduce erosion and sedimentation by stabilizing disturbed areas that would otherwise lay bare for long periods of time before they are worked or stabilized. Temporary stabilization is also used where permanent vegetation growth is not necessary or appropriate.

This work consists of temporary cover by mulch and temporary cover by seeding, including liming and fertilizing (when specified). The contractor coordinates seeding with the construction of fill and cut slopes. In order to limit the area of erodible material, the RCE may require that partially completed slopes be brought to the required slope and that the contractor perform permanent or temporary cover operations at that time.

Seed

Refer to *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for information on seeding schedule, plan, installation, and appropriate use of lime, fertilizers, and biological growth stimulators.

Mulch

Refer to the *SCDOT Supplemental Technical Specification for Hydraulic Erosion Control Products (SC-M-815-11) or latest revision* for more information on Mulch types, application, installation, and maintenance for temporary stabilization. Refer to Table 1 on the following page for Mulch application rates.

Installation:

Refer to the *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for information on seeding schedule, plan, installation, and appropriate use of lime, fertilizers, and biological growth stimulants.

Temporary Cover

Where land disturbing activities have temporarily ceased on the Project and will not resume for a period exceeding 14 calendar days, initiate temporary cover by seeding or mulching on all disturbed areas within 7 calendar days. Initiate temporary cover by seeding within 45 days if the Project will not be worked for a period longer than 60 days.

Where land disturbing activities on a portion of the Project are temporarily ceased, and the land disturbing activities will be resumed within 14 days, temporary stabilization measures do not have to be initiated on that portion of the Project.

Do not use temporary cover by seeding when the ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit.

Scarify all temporary cover areas before fill is placed on top of the temporary cover area.

Use temporary cover on slopes to coincide with the embankment work in 10-foot increments. When 10 feet of fill is in place, perform temporary cover on the slope.

Temporary Cover by Mulch

Apply the mulch with a minimum continuous soil coverage of 95% that is maintained across the entire application area.

Temporary cover by mulch may be used on isolated problem areas or where it is not feasible or practicable to bring an area to final slope and grade. Finish the surface so that permanent cover can be performed without subsequent serious disturbance by additional grading.

Table 1: Mulch Application Rates

Mulch[1,5]	Applicable Slopes[2]	Minimum Application Rate (lbs/acre-dry)[3]	Min Slope Length (ft)
Straw or Hay with Tackifier	≤ 4:1	2,000	N/A
HECP Type 1-Tracer under RECP	Per RECP	1,000	N/A
HECP Type 1	≤ 4:1	2,000	N/A
HECP Type 2	4:1< S ≤ 3:1	2,500	N/A
HECP Type 3	3:1< S ≤ 2:1	3,000	N/A
HECP Type 4	2:1< S ≤ 1:1	3,500	N/A
	>1:1	4,000 (temp cover only)[4]	
Compost Mulch	≤ 2:1	200 CY/acre	N/A

Mulch[1,5]	Applicable Slopes[2]	Minimum Application Rate (lbs/acre-dry)[3]	Min Slope Length (ft)
When site constraints exceed the acceptable application for mulch, use Rolled Erosion Control Products (RECPs); Erosion Control Blanket (ECB) or Turf Reinforcement Matting (TRM)			
Temporary ECB or Type 1 TRM	≤ 2:1	N/A	5
Type 2 TRM	≤ 1.5:1	N/A	5
Type 3 TRM	≤ 1:1	N/A	5

[1] A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is to be applied at the specified mulch rate for the actual slope conditions of the site in accordance with the mulch tables. Payment will be made for the mulch specified not the higher level mulch.

[2] The maximum allowable continuous slope length for all mulch and ECB applications is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

[3] Strictly comply with the manufacturer's mixing recommendations and installation instructions for the actual slope steepness and the actual continuous slope length of the application.

[4] HECP Type 4 may be used for permanent cover applications on slopes 1:1 or greater at a minimum rate of 4,500 pounds per acre as directed by the RCE only when proper TRM installation is not practicable due to site constraints. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

[5] Wood chips or shredded woody materials generated during the clearing stage when trees are shredded using large tub grinders is an acceptable temporary mulch. At the discretion of the RCE, place wood chip mulch on slopes < 3:1. Wood chip mulch *is not* acceptable for temporary seeding or permanent seeding applications.

Temporary Cover by Seeding

Following the preparation of the seedbed, sow seed prior to a rainfall event that compacts the seedbed.

After sowing temporary seed, apply an appropriate mulch prior to a rainfall event that compacts the seedbed. On small areas inaccessible to machinery, the seed may be covered by hand rakes or other methods satisfactory to the RCE. Add fertilizer and lime as directed.

Temporary cover by seeding may be used in isolated problem areas or where it is not feasible or practicable to bring an area to final slope and grade. Finish the surface so that permanent cover can be performed without subsequent serious disturbance by additional grading.

Temporary Cover with Wood Mulch

Wood chips or shredded woody materials generated during the clearing stage when trees are shredded using large tub grinders is an acceptable temporary cover with wood mulch. Wood mulch may be used on slopes less than 3H:1V at the discretion of the RCE. Wood mulch *is not* applicable or acceptable for temporary cover by seeding or permanent cover by seeding. For temporary cover by mulch, install wood mulch materials with the size distributions listed in Table 2.

Table 2: Wood Mulch Size Distribution

Chip Size	Description	% Total Volume
Up to ½ inch	Small	30
1/2 to 1 inch	Medium	50
1 to 4 inches	Large	20

Acceptance

Before acceptance of temporary cover, the Contractor is required to produce temporary cover sufficient to control erosion for a given area and length of time before the next phase of construction or the establishment of permanent cover is to commence.

If temporary cover by seeding is disturbed by the prime, grading, or other Contractor before an acceptable stand of temporary cover by seeding is established, the temporary cover by seeding will be re-established at no cost to SCDOT.

The Contractor is required to produce a satisfactory stand of temporary cover meeting the requirements of this Specification regardless of the time of the year the work is performed.

If a satisfactory stand of temporary vegetative cover with a uniform density of 70% of the seeded area is not achieved within 14 days of sowing the temporary seed, the seeded area will be re-assessed by the RCE. If re-seeding is necessary the Contractor is required to reapply temporary cover by seeding within 7 days at no additional cost to SCDOT.

Inspection and Maintenance:

Contractor is responsible for submitting SCDOT Seeding Inspection Form.

Refer to *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for information on inspection and maintenance requirements.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Slope was improperly dressed before application	Roughen slopes. Furrow along the contour of areas to be seeded.
Coverage is inadequate	Follow recommended application rates. Count the number of seed bags to ensure the correct amount of material is being applied. Reapply to thin areas.
Seeds fail to germinate	Apply straw mulch to keep seeds in place and to moderate soil moisture and temperature. In arid areas, temporary irrigation may be necessary.
Seeded slope fails	Fill in rills and re-seed; fertilize and mulch slopes.
Seeding is washed off slope	Allow at least 24 hours for the materials to dry before a rain event. Follow manufacturer's recommendations. Reapply where necessary.

Temporary Stabilization

2.3 HYDRAULIC EROSION CONTROL PRODUCTS (HECPs)

Use Hydraulic Erosion Control Product (HECPs) listed on *SCDOT QPL 79* as an allowable mulch for temporary cover by mulch, temporary cover by seeding, or permanent cover by seeding applications as outlined in *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision*. Do not use HECPs as a channel liner or for areas receiving concentrated flow. Refer to *SCDOT Supplemental Technical Specification for Hydraulic Erosion Control Products (SC-M-815-11) or latest revision* for more information on HECPs. There are 4 types of HECPs and Table 3 outlines characteristics of each type and situations in which it may be used.

Table 3: HECP Characteristics

Type	Installation
HECP Type 1	When the required observed functional longevity of soil protection is 60 days. When the soil is dry and rain is not expected within 48 hours after application. When there is a high degree of certainty that heavy rains will not immediately follow application.
HECP Type 2	When the required observed functional longevity of soil protection is 90 days. When the soil is dry and rain is not expected within 48 hours after application. When there is a high degree of certainty that heavy rains will not immediately follow application.
HECP Type 3	When the required observed functional longevity of soil protection is 180 days. When the soil is dry and rain is not expected within 24 hours after application. When there is a high degree of certainty that heavy rains will not immediately follow application.
HECP Type 4	When the required observed functional longevity of soil protection is 365 days. As a temporary erosion control blanket for slope applications only. Refer to *SCDOT Supplemental Technical Specification for RECPs (SC-M-815-9) or latest revision.* In environmentally sensitive wetlands and other wildlife areas not compatible with products containing netting. When the site requires immediate erosion protection and there is a risk of impending weather.

Installation:

Apply HECP on stable slopes that do not receive concentrated flow. Divert runoff water away from the face of the slope, thus eliminating damage to the slope face caused by concentrated flow.

Use personnel or subcontractors experienced in the proper procedures for mixing and application of HECP. Use approved hydraulic seeding/mulching machines with appropriate nozzles for HECP applications.

Apply HECP from opposing directions to the soil surface in successive layers, reducing the "shadow effect" to achieve maximum coverage of exposed soil.

The maximum allowable continuous slope length for HECP applications is 50 feet. Provide slope interruption devices for continuous slope length longer than 50 feet. Refer to *SCDOT Supplemental Specification for Inlet Structure Filters Type F – Non Weighted (SC-M-815-8) or latest revision* for slope interruption device description, materials, and construction requirements. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

Install HECP materials at the application rates listed in Table 4.

Table 4: HECP Application Rates

Mulch[1]	Applicable Slopes	Minimum Application Rate (lbs/acre -dry) [2]
HECP Type 1 - Tracer under RECP	Per RECP	1,000
HECP Type 1	≤ 4:1	2,000
HECP Type 2	4:1 < S ≤ 3:1	2,500
HECP Type 3	3:1 < S ≤ 2:1	3,000
HECP Type 4	2:1 < S ≤ 1:1	3,500
	> 1:1	4,000 (temp cover only)[3]
When site constraints exceed the acceptable application for mulch, use Rolled Erosion Control Products (RECPs); Erosion Control Blanket (ECB) or Turf Reinforcement Matting (TRM)		

[1]The maximum allowable continuous slope length for mulch applications is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

[2] A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is applied at the rate for the actual slope condition of the site in accordance with the mulch tables, and payment is for the actual mulch specified, not the higher level mulch.

[3] HECP Type 4 may be used for permanent cover applications on slopes 1:1 or greater at a minimum rate of 4,500 pounds per acre as directed by the RCE only when the proper TRM installation is not practicable due to site constraints. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

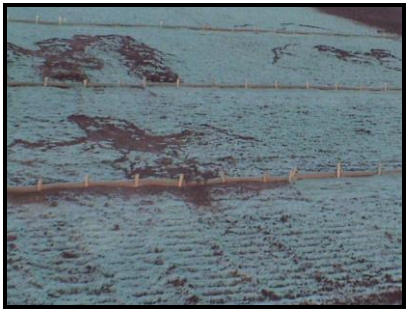
Inspection and Maintenance:

Prepare a HECP maintenance plan that includes the following:

- Reapplication of HECP as directed by RCE to disturbed areas that require continued erosion control.
- Maintenance of equipment to provide uniform application rates.
- Rinsing all HECP mixing and application equipment thoroughly with water to avoid formation of residues and appropriate discharge of rinse water.
- If necessary, reapply HECP in accordance with the manufacturer's instructions. Reapplication is not required unless HECP treated soils are disturbed, or if turbidity or water quality shows the need for an additional application.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Coverage is inadequate	Follow recommended application rates. Ensure that the correct amount of material is implemented. Reapply as necessary.
Mulch is washed away	Do not place mulch in concentrated flow areas. Reapply as necessary.
Area was improperly dressed before application	Remove existing vegetation and roughen embankment and fill areas by rolling with a punch type roller or by track walking.



HECP and Slope Interrupters

HECP Application

2.4 COMPOST

Compost is a product resulting from the controlled biological decomposition of organic material occurring under aerobic conditions that has been sanitized through the generation of heat and stabilized to the point that it is appropriate for its particular application. Ensure compost possess no objectionable odors or substances toxic to plants and does not resemble the raw material from which it was derived.

Use compost as an infill material for sediment tubes, as compost mulch, and as a soil amendment for temporary and permanent seeding applications. Refer to *SCDOT Supplemental Technical Specification for Compost (SC-M-815-3) or latest revision* for additional information.

Use compost only from a compost producer that participates in the United States Composting Council's (USCC) Seal of Testing Assurance (STA) program. ***SCDOT will only accept STA approved compost***.

Compost for Sediment Tubes

Refer to *SCDOT Supplemental Technical Specification for Sediment Tubes for Ditch Checks (SC-M-815-12) or latest revision*.

Compost Mulch

Use compost mulch on slopes up to a 2H:1V grade and a maximum continuous slope length of 50 feet. Use compost on areas that only have sheet flow drainage patterns. Do not use compost as mulch on areas that receive concentrated flows.

Compost Soil Amendment

Use compost as a soil amendment on slopes up to a 2H:1V grade. Use compost on areas that only have sheet flow drainage patterns. Do not use compost on areas that receive concentrated flows.

Installation:

Obtain RCE acceptance and approval for all compost installations.

Avoid very coarse compost with particles larger than 3 inches if the slope is to be landscaped or seeded.

Ensure that the areas which receive compost are uniform and conform to the finished grade and cross-section shown on the Plans. Slightly roughen (scarify) slopes and remove large clods, rocks, stumps, roots larger than 2 inches in diameter, and debris on slopes where vegetation is to be established.

Where it is practical, track up and down the slope using a bulldozer before applying the compost.

Place no more than a 2-inch depth and no less than a 1-inch depth of compost for areas that will receive seeding, planting, or landscaping as shown on the Plans.

Uniformly apply compost using an approved spreader unit. Where applicable, apply the compost layer a minimum of 3 feet over the top of the slope.

On highly unstable soils, use compost in conjunction with appropriate structural measures.

Incorporate seed directly with the compost when using a pneumatic unit. Apply the seed and compost mixture using a pneumatic blower device equipped with a calibrated seed injection system capable of uniformly and simultaneously applying compost and seed.

When not incorporating seed directly into the compost, perform temporary cover by seeding or permanent cover using hydraulic methods for seed application.

When adding compost as a soil amendment, loosen the seedbed (including cut slopes) to a minimum depth of 3 inches before compost is applied. Remove stones larger than 2½ inches in any dimension, large clods, roots, or other debris brought to the surface. Place a 2- to 3-inch depth of compost for areas that will receive seeding, planting, or landscaping as shown on the Plans. Mix the applied compost into the soil to a minimum depth of 3 inches. Ensure that the compost is uniformly distributed within the soil and that no soil/compost interface exists.

Inspection and Maintenance:

General

Inspect regularly until grass or vegetation is firmly established.

Repair all damaged areas immediately by restoring the compost to its finished grade, re-apply fertilizer, seed, and replace the appropriate compost mulch material as needed.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Coverage is inadequate	Follow recommended application rates. Ensure that the correct amount of material is implemented. Reapply as necessary.
Compost is washed away	Repair all damaged areas immediately by restoring the compost to its finished grade, re-apply fertilizer, seed, and replace the appropriate compost material as needed.
Area was improperly dressed before application	Remove existing vegetation and slightly roughen the embankment where vegetation is to be established. Where it is practical, track (compact) perpendicular to contours on the slope using a bulldozer before applying compost.
Excessive water flows across stabilized surface	Use other appropriate BMPs or structural controls to limit flow onto stabilized area and/or to reduce slope lengths.

Pneumatic Compost Slope Application

2.5 EROSION CONTROL BLANKETS (ECBs)

Use temporary erosion control blankets (ECBs) listed on *SCDOT QPL 55* to provide temporary erosion control and facilitate vegetation establishment. ECBs are composed of processed degradable natural and/or polymer fibers mechanically bound together between synthetic or natural fiber nettings.

Installation:

Install temporary ECBs on slopes **2H:1V** or less only. For slopes greater than **2H:1V**, use turf reinforcement matting (TRM).

Prior to ECB installation, grade and compact the area according to the Plans.

Remove large rocks, soil clods, vegetation, and other sharp objects that could keep the ECB from intimate contact with subgrade.

Loosen the top 2 to 3 inches of soil above final grade.

Add seed, lime, and fertilizer as outlined in *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision.*

The maximum allowable continuous slope length for Temporary ECB slope applications is 50 feet. Provide slope interruption devices for continuous slope length longer than 50 feet. Refer to *SCDOT Supplemental Technical Specification for Inlet Structure Filters Type F – Non Weighted (SC-M-815-8) or latest revision* for slope interruption device description, materials, and construction requirements. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

Select anchors that have sufficient ground penetration to resist pullout. Use anchors (stakes, pins, or staples) with a minimum length of 6 inches to secure ECBs. Use 12-inch anchors for specific ECBs in sandy, loose, or wet soils or as directed by the RCE or manufacturer's representative.

Use Table 5 to determine minimum anchoring frequency. Refer to the manufacturer's recommendation for additional information. Install anchors at the manufacturer's rate if it is greater than the minimum values listed in Table 5 to ensure the manufacturer's warranty is not violated.

Table 5: ECB Anchoring Requirements

Slope Grade	Anchoring Frequency
Up to 3H:1V	1.5 anchors per square yard
3H:1V to 2H:1V	2.0 anchors per square yard
Channel Bottom Applications	4.0 anchors per square yard

Slope Installation

Refer to *SCDOT Supplemental Technical Specification for RECPs (SC-M-815-9) or latest revision* for detailed ECB slope installation procedures.

In general, at the top of the slope construct an anchor trench to inhibit undermining from stray surface water. Extend the upslope terminal end of the ECB past the anchor trench.

Use anchors to fasten the ECB material into the upslope anchor trench and backfill the trench with soil and compact. Apply seed to the backfilled soil surface and cover with the remaining ECB on the terminal end. Anchor the terminal end down slope of the anchor trench.

Unroll the ECB parallel to the primary direction of water flow and place in direct contact with the soil surface. Overlap the edges of adjacent (vertically down the slope) ECBs a minimum of 3 inches with the upslope roll overlapping on top of the down slope roll in shingle style.

Overlap the edges of parallel (horizontal across the slope) blankets 3 to 6 inches.

Channel Installation

Refer to *SCDOT Supplemental Technical Specification for RECPs (SC-M-815-9) or latest revision* for detailed ECB channel installation procedures.

In general, excavate anchor trenches or install anchor check slots perpendicular to the flow direction across the entire width of the channel at 30-foot maximum intervals and at the terminal end of the channel reach.

A trench or check slot alternative installation is a double row of anchors placed 4 inches apart. Drive all anchors flush with the soil surface.

Beginning at the downstream end in the center of the channel, place the initial end of the first ECB in the anchor trench and secure it with anchors.

Position adjacent rolls in the anchor trench in the same manner, overlapping the proceeding roll a minimum of 3 inches. Secure the ECB along the anchor trench, backfill, and compact with specified soil.

Unroll the center strip of ECB upstream over compacted trench. Stop at the next check slot or terminal anchor trench. Unroll adjacent rolls of ECB upstream in similar fashion, maintaining a 3-inch overlap.

Fold and secure the ECB into transverse check slots. Lay the ECB in the bottom of the slot, and then fold back against itself. Anchor through both layers of ECB. Backfill with soil and compact. Continue unrolling the ECB widths upstream over compacted slot to next check slot or terminal anchor trench.

Cut longitudinal anchor slots at the top of each slope. Anchor the ECB material into the longitudinal anchor slots.

Inspection and Maintenance:

Ensure the anchoring pattern is consistent with that shown on the manufacturer's installation sheet. If there is evidence that the ECB is not securely fastened to the soil, install extra anchors to inhibit the ECB from becoming dislodged.

Inspect regularly until grass or vegetation is firmly established.

Repair all damaged areas immediately by restoring the soil on slopes or channels to its finished grade, re-apply fertilizer and seed, and replacing the appropriate ECB material as needed.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Undercutting occurs along the top of the slope	Dig a 6-inch by 6-inch trench along the top of the slope and anchor blanket into trench by back filling and tamping the soil.
Blankets separate along the seams	Overlap adjacent blanket 2 to 3 inches and anchor every 3 feet.
Blankets separate where the rolls are attached end to end	Shingle ECBs so top blanket covers bottom blanket by 6 inches and anchor through the overlapped areas every 12 inches.
Blanket does not make complete contact with the soil surface	Prepare the soil surface by removing rocks, clods, sticks, and vegetation and fill in rills and uneven areas.
Excessive water flows across stabilized surface	Use other BMPs to limit flow on stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

Temporary Erosion Control Blankets

2.6 TURF REINFORCEMENT MATTING (TRM)

Use turf reinforcement matting (TRM) listed on *SCDOT QPL 56* as a synthetic, non-degradable mesh or mat designed to impart immediate erosion protection, enhance vegetation establishment, and provide long-term functionality by permanently reinforcing vegetation during and after maturation. It is for use in hydraulic applications, such as high flow ditches and channels, steep slopes, stream banks, and shorelines, where erosive forces may exceed the limits of natural, unreinforced vegetation or in areas where limited vegetation establishment is anticipated.

Type 1 TRM: For slopes **2H:1V** or less

Type 2 TRM: For slopes **1.5H:1V** or less

Type 3 TRM: For slopes **1.0H:1V** or less

Installation:

Prior to TRM installation, grade and compact the area according to the Plans.

Remove large rocks, soil clods, vegetation, and other sharp objects that could keep the TRM from intimate contact with subgrade.

Loosen the top 2 to 3 inches of soil above final grade.

Add seed, lime, and fertilizer as outlined in *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision.*

Install the TRM at the elevation and the alignment indicated on the Plans.

Use anchors (stakes, pins, or staples) with a minimum length of 6 inches to secure permanent TRMs. Use longer anchors for specific TRM installation in sandy, loose, or wet soils, or as directed by the RCE or manufacturer's representative.

Use Table 6 to determine minimum anchoring frequency. Refer to the manufacturer's recommendation for additional information. Install anchors at the manufacturer's rate if it is greater than the minimum values listed in Table 6 to ensure the manufacturer's warranty is not violated.

Table 6. TRM Anchoring Requirements

Slope Grade	Anchoring Frequency
Up to 3H:1V	1.5 anchors per square yard
3H:1V to 2H:1V	2.0 anchors per square yard
2H:1V to 1H:1V	3.5 anchors per square yard
Steeper than 1H:1V and Channel Bottoms	4.0 anchors per square yard

Slope and Channel Installation

Refer to *SCDOT Supplemental Technical Specification for RECPs (SC-M-815-9) or latest revision* for TRM slope and channel installation procedures. Also refer to Section 2.5 for installation guidance.

Inspection and Maintenance:

Ensure the anchoring pattern is consistent with that shown on the manufacturer's installation sheet. If there is evidence that the TRM is not securely fastened to the soil, install extra pins or staples to inhibit the TRM from becoming dislodged.

Inspect regularly until grass or vegetation is firmly established.

Repair all damaged areas immediately by restoring the soil on slopes or channels to its finished grade, re-apply fertilizer and seed, and replacing the appropriate TRM material as needed.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Improper anchoring	Dig trench along the top and bury the blankets. Use staples to anchor according to manufacturer's recommendations.
Undercutting due to inadequate preparation	Prepare the soil surface. Remove rocks, clods and other obstructions. Fill in rills in uneven areas to promote good contact between mat and soil.
Excessive water flows across stabilized slope surface	Use other BMPs to limit flow on stabilized area. Use other BMPs to reduce slope lengths. Do not use to stabilize areas with swift moving concentrated flows.

Turf Reinforcement Matting

2.7 FINAL STABILIZATION

Several methods can be used for final stabilization including permanent cover with seed, permanent planting of ground cover plants and sodding.

Installation:

Use seed that conforms to all state laws and all requirements and regulations of the South Carolina Department of Agriculture (SCDA). Refer to *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for detailed information on seed selection, installation and application of lime, fertilizer and biological growth stimulants for seeding and final stabilization. Permanent seeding applications using the pre-blended seed mixes (simplified seeding table) must be approved and listed on the most recent edition of *SCDOT QPL 88.*

Mulch

Mulch is required for all permanent cover applications.

Hydraulic Erosion Control Products (HECPs)

Refer to Section 2.3 and *SCDOT Supplemental Technical Specification for HECP (SC-M-815-11) or latest revision* for HECP description, materials, and construction requirements.

Compost Mulch

Refer to *SCDOT Supplemental Technical Specification for Compost (SC-M-815-3) or latest revision* for Compost Mulch description, materials, and construction requirements.

Temporary Erosion Control Blankets (ECBs)

Refer to *SCDOT Supplemental Technical Specification for RECPs (SC-M-815-9) or latest revision* for ECB description, materials, and construction requirements.

Turf Reinforcement Matting (TRM)

Refer to *SCDOT Supplemental Technical Specification for RECPs (SC-M-815-9) or latest revision* for TRM description, materials, and construction requirements.

Slope Interruption Devices

The maximum allowable continuous slope length for all straw and hay mulch, HECP, compost mulch, and ECB applications is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. Refer to *SCDOT Supplemental Specification for Inlet Structure Filters Type F*

– *Non Weighted (SC-M-815-8) or latest revision* for slope interruption device description, materials, and construction requirements. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

Seeding Dates and Rates of Application

Refer to the *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for seeding plan, schedule, and more information on final stabilization by seeding.

Perform seeding work during the periods and at the rates specified in the seeding tables of the Specification.

Do not use temporary cover by seeding, permanent cover, or permanent grassing for non permitted resurfacing projects when the ground is frozen and/or when the 10-day forecasted low temperature remains below 35 degrees Fahrenheit, or when the ground is excessively wet.

Do not conduct seeding work when the ground is excessively dry (periods of drought) unless watering is specified in the Contract or directed by the RCE. During periods of adverse conditions, use temporary stabilization by mulch according to the Specification.

Ensure that the areas to be seeded are uniform and conform to the finished grade and cross-section shown on the Plans or as otherwise directed by the RCE. Perform minor shaping and evening of uneven and rough areas outside of graded sections if necessary.

Loosen the seedbed (including cut slopes) to a minimum depth of 3 inches before select material, compost, other acceptable soil amendments, agricultural lime, fertilizer, mulch, or seed is applied. Prepare the seedbed in a manner that ensures the seeding application remains on slopes and germinates. The preferred method is vertically tracking the seedbed up and down the slope with proper equipment.

Remove stones larger than 2½ inches in any dimension, large clods, roots, or other debris brought to the surface.

Use compost or soil amendments as directed by the RCE for shoulders and slopes if good seedbed material is not located on site.

Permanent Cover

Where land disturbing activities have permanently ceased on the Project and will not resume for a period exceeding 14 calendar days, initiate permanent cover on all disturbed areas within 7 calendar days. This condition may require the use of permanent and temporary stabilization measures to protect exposed soils.

Following the application of fertilizer and preparation of seedbed according to the Specification, perform permanent cover within 5 working days and/or prior to a rainfall event that compacts the prepared seedbed.

Uniformly sow seed at the rate specified by the use of approved mechanical seed drills, rotary hand seeders, hydraulic equipment, or any other type of equipment that produces a uniform seed application.

After sowing permanent seed, apply an appropriate mulch within 5 working days and/or prior to a rainfall event that compacts the prepared seedbed.

Mulch

Apply mulch according to Table 7.

Table 7: Application of Mulch

Mulch[1,5]	Applicable Slopes[2]	Minimum Application Rate (lbs/acre-dry)[3]	Min Slope Length (ft)
Straw or Hay with Tackifier	≤ 4:1	2,000	N/A
HECP Type 1-Tracer under RECP	Per RECP	1000	N/A
HECP Type 1	≤ 4:1	2,000	N/A
HECP Type 2	4:1< S ≤ 3:1	2,500	N/A
HECP Type 3	3:1< S ≤ 2:1	3,000	N/A
HECP Type 4	2:1< S ≤ 1:1	3,500	N/A
	>1:1	4,000 (temp cover only)[4]	
Compost Mulch	≤ 2:1	200 CY/acre	N/A
When site constraints exceed the acceptable application for mulch, use Rolled Erosion Control Products (RECPs); Erosion Control Blanket (ECB) or Turf Reinforcement Matting (TRM)			
Temporary ECB or Type 1 TRM	≤ 2:1	N/A	5
Type 2 TRM	≤ 1.5:1	N/A	5
Type 3 TRM	≤ 1:1	N/A	5

[1] A higher level of mulch may be applied than that specified on the Plans, Specifications, and other terms of the Contract. In this situation, the higher level mulch is to be applied at the specified mulch rate for the actual slope conditions of the site in accordance with the mulch tables. Payment will be made for the mulch specified, not the higher level mulch.

[2] The maximum allowable continuous slope length for all mulch and ECB applications is 50 feet. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

[3] Strictly comply with the manufacturer's mixing recommendations and installation instructions for the actual slope steepness and the actual continuous slope length of the application.

[4] HECP Type 4 may be used for permanent cover applications on slopes 1:1 or greater at a minimum rate of 4,500 pounds per acre as directed by the RCE only when proper TRM installation is not practicable due to site constraints. Slope interruption devices or TRMs are required for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

[5] Wood chips or shredded woody materials generated during the clearing stage when trees are shredded using large tub grinders is an acceptable temporary mulch. At the discretion of the RCE, place wood chip mulch on slopes < 3:1. Wood chip mulch *is not* acceptable for temporary seeding or permanent seeding applications.

Permanent Grassing for Non Permitted Resurfacing Projects (PGNPRP)

Refer to the *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for more information about permanent grassing for non permitted resurfacing projects.

All permanent grassing for non permitted resurfacing projects requires the application of HECP Type 3 with a minimum application rate of 2,000 pounds per acre. Where applicable, track all slopes prior to seeding.

Acceptance

Before acceptance of permanent cover, a uniform perennial vegetative cover with a density of 70% of each square yard of the seeded area is required by the Contractor. A well-developed root system must be established to sufficiently survive dry periods and winter weather and be capable of reestablishment in the spring.

If a satisfactory stand of perennial vegetative cover with a uniform density of 70% of the seeded area is not achieved within 45 days of sowing the permanent seed, the seeded area will be re-assessed by the RCE. If re-seeding is necessary, the Contractor is required to reapply permanent cover within 7 days at no additional cost to SCDOT.

Sodding

Refer to the *2007 SCDOT Standard Specifications for Highway Construction, Section 813 or latest revision* for more information on sodding for permanent stabilization.

Inspection and Maintenance:

The Contractor must complete and sign the SCDOT Seeding Inspection Form and submit the completed form at the time of installation to the RCE or a member of the RCE's staff. The RCE or member of the RCE's staff must document receipt of the submitted SCDOT Seeding Inspection Form.

Refer to *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision* for inspection and maintenance information.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Areas are eroded	Re-seed and re-mulch, or re-work eroded areas if erosion is severe prior to re-seeding.
Stand of permanent vegetation has less than 70% cover	Re-evaluate choice of plant materials and quantities of lime and fertilizer used. Overseed and add lime and fertilizer in accordance with soil test results.

Final Stabilization

2.8 RIPRAP CHANNEL STABILIZATION

Riprap is a permanent, erosion-resistant channel lining aggregate consisting of large, loose, angular stone with a nonwoven geotextile filter fabric or granular underlining to prevent soil movement into or through the riprap.

Installation:

Place a nonwoven geotextile filter fabric or granular filter material underneath the riprap.

Extend riprap up the banks of the channel to a height equal to the maximum 10-year flow depth, or to a point where vegetation can be established to adequately protect the channel.

Extend riprap placed in channel bends upstream and downstream from the point of curvature at least 5 times the channel bottom width. Extend the riprap across the bottom and up both sides of the channel.

Inspection and Maintenance:

Once riprap installation is complete, it requires very little maintenance.

Inspect periodically to determine if high flows have caused scour beneath the riprap or filter fabric or dislodged any of the stone.

Properly control sediment-laden construction runoff that may drain to the point of the new installation.

If repairs are needed, perform them immediately.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
High flows have caused scour beneath the riprap or filter fabric or dislodged any of the stone	Replace filter fabric and rearrange stone appropriately.
Riprap blocks channel, causing erosion along edges	Make sure excavation is deep enough, rearrange riprap appropriately.
Piping or slumping occurs	Make sure a nonwoven filter fabric was installed and make sure it isn't torn or damaged.
Stones have moved and erosion of foundation has occurred	Make sure riprap is properly graded.
Undercut riprap slope and slumping occurring	Check to be sure that foundation toe is properly reinforced.
Stone displacement occurring	Make sure fill slopes have been properly compacted, remove debris and make needed repairs.

Riprap Lined Channel

2.9 OUTLET PROTECTION

Outlet protection is a protective measure for the immediate area around the outlet of a pipe or culvert. Many different techniques can be used for outlet protection including high performance TRMs, riprap, transition mats, grouted riprap, concrete, plunge pools, gabion baskets, or other structural measures.

Installation:

Do not protect outlets at the top of cut slopes or on slopes steeper than 10% with only riprap outlet protection. Additional protection such as TRM is required.

Follow applicable standards for installation of the selected materials used for outlet protection.

Install a minimum protection width of 3 times the outside diameter of the outlet pipe at the toe of slope or upstream end of protection, adjacent to the outlet pipe.

Extend outlet protection up the slope a minimum of 1-foot above the pipe invert.

Extend outlet protection down the defined channel as shown on the Plans or as directed by RCE.

Follow manufacturer's installation procedures for high performance TRMs and other manufactured products such as transition mats or concrete blocks.

A manufacturer’s representative may be required to oversee all installation procedures and officially approve the installation of manufactured products used for outlet protection.

Extend outlet protection across the channel bottom and up the channel banks to the top of the bank.

Install outlet protection with no slope along its length (0.5% grade) where applicable. Ensure the downstream invert elevation of the outlet protection is equal to the elevation of the invert of the receiving channel. Ensure there is no overfalling at the end of the protection.

If the outlet discharges into a well-defined channel, the receiving side slopes of the channel should be as shown on the Plans.

Install outlet protection so there are no bends in the horizontal alignment.

Place a nonwoven geotextile filter fabric under all riprap outlet protection installations.

Provide adequate length of outlet protection measure to provide sufficient protection.

Inspection and Maintenance:

Check all outlet protection, aprons, plunge pools and structural outlets for damage. Immediately make all needed repairs to prevent further damage.

If any evidence of erosion or scouring is apparent, modify the design as needed to provide long term protection (keep in mind fish passage requirements if applicable).

Inspect outlet structures after heavy rains to see if any erosion has taken place around or below the structure.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Riprap washes away	Replace riprap with a larger diameter based on the pipe diameter and discharge velocity.
Apron is displaced	Align apron with receiving water and keep it straight throughout its length. Repair fabric and replace riprap that has washed away.
Scour occurs around apron or riprap	Repair damage to slopes or underlying filter fabric.
Outlet erodes	Stabilize outlets; replace lost riprap; grout riprap.

Riprap Outlet Protection

2.10 DUST CONTROL

Dust controls are BMPs that reduce surface and air movement of dust from disturbed soil surfaces. Use dust control BMPs whenever there are offsite impacts, especially during periods of drought, and implement them until final stabilization is reached. Dust control BMPs include: project phasing, vegetative cover, mulch, sprinkling water, spray-on adhesives, calcium chloride, barriers, and covers.

Installation

Apply spray-on chemical soil treatments (palliatives) per the manufacturer's specifications and apply with equipment approved by the manufacturer.

Inspection and Maintenance

Because dust controls are dependent on specific site and weather conditions, inspection and maintenance are unique for each site.

Dust control BMPs using the application of either water or chemicals require more monitoring than structural or vegetative controls to remain effective.

Inspect structural controls for deterioration on a regular basis to ensure that they are still achieving their intended purpose.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive dust leaves the site	Increase water application frequency. Consider using a palliative or binder on inactive areas.
Vehicles kick up dust	Water more frequently. Limit vehicle speeds. Stabilize the roadway.
Watering for dust control causes erosion	Reduce water pressure on the water truck. Check watering equipment to ensure that it has a positive shutoff. Water less frequently.
Sprayed areas are ineffective at limiting dust	Re-spray areas and ensure proper application rates.

Dust Control

2.11 SLOPE INTERRUPTION DEVICES

Slope interruption devices are temporary devices placed along slopes to minimize concentrated flow from forming on the face of the slope. Locations for installation are designated on the Plans or by the RCE. The maximum allowable continuous slope length for HECP (Hydraulic Erosion Control Products) and ECB (temporary Erosion Control Blanket) applications is 50 feet. Provide slope interruption devices for continuous slope length longer than 50 feet. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed. Slope interruption devices consist of non-weighted inlet tubes secured to the ground using the methods listed below. Non-weighted tubes must be biodegradable.

Only select materials for slope interruption devices that are listed on the most recent edition of *SCDOT QPL 58* – Type F Non-Weighted Inlet Tubes.

Installation

Non-weighted inlet tubes for slope interruption devices on slopes stabilized with HECP require trenching. A trench parallel to the contour of the slope should be excavated to a depth that is ⅓ the tube diameter. The excavated soil should be placed on the up-slope side of the trench.

Non-weighted inlet tubes for slopes stabilized with ECBs do not require trenching. Ensure the installation of the slope interruption device does not damage the installed ECB.

Non-weighted inlet tubes for slope interruption devices should be installed using wooden stakes with a minimum length of 3 feet with a minimum measured dimension of ¾-inch by ¾-inch and a maximum measured dimension of 1-inch by 1-inch. Ensure the areas for post installation are compacted so the posts are properly installed.

Adjacent tubes should be abutted tightly, end to end, without overlapping the ends. The tube ends should be tied together using heavy twine or plastic locking ties.

Inspection and Maintenance

Inspect slope interruption devices for gaps that may allow concentrated flow to establish.

Slope interruption devices should be removed and/or replaced as needed to adapt to changing construction site conditions.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive ponding on upslope side of device	Additional slope interruption devices may be installed to reduce effective slope length or sediment removal may be necessary.
Concentrated flow on slope	Check inlet tubes for gaps or undercutting.
Sediment build-up on upslope side of device	Remove sediment as necessary.

Slope Interruption Devices with HECP

Slope Interruption Devices with ECB

2.12 LEVEL SPREADER FOR PIPE OUTLETS

Level spreaders for pipe outlet discharges are used as an energy dissipater to disperse concentrated runoff uniformly. Level spreaders are used for peak design flow rates up to 30 cubic feet per second (cfs). Level spreaders are constructed at virtually zero percent grade across a slope, and consist of a permanent structure used to disperse or “spread” concentrated flow thinly over the level spreader lip. The main purpose is to spread potentially erosive concentrated flow over a wide area to reduce erosion at the outlet.

Level spreader dimensions are derived from the design peak flow rates (cfs). Table 8 shows the minimum depth and minimum length of the level spreader lip based on the discharge pipe size.

Table 8: Minimum Depth and Length of Level Spreader

Pipe Size (inches)	Minimum Depth (feet)	Minimum Lip Length (feet)
12	1.0	11.0
18	1.5	16.5
24	2.0	22.0
30	2.5	27.5
36	3.0	33.0

Installation

Ensure the downstream area is stabilized prior to the construction of the level spreader.

A forebay or excavated swale should be used for the preliminary treatment of stormwater.

A level spreader lip made of earth, gravel, or concrete should be included.

The level spreader lip should be installed with a minimum top width of 6 inches.

The level spreader lip should be installed with a minimum 6-inch drop to the existing downstream ground allowing water to pass over the lip without interference from vegetation.

Install a TRM a minimum of 3 feet downstream of the level spreader lip. The TRM limits erosion as water discharges from the top of the level spreader to the downstream vegetated area.

Inspection and Maintenance

Regular inspection and maintenance is critical to the effective operation of level spreaders. During the first year after construction, level spreaders should be inspected for proper distribution of flows and signs of erosion during and after all major rainfall events. After the first year, level spreaders can be inspected annually.

Summary of maintenance requirements:

- Maintain level spreaders annually and after all major storm events.
- Check the level spreader and downstream areas for signs of erosion.
- Remove sediment and debris from the forebay and from behind the level spreader lip when it reaches a depth of 50% of the storage volume or depth.
- As needed, mow the grass in the forebay and around the level spreader.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Erosion downstream of level spreader	Re-seeding and install turf reinforcement matting (TRM).
Forebay filled with sediment/debris	Clear sediment and re-grade forebay area if needed.

Level Spreader for Outlet Protection

2.13 HYDRAULIC BIOTIC SOIL AMENDMENTS (HBSAs)

Use Hydraulic Biotic Soil Amendments (HBSAs) listed on *SCDOT QPL 98* as engineered soil amendments to improve the development of deficient soils and to facilitate sustainable vegetation. They are typically hydraulically applied, but some products can be applied using other methods. Certain HBSAs may help achieve a minimal level of erosion control but may not replace the use of erosion control products. Strictly follow manufacturer's installation requirements.

Hydraulic Biotic Soil Amendments are used to amend poor quality soils which have a lack of organic matter and little to no bioactivity. Use HBSAs if soil is determined to be deficient from the results of a soil organic matter test or the soil analysis as outlined in *SCDOT Supplemental Technical Specification for Seeding SC-M-810-4 or latest revision*. Soils with less than 3% organic matter are typically considered deficient and a HBSA should be utilized.

Installation

Ensure the seedbed conforms to the finished grade and cross section shown on the Plans or as otherwise directed by the RCE before applying the HBSA.

HBSA products are typically applied using hydraulic methods and equipment. Use personnel or subcontractors experienced in the proper procedures for mixing and application of HBSA. Use approved hydraulic seeding/mulching machines with appropriate nozzles for HBSA applications.

Apply HBSA from opposing directions to the soil surface in successive layers, reducing the "shadow effect" to achieve maximum coverage.

Mix seed, fertilizer, tackifier, and/or any other soil amendments with the HBSA before application if instructed to do so by the manufacturer.

Some HBSA products include erosion control capabilities and some require a separate application of an erosion control product. If erosion control products are to be used, they should be installed after the application of the HSBA is complete.

Refer to *SCDOT Supplemental Technical Specification for Hydraulic Erosion Control Products SC-M-815-11 or latest revision* and *SCDOT Supplemental Technical Specification for RECPs SC-M-815-9 or latest revision* for more information on erosion control products.

Always follow all manufacturer's recommendations for HBSA installation.

Inspection and Maintenance

Evaluate the quality of the HBSA application by visual observation after it is applied. Ensure the HBSA uniformly covers the entire application area with a minimum coverage rate of 95%. Do not apply more or less of the product to any certain sections of the subject area. The product application should remain uniform throughout the entire treated area for best results.

Prepare a HBSA maintenance plan that includes the following:

- Reapplication of HBSA to disturbed areas as directed by the RCE.
- Proper maintenance of equipment to provide uniform application rates.
- Rinsing thoroughly of all HBSA mixing and application equipment and appropriate discharge of rinse water.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Coverage is inadequate	Follow manufacturer's recommendations for application rates. Ensure the correct amount of material is implemented. Reapply as necessary.
HBSA is washed away	Re-route concentrated flow away from HBSA area. Reapply as necessary.
Area was improperly prepared before application	Remove existing vegetation and roughen application area by rolling with a punch type roller or by track walking.

Hydraulic Biotic Soil Amendments

3.0 SEDIMENT CONTROL BMPs

The following Sediment Control BMPs are discussed in this Field Manual in the indicated Sections. Drawings and details for these BMPs are located at the end of the Field Manual in Section 11.0.

3.1 TEMPORARY SURFACE OUTLET AND BAFFLE SEDIMENT BASIN

A temporary surface outlet and baffle sediment basin is a basin where sediment-laden runoff is temporarily detained, allowing sediment to settle out before the runoff is discharged. The purpose of a temporary surface outlet and baffle sediment basin is to collect and store sediment from disturbed areas cleared or graded during construction. A surface outlet and baffle sediment basin implements three spillway devices:

1. A primary riser spillway consisting of a solid riser with no staged discharges or low flow orifices connected to an outflow barrel. Stormwater enters the primary riser spillway by overtopping the structure and through a floating skimmer.

2. A floating skimmer attached to the bottom of the primary riser dewatering the runoff volume below the top elevation of the primary riser. The floating skimmer dewaters the volume below the primary riser in a time period ranging between 24 to 72 hours.

3. A stabilized emergency spillway that safely passes the 100-year, 24-hour storm event.

Installation:

All sediment basins should be constructed in accordance with the Plans, *SCDOT Standard Drawing 815-305* or as approved by the RCE.

Basins should be constructed before any grading takes place within the drainage area.

Key and core is required on all embankments.

The riser should be placed at the deepest point of the basin.

An anti-vortex device or trash rack is placed over the primary riser pipe to prevent trash and debris from entering and clogging the spillway.

Basin bottom should have a -0.5% slope towards the riser.

Minimum of 3 baffles 4 feet in height installed in the basin in the Upper State.

Minimum of 1 baffle 4 feet in height installed in the basin in the Lower State.

At least one row of porous baffles placed between the primary riser structure and all pipes or channels discharging to the basin.

Ensure temporary stabilization by seeding is performed and temporary erosion control blankets are installed on exposed basin side slopes.

During construction, temporary surface outlet and sediment basins should be surrounded by Woven Wire Fence-Type 1, with gate.

Inspection and Maintenance

The key to a functional sediment basin is continual monitoring, regular maintenance, and regular sediment removal. If maintenance or repairs are necessary, perform them immediately.

Attention to sediment accumulation within the basin is extremely important. Monitor sediment deposition in the basin during each inspection. Significant concentrations of heavy metals (e.g., lead, zinc, and cadmium) as well as some organics such as pesticides may be expected to accumulate at the bottom of basins.

Remove trapped sediment from the basin. Removed sediment may be stabilized on site.

Remove sediment when it reaches 50% of storage volume or reaches the top of the designed cleanout stake.

Remove all temporary sediment basins within 30 days after final site stabilization is achieved or after it is no longer needed.

Grade and permanently stabilize all disturbed areas resulting from the removal of the sediment basin.

Floating skimmer – Inspect the floating skimmer after each rain event to ensure that it is not clogged with sediment. Remove sediment that accumulates on the riprap pad underneath the floating skimmer.

Inlet/outlet pipes – Inspect pipes for sediment and debris blockage; maintenance is required when the pipe is ⅓ blocked or damaged to a point to restrict flow.

Inlet/outlet protection – Inspect inlet/outlet protection and repair or replace when protection is damaged, riprap is displaced, or covered by sediment.

Inspect baffles after each rain event for erosion or damage.

Repair, seed, and replace ECBs on basin side slope areas that have eroded or have become damaged by equipment from sediment cleanout.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Outlet pipe is clogged with debris	Clean outlet pipe.
Spillway erodes due to high velocity flows	Stabilize outlet with riprap or line spillway with plastic sheeting or geotextile blankets.
Slope sides erode	Stabilize slopes with rock, vegetation, or equivalent method.
Excessive accumulated sediment buildup	Remove sediment to retain storage capacity.
Baffles torn or sagging	Replace baffle and install top support wire if necessary.
The upstream drainage area is too large	Ensure that the basin is designed to accommodate the inflow for the designed storm. Limit contributing drainage area or expand basin. Ensure drainage area does not exceed recommended acreage. If the drainage area does exceed this limit, use other or additional BMPs.

Temporary Surface Outlet and Baffle Sediment Basin

3.2 FLOATING SKIMMER

Floating skimmers float at the water surface of a sediment basin or sediment trap and dewater from the water surface where sediment concentrations are at a minimum in the water column. Floating skimmers release a low rate of flow draining the basin slowly at a constant rate. The inlet of the skimmer device is sized according to the basin volume and designed to drain the basin in a fixed amount of time.

Use floating skimmers that are listed on the most recent edition of *SCDOT QPL 82*.

Installation:

Manufactured floating skimmers should be installed in accordance with the manufacturer's written installation instructions. The floating skimmer should be positioned over a skimmer pit. The skimmer pit should have dimensions of 4 feet x 4 feet with a minimum depth of 2 feet. The skimmer pit is filled with Class A or B riprap. Ensure the floating skimmer is assembled level over the skimmer pit. A flexible joint can be constructed with a section of Schedule 40 flexible PVC pipe at the connection with the riser. The flexible joint and flexible PVC pipe allows the skimmer to be retrieved from the bank using the maintenance rope.

The maintenance rope should be floatable and is used to remove trash and debris which accumulate on the outside of the trash guard. One end of the maintenance rope is tied around a secure portion of the floating skimmer and the other end is tied to a metal stake driven into the basin embankment near the riser. Ensure the rope attachment to the metal stake is higher than the design water surface level. Ensure a good knot is established that will not become loose. Ensure there is enough slack in the rope to allow the floating skimmer to float up and down through its full range of motion so that it settles into the skimmer pit after the basin drains.

Floating skimmers should be removed at the end of the construction phase of the Project. If the basin is to be converted to a permanent water quantity or quality basin, ensure the orifice where the floating skimmer was attached to the basin riser is covered, adjusted, or modified according to the Project Plans and Specifications.

Inspection and Maintenance:

Floating skimmers which sink or completely suspend under the water surface are not to be accepted. A portion of the floating skimmer must be visible above the water surface at all times. Vent holes are required on all skimmers to ensure the device drains by gravity flow. Inlets or orifices to the skimmer may be submerged no greater than 6 inches below the water surface.

Inspect the floating skimmer for any structural damage, clogging, or excessive sediment accumulation.

If the skimmer becomes stuck in the mud at the bottom of the basin, it must be freed to allow for normal operation. This can typically be done by use of the maintenance rope.

Sediment deposits should be removed when the floating skimmer cannot settle low enough to completely drain the entire basin.

While draining the basin, the trash guard of the floating skimmer may clog with debris. Typically, a few jerks on the maintenance rope will clear the floating skimmer of debris and restore flow. If jerking the maintenance rope does not work, the skimmer should be pulled to the embankment with the maintenance rope and all debris manually cleaned from the trash guard. An internal clog or blockage may require the device to be disassembled and repaired.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Skimmer is stuck in mud	Free from mud using maintenance rope.
Skimmer gets internal clog or blockage	Disassemble device and repair.
Sediment builds up under skimmer	Pull skimmer to side and remove sediment from skimmer pit.

Floating Skimmer

3.3 POROUS BAFFLES

Porous baffle systems are used inside sediment basins to reduce the velocity and turbulence of water flowing through the structure by spreading the flow across the entire width of the basin. The reduction of turbulent flow facilitates the settling of sediment and improves sediment retention efficiency for sediment detainment structures.

Use materials for porous baffles that are listed on the most recent edition of *SCDOT QPL 83*.

Installation:

Porous baffle systems should be constructed inside sediment basins. Ensure porous baffles are installed perpendicular to flow within the sediment basins. When possible, porous baffle systems should be installed across the entire width of the sediment basin.

Porous baffle systems should not be installed until the sediment basin is excavated and graded with a level bottom surface.

Steel posts should be installed on maximum 4-foot centers across the basin bottom and up the embankments. The steel posts are driven to a minimum depth of 2 feet or to the maximum extent practicable.

When using SCDOT sediment basin design aids, all porous baffles have a 4-foot height from the basin bottom and utilize 6-foot posts.

The porous baffle system material should be attached to the upstream side of the steel posts using heavy-duty plastic ties or wire ties that are evenly spaced and placed in a manner to prevent sagging or tearing of the fabric. In all cases, ties should be spaced at maximum 6-inch intervals.

12-inch anchors (stakes, pins, or staples) spaced on 1-foot intervals should be used to secure the porous baffle system material to the basin bottom and up the sediment basin/trap embankments.

In cases where the porous baffle material sags between support posts, a 9-gauge steel wire or rope support should be woven across the top of the porous baffle system to prevent sagging.

When joints are necessary, the materials are wrapped together at a support steel post with both ends fastened to the post with a 12-inch minimum overlap.

Do not use silt fence material for porous baffle systems.

Inspection and Maintenance:

Check for sediment buildup and structure integrity. **Sediment should be removed when it reaches 50% of the height of the first baffle row.**

Check where runoff has eroded a channel beneath the baffle, or where the baffle has sagged or collapsed. Ensure that the baffle material stays securely installed along the basin sides and in the bottom. Ensure the baffle system does not sag across the top of the baffle system. The baffle material should be replaced if torn or if evidence of deterioration is noted.

A porous baffle should be removed and replaced whenever it has deteriorated to the extent that it reduces the effectiveness of the porous baffle system. Access should be maintained to the porous baffles for prompt repair or replacement if the baffle collapses, tears, decomposes, or becomes ineffective.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Baffles are sagging	Install a support wire across the top of the porous baffle.
Sediment build-up on baffles	Removal of sediment when it reaches 50% of the height of the first baffle row.

Porous Baffles

3.4 MULTIPURPOSE BASIN / DETENTION BASIN

Multipurpose basins are permanent detention basins designed for use as temporary sediment basins during the construction phase of a project.

Two spillway configurations are commonly used in the life span of a multipurpose basin. The first configuration is the temporary surface outlet and baffle sediment basin primary riser spillway consisting of a solid concrete riser with ***covered or sealed staged discharges***. Runoff only enters the primary riser structure by overtopping and through the floating skimmer.

The second configuration is the permanent basin riser spillway designed to reduce post-development peak flow rates to pre-development peak flow rates for the 2-year and 10-year, 24-hour storm events where applicable or designed for post-construction water quality control. Post-construction staged orifices, low flow orifices, or staged weirs ***are securely covered or sealed during the construction phase***. Uncover post-construction staged orifices, low flow orifices, or staged weirs after the construction phase is complete.

Installation:

Construct basins before any grading takes place within the drainage area.

Key and core is required on all embankments.

The riser should be placed at the deepest point of the basin.

An anti-vortex device or trash rack is placed over the primary riser pipe to prevent trash and debris from entering and clogging the spillway.

Basin bottom should have a -0.5% slope towards the riser.

Ensure that temporary stabilization by seeding is performed and temporary erosion control blankets are installed on exposed basin side slopes.

When the construction phase has ended, remove Woven Wire Fence-Type 1 and install Security Fence per the *2007 SCDOT Standard Specifications for Highway Construction, Section 806 or latest revision*.

Inspection and Maintenance:

Sediment deposition should be continually monitored in the basin. Owners and maintenance authorities should be aware that significant concentrations of heavy metals (e.g., lead, zinc, and cadmium) as well as some organics such as pesticides may be expected to accumulate at the bottom of these facilities.

Remove sediment when it reaches 50% of storage volume or reaches the top of the designed cleanout stake or level where applicable.

Remove trapped sediment from the basin. Removed sediment may be stabilized on site.

When the sediment pond phase has expired, clean the basin of deposited sediment and re-grade to meet the permanent basin contours if necessary. Seed or re-seed the basin in areas where bare soil is present to provide permanent stabilization.

Floating skimmers and baffles may be removed when the construction phase ends.

Preventive Measures and Troubleshooting Guide:

See Preventive Measures and Troubleshooting Guides for Temporary Surface Outlet and Baffle Sediment Basin (Section 3.1).

Multipurpose Basin

3.5 SEDIMENT DAM

A temporary sediment dam is formed by excavating a basin or by placing an earthen embankment across a low area or drainage swale. An outlet or spillway is constructed using No. 5 or No. 57 stone and Class A or B riprap aggregate to slow the release of runoff. The dam retains the runoff long enough to allow sediment to settle out.

Installation:

Construct sediment dams in accordance with the Plans, *SCDOT Standard Drawing 815-405* or as approved by the RCE.

Install a Class 2 nonwoven geotextile before installing outlet structure riprap.

For watersheds ≤ 3 acres, Class A riprap is required for the rock structure. For watersheds > 3 acres, Class B riprap is required.

Place a 6-inch layer of No. 5 or No. 57 stone on upstream face of the riprap.

Construct the rock structure with an overflow weir.

Ensure all sediment dam slopes are 3H:1V or less steep where practicable.

Mark the sediment cleanout level of dam with a stake in the field.

Seed and mulch all disturbed areas.

Embankment Requirements:

- Maximum dam height: 5 feet.
- Maximum stone height: 3.5 feet.
- Minimum rock bottom width: 3 feet.

Machine compact all embankments to ensure stability. To reduce flow rate from the dam, line the outlet with well-graded stone.

Inspection and Maintenance:

When repairs or maintenance are necessary, perform them immediately. Check sediment dams for sediment accumulation, proper drainage, and damage from erosion.

The primary maintenance consideration is the removal of accumulated sediment from the basin. This must be done periodically to ensure the dam's continued effectiveness.

Inspect the depth of the spillway and ensure that is maintained at a minimum depth of 1-foot below the low point of the dam embankment.

Remove deposited sediment when the sediment dam reaches the marked level on the sediment cleanout stake.

Remove trapped sediment from the basin; it may be stabilized on site.

Remove all temporary sediment dams within 30 days after final site stabilization is achieved or it is no longer needed.

Grade and permanently stabilize all disturbed areas resulting from the removal of the sediment dam.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Stone is clogged with the sediment/debris	Replace stone as necessary when basin fails to drain.
Spillway erodes due to high velocity flows	Replace eroded/dislodged riprap and stone.
Slope sides erode	Stabilize slopes with rock, vegetation, or equivalent method.
Excessive accumulated sediment buildup	Remove sediment to retain holding capacity.
Drainage area is too large	Ensure that the dam is designed to accommodate the inflow for the designed storm. Limit drainage contributing area. Consider other or additional BMPs.

Sediment Dam

3.6 SEDIMENT DAM FOR PIPE INLET

Sediment dams for pipe inlets are temporary BMPs used to remove sediment from construction runoff where the total drainage area is less than or equal to 2 acres that drains directly to a single pipe inlet. Sediment dams for pipe inlets are typically located inside the right-of-way.

Installation:

Construct sediment dams for pipe inlets in accordance with the Plans, *SCDOT Standard Drawing 815-406-00 or latest revision*, or as approved by the RCE.

The top of the rock dam has a minimum width (parallel to flow) of 24 inches.

Class B riprap for the rock dam should be mechanically placed and shaped.

Place a 6-inch layer of Aggregate No. 5 or No. 57 stone on the upstream face of the Class B riprap.

The maximum upstream and downstream slope of the placed riprap is 1H:1V.

Placer a Class 2 nonwoven geotextile under the riprap for erosion control.

The rock dam height should be equal to the outer diameter of the inlet pipe.

Inspection and Maintenance:

When repairs or maintenance are necessary, perform them immediately. Check sediment dams for sediment accumulation, proper drainage, and damage from erosion.

The primary maintenance consideration is the removal of accumulated sediment from behind the sediment dam. This must be done periodically to ensure the dam's continued effectiveness.

Remove deposited sediment when the sediment dam reaches the marked level on the sediment cleanout stake.

Remove trapped sediment; it may be stabilized on site.

Remove all temporary sediment dams for pipe inlets within 30 days after final site stabilization is achieved or it is no longer needed.

Grade and permanently stabilize all disturbed areas resulting from the removal of the sediment dam for pipe inlet.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Stone is clogged with the sediment/debris	Replace stone as necessary when basin fails to drain.
Spillway erodes due to high velocity flows	Replace eroded/dislodged riprap and stone.
There is excessive accumulated sediment buildup	Remove sediment to retain holding capacity.
Drainage area is too large	Ensure that the dam is designed to accommodate the inflow for the designed storm. Limit drainage contributing area. Consider other additional BMPs.

Sediment Dam for Pipe Inlet

3.7 SILT FENCE SYSTEMS

Silt fence systems are used as a temporary perimeter control around sites where there is soil disturbance due to construction activities. Silt fence systems consist of filter fabric stretched across posts. The lower edge of the fence is trenched into the ground and covered by compacted backfill.

Geotextile Filter Fabric and Steel Post System:

This silt fence system is composed of geotextile filter fabric and steel posts spaced 6 feet on center. Use geotextile filter fabric that is listed on the most recent edition of *SCDOT QPL 34*.

Use steel posts meeting the following minimum physical requirements:

- Minimum length of 5 feet and composed of high strength steel.
- Standard “T” section with a nominal face width of 1.38 inches and nominal “T” length of 1.48 inches.
- Weighs 1.25 pounds per foot (± 8%).
- Painted with a water based baked enamel paint.
- In the Lower State, has a soil stabilization plate made of 15-gauge steel with a minimum cross section area of 17 square inches attached near the bottom that is below the ground level for added stability.
- A soil stabilization plate is not required in the Upper State.
- Attach soil stabilization plates to the steel posts according to Table 9.

Table 9: Soil stabilization Plate Installation

Post Length (feet)	Top of Soil Stabilization Plate Relative to Bottom of Steel Post (inches)
5.0 and 5.5	13.0
6.0, 6.5, and 7.0	15.25
8.0	17.5
10.0	19.5

Belted Silt Retention and Wood Post System:

This silt fence system is composed of belted silt retention fabric (BSRF) filter fabric and wood posts spaced 4 feet on center. Use belted silt retention fabric (BSRF) and wood posts meeting the following minimum characteristics:

- Minimum length of 4 feet. Composed of a hardwood such as oak. Pine wood posts are not acceptable.
- Rectangular in shape with a minimum dimension of 1¼ inches by 1¾ inches.
- Has a 2-foot long, 1-inch wide, ⅜-inch thick bonding strip applied to secure the fabric to each wood post.

Installation:

Construct the silt fence system in accordance with the Plans, *SCDOT Standard Drawing 815-605-00 or latest revision*, or as approved by the RCE. Install the silt fence system before major construction in an area is started.

Install the geotextile filter fabric and steel post system and belted silt retention fabric and wood post system according to the manufacturer's specifications. Refer to *SCDOT Supplemental Technical Specification for Silt Fence Systems (SC-M-815-2) or latest revision* for installation and maintenance procedures.

Geotextile Filter Fabric and Steel Post System

Install steel posts to a minimum depth of 2 feet. Posts should protrude 1 to 2 inches minimum above the fabric, but no more than 3 feet of the post should protrude above the ground. Space steel posts on a maximum of 6-foot centers.

Attach fabric to the steel posts using heavy-duty plastic ties that are evenly spaced and placed in a manner to prevent sagging or tearing of the fabric. In all cases, ties should be affixed in no less than 4 places.

Install the fabric to a minimum height of 24 inches above the ground. When necessary, the height of the fence above ground may be greater than 24 inches.

Belted Silt Retention Fabric and Wood Post System

Install the wood posts into the ground to a minimum depth of 24 inches while allowing a minimum of 24 inches of BSRF fabric to be left above the ground.

Space the wood posts on a maximum of 4-foot centers. Tightly stretch the BSRF fabric along the inside 1¾-inch dimension of the wood post and attach the BSRF fabric to the wood post with a 2-foot long, 1-inch wide, ⅜-inch thick

bonding strip with 1½-inch by ½-inch staples. The strip is used to tightly bond the fabric to the support post, preventing tear-down from the top and adds linear support by stabilizing the fabric.

Use 4 staples to secure the BSRF fabric to the hardwood post. Install the BSRF fabric at a minimum height of 24 inches above the ground. When necessary, the height of the fabric above ground may be greater than 24 inches.

All Silt Fence Systems

Install silt fence perpendicular to the direction of flow at the proper distance from the toe of steep slopes to provide sediment storage and access for maintenance and cleanout.

Install fabric from continuous rolls cut to the length of the barrier to avoid joints. When joints are necessary, wrap fabric together at a support post with both ends fastened to the post, with a 6-inch minimum overlap.

In areas where conditions warrant, larger steel posts or reduced post spacing may be required to provide an adequate fence to handle the stress from sediment loading.

In tidal areas, extra silt fence height may be required. The steel post height will be twice the exposed post height. Steel post spacing will remain the same and extra height fabric will be 4, 5, or 6 feet depending upon average tidal change.

Install silt fence using the installation dimensions of Table 10:

Table 10: Silt Fence Systems Installation

Height of Fill	Fill Slope	Minimum Silt Fence Offset from Toe of Slope (ft)	Minimum Right of Way Offset from Toe of Slope (ft)	Check Length (feet)**
<6	2:1 to 6:1	2	3	2
6-10	2:1	12*	13*	5
	3:1	7*	8*	4
	4:1	5*	6*	3
	5:1 or 6:1	3	4	3
>10	2:1	12*	13*	5
	3:1	8*	9*	5
	4:1	6*	7*	4
	5:1 or 6:1	4	5	4

*These minimum offsets may be reduced when curb and gutter or some other feature reduces the flow of water down the slope. The smaller offsets of each group of height of fill cannot be reduced.
**Silt fence checks will have a maximum length of 5 feet or until they tie back into the slope.

Inspection and Maintenance:

Immediately correct any deficiencies noticed upon inspection.

Check for sediment buildup and fence integrity.

Check where runoff has eroded a channel beneath the fence, or where the fence has sagged or collapsed by fence overtopping.

Remove fabric and replace whenever it has deteriorated to such extent that it reduces the effectiveness of the silt fence system.

Review daily the location of silt fence systems in areas where construction activities have changed the natural contour and drainage runoff to ensure that the silt fence systems are properly located for effectiveness.

Maintain the silt fence system until its capacity has been reached or erosion activity in the area has been stabilized.

Remove sediment accumulated along the fence when it reaches approximately ⅓ the height of the fence, especially if heavy rains are expected.

Remove trapped sediment and stabilize on site.

If a silt fence system or portion of fence is located in an area where removing the sediment is not possible, install a second silt fence, if necessary.

Remove the silt fence system within 30 days after final stabilization is achieved or after temporary Best Management Practices (BMPs) are no longer needed. Permanently stabilize disturbed areas resulting from silt fence system removal.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment accumulation	Remove sediment. Stabilize or install other BMPs upstream to reduce eroded sediment.
Bottom of fence is not properly keyed in	Dig trench, place fabric, and backfill.
Length of slope draining to silt fence is too long	Shorten slope length using diversion ditches, additional silt fence runs, or other BMPs.

Field Condition	Common Solutions
Storage capacity is inadequate due to sediment buildup	Remove accumulated sediment when it reaches ⅓ the height of the barrier.
There is a lack of sufficient ponding area	Install fence with at least a 5-foot setback from the toe of the slope where possible. Divert flow at top of slope with diversion ditches.
Erosion occurs around barrier ends	Turn ends of barriers into the up-slope area every 100 feet.
Silt fence is not installed along level contour	Reinstall silt fence so that change in elevation does not exceed ⅓ the fabric height along the reach.
Slope draining to fence is too steep	Shorten slope length using slope breaks. Increase setback of silt fence from the toe of slope.
Tie backs or j-hooks not installed or installed incorrectly	Place tie backs or j-hooks at a maximum separation of 100 feet.
Posts are too far apart	Add posts a maximum of 6 feet apart.
Concentrated flows causing erosion	Place cross barrier check dams behind silt fence.

Belted Retention Fence – Wood Post

Silt Fence with Steel Post

3.8 SEDIMENT TUBES FOR DITCH CHECKS

Sediment tubes for ditch checks are temporary erosion control devices for use along contours and in drainage conveyance swales to reduce the erosive forces of stormwater runoff. Use sediment tubes listed on the most recent edition of the *SCDOT QPL 57*.

Provide sediment tubes for ditch checks that exhibit the following properties:

- Do not use straw bales, natural pine needles, leaf mulch, and/or grass clippings.
- Materials are certified 100% weed free.
- Materials are enclosed by tubular, flexible outer netting treated with ultraviolet stabilizers.
- Tubes are at least 10 feet long and have a pre-installation diameter between 18 and 24 inches.

Do not use straw, curled excelsior wood, or natural coconut rolled erosion control products (RECPs) that are rolled up to create a sediment tube for ditch checks device.

Installation:

Ensure sediment tubes for ditch checks are in complete contact with the underlying soil or underlying surface. Remove all rocks, clods, vegetation, or other obstructions that would prevent the installed sediment tubes for ditch checks from having direct contact with the underlying soil or surface.

If requested by the RCE, provide a manufacturer's representative on-site to oversee and approve the initial installation of sediment tubes for ditch checks. Provide a letter from the manufacturer approving the installation if requested by the RCE.

Construct a small U-shaped trench to a depth that is 20% of the sediment tube for ditch checks diameter. Lay the sediment tube flat in the U-shaped trench and compact the upstream sediment tube soil interface. Place and anchor the sediment tube ends so they are positioned upstream of the sediment tube center point.

Sediment tubes for ditch checks weighing more than 18 pounds per foot do not require trenching. Backfill these sediment tubes with coarse filter media on the upstream side of the sediment tube to increase the contact area with soil, increase filter size, slow down flow, capture more sediment, reduce

undercutting, and reduce installation time. Place and anchor the sediment tube ends so they are positioned upstream of the sediment tube center point.

Do not completely bury sediment tubes for ditch checks during installation. Install sediment tubes ensuring no gaps exist between the soil and the bottom of the sediment tube. Lap the ends of adjacent sediment tubes a minimum of6 inches to prevent flow and sediment from passing through the field joint. Never stack sediment tubes on top of one another.

Avoid damage to sediment tubes for ditch checks during installation. If a sediment tube becomes damaged during installation, place a stake on both sides of the damaged area terminating the tube segment and install a new tube segment.

Install sediment tubes for ditch checks in swales or drainage ditches perpendicular to the flow of water and extend them up the side slopes a minimum of 1-foot above the design flow depth. Space sediment tubes for ditch checks according to Table 11.

Table 11: Sediment Tube Spacing

Slope	Maximum Sediment Tube Spacing
Less than 2%	150 feet
2%	100 feet
3%	75 feet
4%	50 feet
5%	40 feet
6%	30 feet
Greater than 6%	25 feet

Install sediment tubes for ditch checks using wooden stakes with a minimum measured dimension of ¾-inch by ¾-inch and a maximum measured dimension of 2 inches by 2 inches, or using steel posts (1.25 lbs/ linear foot) a minimum of 4 feet in length. Use steel posts without a kick plate and painting is not required. Space posts or stakes on 2-foot centers and drive them into the ground to a depth of 2 feet or to the maximum extent practicable.

Install the stakes on the downstream third of the sediment tube.

An acceptable alternative installation is driving stakes on 2-foot centers on each side of the sediment tube and connecting them with natural fiber twine or steel wire to inhibit the non-weighted sediment tube from moving vertically. Sediment tubes can also be secured by installing the stakes on 2-foot centers in an X-crossing pattern ensuring direct soil contact at all times.

Select the sediment tubes for ditch checks length to minimize the number of sediment tubes needed to span the width of the drainage conveyance. If the required ditch check length (perpendicular to the water flow) is 15 feet, then one 15-foot sediment tube is preferred compared to two overlapping 10-foot sediment tubes.

Install sediment tubes for ditch checks over bare soil, mulched areas, or erosion control blankets.

Inspection and Maintenance:

Inspect sediment tubes after installation to ensure that no gaps exist under the sediment tubes or between the joints of adjacent ends of sediment tubes.

Repair rills, gullies, and undercutting near the sediment tubes.

Remove sediment deposits that impair the filtration capability of a sediment tube when the sediment reaches ⅓ the height of the exposed sediment tube.

Remove and/or replace installed sediment tubes as required to adapt to changing construction site conditions.

Before final stabilization, backfill all trenches, depressions, or other ground disturbances caused by the removal of sediment tubes.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Too much sediment has accumulated	Remove accumulated sediment to recover holding capacity.
There is insufficient ponding area	Space check dams farther apart. Increase height of dam.

Sediment Tube for Ditch Check

3.9 STABILIZED CONSTRUCTION ENTRANCE

A stabilized construction entrance is a temporary stone-stabilized pad with a nonwoven geotextile fabric underlining, located at defined points of vehicular ingress and egress on construction sites to reduce the amount of mud, dirt, and rocks transported onto public roads by motor vehicles, equipment, and runoff. The entrance shall have an adequate radius to prevent tracking of mud at the edge of the entrance and so that long vehicles do not leave the stabilized area when turning onto or off of the paved roadway.

Installation:

Install a stabilized construction entrance composed of a Class 2 nonwoven geotextile fabric and aggregate stone No. 1, 2, 24, or 3 as construction entrance material.

Install a stabilized construction entrance at all defined points where traffic enters or leaves a construction site and moving directly off or onto a public road.

Use construction entrances in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by vehicles.

Ensure that the stabilized construction entrance is a minimum of 24 feet wide by 100 feet long and modify as necessary to accommodate site constraints.

Place an adequate radius at the intersection with the road to prevent tracking of mud at the edge of the entrance. If washing is used, make provisions to intercept the wash water and trap the sediment before it is carried offsite.

Require washdown facilities as needed. In general, establish washdown facilities with crushed gravel and drain into a sediment trap or sediment basin.

Remove all vegetation and any objectionable material from the foundation area.

Divert all surface runoff and drainage from the stabilized construction entrance to a sediment trap or basin. Install a Class 2 nonwoven geotextile fabric before placing any stone. If necessary, install a culvert pipe across the entrance to provide positive drainage.

Place the No. 1, 2, 24, or 3 aggregate stone at a minimum depth of 6 inches uniform on top of the geotextile fabric.

Inspection and Maintenance:

Check for mud and sediment buildup and pad integrity. Wash, replace, or add stone whenever the entrance fails to perform effectively. Reshape stone pad as needed for drainage and runoff control. Brush or sweep up soil that has been tracked offsite immediately for proper disposal. Flushing should only be used when the water can be discharged to a sediment trap or basin.

Maintain the stabilized construction entrance until the remainder of the construction site has been fully stabilized.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Access points require constant maintenance.	Select proper stabilization material or consider alternate methods for longevity, performance, and site conditions.
Stone is tracked onto roadway.	Limit larger vehicles from construction exit or use larger diameter material.
Excessive sediment is tracked onto roadway.	Increase length of stabilized exit. Regularly maintain access area to remove sediment buildup.
Sediment-laden water is leaving the construction site.	Properly grade access points to prevent runoff from leaving site. Route runoff through a sediment-trapping device.

Stabilized Construction Entrance

3.10 TYPE A INLET STRUCTURE FILTER

Type A inlet structure filters are for inlets with peak flows **less** than **1 ft^3/sec**. Do not use Type A inlet filters for inlets that receive concentrated flow. Refer to *SCDOT Supplemental Technical Specifications for Inlet Structure Filters (SC-M-815-8) or latest revision.* Use filter fabric listed on the most recent edition of the *SCDOT QPL 34*. Use sediment tubes listed on the most recent edition of the *SCDOT QPL 57 and 58*.

Installation:

Install inlet structure filters in accordance with the manufacturer's written installation instructions, in compliance with these specifications and with all OSHA, local, state, and federal codes and regulations.

Filter Fabric Inlet Protection Installation

Excavate a trench 6 inches deep around the outside perimeter of the inlet unless the fabric is pneumatically installed. Extend the filter fabric a minimum of 12 inches into the trench. Backfill the trench with soil or crushed stone and compact over the filter fabric unless the fabric is pneumatically installed.

Install steel posts with a minimum post length of 5 feet consisting of standard "T" sections with a weight of 1.25 pounds per foot. Space posts around the perimeter of the inlet on maximum 2-foot centers and drive them into the ground to a depth of 2 feet or to the maximum depth practicable. Ensure the areas for post installation are compacted so the posts are properly installed.

Install the filter fabric to a minimum height of 2 feet above grade. Cut the filter fabric from a continuous roll to the length of the protected area to avoid the use of joints. When joints are necessary, wrap filter fabric together only at a support post with both ends securely fastened to the post, with a minimum 6-inch overlap. Attach fabric to steel posts with heavy-duty plastic ties. Attach a minimum of four evenly spaced ties in a manner to prevent sagging or tearing of the fabric. In all cases, affix ties in no less than four places.

Sediment Tube Inlet Protection Installation

Ensure that sediment tubes are in complete contact with the underlying soil or underlying surface. Remove all rocks, clods, vegetation or other obstructions so that installed inlet structure filters have direct contact with the underlying surface.

Install sediment tubes by laying them flat on the ground. Construct a small trench to a depth that is 20% of the sediment tube diameter. Lay the sediment tube in the trench and compact the upstream sediment tube soil interface. Do not bury sediment tubes. Install all sediment tubes so no gaps exist between

the soil and the bottom of the sediment tube. Lap the ends of adjacent sediment tubes a minimum of 6 inches to prevent flow and sediment from passing through the joint. Never stack sediment tubes on top of one another.

Install sediment tubes using wooden stakes with a minimum post length of 4 feet and a minimum measured dimension of ¾-inch by ¾-inch and a maximum measured dimension of 2 inches by 2 inches, or using steel posts (1.25 lbs/ linear foot). Use steel posts without a kick plate and painting is not required. Space posts or stakes on 2-foot centers and drive them into the ground to a depth of 2 feet or to the maximum extent practicable.

Install the stakes on the downstream ⅓ of the sediment tube.

Ensure the areas for stake installation are compacted so the posts are properly installed.

Inspection and Maintenance:

Inspect Type A inlet structure filters after installation for gaps that may permit sediment to enter the storm drainage system.

Correct any damage and perform needed repairs.

Replace the filter fabric if it becomes clogged or as directed by the RCE. Take care not to damage or undercut fabric when removing sediment.

Remove all accumulated sediment and debris from the surface and vicinity of inlet structure after each rain event or as directed by the RCE or manufacturer's representative.

Remove sediment when it reaches approximately ⅓ the height of each inlet structure filter. If a sump is used, remove sediment when it fills approximately ⅓ the depth of the hole. Maintain the pool area, always providing adequate sediment storage volume for the next storm event.

Remove, move, and/or replace inlet structure filters as required to adapt to changing construction site conditions.

Remove inlet structure filters from the site when the functional longevity is exceeded.

Dispose of inlet structure filters no longer in use at an appropriate recycling or solid waste facility.

Before final stabilization, backfill and repair all trenches, depressions and other ground disturbances caused by the removal of inlet structure filters.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment is entering the inlet	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that the barriers around the inlet are installed correctly. Use a different type of inlet protection if concentrated flows are observed.
Sediment or other debris clogs filter fabric or sediment tube	Replace filter fabric or sediment tube.
Sediment reaches ⅓ the height of the inlet filter	Remove sediment.
Ponded water causes a traffic concern	Use alternate BMPs upstream. Remove inlet protection if necessary.

Type A Inlet Filters

3.11 TYPE B INLET STRUCTURE FILTER

Type B medium flow, low velocity inlet structure filters are for inlets with peak flow rates **less** than **3 ft^3/sec**. Use Type B filters where an overflow capacity is not required. Use materials that meet the requirements set forth in the *SCDOT Supplemental Technical Specifications for Inlet Structure Filters (SC-M-815-8) or latest revision.* Provide heavy-duty wire ties to attach the wire mesh material to posts. Place Aggregate No. 5 or No. 57 stone against the hardware fabric on all 4 sides of the inlet.

Installation:

Install inlet structure filters in accordance with the manufacturer's written installation instructions, in compliance with these specifications and with all OSHA, local, state, and federal codes and regulations.

Excavate a trench 6 inches deep around the outside perimeter of the inlet.

Use hardware fabric or comparable wire mesh with maximum openings of ½-inch by ½-inch as the supporting material. Extend the fabric a minimum of 6 inches into the ground. Backfill the trench with soil or crushed stone and compact over the hardware fabric.

Install steel posts with a minimum post length of 4 feet consisting of standard "T" sections with a weight of 1.25 pounds per foot. Space the steel posts a maximum of 2 feet apart around the perimeter of the inlet and drive them into the ground to a minimum depth of 1.5 feet or to the maximum extent practicable.

Install the wire mesh fabric above grade a minimum of 1.5 feet. Use heavy-duty wire ties spaced a maximum of 6 inches apart to attach the wire mesh material to the steel posts. Place Aggregate No. 5 or No. 57 stone to a minimum height of 1-foot and a maximum height of 2 feet against all 4 sides of the hardware fabric.

Ensure the areas for post installation are compacted so the posts are properly installed.

Inspection and Maintenance:

Inspect Type B filters after installation for gaps that may permit sediment to enter the storm drainage system.

Correct any damage and perform needed repairs.

Clean when it becomes covered or clogged with deposited sediment or debris.

If the stones become clogged with sediment, pull the stones away from the inlet and clean or replace the stone. Since cleaning of gravel at a construction site may be difficult, an alternative approach is to remove clogged stone as fill and place fresh stone around the inlet. No separate measurement or payment will be made for this work.

Remove all accumulated sediment and debris from the surface and vicinity of inlet structure filters after each rain event.

Remove sediment when it reaches approximately ⅓ the height of each inlet structure filter. If a sump is used, remove sediment when it fills approximately ⅓ the depth of the hole. Maintain the pool area, always providing adequate sediment storage volume for the next storm event.

Remove inlet structure filters from the site when the functional longevity is exceeded.

Dispose of inlet structure filters no longer in use at an appropriate recycling or solid waste facility.

Before final stabilization, backfill and repair all trenches, depressions and other ground disturbances caused by the removal of inlet structure filters.

Remove all construction material and sediment and dispose of them properly. Grade the disturbed areas to the elevation of the inlet structure crest. Stabilize bare areas immediately.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment is entering the inlet	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that the inlet protection is installed correctly.
Sediment reaches ⅓ the height of the filter fabric	Remove sediment.
Filter material becomes clogged with sediment	Clean the inlet filter when it becomes covered or clogged with sediment or debris. Replace stone as necessary.
Ponded water causes a traffic concern.	Use alternate BMPs upstream. Remove inlet protection if necessary.

Type B Inlet Filters

3.12 TYPE D INLET STRUCTURE FILTER

Use Type D high flow, high velocity inlet filters for drainage areas up to **2 acres**, and for inlets where flow rates may exceed **3 ft^3/sec**. Use Type D1 filters for median applications. Use Type D2 filters for sump applications. Use Type D1 or D2 filters where an overflow capacity **is** required to prevent excessive ponding around the structure and to protect inlet structures not associated with curb inlets. Use Type D filters to protect inlet structures such as Catch Basin Type 9, yard inlets, Drop Inlet 24 inches by 24 inches, Drop Inlet 24 inches by 36 inches, and manholes.

Use a Type D inlet structure filter that meets the minimum requirements listed in the *SCDOT Supplemental Technical Specification for Inlet Structure Filters (SC-M-815-8) or latest revision*. Use Type D inlet filters listed on the most recent edition of the *SCDOT QPL 58*.

Installation:

Install inlet structure filters in accordance with the manufacturer's written installation instructions, in compliance with these specifications and with all OSHA, local, state, and federal codes and regulations.

Secure Type D inlet filters with No. 5 or No. 57 stone as ballast in lieu of soil when soil is recommended by the manufacturer. Properly install Type D inlet filters so the inlet is completely enclosed.

Inspection and Maintenance:

Inspect inlet structure filters after installation for gaps that may permit sediment to enter the storm drainage system.

Correct any damage and perform needed repairs.

Remove all accumulated sediment and debris from the surface and vicinity of inlet structure filters after each rain event.

Remove and/or replace Type D inlet filters as needed to adapt to changing construction site conditions. Clean Type D inlet filter when it becomes covered or clogged with deposited sediment or debris. When applicable, replace the Type D inlet filter material when needed.

Remove sediment when it reaches approximately ⅓ the height of each inlet structure filter. If a sump is used, remove sediment when it fills approximately ⅓ the depth of the hole. Maintain the pool area, always providing adequate sediment storage volume for the next storm event.

Remove inlet structure filters from the site when the functional longevity is exceeded.

Dispose of inlet structure filters no longer in use at an appropriate recycling or solid waste facility.

Before final stabilization, backfill and repair all trenches, depressions, and other ground disturbances caused by the removal of inlet structure filters.

Remove all construction material and sediment and dispose of them properly. Grade the disturbed areas to the elevation of the inlet structure crest. Stabilize bare areas immediately.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment is entering the inlet	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that the barriers around the inlet are installed correctly.
Sediment reaches ⅓ the height of the structure	Remove sediment.
Stone filter material becomes clogged with sediment	Pull stones away from inlet and clean them, or replace them with new stones.
Ponded water causes a traffic concern	Use alternate BMPs upstream. Remove drain inlet protection if necessary.

(Photo Courtesy of ACF Environmental)

(Photo Courtesy of SiltSaver)

Type D Inlet Filters

3.13 TYPE E INLET STRUCTURE FILTER

Install a Type E surface course curb inlet filter to protect Catch Basin Types 1, 16, 17 and 18 after the road surface course is placed. Use a Type E inlet structure filter that meets the minimum requirements listed in the *SCDOT Supplemental Technical Specification for Inlet Structure Filters (SC-M-815-8) or latest revision*. Use Type E inlet filters listed on the most recent edition of the *SCDOT QPL 58*.

Installation:

Ensure Type E filters are in complete contact with the underlying surface. Remove all rocks, clods, vegetation, or other obstructions so that installed inlet structure filters have direct contact with the underlying surface. Install Type E filters in accordance with the manufacturer's written installation instructions, in compliance with these specifications and with all OSHA, local, state, and federal codes and regulations.

Use Type E surface course inlet filters in conjunction with Catch Basin Types 1, 16, 17 and 18 after the placement of the road surface course. Place surface course inlet filters where sediment may spill over sidewalks and curbs.

Install Type E inlet filters in front of curb inlet openings and ensure that the maximum height of the filter does not completely block the inlet opening.

When applicable, fill aggregate compartments to a level (at least half full) that keeps the surface course inlet filter in place and creates a seal between the surface course inlet filter and the road surface.

Inspection and Maintenance:

Inspect inlet structure filters after installation for gaps that may permit sediment to enter the storm drainage system.

Correct any damage and perform needed repairs.

Remove all accumulated sediment and debris from the surface and vicinity after each rain event or as directed by the RCE or manufacturer's representative.

Clean Type E inlet filters when it becomes covered or clogged with deposited sediment or debris. Remove and replace Type E inlet filters as necessary to adapt to changing construction site conditions.

Remove sediment when it reaches approximately ⅓ the height of each filter.

Remove inlet structure filters from the site when the functional longevity is exceeded.

Dispose of inlet structure filters no longer in use at an appropriate recycling or solid waste facility.

Before final stabilization, backfill and repair all trenches, depressions, and other ground disturbances caused by the removal of inlet structure filters.

Remove all construction material and sediment and dispose of them properly. Grade the disturbed areas to the elevation of the inlet structure crest. Stabilize bare areas immediately.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment is entering the inlet	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that pre-fabricated BMPs are installed correctly.
Sediment reaches ⅓ the height of the structure	Remove sediment.
Filter material becomes clogged with sediment.	Pull BMPs from inlet and clean them, or replace BMPs with new filter material.
Ponded water causes a traffic concern	Use alternate BMPs upstream. Remove drain inlet protection if necessary.

Type E Inlet Filter

3.14 TYPE F INLET STRUCTURE FILTER

Use Type F inlet tubes that meet the requirements of *SCDOT Supplemental Technical Specification for Inlet Structure Filters (SC-M-815-8) or latest revision.* Use Type F inlet filters listed on the most recent edition of the *SCDOT QPL 58*.

Type F inlet tubes are classified in two categories: weighted inlet tubes and non-weighted inlet tubes.

Weighted Inlet Tubes

Provide a Type F weighted inlet tube capable of staying in place without external stabilization measures and has a weighted inner core or other weighted mechanism to keep it in place.

Pre-installed diameter is 6 - 12 inches.

Mass per unit length must be:

- 6-inch diameter = 6 lbs/ft minimum
- 12-inch diameter = 12 lbs/ft minimum

Length per tube is at least 6 feet.

Install a weighted Type F inlet tube to protect Catch Basin Types 1, 9, 12, 14, 15, 16, 17, 18, Drop Inlets 24 inches by 24 inches, Drop Inlet 24 inches by 36 inches, manholes, and trench drains with drainage areas less than **1 acre**. Place weighted Type F inlet tubes on gravel, concrete, asphalt, or other hard surfaces around drainage inlets where stakes cannot be driven. Install weighted inlet tubes where construction traffic may occur around the inlet. All weighted Type F inlet structure filters are applicable as Type E inlet structure filters.

Use both weighted and non-weighted Type F inlet tubes as weep hole inlet filters. Use non-weighted Type F inlet tubes only where stakes can be driven into the ground or subgrade to secure the tube.

Non-Weighted Inlet Tubes

Provide stakes or other means to stabilize Type F non-weighted inlet tubes to keep them safely in place.

Pre-installed diameter is 6 - 12 inches.

Mass per unit length is:

- 6-inch diameter = 1.0 lbs/ft minimum
- 12-inch diameter = 2.0 lbs/ft minimum

Length per tube is at least 6 feet.

Use non-weighted Type F inlet tubes as inlet filters for Catch Basin Types 1, 16, 17, and 18 with drainage areas less than **1 acre** where stakes or posts can be driven. Place non-weighted Type F inlet tubes on subgrade. Non-weighted Type F inlet tubes are applicable until the road base course is placed.

Use non-weighted Type F inlet tubes that are biodegradable as slope interruption devices for erosion prevention on slopes greater than 50 feet in length for HECP and temporary ECB slope applications. At the discretion of the RCE, use slope interruption devices on slope lengths less than 50 feet when slope erosion is observed.

Installation:

Install inlet structure filters in accordance with the manufacturer's written installation instructions, in compliance with these specifications, and with all OSHA, local, state, and federal codes and regulations.

Refer to *SCDOT Supplemental Technical Specification for Inlet Structure Filters (SC-M-815-8) or latest revision* for more information on installation and maintenance.

Inspection and Maintenance:

Inspect Type F filters after installation for gaps that may permit sediment to enter the storm drainage system.

Correct any damage and perform needed repairs.

Remove all accumulated sediment and debris from the surface and vicinity of inlet structure filters after each rain event.

Remove sediment when it reaches approximately ⅓ the height of each inlet structure filter. If a sump is used, remove sediment when it fills approximately ⅓ the depth of the hole. Maintain the pool area, always providing adequate sediment storage volume for the next storm event.

Remove, move, and/or replace inlet structure filters as required to adapt to changing construction site conditions.

Remove inlet structure filters from the site when the functional longevity is exceeded.

Dispose of inlet structure filters no longer in use at an appropriate recycling or solid waste facility.

Before final stabilization, backfill and repair all trenches, depressions, and other ground disturbances caused by the removal of inlet structure filters.

Remove all construction material and sediment and dispose of them properly. Grade the disturbed areas to the elevation of the inlet structure crest. Stabilize bare areas immediately.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment is entering the inlet	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that pre-fabricated BMPs are installed correctly.
Sediment reaches ⅓ the height of the structure	Remove sediment.
Filter material becomes clogged with sediment	Pull BMPs from inlet and clean them, or replace BMPs with new filter material.
Ponded water causes a traffic concern	Use alternate BMPs upstream. Remove drain inlet protection if necessary.

Weighted **Non-Weighted**

Type F Inlet Filters

3.15 TYPE G INLET STRUCTURE FILTER

Install a Type G suspended internal inlet filter for inlets with drainage areas less than **1 acre and** peak flow rates to the inlet **less** than **3 ft^3/sec.** Use Type G suspended inlet filters to protect inlet structures such as Catch Basin Type 9, yard inlets, Drop Inlet 24 inches by 24 inches, Drop Inlet 24 inches by 36 inches, and manholes. Use Type G inlet filters listed on the most recent edition of the *SCDOT QPL 58*.

Use Type G internal inlet filters that are manufactured to fit the opening of the catch basin or drop inlet. Use Type G internal inlet filters during construction to prevent silt and sediment from entering drainage systems while allowing water to pass through freely.

Use Type G suspended inlet filters that exhibit the following properties:

- Have corrosion resistant attachments to facilitate installation and emptying of the Type G inlet filter.
- Have corrosion resistant mechanisms to keep the sides of the Type G inlet filter from touching the catch basin walls.
- Supported by a corrosion resistant rigid frame keeping the inlet filter in suspension without the weight of the grate securing the inlet filter and without any above grade support.
- Have mechanisms to ensure overflow bypass when the filter is full or extreme flow rates are experienced.
- Have a minimum of 2 cubic feet sediment storage capacity.

Installation:

Install inlet structure filters in accordance with the manufacturer's written installation instructions, in compliance with these specifications, and with all OSHA, local, state, and federal codes and regulations.

Install Type G suspended internal inlet filters in accordance with the manufacturer's written installation instructions. Properly install rigid inlet protection so the inlet is completely enclosed.

Type G inlet filters are reusable. Once the construction cycle is complete, remove Type G inlet filter from the basin, and clean. Store Type G inlet filters out of the sunlight until needed on another project.

Inspection and Maintenance:

Inspect Type G filters after installation for gaps that may permit sediment to enter the storm drainage system.

Correct any damage and perform needed repairs.

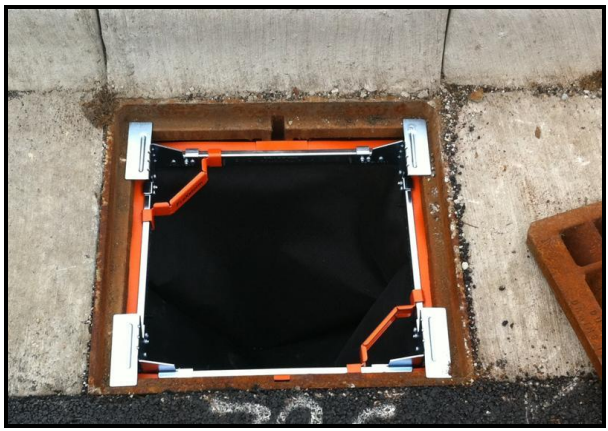
Remove accumulated sediment and debris from Type G inlet filters after each rainfall event or as directed by the RCE or the manufacturer's representative.

Remove, move, and/or replace Type G inlet filters as required to adapt to changing site conditions.

Remove Type G inlet filters from the site when the functional longevity is exceeded as determined by the RCE or the manufacturer's representative.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Excessive sediment is entering the inlet	Ensure that soil stabilization and sediment control devices are installed upstream of inlets. Ensure that pre-fabricated BMPs are installed correctly.
Filter material becomes clogged with sediment	Pull BMPs from inlet and clean them, or replace BMPs with new filter material.
Ponded water causes a traffic concern	Use alternate BMPs upstream. Remove drain inlet protection if necessary.



Type G Suspended Internal Inlet Filter

3.16 POLYMER COAGULANTS / FLOCCULANTS

Apply flocculants as directed by the RCE. Flocculants are used to treat construction stormwater runoff that contains high amounts of eroded fine silt, clay, or colloidal particles resulting in high turbidity (cloudiness) in the runoff water. The most common flocculants for stormwater treatment are polyacrylamide (PAM) and chitosan-based products.

Use a flocculant that is site specific to the exposed soil. Determine the site specific flocculant and application rate by using a flocculant as directed by the RCE.

Installation:

Always follow the specific manufacturer's application guidelines.

Flocculant is available in four media types (dry powder, liquid, emulsion, and solid). These media are introduced into stormwater runoff conveyances and treatment systems in order to enhance eroded particle settlement in a downstream sediment control structure.

Ensure a sediment basin, sediment dam, or sediment trapping structure or device is installed downstream of where flocculant is applied to reduce turbidity.

The following ***Passive Treatment Systems*** may be used as directed by the RCE on SCDOT projects where turbidity removal is required:

- Dry powder flocculant treated sediment tubes, ditch checks, or weirs installed upgrade from a sediment basin, sediment dam, or other sediment trapping structure or device.

- Application of dry powder flocculant in conjunction with mulch, straw, or erosion control blanket, directly to slopes or directly to a stormwater conveyance ditch, upgrade from a sediment basin, sediment dam, or other sediment trapping structure or device.

- Application of liquid or emulsion flocculant to slopes as part of a hydromulch practice installed upgrade from a sediment basin, sediment dam, or other sediment trapping structure or device.

- Erosion control blankets, turf reinforcement matting, and sediment tubes pre-inoculated with flocculant, installed upgrade from a sediment basin, sediment dam, or other sediment trapping structure or device.

- Mechanical, pumped, or gravity metered application of liquid and emulsion flocculant directly into the stormwater runoff conveyance ditch,

pipe or culvert upgrade from a sediment basin, sediment dam, or other sediment trapping structure or device.

- Solid flocculant blocks, logs and flats installed directly in a stormwater conveyance ditch, pipe or culvert in locations of turbulent flow and upgrade from a sediment basin, sediment dam, or other sediment trapping structure or device.

Mix and apply flocculant in accordance with all Occupational Safety and Health Administration (OSHA) Material Safety Data Sheet (MSDS) requirements and the manufacturer's recommendations for the specified use conforming to all federal, state, and local laws, rules and regulations. A manufacturer's representative is required to provide application instructions to the contractor and verify the installation according to the manufacturer's application instructions.

***Do not over apply flocculant*.** Excessive flocculant application can increase suspended solids in water. Application rates of flocculant above the results of the site specific soil tests or manufacturer's recommendation do not provide additional effectiveness.

Always apply flocculant upstream of a sediment basin, sediment dam, ditch checks, sediment tube, dewatering bag, or other sediment trapping structure or device.

Inspection and Maintenance:

After any rain event of one-half (½) inches or greater, reapply dry powder polymer used with sediment tubes, ditch checks, or weirs. Also inspect any solid flocculant applications to assess whether maintenance or replacement is necessary.

Degradation of flocculant is expected to occur as a result of high rainfall, mechanical degradation, chemical, and biological hydrolysis, sunlight, salt, and temperature effects. Reapply flocculant in accordance with the manufacturer's instructions.

Maintain all equipment to provide the application rates recommended by the manufacturer. In an approved area, rinse all equipment used to mix and apply flocculant thoroughly with water to avoid formation of residues.

Reuse or dispose recovered flocculated sediments containing flocculant in accordance with local, state, and Federal regulations.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Sediment or turbidity is not properly being controlled	Follow recommended application rates. Count number of bags, jugs, or weigh applied product to ensure correct amount is applied. Reapplication may be necessary. DO NOT over apply the flocculant. Ensure sediment trapping BMPs are working properly and are properly maintained. Add additional sediment trapping BMPs.
Application areas degrade or become ineffective	Reapply flocculant and follow recommended application rates. Consider other or additional BMPs.

Passive Flocculant Treatment System with Sediment Tubes
(Photo Courtesy of Clemson University)

3.17 DEWATERING BAGS

Use dewatering bags for dewatering operations that do not discharge to sediment dams or sediment basins. Dewatering bags are fabricated from nonwoven geotextile materials that filter sediment-laden water from dewatering operations. Sediment-laden water is pumped into the nonwoven geotextile fabric bag that allows filtered water to pass through. Use dewatering bags composed of a UV resistant, nonwoven geotextile sewn into a completely enclosed bag. Use dewatering bags sewn with high strength double stitched seams.

Installation:

Use dewatering bags listed on the most recent edition of the *SCDOT QPL 80*.

The following steps are used to select an appropriately sized dewatering bag. Consult with the RCE to select dewatering bag size if insufficient information is known about the site conditions.

1. Determine the peak flow rate generated from the dewatering pump in gallons per minute.

2. Determine the peak flow rate through the dewatering bag in gallons per minute based on the dewatering bag peak flow rate and surface area provided by the manufacturer.

3. Select a dewatering bag that passes twice as much flow generated from the dewatering pump to account for a 50% clogging factor.

Install dewatering bags on a mild slope to ensure incoming water flows downhill through the dewatering bag.

Secure the hose to bag connection using a heavy duty pipe clamp or rope. When using a rope to attach the pump hose to the dewatering bag, make a minimum of 6 wraps around the hose over a 6-inch width of the bag, and fasten with a secure rope knot.

The bottom area of dewatering bags will not allow flow to pass through when the bag is placed on a low-permeable or impermeable surface. Place the dewatering bag on an aggregate, hay bales, or other highly permeable surface to maximize water flow through the entire surface area of the bag.

Dispose of the dewatering bag as directed by the RCE. If allowed, the dewatering bag may be cut open and the contents seeded after removing the fabric. Securely tie off the pump hose connection sleeve when transporting full dewatering bags for disposal. Do not clean and reuse a dewatering bag after the voids are clogged with trapped sediment.

Inspection and Maintenance:

Monitor the dewatering bag at all times while the pump is running. While monitoring, ensure the hose to bag connection is secure with only minimal leaking. Check for flow permeating from the bottom surface of the dewatering bag. If flow appears restricted, move bag to a surface with higher permeability.

Follow all manufacturer recommendations for inspection and maintenance guidelines.

Dewatering bags are full when they no longer efficiently filter sediment or pass water at a reasonable rate. Incoming flow rates will vary depending on the size of the dewatering bag, the type and amount of sediment discharged into the dewatering bag, the permeability of the underlying aggregate, and the degree of slope on which the bag lies.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Discharge or treated water causes erosion	Install outlet protection or velocity dissipation device.
Treatment unit fills with sediment	Discontinue pumping the full dewatering bag and begin using a new bag.
Dewatering discharge flow is higher than expected	Alter the treatment unit to handle increased flow.
Water spread on the construction site is not infiltrating fast enough and is entering the storm drain system or receiving water body	Stop dewatering. Install a sediment treatment system and test discharge as necessary.

Dewatering Bags

3.18 PERIMETER CONTROL

Perimeter control is used as a temporary sediment control practice around the perimeter of sites where there will be soil disturbance due to construction activities. Perimeter control consists of a barrier supported by posts. Perimeter control is used as a sediment control practice for sheet flow runoff conditions. Perimeter control should not be used for areas receiving concentrated flow.

Installation:

Use perimeter control listed on the most recent edition of the *SCDOT QPL 84*.

Straw bales, natural pine needle bales, leaf mulch, and/or grass clippings should not be used as perimeter control.

Perimeter control should be installed perpendicular to the direction of flow.

If trenching of perimeter control material is required, a trench should be excavated approximately 6 inches wide and 6 inches deep, the perimeter control material is placed into the 6-inch deep trench, extending the remaining 6 inches towards the upslope side of the trench.

Perimeter control is installed in continuous lengths to avoid joints. When joints are necessary, the ends of adjacent perimeter control should be lapped with a minimum 6-inch overlap to prevent flow and sediment from passing through the field joint.

When using sediment tubes for perimeter control ensure the minimum installed sediment tube height is 18 inches above the ground.

The posts should be installed in the middle, on the downstream third of the sediment tubes for perimeter control, or install posts per the manufacturer's recommendation.

Inspection and Maintenance:

Inspect perimeter control after installation to ensure that no gaps exist under the perimeter control or between the joints of adjacent ends of sediment tubes.

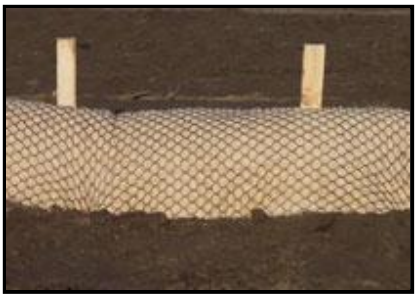
Sediment deposits should be removed that impair the sediment control capability of the perimeter control and when the sediment reaches ⅓ of the height of the exposed perimeter control.

Installed perimeter controls should be removed and/or replaced as required to adapt to changing construction site conditions.

Perimeter controls should be removed within 30 days after final stabilization is achieved or after temporary Best Management Practices (BMPs) are no longer needed.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Erosion beneath perimeter control	Repair rills, gullies, and undercutting near perimeter control that may be causing concentrated flow.
Sediment build-up on perimeter control	Remove sediment if possible. Install additional perimeter control if unable to access and remove sediment on previous installation.
Runoff pattern and site conditions have changed	Install additional perimeter controls.



Perimeter Control

3.19 ROCK DITCH CHECK

A rock ditch check is a small, temporary, or permanent rock fill dam constructed across a drainage ditch, swale, or channel to lower the speed of concentrated flows.

Installation:

Never place ditch checks in live USGS blue line streams.

Ditch checks are not applicable for draining areas greater than 2 acres.

Use Class A 6-inch D_{50} riprap for the main body of the ditch check. Place a Class 2 nonwoven geotextile fabric beneath the riprap prior to installation of the riprap. Place a uniform 6-inch layer of aggregate No. 5 or No. 57 stone on the upstream face of the riprap.

Place rock by hand or mechanical placement (no dumping of rock to form dam) to achieve complete coverage of the ditch or swale and to ensure that the center of the check is lower than the edges.

Ensure the slopes of the ditch check are no steeper than 2H:1V, but slopes may be flattened due to traffic safety as directed by the RCE.

Ensure the rock ditch check height does not exceed a height of 2 feet at the centerline of the channel.

Ensure the rock ditch check has a minimum top flow length of 2 feet.

Ensure the center of the ditch check dam is lower than its edges.

Place stone over the channel banks to prevent water from cutting around the ditch check.

Ensure the maximum spacing between ditch checks is such that the elevation of the toe of the upstream check is at the same elevation as the top of the next downstream ditch check.

Inspection and Maintenance:

Remove large debris, trash, and leaves.

If erosion causes the edges to fall to a height equal to or below the height of the center, make repairs immediately.

Remove accumulated sediment from the upstream side of the ditch check when the sediment has reached a height of approximately ½ the original height of the dam (measured at the center).

Remove accumulated sediment prior to removing the ditch check.

Remove ditch checks only after the contributing drainage area has been completely stabilized.

Before final stabilization, backfill all trenches, depressions, or other ground disturbances caused by the removal of ditch checks.

Clear all rock and gravel from vegetated areas before attempting to mow the grass between ditch checks. Failure to remove stones and gravel can result in serious injury from flying debris.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Too much sediment has accumulated	Remove accumulated sediment to recover holding capacity.
There is insufficient ponding area	Space check dams farther apart. Increase height of dam.
The check dam is higher than the drainage channel	Lower check dam so that it is 6 inches lower than the channel side.
Check dams wash away	Use larger stone for the body of the check dam. Decrease check dam spacing by adding more dams.
Wrong type of materials is used to construct check dam	Use larger stones. Do not use straw bales or silt fence for checks.

Rock Ditch Check

3.20 ENHANCED STACKED DITCH CHECK

Use enhanced stacked ditch checks listed on *SCDOT QPL 99* as temporary erosion prevention and sediment control devices in drainage conveyance swales and ditches to reduce the erosive forces of stormwater runoff and allow for sedimentation of eroded particles.

Installation:

Never place ditch checks in live USGS blue line streams.

Ditch checks are not applicable for draining areas greater than 2 acres.

If requested by the RCE, provide a manufacturer's representative on-site to oversee and approve the initial installation of enhanced stacked ditch checks. Provide a letter from the manufacturer approving the installation if requested by the RCE.

Install by placing two bottom support tubes over an installed TRM or Fabric covered trench. Place one top tube on top of the supporting tubes, forming a pyramid type structure.

Place and anchor ends so they are positioned upstream of the enhanced stacked ditch check center point.

Extend enhanced stacked ditch check tubes up the side slopes a minimum of 1-foot above ditch check weir height.

Install using 5-foot minimum length steel posts on maximum 2-foot centers driven a minimum of 2 feet in the ground or to the maximum extent practicable for site conditions.

Only install posts through pre-installed post holes or pre-installed external post attachment structures on the downstream side of the enhanced stacked ditch check. Do not install posts through enhanced stacked ditch check tubes. Install posts at a 60 degree angle with the top of the post pointing upstream.

Ensure the enhanced stacked ditch check height is within the acceptable range of 15 inches to 24 inches.

Ensure the maximum spacing between enhanced stacked ditch checks is such that the elevation of the toe of the upstream check is at the same elevation as the top of the next downstream ditch check.

Select the enhanced stacked ditch check length to minimize the number of tubes needed to span the width of the drainage conveyance. If the required ditch check length (perpendicular to the water flow) is 15 feet, then one 15-foot sediment tube is preferred compared to two overlapping 10-foot tubes.

Inspection and Maintenance:

Remove large debris, trash, and leaves.

Repair rills, gullies, and undercutting near the enhanced stacked ditch check.

Remove sediment deposits that impair the filtration capability of the enhanced stacked ditch check when the sediment reaches ⅓ the height of the exposed enhanced stacked ditch check.

Remove and/or replace installed enhanced stacked ditch checks as required to adapt to changing construction site conditions.

Remove enhanced stacked ditch checks only after the contributing drainage area has been completely stabilized.

Before final stabilization, backfill all trenches, depressions, or other ground disturbances caused by the removal of enhanced stacked ditch checks.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Too much sediment has accumulated	Remove accumulated sediment to recover holding capacity.
There is insufficient ponding area	Space check dams farther apart. Increase height of dam.

Enhanced Stacked Ditch Checks

3.21 FLOATING TURBIDITY BARRIER

A floating turbidity barrier is a synthetic fabric barrier which is suspended within a body of water, supported by floatation material on the top edge, and held in a vertical position by a ballast on the posterior edge.

Turbidity barriers are designed to restrict the flow of sediment laden runoff from a land disturbance, to keep it confined to a limited area, and to allow the silt and sediment to be trapped and settle. They are designed to prevent the spread of sediment into downstream or connecting surface waters by keeping the material in a static holding area until it can settle.

Installation:

Place floating turbidity barrier at the location shown on the Plans and in accordance with the manufacturer's recommendations.

Anchor the ends on the undisturbed shoreline with sufficient support to secure the barrier in place during turbulent conditions.

Place vertical supports and/or anchors along the barrier as necessary to prevent the barrier from drifting. Maintain the floating turbidity barrier until all disturbed areas have been stabilized sufficiently.

If requested by the RCE, provide a manufacturer's representative on-site to oversee and approve the initial installation of floating turbidity barriers. Provide a letter from the manufacturer approving the installation if requested by the RCE.

Do not use floating turbidity barriers in current velocities greater than 2 feet per second unless there are exceptional circumstances and special designs are considered.

Place floating turbidity barriers parallel to the direction of flow of a moving body of water. Never place them across the entire width of a river or stream.

Use floating turbidity barriers with a bright color (typically yellow or orange) that attracts the attention of nearby boaters. Use lighted buoys in areas trafficked by boaters. Buoys used for floating turbidity barriers will comply with the South Carolina Department of Natural Resources law enforcement buoy specifications.

Inspection and Maintenance:

Follow manufacturer's recommendations for maintenance activities. Maintenance generally consists of making sure the barrier is positioned correctly and functioning to contain high turbidity runoff.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
High turbidity water is escaping the barrier	Locate problem area and repair barrier.
Barrier is not in correct position	Check for loose barrier anchors. Re-anchor into correct position.
Gaps exist at ends or joints of barrier	Close gaps so that barrier is secure at ends and at all joints.
Barrier is not floating	Check for debris or tangled anchor lines holding the barrier down. Remove debris and ensure anchors are installed correctly.
Barrier becomes loose or damaged due to wind, waves, or flow of water	Consider a more robust type of floating turbidity barrier that will function under site conditions.

Floating Turbidity Barrier

4.0 STORMWATER RUNOFF CONTROL BMPs

The following Stormwater Runoff Control Measures are discussed in this Field Manual in the indicated Sections. Drawings and details for these BMPs are located at the end of the Field Manual in Section 11.0.

4.1 Pipe Slope Drain

4.2 Runoff Diversion Measures

4.1 PIPE SLOPE DRAINS

Refer to the *2007 SCDOT Standard Specifications for Highway Construction, Section 803, or latest revision* for material specifications and installation requirements. Install on shoulders, slopes, and at other locations to convey surface runoff down the face of slopes without causing erosion. Slope drains intercept and direct surface runoff into a drainage system, trapping device, or stabilized area. In the appropriate application, pipe slope drains significantly reduce rill and gully erosion on slopes. Use single pipe slope drains for drainage areas up to 1 acre.

Classified into two categories depending on installation and material used:

1. Permanent pipe slope drains (typically corrugated aluminum alloy pipe, PVC pipe, or non-perforated corrugated HDPE pipe).
2. Temporary flexible pipe slope drains (typically non-perforated corrugated HDPE pipe).

Installation:

Construct pipe slope drains in conformance with details on the Plans and at locations designated by the RCE. Perform all construction in accordance with applicable provisions and requirements in the *2007 SCDOT Standard Specifications for Highway Construction, Section 714 or latest revision*.

Fasten pipe joints together with resilient water-tight pipe connectors, bands, couplings, and gaskets to prevent separation for all permanent and temporary flexible pipe slope drains.

Install diversion berms, dikes, sandbags, or other runoff conveyance measures to direct runoff towards and into pipe slope drains.

Ensure the berm height or runoff conveyance measure around the pipe inlet is at least 0.5 feet higher than the top of pipe. Compact and stabilize the berm or runoff conveyance measure at the pipe inlet to prevent erosion.

Provide inlet stabilization with a fabricated metal intake spillway assembly, ECBs, TRM, sand bags, riprap, or other applicable erosion control practice.

Install a shallow sump at the pipe inlet to prevent pipe blockage from sediment and debris.

At 10-foot maximum spacing intervals, place hold down stakes on each side of the pipe at 45 degree angles to secure pipe to the slope surface. Use 4-foot minimum length wooden stakes with minimum measured dimensions of ¾-inch by ¾-inch and maximum measured dimensions of 2 inches by 2 inches, or 4-foot minimum length steel posts (1.25 lbs/ linear foot). Use steel posts without a kick plate and painting is not required. Drive stakes into the ground to a depth of 2 feet or to the maximum extent practicable.

Extend pipe at least 4 feet beyond toe of slope and provide non-erosive discharge using a flared pipe end section, TRM, riprap, or other applicable erosion prevention practice.

Direct all flows conveying sediment-laden water to a sediment control BMP.

Inspection and Maintenance:

Ensure soil around the pipe entrance is fully compacted or use sandbags to prevent bypassing and undercutting of the structure.

Inspect pipe to ensure no clogging exists. If pipe clogging is a continuing problem, place a screen or grate at the pipe slope drain inlet.

Ensure appropriate outlet protection is installed to prevent erosion.

Remove temporary pipe slope drains within 30 days after final site stabilization is achieved or after the temporary BMP is no longer needed.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Pipe separates	Reconnect pipe sections. Securely anchor pipe to soil. Ensure pipe connections are watertight.
Pipe outlet erodes	Repair damage and stabilize with a flared end section, riprap, TRM, or velocity dissipation device. If necessary, reduce flows being discharged.
Erosion occurs around inlet	Compact soil and stabilize area with flared end section, TRM, or filter fabric and riprap. Re-grade around inlet to reduce the gradient angle.
Slope drain overtops	Decrease drainage area, increase pipe diameter, or add additional pipes to carry flows.

Pipe Slope Drain Inlet with Berm

Pipe Slope Drains

4.2 RUNOFF DIVERSION MEASURES

Diversion dikes and berms (ridges of compacted soil) are used to divert upstream/upslope clean water runoff from crossing areas where there is a high risk of erosion.

Temporary silt ditches or swales (excavated depressions) are used to prevent sediment laden runoff from leaving the site before being treated by a sediment control BMP.

Runoff diversion structures may be used for temporary or permanent clean water stormwater control or temporary sediment laden stormwater control.

Installation:

Construct and stabilize diversion structures using vegetation, sod, and ECBs or TRM before any major land disturbing activity takes place.

The top width of diversion dikes is at least 2 feet wide. The bottom width at ground level is typically 8 feet.

The minimum height for earthen dikes is 1.5 feet, with side slopes no steeper than 2H:1V.

Minimize construction traffic over diversion dikes and berms. However, for points where vehicles must cross the dike, the slope should be no steeper than 3H:1V and construct the mound with gravel rather than soil.

Temporary silt ditches may be trapezoidal (0- to 2-foot bottom width) or V-shaped.

The minimum depth for silt ditches is 1-foot, with side slopes no steeper than 2H:1V.

Prior to swale excavation or dike building, clear and grub all trees, brush, stumps, and other objects in the path of the diversion structure.

Ensure the minimum constructed cross section meets all dimensions shown on the Plans.

Immediately after construction establish vegetation by placing an ECB on the diversion dikes and silt ditches.

Ensure the upslope side of the dike provides positive drainage so no erosion occurs at the outlet. Provide energy dissipation measures as necessary.

Discharge sediment laden runoff to a sediment trapping BMP.

Inspection and Maintenance:

Repair any damage caused by construction traffic or other activities before the end of each working day.

Maintain dikes and ditches at the original height or depth and repair any decrease in height or depth due to settling or erosion immediately.

To remain effective, earthen dikes must be compacted at all times.

Preventive Measures and Troubleshooting Guide:

Field Condition	**Common Solutions**
Dikes wash out	Re-grade, compact and stabilize the soil used to build earthen dikes.
Area behind dikes erode	Stabilize the area. Use other BMPs to stabilize the uphill side of the dike.
Concentrated flow causes erosion	Stabilize area and use check dams, ECBs, TRMs or riprap to prevent erosion.
Ditches and swales erode due to high velocity flows	Stabilize and use check dams, ECBs, TRMs or riprap to prevent erosion.
Ditches and swales are overtaken by flows	Determine the upstream contributing areas and size ditches and swales to handle anticipated flow velocities.
Outlet erodes	Re-grade and stabilize outlet with ECBs, TRMs, riprap, or other stabilization BMPs.

Temporary Silt Ditch

5.0 POST-CONSTRUCTION WATER QUALITY CONTROLS

The following post-construction water quality BMPs are discussed in this Field BMP Manual. Drawings and details for these BMPs are located at the end of the Field Manual in Section 11.0.

5.1 Grassed Channels and Swales

5.2 Vegetated Filter Strips

5.3 Stormwater Manufactured Treatment Devices (MTDs)

5.4 Dissolved Oxygen Enhancement Structures

5.5 Dry Detention Basins

5.6 Wet Detention Basins

5.7 Infiltration Trench

5.8 Bioretention Areas

5.9 Bio-Swales

5.1 GRASSED CHANNELS AND SWALES

Grassed channels and swales are designed and installed as a stormwater conveyance system. Grassed channels and swales improve water quality by providing pollutant removal as runoff is filtered by the vegetation and by the opportunity to infiltrate the runoff into the underlying soil layer. Grassed channels and swales also reduce flow velocities in comparison to hard piping systems. Grassed channels and swales require continual permanent vegetative cover in order to provide adequate treatment of runoff. Grassed channels and swales are not designed to treat DOT Right-of-Way (ROW) drainage areas greater than 5 acres. Large drainage areas may be divided into sub-watersheds and treated using multiple grassed channels and swales.

Installation:

Grassed channels and swales should not be installed when the contributing area is not completely stabilized or is periodically being disturbed.

Earthen flow control structures in grassed channels and swales should be installed in accordance to Table 13 on the following page.

The body of the earthen flow control structure may be installed using grassed earthen berms to a height 0.5 feet above the channel bottom with a minimum top flow length of 1-foot. The upstream and downstream slopes of the earthen flow control structure should not be steeper than 2H:1V.

A forebay and/or energy dissipation may be provided at pipe inlets to grassed channels and swales where applicable.

The minimum channel length is 100 feet in order to achieve water quality benefits. If site constraints do not allow 100 feet, vegetated swales with a slope less than or equal to 1% and a DOT ROW drainage area less than or equal to 0.5 acres may be 75-feet long with a minimum of five (5) earthen flow control structures.

Ensure excavation minimizes the compaction of the bottom of grassed channels and swales.

Grassed channels and swales should be planted with a permanent turf type grasses as outlined in *SCDOT Supplemental Technical Specification for Seeding (SC-M-810-4) or latest revision*.

Grassed channels and swales should have 1-foot of freeboard distance above the 10-year, 24-hour storm water surface elevation, if site conditions allow.

Provide a 2-foot minimum bottom width. V-shaped ditches shall not be used.

Table 13: Earthen Flow Control Structures Requirements

Maximum DOT ROW Drainage Area (acres)	Maximum Vegetated Channel Longitudinal Slope	Number of Earthen Flow Control Structures Required	
		Upper State	Lower State
0.25	≤ 0.5%	3 per 100 ft	
	1.0%		
	2.0%	5 per 100 ft	5 per 100 ft
	4.0%		
	6.0%	7 per 100 ft	
0.50	≤ 0.5%	5 per 100 ft	
	1.0%		
	2.0%	6 per 100 ft	
	4.0%		
1.00	≤ 0.5 – 4.0%	6 per 100 ft	
2.00	≤ 0.5 – 4.0%	7 per 100 ft	
3.00	≤ 0.5 – 4.0%	8 per 100 ft	
4.00	≤ 0.5 – 4.0%	9 per 100 ft	
5.00	≤ 0.5 – 1.0%	10 per 100 ft	9 per 100 ft
	2.0 – 4.0%		10 per 100 ft

Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of grassed channels and swales. Typical maintenance responsibilities include:

- Mow grass within swales at least twice during the growing season to maintain a maximum height of approximately 6 inches.
- Repair erosion, rills, and gullies inside the channel.
- Remove accumulated sediment as necessary.
- Grass channels may periodically require aeration of the channel bed in order to increase the permeability of the system.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solutions
Channel or swale fails to drain	Ensure the minimal channel slope is achieved. Aerate the area if needed.
Channel bed eroding	Use other BMPs such as TRM to stabilize the area.
The earthen flow control structure is higher than the drainage channel	Lower flow control structure so that it is 6 inches lower than the channel side.
Sedimentation in the channel	Remove sediment build-up within the grass channel.

Grassed Channels and Swales

5.2 VEGETATED FILTER STRIPS

Vegetated filter strips (VFS) are vegetated surfaces that are designed to treat sheet flow from adjacent surfaces. Vegetated filter strips function by slowing runoff velocities and filtering out sediment and other pollutants, and by providing some infiltration into underlying soils. For SCDOT applications, a grassed shoulder receiving sheet flow from a paved surface will function as the VFS.

Installation:

Vegetated filter strip construction should only begin after the up-gradient site has been sufficiently stabilized and temporary erosion and sediment control measures are in place.

The filter strip should have the following minimum flow length:

Table 14: Minimum Flow Length of Vegetated Filter Strip

Width of Road Draining to Filter Strip (ft)	Minimum Width of VFS (ft)	
	Upper State	Lower State
12*	4*	4*
24	8	6
36	16	10
*If 4 feet of VFS is not possible, 2 feet may be used.		

For an effective vegetated filter strip, it is essential to prepare the soils properly and plant and maintain a dense, vigorous stand of permanent vegetation.

Ensure concentrated flows do not discharge to the VFS, as they lead to erosion and failure of the system.

A small trench filled with pea gravel running along the top slope of the filter strip serves two purposes. First, it acts as a pretreatment device, settling out sediment particles before they reach the practice. Second, it acts as a level spreader, maintaining sheet flow as runoff flows over the filter strip.

Inspection and Maintenance:

Maintenance is very important for VFS, particularly in terms of ensuring that flow does not short circuit the practice. They require similar maintenance to

other vegetative practices. The following list includes recurring maintenance and operation activities that are required to maintain a functional filter strip:

- Inspect vegetation for rills and gullies annually. Rills and gullies should be corrected and bare areas seeded or sodded.
- Inspect grass after installation to ensure that it has established. If not, it should be replaced with an alternative species.
- VFS should be mowed as needed during the growing season.

Preventive Measures and Troubleshooting Guide:

Field Condition	Common Solution
Grass is too short or too long (if applicable)	Maintain grass at a height of approximately 3 to 6 inches.
Areas of bare soil and/or erosive gullies have formed	Re-grade the soil if necessary to remove the gully, and then plant a ground cover and water until it is established. Provide lime and a one-time fertilizer application.
Sediment is building up on the filter strip	Remove the sediment and re-stabilize the soil with vegetation if necessary. Provide lime and a one-time fertilizer application.
Grass is dead, diseased, or dying	Determine the source of the problem: soils, hydrology, disease, etc. Remedy the problem and replace plants. Provide a one-time fertilizer application.

Vegetated Filter Strips

5.3 STORMWATER MANUFACTURED TREATMENT DEVICES (MTDs)

Stormwater manufactured treatment devices (MTDs) function as stormwater treatment devices before stormwater runoff is discharged to Best Management Practices (BMPs) off-site, or to receiving water bodies and may be incorporated into a series of water quality BMPs to remove pollutants from stormwater runoff.

Type 1 and 3 MTDs should be selected from *SCDOT QPL 78.* (Type 3 MTD shall only be used in limited areas)

SCDOT allows two types of MTDs:

1. MTD Type 1 - Separation Devices (Standard Stormwater MTD). Contains a sump for sediment deposition with a series of chambers, baffles, or weirs to trap trash, oil, grease, and other contaminants.

2. MTD Type 3 - Catch Basin Inserts (Limited Space). MTD Type 3 must provide overflow features that do not reduce the original hydraulic capacity of the catch basin.

Installation:

MTDs are applicable for a maximum drainage area of 3 acres.

Proper site preparation is essential for MTD installation. The site should be prepared per the Plans, Specifications, and the manufacturer's instructions.

Ensure the MTD is placed and leveled according the manufacturer's requirements and to the elevations shown on the Working Drawings and Plans.

A manufacturer's representative is required to provide specific MTD assembly instructions to the contractor and verify the assembly for each of the manufacturer's specific MTDs according to the manufacturer's design and assembly instructions.

Perform precast MTD Type 1 excavation, bed preparation, backfilling, and compaction as required by the *2007 SCDOT Standard Specifications for Highway Construction, **Section 719** or latest revision*.

Ensure proper site stabilization is achieved so MTDs function as designed. Do not use MTDs to trap eroded sediment from construction operations, unless the manufacturer has approved such use in writing. Install MTDs as the last stormwater runoff structures installed on site, or keep these MTDs off-line or isolated until final stabilization is achieved.

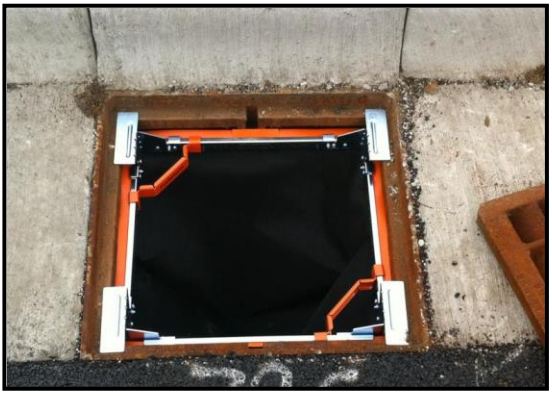
Inspection and Maintenance:

SCDOT owned stormwater MTDs are maintained by a 3rd party contractor.

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Inspect MTDs	Semi-annually
Sediment removal from MTDs	As needed
Debris removal	As needed
Trim vegetation if applies	As needed

Type 1 MTDs



Type 3 MTD

5.4 DISSOLVED OXYGEN ENHANCEMENT STRUCTURES

Dissolved oxygen enhancement structures are enhanced riprap structures and aeration pads which provide aeration of stormwater runoff as it flows through and across the structure, causing an increase to dissolved oxygen levels. Use dissolved oxygen enhancement structures in medians and drainage conveyance swales or ditches as an enhancement to vegetated swales when discharging to impaired water bodies impaired for Dissolved Oxygen (DO). Dissolved oxygen enhancement structures are used to improve water quality and do not provide stormwater runoff volume control.

Installation:

Do not install dissolved oxygen enhancement structures on sites where the contributing area is not completely stabilized or is periodically being disturbed.

Ensure installation minimizes the compaction of the bottom of dissolved oxygen enhancement structures. Operate excavators and backhoes on the ground adjacent to dissolved oxygen enhancement structures or use low ground-contact pressure equipment. Do not operate heavy equipment on the bottom of dissolved oxygen enhancement structures.

Typical dissolved oxygen enhancement structures have a minimum bottom width between 2 and 8 feet. Exact dimensions will be dictated by channel dimensions. See *SCDOT Standard Drawing 815-007-00 or latest revision* for dimensions and design guidance.

Flow enters dissolved oxygen enhancement structures through conveyance channels. Place enhanced riprap structures perpendicular to the flow path to promote aeration of stormwater flows. Install an aeration pad on the downstream side of the structure. Place the enhanced riprap structure at the final stormwater runoff outfall point prior to the discharge to the receiving water body.

Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of dissolved oxygen enhancement structures. Typical maintenance responsibilities include:

- Keep a record of the average de-watering time of the dissolved oxygen enhancement structures to determine if maintenance is required.
- Remove trash and debris periodically as needed.
- Remove sediment build-up as needed.

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Inspect side slopes for erosion and repair	Annually, or as needed
Inspect channel bottom for erosion and repair	Annually, or as needed
Remove trash and debris	Annually
Inspect for clogging and correct the problem	Annually
Remove sediment build-up upstream of the Dissolved Oxygen Enhancement Structure	As needed, after 25% of the original design volume has filled

Dissolved Oxygen Enhancement Structures

5.5 DRY DETENTION BASINS

A dry detention basin does not maintain a permanent pool and is intended to manage both the quantity and quality of stormwater runoff before discharging. Stormwater runoff enters a dry detention basin through one or more inlets that discharge into a forebay that is designed to settle out larger sediment. The runoff then passes over a forebay berm and into the main dry detention basin. Runoff exits the basin through the principal spillway. In the case of extreme rainfall events, an emergency spillway is included in the design in order to safely pass high flow rates.

Installation:

Basins should be constructed before any grading takes place within the drainage area.

Key and core is required on all embankments.

The riser should be placed at the deepest point of the basin.

An anti-vortex device or trash rack is placed over the primary riser pipe to prevent trash and debris from entering and clogging the spillway.

The maximum depth is 10 feet without requiring a geotechnical slope stability analysis.

The basin bottom has a minimum slope of 0.5% and an optimal slope of 2%.

The optimal ratio of flow length to flow width is 3L:1W. Due to site constraints, the minimum allowable design ratio of flow length to flow width is 1.5L:1W.

Low flow channels may be used to prevent standing water for dry basins in areas with low permeable soils.

All inlets to dry detention basins should include a forebay for pre-treatment.

Inspection and Maintenance:

SCDOT owned dry detention basins are typically maintained by a 3rd party contractor.

Sediment deposition should be continually monitored in the basin. Concentrations of heavy metals (e.g., lead, zinc, and cadmium), as well as some organics such as pesticides, may accumulate at the bottom of these facilities.

Remove sediment when it reaches 50% of storage volume or reaches the top of the designed cleanout stake or level where applicable.

Inlets and spillway structures should be kept clear of vegetation and debris. Root growth from wooded vegetation can damage inlet pipes and spillway structures.

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Clean and remove debris from inlet and outlet structures	After large storm events
Mow side slopes	As needed
Removal of invasive vegetation	Semi-annually
Inspect for damage to outlet control structure	Annually
Inspect for sediment accumulation in the basin and forebay	Annually
Inspect for operational inlet and outlet structures	Annually
Repair embankment, side slopes, undercut or eroded areas	Annually, or as needed
Pesticide/ Nutrient management	Annually, or as needed
Remove sediment from the forebay	Per design cycle (typical 5-10 year maintenance) after 50% of total forebay capacity is filled
Remove sediment accumulations from the main permanent pool	Per design cycle (typical 5-10 year maintenance) after 25% of permanent pool volume is filled

Dry Detention Basins

5.6 WET DETENTION BASINS

A wet detention basin can manage both the quantity and quality of stormwater runoff before discharging off-site. The minimum drainage area for wet detention ponds ranges from 10-25 acres, depending on the specific wet detention application.

Stormwater runoff enters a wet detention basin through one or more inlets that discharge into a forebay that is designed to settle out larger sediment. The runoff then passes over a forebay berm and into the main wet detention basin, becoming part of a combined temporary and permanent storage. The temporary water quality storage volume drains from the wet detention basin over a minimum period of 24 hours. Permanent storage remains in the wet detention basin, where natural processes facilitate both settling and nutrient reduction of the water contained within the wet detention basin.

Installation:

In general, pond designs are unique for each site and application.

Follow the Plans for specific pond installation.

The low flow (water quality) orifice should be equipped with a trash guard.

An anti-vortex device or trash rack is placed over the primary riser pipe to prevent trash and debris from entering and clogging the spillway.

A sediment marker should be placed in the forebay to determine when sediment removal is required.

All inlets to the basins should include a forebay for pre-treatment.

Inspection and Maintenance:

SCDOT owned wet detention basins are typically maintained by a 3rd party contractor.

Regular inspection and maintenance is critical to the effective operation of stormwater ponds as designed.

Since decomposing vegetation captured in the wet pond can release pollutants, especially nutrients, it may be necessary to harvest dead vegetation annually. Otherwise the decaying vegetation can export pollutants out of the pond and also can cause nuisance conditions to occur.

Debris should be cleared from all inlet and outlet structures monthly.

All eroded or undercut areas should be repaired as needed.

Sediment accumulations in the main pond area should be monitored and sediment should be removed when the permanent pool volume has been significantly filled and/or the pond becomes eutrophic.

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Clean and remove debris from inlet and outlet structures	Monthly, or after large storm events
Mow side slopes	Monthly, or as needed
Removal of invasive vegetation	Semi-annually
Inspect for damage to control structure	Annually
Inspect sediment accumulation in the facility and forebay	Annually
Inspect for operational inlet and outlet structures	Annually
Repair embankment, side slopes, undercut or eroded areas	Annually, or as needed
Perform wetland plant management and harvesting	Annually
Remove sediment from the forebay	Per design cycle, as needed, after 50% of total forebay capacity is filled
Remove sediment accumulations in the main permanent pool	5 to 10 year cycle, after 25% of the permanent pool volume is filled

Wet Detention Basins

5.7 INFILTRATION TRENCH

Infiltration trenches are excavations filled with stone to create an underground reservoir to manage stormwater runoff. Use individual infiltration trenches for drainage areas up to 2 acres in size.

Stormwater runoff enters the infiltration trench, is temporarily stored, and gradually exfiltrates through the bottom and sides of the trench into the subsoil. Infiltration trenches fully de-water within a 24- to 72-hour period depending on trench dimensions and soil type.

Installation:

Infiltration trenches should be used on sites where the drainage area will remain well stabilized after the construction phase to prevent excess sediment and debris from clogging the facility.

Infiltration trenches should not be installed on a site until the contributing drainage area is completely stabilized.

Infiltration trenches should not be placed in fill material because piping along the fill-natural ground interface may cause slope failure.

Stone fill media should consist of 1.0- to 2.5-inch D_{50} crushed stone with 6 inches of pea gravel located on top separated by a Class 2 permeable nonwoven geotextile filter fabric. This filter fabric prevents sediment from passing into the stone media, and should be easily separated from the geotextiles that protect the sides of the excavated trench.

Place a Class 2 permeable nonwoven geotextile filter fabric on the trench bottom and sides.

Observation wells should be installed in every infiltration trench at a maximum spacing of 100 ft and be made of 4- to 6-inch PVC pipe. The wells should extend to the bottom of the trench to show the rate of de-watering after a storm event, and helps predict when maintenance needs to be performed. The observation well should be installed along the centerline of the trench, and be flush with the ground elevation of the trench. The top of the well should be capped and locked to discourage vandalism and tampering.

Inspection and Maintenance:

A record should be kept of the average de-watering time of the infiltration trench to determine if maintenance is required.

The top 6-inch layer of pea gravel and geotextile separating the pea gravel from the stone media serve as a sediment barrier and will be required to be replaced when full of sediment.

Debris and trash should be cleared from all inlet and outlet structures monthly.

The observation well should be checked after three consecutive days of dry weather after a rainfall event. If complete de-watering is not observed within this period, there may be clogging within the trench and proper maintenance should be performed.

Trees, shrubs, or invasive vegetation should be removed semi-annually.

If complete failure is observed, total rehabilitation of the trench should be performed by excavating the trench walls to expose clean soil, and replacing the gravel, geotextiles, and topsoil.

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Ensure that the contributing area is stabilized with no active erosion	Monthly
Grass filter strips should be mowed and grass clippings should be removed	Monthly
Check observation wells after 72 hours of rainfall. Wells should be empty after this time period. If wells have standing water, the underdrain system or outlet may be clogged	Semi-annual (every 6 months)
Remove invasive vegetation	Semi-annual (every 6 months)
Inspect pretreatment structures for deposited sediment	Semi-annual (every 6 months)
Replace pea gravel, topsoil and top surface filter fabric	When clogging or surface standing water is observed
Perform total rehabilitation of infiltration trench	Upon observed failure

Infiltration Trenches

5.8 BIORETENTION AREAS

Bioretention areas are stormwater basins intended to provide water quality management by filtering stormwater runoff before release into a stormwater conveyance system or stabilized outfall. Use individual bioretention areas for drainage areas up to 2 acres in size.

Stormwater runoff enters bioretention areas and is temporarily stored in a shallow pond on top of a filter media layer. The ponded water then slowly filters down through the filter media and is absorbed by the plantings. As the excess water filters through the system, it is temporarily stored and collected by an underdrain system that eventually discharges to a designed storm conveyance system.

Installation:

Bioretention areas are sensitive to fine sediments and should not be installed until contributing drainage areas are completely stabilized with minimal erosion.

Heavy equipment should not be operated within the perimeter of bioretention areas during excavation, underdrain placement, backfilling, planting, or mulching.

Bioretention areas have a minimum width of 10 feet and a minimum flow length of 40 feet to establish a strong healthy stand of vegetation.

Pre-treatment of runoff is required to reduce incoming velocities, evenly spread flow over entire area, and provide removal of coarse sediments. The pre-treatment may consist of:

- Forebays
- Grass filter strips
- Gravel or stone diaphragms
- Level spreaders
- Manufactured treatment devices (MTDs)

Ensure the filter media of the bioretention area is level to allow uniform ponding over the entire area. The maximum ponding depth above the filter media is 9 to 12 inches to allow the bioretention area to drain within a reasonable time and to prevent long periods of plant submergence.

Ensure contractor provides a filter media with a minimum infiltration rate of 1 inch/hour and a maximum rate of 6 inches/hour.

Shredded hardwood mulch is preferred because it resists flotation. Pine needles are also applicable for certain situations. Pine bark mulch should be avoided.

The underdrain system should consist of perforated, continuous closed-joint conduits of corrugated plastic pipe with a minimal longitudinal slope of 0.5%.

Filter gravel should be placed around the drainage pipe at a minimum depth of 8 inches.

Place a Class 2 permeable nonwoven geotextile fabric between the gravel and the planting mix.

Several non-perforated PVC pipes should vertically connect to the under drain pipe and extend to the surface of the planting mix to provide access to clean out the perforated drainage pipe.

For bioretention applications near roadways, site distances and other safety concerns should be considered when selecting plant heights.

Acceptable bioretention area plantings include:

- Turf grass only
- Native grasses and perennials
- Shrubs
- Trees

Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of bioretention areas as designed.

The surface of the ponding area may become clogged with fine sediments over time. Core aeration or cultivating un-vegetated areas may be required to ensure adequate filtration.

Other required periodic maintenance includes but is not limited to:

- Pruning and weeding
- Replacing and/or replenishing mulch
- Removing trash and debris
- Treating diseased trees and shrubs
- Mowing turf areas
- Removing and replacing dead and diseased vegetation
- Inspection and repairing of eroded areas

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Pruning and weeding	As needed
Remove trash and debris	As needed
Inspect inflow points for clogging. Remove any sediment	Semi-annually (every 6 months)
Repair eroded areas. Re-seed or sod as necessary	Semi-annually (every 6 months)
Mulch void areas	Semi-annually (every 6 months)
Inspect trees and shrubs to evaluate their health	Semi-annually (every 6 months)
Remove and replace dead or severely diseased vegetation	Semi-annually (every 6 months)
Removal of invasive vegetation	Semi-annually (every 6 months)
Nutrient and pesticide management	Annually, or as needed
Water vegetation, shrubs and trees	Semi-annually (every 6 months)
Remove mulch, reapply new layer	Annually
Place fresh mulch over entire area	As needed
Replace pea gravel diaphragm	Every 2 to 3 years if needed

Bioretention Areas

5.9 BIO-SWALES

A bio-swale is a shallow open-channel drainage way that is stabilized with turf grass or other vegetation and is used to covey runoff and filter pollutants. Bio-swales are different from normal drainage swales in that they have structures implemented to enhance detention and stormwater pollutant removal. Bio-swales are an enhancement to vegetated swales which include a layer of filter media that overlays an underdrain system. Because bio-swales are sensitive to fine sediments, they should not be installed until a site is completely stabilized.

Installation:

Bio-swales should not be installed on sites where the contributing area is not completely stabilized or is periodically being disturbed.

Bio-swales should be installed with a minimal surface channel slope ranging from 1% to 2%, forcing a slow and shallow flow.

Flow can enter the bio-swale through a pre-treatment forebay or it may enter along the sides of the swale as sheet flow produced by level spreader trenches along the top of the bank.

Ensure excavation minimizes the compaction of the bottom of bio-swales.

A minimum 4-inch diameter perforated PVC pipe is used in a 6-inch layer of No. 57 Aggregate gravel or equivalent filter material as the underdrain system.

A Class 2 permeable nonwoven geotextile filter fabric should be placed between the gravel and the overlaying permeable filter media.

Ensure contractor provides a filter media with a minimum infiltration rate of 1 inch/hour and a maximum rate of 6 inches/hour.

All inlets to the bio-swale should have a forebay for pretreatment.

Inspection and Maintenance:

Regular inspection and maintenance is critical to the effective operation of bio-swales. Maintenance responsibility is vested with a responsible authority by means of an enforceable maintenance agreement that is executed as a condition of plan approval. Typical maintenance responsibilities include:

- Keep a record of the average de-watering time of the bio-swale to determine if maintenance is required.
- Perform light core aeration as required to ensure adequate filtration when the surface of the filter bed becomes clogged with fine sediments.

- Perform mowing and trash/debris removal to maintain storage volume and to maintain appearance periodically as needed.

Summary of Maintenance Requirements:

Required Maintenance	Frequency
Mow grass to maintain design height and remove clippings	As needed (frequent/seasonally)
Nutrient and pesticide management	Annually, or as needed
Inspect side slopes for erosion and repair	Annually, or as needed
Inspect channel bottom for erosion and repair	Annually, or as needed
Remove trash and debris accumulated in forebay	Annually
Inspect vegetation and plant an alternative grass species if original cover is not established	Annually (semi-annually first year)
Inspect for clogging and correct the problem	Annually
Roto-till or cultivate the surface of the bed when the bio-swale does not draw down in 48 hours	As needed
Remove sediment build-up within the bottom of the bio-swale	As needed, after 25% of the original design volume has filled

Bio-swales

6.0 NON-STORMWATER DISCHARGE CONTROLS

Non-stormwater discharges are defined as discharges to receiving water bodies that are not entirely composed of stormwater. Appropriate pollution prevention BMPs for the non-stormwater component(s) of the following types of discharges must be implemented:

- Fire hydrant flushings;
- Waters used to wash vehicles or control dust;
- Potable water sources including water line flushings;
- Routine external building wash down which does not use detergents;
- Pavement wash waters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
- Air conditioning condensate;
- Springs;
- Uncontaminated groundwater; and,
- Foundation and footing drains where flows are not contaminated with process materials such as solvents.

Control of non-stormwater discharges consists mainly of source controls or good-housekeeping practices to prevent pollutants from coming into contact with stormwater or being directly discharged into receiving waters. BMPs for management of non-stormwater discharges are discussed in this Field Manual in the indicated Sections:

6.1 Vehicle and Equipment Washing

6.2 Concrete Truck Washout

6.3 Potable Water

6.4 Illicit Connection/ Illegal Discharge Detection and Reporting

6.1 VEHICLE AND EQUIPMENT WASHING

On-site vehicle and equipment washing is discouraged. All vehicles/equipment that regularly enter and leave the construction site should be cleaned off-site. However, if vehicle or equipment cleaning operations must be performed on a construction site, the BMPs presented below should be used to minimize or eliminate the discharge of pollutants to storm drain systems or to watercourses.

BMPs:

Wash vehicles and equipment within a structure or building equipped with appropriate disposal facilities, if possible.

When vehicle and equipment washing must occur on-site and outside, the outside cleaning area should have the following characteristics, and should be arranged with the RCE:

- Located away from storm drain inlets, drainage facilities, or watercourses;
- Paved with concrete or asphalt and bermed to contain wash waters and to prevent run-on and runoff;
- Configured with a sump to allow collection and disposal of wash water;
- Wash waters should not be discharged to storm drains or watercourses; and,
- Used only when necessary.

Cleaning of vehicles and equipment with soap, solvents, or steam should not occur on the project site unless the RCE has been notified in advance and the resulting wastes are fully contained and disposed of properly outside the highway right-of-way.

The use of diesel for vehicle and equipment cleaning is prohibited.

Vehicle and equipment wash water should be contained for percolation or evaporative drying away from storm drain inlets or watercourses and should not be discharged within the highway right-of-way. Apply sediment control BMPs if applicable.

When cleaning vehicles/equipment with water:

- Use as little water as possible. High pressure sprayers may use less water than a hose, and should be considered; and,

- Use positive shutoff valves to minimize water usage.

Minimize the use of solvents. Thinners or solvents should not be discharged into the sanitary or storm sewer systems when cleaning large machine parts where discharge of water is required. Alternative methods should be used for cleaning larger equipment parts such as high pressure, high temperature water washes, or steam cleaning.

Equipment washing detergents can be used and wash water discharged into the sanitary system if grit is removed from the solution first. The water discharged into the sewer system must not exceed discharge limits set by the local sewer authority.

Small parts can be cleaned with degreasing solvents, which are reused after filtering or recycled. These solvents should not be discharged into any sewer.

Inspection and Maintenance:

Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate vehicle and equipment washing and cleaning practices are being implemented.

Inspect wash water sump regularly and remove liquids and sediment as needed or as directed by the RCE.

Vehicle Washing

6.2 CONCRETE TRUCK WASHOUT

Discharges from concrete truck washouts to Waters of the State or the stormwater conveyance system are not allowed. These procedures and practices are designed to eliminate the discharge of concrete waste materials to waters of the State and storm drain systems.

BMPs:

Sites adjacent to waters of the State

Temporary concrete washout facilities should be constructed above grade or below grade at the option of the RCE. Temporary concrete washout facilities should be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

- Each facility should be located away from construction traffic or access areas to prevent disturbance or tracking.
- A sign should be installed within 30 feet each washout facility to inform concrete equipment operators to utilize the proper facilities.
- Temporary washout facilities should have a temporary pit or bermed area of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.
- Washout of concrete mixer trucks should be performed in designated areas only.
- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated washout area or properly disposed offsite.
- Once concrete wastes are washed into the designated area and allowed to harden, the concrete should be broken up, removed, and disposed.

Sites NOT adjacent to waters of the State

For applications not adjacent to waters of the State, the concrete washout activities may be conducted on-site with no washout facility. For these applications, concrete washout activities should abide by of the following guidelines to ensure no discharges of concrete washout waste.

- Washout locations should be located a minimum of 50 feet from storm drain inlets, open drainage channels or any other portion of the stormwater conveyance system.

- Washout locations should be located away from construction traffic on near level ground. Avoid concrete washout to areas with overland slopes.

- Immediately remove and dispose of concrete materials after hardening.

Inspection and Maintenance:

Monitor employees and subcontractors throughout the duration of the construction project to ensure appropriate practices are being implemented.

Inspect washout sump regularly and remove liquids and sediment as needed or as directed by the RCE.

Concrete Truck Washout

6.3 POTABLE WATER

Potable water management consists of BMPs to manage the discharge of potential pollutants to storm drains or water courses generated during discharges from lawn or garden watering, planned and unplanned discharges from potable water sources, water line flushing, and hydrant flushing.

BMPs:

Where possible, direct water from off-site sources around or through a construction site in a way that minimizes contact with the construction site.

When possible, discharges from water line flushing should be reused for landscaping purposes.

Shut off the water source to broken lines or valves as soon as possible to prevent excess water flow.

Protect downstream stormwater drainage system and watercourses from water pumped or bailed from trenches excavated to repair water lines.

Inspection and Maintenance:

Repair broken water lines as soon as possible.

Potable Water

6.4 ILLICIT CONNECTION / ILLEGAL DISCHARGE DETECTION AND REPORTING

The BMPs provided in this section are designed for construction contractors to recognize illicit connections or illegally dumped or discharged materials on a construction site. Illicit connection/illegal discharge detection and reporting is applicable anytime an illicit connection or discharge is discovered or illegally dumped material is found on the construction site and applies to all construction projects.

BMPs:

Inspect the construction site before beginning the job for evidence of illicit connections or illegal dumping or discharges.

Inspect site regularly during project execution for evidence of illicit connections or illegal dumping or discharges.

Observe site perimeter for evidence or potential of illicitly discharged or illegally dumped material, which may enter the job site.

Solids – Look for debris or rubbish piles. Solid waste dumping often occurs on roadways with light traffic loads or in areas not easily visible from the traveled way.

Liquids – signs of illegal dumping or discharge can include:

- Visible signs of staining or unusual colors to the pavement or surrounding adjacent soils;
- Pungent odors coming from the drainage system;
- Discoloration or oily substances in the water or stains and residues detained within ditches, channels, or drain boxes; and,
- Abnormal water flow during the dry weather season.

Urban Areas – Evidence of illicit connections or illegal discharges is typically detected at storm drain outfall locations or at manholes. Signs of an illicit connection or illegal discharge can include:

- Abnormal water flow during the dry weather season;
- Unusual flows in subdrain systems used for dewatering;
- Discoloration or oily substances in the water or stains and residues detained within ditches, channels, or drain boxes; and,

- Excessive sediment deposits, particularly adjacent to or near active off-site construction projects.

Rural Areas – Illicit connections or illegal discharges involving irrigation drainage ditches are detected by visual inspections. Signs of an illicit discharge can include:

- Abnormal water flow during the dry weather season;
- Non-standard junction structures; and,
- Broken concrete or other disturbances at or near junction structures.

Inspection and Maintenance:

Notify the RCE of any illicit connections and illegal dumping or discharge incidents at the time of discovery.

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

Illicit Connection/Discharges

7.0 SPECIAL CONSTRUCTION OPERATION BMPs

Pollution Prevention (P2) BMPs for water quality management during Special Construction Operations are discussed in this Field Manual in the indicated Sections:

7.1 Paving and Grinding Operations

7.2 Pile Driving Operations

7.3 Concrete Curing

7.4 Concrete Finishing

7.5 Material and Equipment Use Over Water

7.6 Structure Demolition and Removal Over Water

7.7 Fertilizer Management

7.8 Stockpile Management

7.1 PAVING AND GRINDING OPERATIONS

There are various procedures and BMPs that can be implemented during paving and grading operations to minimize the transport of pollutants to the storm drain system or receiving water body.

BMPs:

Paving, Surfacing and Resurfacing

Substances used to coat asphalt transport trucks, asphalt trucks, and asphalt spreading equipment should not contain soap and should be non-foaming and non-toxic.

Place plastic material under asphaltic concrete (AC) paving equipment while not in use to catch and/or contain drips and leaks to prevent soil contamination.

When paving involves AC, the following steps should be implemented to prevent the discharge of uncompacted or loose AC, tack coats, equipment cleaners, or other paving materials:

- Minimize sand and gravel from new asphalt from getting into storm drains, streets, and creeks by sweeping;
- Old or spilled asphalt must be recycled or disposed as approved by the RCE;
- AC grindings, pieces, or chunks used in embankments or shoulder backing should not be allowed to enter any storm drain or watercourses. Install silt fence until structure is stabilized or permanent controls are in place;
- Collect and remove all broken asphalt and recycle when practical; otherwise, dispose of properly;
- Any AC chunks and pieces used in embankments must be placed above the water table and covered by at least 1-foot of material;
- During chip seal application and sweeping operations, petroleum or petroleum covered aggregate should not be allowed to enter any storm drain or watercourses. Use silt fence until installation is complete;
- Drainage inlet structures and manholes should be covered with filter fabric during application of seal coat, tack coat, slurry seal, and/or fog seal;

- Seal coat, tack coat, slurry seal, or fog seal should not be applied if rainfall is predicted to occur during the application or curing period;

- Clean asphalt-coated equipment off-site whenever possible. When cleaning dry, hardened asphalt from equipment, manage hardened asphalt debris as a solid waste as described in *Section 8.1, Solid Waste Management*;

- Any cleaning onsite should follow BMPs provided in *Section 6.1, Vehicle and Equipment Washing*;

- Do not wash sweepings from exposed aggregate concrete into a storm drain system. Collect and return to aggregate base stockpile, or dispose of properly; and

- Allow aggregate rinse to settle. Then allow rinse water to dry in a temporary pit as described in *Section 8.5 Concrete Waste Management.*

Saw Cutting, Grinding, and Removal

Do not allow saw-cut Portland concrete cement (PCC) slurry to enter storm drains or watercourses.

Residue from PCC grinding operations should be picked up by means of a vacuum attachment to the grinding machine, should not be allowed to flow across the pavement, and should not be left on the surface of the pavement. See also *Section 8.2, Liquid Waste Management* and *Section 8.5, Concrete Waste Management.*

Collect pavement digout material by mechanical or manual methods. This material may be recycled if approved by the RCE for use as shoulder backing or base material at locations approved by the RCE.

If digout material cannot be recycled, transport the material back to a maintenance facility or approved storage site.

Digout activities should not be conducted in the rain.

When approved by the RCE, stockpile material removed from roadways away from drain inlets, drainage ditches, and watercourses and stored consistent with BMPs provided in *Section 7.8, Stockpile Management*.

Disposal or use of AC grinding should be approved by the RCE. See *Section 8.5, Concrete Waste Management.*

Thermoplastic Striping

All thermoplastic striper and pre-heater equipment shutoff valves should be inspected to ensure that they are working properly to prevent leaking thermoplastic from entering drain inlets, the stormwater drainage system, or watercourses.

The pre-heater should be filled carefully to prevent splashing or spilling of hot thermoplastic. Six inches of space should be left at the top of the pre-heater container when filling thermoplastic to allow room for material to move when the vehicle is deadheaded.

Contractor should not pre-heat, transfer, or load thermoplastic near drain inlets or watercourses.

Clean truck beds daily of loose debris and melted thermoplastic. When possible recycle thermoplastic material. Thermoplastic waste should be disposed of properly as a solid waste.

Raised/Recessed Pavement Marker Application and Removal

Do not transfer or load bituminous material near storm drain inlets, the stormwater drainage system, or watercourses.

Melting tanks should be loaded with care and not filled to beyond 6 inches from the top to leave room for splashing when vehicle is deadheaded.

When servicing or filling melting tanks, ensure all pressure is released before removing lids to avoid spills.

On large scale projects, use mechanical or manual methods to collect excess bituminous material from the roadway after removal of markers.

Waste should be disposed of properly. See *Section 8.1, Solid Waste Management.*

Inspection and Maintenance:

Inspect and maintain machinery regularly to minimize leaks and drips.

Ensure that employees and subcontractors are implementing appropriate measures during paving and grinding operations.

Paving and Grinding

7.2 PILE DRIVING OPERATIONS

Proper control and use of equipment, materials, and waste products from pile driving operations will reduce the discharge of potential pollutants to the storm drain system or watercourses. The BMPs presented below apply to construction sites near or adjacent to a watercourse or groundwater where permanent and temporary pile driving operations (impact and vibratory) take place, including operations using pile shells for construction of cast-in-steel shell and cast-in-drilled-hole piles.

BMPs:

Have spill kits and cleanup materials available at all locations of pile driving. Refer to *Section 8.6, Spill Prevention, Control, and Cleanup*.

Park equipment over plastic sheeting or equivalent where possible. Plastic sheeting is not a substitute for drip pans or absorbent pads. The storage or use of equipment in streambeds or other bodies of water should comply with all applicable permits.

When not in use, store pile driving equipment away from concentrated flows of stormwater, drainage courses, and inlets. Protect hammers and other hydraulic attachments from run-on by placing them on plywood and covering them with plastic or a comparable material prior to the onset of rain.

Inspection and Maintenance:

Inspect pile driving areas and equipment for leaks and spills on a daily basis.

Inspect equipment routinely and repair equipment as needed, (e.g., worn or damaged hoses, fittings, gaskets).

Pile Driving

7.3 CONCRETE CURING

Concrete curing is used in the construction of structures such as bridges, or retaining walls. Concrete curing includes the use of both chemical and water methods. Proper BMPs minimize pollution of runoff during concrete curing. All concrete elements of a structure (e.g., footings, column, abutments, stems, soffit, deck) are subject to curing requirements.

BMPs:

Chemical Curing

Avoid over-spray of curing compounds close to the concrete surface. Apply an amount of compound that covers the surface, but does not allow any runoff of the compound.

Use proper storage and handling techniques for concrete curing compound.

Protect drain inlets prior to the application of curing compounds.

Water Curing

Direct cure water away from inlets and watercourses to collection areas for removal as approved by the RCE and in accordance with all applicable permits.

Inspection and Maintenance:

Discharges to waterways should be reported to the RCE immediately upon discovery.

Concrete Curing

7.4 CONCRETE FINISHING

Concrete finishing methods include sand blasting, shot blasting, grinding, or high pressure water blasting. Proper P2 procedures minimize the impact that concrete finishing may have on receiving waterbodies. These procedures apply to all construction locations where concrete finishing operations are performed.

BMPs:

Collect and properly dispose of water and solid waste from high-pressure water blasting operations.

Collect water from blasting operations and transport or dispose of water in a non-erodible manner.

Direct water from blasting operations away from inlets and watercourses to collection areas for removal (e.g., dewatering) as approved in advance by the RCE and in accordance with applicable permits.

Protect inlets during sandblasting operations.

Minimize the drift of dust and blast materials as much as possible by keeping the blasting nozzle close to the surface.

When blast residue contains a potentially hazardous waste, refer to *Section 8.3, Hazardous Waste Management.*

Specific permit requirements may be included in the contract documents for certain concrete finishing operations.

Inspection and Maintenance:

At the end of each work shift, remove and contain the liquid and solid wastes from containment structures, if any, and from the general work area.

Discharges to waterways should be reported to the RCE immediately upon discovery.

Concrete Finishing

7.5 MATERIAL AND EQUIPMENT USE OVER WATER

The BMPs presented in this section should be used where materials and equipment are used on barges, boats, docks, and other platforms over or adjacent to a watercourse in order to minimize or eliminate the discharge of potential pollutants to the watercourse. These BMPs should be implemented to collect and contain construction materials and wastes (solid and liquid) and any other materials that may be detrimental if released.

BMPs:

Use drip pans and absorbent materials for equipment and vehicles to ensure that an adequate supply of spill cleanup materials is available.

Keep equipment that is in use in streambeds or on docks, barges, or other structures over waterbodies leak free.

Drip pans should be placed under all vehicles and equipment placed on docks, barges, or other structures over water when the vehicle or equipment is expected to be idle for more than one hour.

Properly maintain equipment. If a leaking line cannot be repaired, remove equipment from over the water.

Provide watertight curbs or toe boards to contain spills and prevent materials, tools, and debris from leaving the barge platform, dock, etc.

Secure all materials to prevent discharges to receiving waters via wind.

Identify types of spill control measures to be employed, including the storage of such materials and equipment. Ensure that staff is trained regarding the deployment and access of control measures and those measures are used.

Ensure the timely and proper removal of accumulated wastes.

Comply with all necessary permits required for construction within or near the watercourse, such as U.S. Army Corps of Engineers, and other permitting agencies.

Inspection and Maintenance:

Inspect equipment for leaks and spills on a daily basis, and make necessary repairs.

Inspect and maintain all associated BMPs and perimeter controls to ensure continuous protection of the watercourse.

Discharges to waterways should be reported to the RCE immediately upon discovery.

7.6 STRUCTURE DEMOLITION AND REMOVAL OVER WATER

Water bodies should be protected from debris and wastes associated with structure demolition or removal over or adjacent to watercourses. The BMPs presented in this section can be used for full bridge demolition and removal, partial bridge removal (e.g., barrier rail, edge of deck) associated with bridge widening projects, concrete channel removal, or any other structures removal that could potentially affect water quality.

BMPs:

Do not allow demolished material to enter waterway.

Use attachments on construction equipment such as backhoes to catch debris from small demolition operations.

Use covers or platforms to collect debris. Platforms and covers are to be approved by the RCE.

Stockpile accumulated debris and waste generated during demolition away from watercourses and in accordance with *Section 7.8, Stockpile Management*.

Ensure safe passage of wildlife, as necessary.

For structures containing hazardous materials (e.g., lead paint or asbestos) refer to *Section 8.3, Hazardous Waste Management*.

Specific permit requirements may be included in the contract documents.

Inspection and Maintenance:

Inspect demolition areas on a daily basis.

Any debris-catching devices should be emptied regularly. Collected debris should be removed and stored away from the watercourse and protected from run-on and runoff.

Discharges to waterways should be reported to the RCE immediately upon discovery.

Demolition Over Water

7.7 FERTILIZER MANAGEMENT

This section provides BMPs that will aid in reducing the contributions of pollutants from fertilizers to stormwater discharges.

BMPs:

Fertilizer Applications

Fertilizers used in re-vegetating graded areas often cause inorganic nutrient pollution. The use of proper soil-stabilization measures, sediment control, and stormwater detention structures can be effective means of keeping these materials out of waterways.

Nutrient pollution can be minimized by working fertilizers and liming materials into the soil to depths of 4 to 6 inches and proper timing of the application. Hydro-seeding operations, in which seed, fertilizers, and lime are applied to the ground surface in a one-step operation, are more conducive to nutrient pollution than are conventional seedbed-preparation operations, where the fertilizers and lime are tilled into the soil.

In the case of surface dressings, control can be achieved by applying the required quantity of fertilizer in more than one operation. For example, an area requiring an application of 500 pounds per acre of fertilizer could be dressed with about 125 pounds per acre at four separate times over the growing season.

Use of fertilizers containing little or no phosphorous may be required by state authorities if the development is near sensitive water bodies. In any event, great care should be taken to use only the minimum amount of phosphorus needed, as determined by soil tests.

Near sensitive surface waters, the addition of lime can affect the pH (or acidity) of runoff to receiving waters. Importing topsoil or amending the existing soil with compost is better than heavily liming and fertilizing exposed subsoil.

Storage and Handling

Establish a locked, weather-resistant storage area for fertilizer on the construction site.

Container lids should be tightly closed.

In case of a leak, put original container into a larger container and label it properly.

Keep a list of products in storage.

Use plastic sheeting to line the storage area.

Remind workers during pre-construction or safety meetings about proper storage and handling of materials.

Inspection and Maintenance:

All storage sheds, dumpsters, or other storage facilities should be regularly monitored for leaks and repaired as necessary.

Fertilizer

7.8 STOCKPILE MANAGEMENT

The stockpile management BMPs described in this section are designed to reduce or eliminate air and stormwater pollution from stockpiles of soil, and paving materials such as PCC rubble, AC, AC rubble, aggregate base, aggregate subbase or pre-mixed aggregate, asphalt binder (so-called "cold mix" asphalt) and pressure treated wood. These practices should be implemented at all construction sites that stockpile soil or these other materials.

BMPs:

Protection of stockpiles is a year-round requirement.

Cover, stabilize, or protect all active stockpiles with a temporary linear sediment barrier prior to the onset of precipitation.

Cover and protect all non-active stockpiles with a temporary perimeter sediment barrier at all times.

Cover stockpiles with plastic, mats, blankets, mulches, or spray with water or soil binders.

Surround the base of a stockpile with a row of sediment tubes, silt fence, or other sediment barrier.

Keep the height of stockpiles low, and adjust the shape and orientation of the stockpiles to reduce the area of exposure to the prevailing wind.

Locate stockpiles a minimum of 50 feet away from concentrated flows of stormwater, drainage courses, and inlets.

Place bagged materials on pallets and under cover.

Place cold mix stockpiles on and cover with plastic or comparable material at all times.

Cover treated wood (wood treated with copper, chromium and arsenic or ammonia, copper, zinc, and arsenate) with plastic or comparable material

Inspection and Maintenance:

Repair and/or replace perimeter controls and covers as needed, or as directed by the RCE to keep them functioning properly. Remove sediment when sediment accumulation reaches ⅓ of the barrier height.

Stockpile Management

8.0 WASTE MANAGEMENT BMPs

Waste Management BMPs for construction sites are discussed in this Field Manual in the indicated Sections:

8.1 Solid Waste Management

8.2 Liquid Waste Management

8.3 Hazardous Waste Management

8.4 Sanitary / Septic Waste Management

8.5 Concrete Waste Management

8.6 Spill Prevention, Control, and Cleanup

8.1 SOLID WASTE MANAGEMENT

Solid waste management BMPs are designed to minimize or eliminate the discharge of pollutants to the drainage system or to watercourses as a result of the creation, stockpiling, or removal of construction site wastes. The BMPs presented below can be implemented on all construction projects that generate solid wastes.

Solid wastes include but are not limited to:

- Construction wastes including brick, mortar, timber, steel, metal scraps, sawdust, pipe and electrical cuttings, non-hazardous equipment parts, Styrofoam, and other materials used to transport and package construction materials.

- Highway planting wastes, including vegetative material, plant containers, and packaging materials.

- Litter, including food containers, beverage cans, coffee cups, paper bags, plastic wrappers, smoking materials, and litter generated by the public.

BMPs:

Instruct employees and subcontractors on identification of solid waste and hazardous waste and proper disposal procedures and encourage these procedures to be followed.

Hold regular meetings to discuss and reinforce disposal procedures (incorporate into regular safety meetings).

Wherever possible, minimize production of solid waste materials.

Dumpsters of sufficient size and number should be provided to contain the solid waste generated by the project and properly serviced. Frequent garbage removal helps maintain clean construction sites and minimizes the exposure of waste to stormwater.

The site should be kept clean of litter debris.

To prevent clogging of the storm drainage system, litter and debris removal from drainage system, drainage grates, trash racks, and ditch lines should be a priority.

Trash receptacles should be provided in the contractor's yard, field trailer areas, and at locations where workers congregate for lunch and break periods. These containers should be handled and by trash hauling contractors. Only watertight dumpsters are acceptable for use on-site.

Construction debris and litter from work areas within the construction limits of the project site should be collected and placed in watertight dumpsters at least weekly regardless of whether the litter was generated by the contractor, the public, or others. Collected litter and debris should not be placed in or next to drain inlets, stormwater drainage systems, or watercourses.

Solid waste storage areas should be located at least 50 feet from drainage facilities and watercourses and should not be located in areas prone to flooding or ponding.

Dumpster washout on the project site is not allowed.

Plan for additional containers during the demolition phase of construction.

Plan for more frequent pickup during the demolition phase of construction.

Construction waste should be stored in a designated area approved by the RCE and should be removed from the site every two weeks or as directed by the RCE.

Segregate potentially hazardous waste from non-hazardous construction site waste.

Make sure the toxic liquid wastes (e.g., used oils, solvents, and paints) and chemical (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for construction debris.

For disposal of hazardous waste, see *Section 8.3, Hazardous Waste Management*. Have hazardous waste hauled to an appropriate disposal and/or recycling facility.

Salvage or recycle useful vegetation debris, packaging, and/or surplus building materials when practical. For example, trees and shrubs from land clearing can be converted into wood chips, then used as mulch on graded areas. Wood pallets, cardboard boxes, and construction scraps can also be recycled.

Inspection and Maintenance:

The RCE should monitor onsite solid waste storage and disposal procedures.

Inspect site for litter and debris.

Solid Waste Management

8.2 LIQUID WASTE MANAGEMENT

Liquid waste management BMPs are designed to prevent or minimize the discharge of pollutants to the storm drain system or receiving waters as a result of the creation, collection, and disposal of non-hazardous liquid wastes. Liquid waste management BMPs are applicable to construction projects that generate any of the following non-hazardous byproducts, residuals, or wastes:

- Drilling slurries and drilling fluids;
- Grease-free and oil-free wastewater and rinse water;
- Dredgings; and,
- Other non-stormwater liquid discharges not permitted by separate permits.

Disposal of some liquid wastes may be subject to specific laws and regulations, or to requirements of other permits secured for the construction project (e.g., other NPDES permits, Army Corps of Engineers permits, etc.).

This section does not apply to dewatering operations (see *Section 3.17, Dewatering Bags*) or to permitted non-stormwater discharges (see *Sections 6.1 – 6.4*).

BMPs:

General Practices

The RCE should oversee and enforce proper liquid waste management procedures and practices.

Instruct employees and subcontractors how to safely differentiate between non-hazardous liquid waste and potential or known hazardous liquid waste.

Instruct employees, subcontractors, and suppliers that it is unacceptable for any liquid waste to enter any storm drainage structure, waterway, or receiving water.

Educate employees and subcontractors on liquid waste generating activities and liquid waste storage and disposal procedures.

Incorporate the discussion of proper disposal procedures into regular safety meetings.

Apply the BMPs identified in *Section 6.1, Vehicle and Equipment Washing*, for managing wash water and rinse water from vehicle and equipment cleaning operations.

Containing Liquid Wastes

Drilling residue and drilling fluids should not be allowed to enter storm drains and watercourses and should be disposed of outside the highway right-of-way.

If an appropriate location is available, as determined by the RCE, drilling residue and drilling fluids may be dried by infiltration and evaporation in a containment facility constructed as described in *Section 8.5, Concrete Waste Management*.

Liquid wastes generated as part of an operational procedure, such as water-laden dredged material and drilling mud, should be contained and not allowed to flow into drainage channels or receiving waters prior to treatment.

Contain liquid wastes in a controlled area, such as a holding pit, sediment basin, roll-off bin, or portable tank.

Containment devices must be structurally sound and leak free. Containment devices must be of sufficient quantity or volume to completely contain the liquid wastes generated.

Take precautions to avoid spills or accidental releases of contained liquid wastes. Apply the education measures and spill response procedures outlined *in Section 8.6, Spill Prevention, Control, and Cleanup*.

Do not locate containment areas or devices where accidental release of the contained liquid can threaten health or safety, or discharge to water bodies, channel, or storm drains.

Capturing Liquid Wastes

Capture all liquid wastes running off a surface, which has the potential to affect the storm drainage system, such as wash water and rinse water from cleaning walls or pavement.

Do not allow liquid wastes to flow or discharge uncontrolled. Use temporary dikes or berms to intercept flows and direct them to a containment area or device for capture.

If the liquid waste is sediment laden, use a sediment trap (*see Section 3.5, Sediment Dam*) for capturing and treating the liquid waste stream, or capture in a containment device and allow sediment to settle.

Disposing of Liquid Wastes

Liquid wastes, such as from dredged material, may require testing and certification whether it is hazardous or not before a disposal method can be determined.

For disposal of hazardous waste, see *Section 8.3, Hazardous Waste Management.*

If necessary, further treat liquid wastes prior to disposal. Treatment may include, though is not limited to, sedimentation, filtration, and chemical neutralization.

Inspection and Maintenance:

Spot check employees and subcontractors at least monthly throughout the job to ensure appropriate practices are being employed.

Remove deposited solids in containment areas and capturing devices as needed, and at the completion of the task. Dispose of any solids as described in *Section 8.1, Solid Waste Management*.

Inspect containment areas and capturing devices frequently for damage, and repair as needed.

Liquid Waste Management

8.3 HAZARDOUS WASTE MANAGEMENT

The BMPs described in this section are designed to minimize or eliminate the discharge of pollutants from construction site hazardous wastes to the storm drain systems or to watercourses. These BMPs apply to all construction sites. Hazardous waste management practices are implemented on construction projects that generate waste from the use of:

- Petroleum products
- Asphalt products
- Concrete curing compounds
- Pesticides
- Acids
- Paints
- Stains
- Solvents
- Wood preservatives
- Roofing tar

Hazardous products may include one or more of the following words on the label: Caustic, Caution, Combustible, Corrosive, Danger, Explosive, Flammable, Poisonous, Volatile, or Warning.

Use of the BMPs described below does not relieve SCDOT or their contractors from responsibility for compliance with all federal, state, and local laws regarding storage, handling, transportation, and disposal of hazardous wastes.

BMPs:

Education

Educate employees and subcontractors on hazardous waste storage and disposal procedures and on potential dangers to humans and the environment from hazardous wastes.

Instruct employees and subcontractors in identification of hazardous waste.

Hold regular meetings to discuss and reinforce hazardous waste management procedures (incorporate into regular safety meetings).

The RCE should oversee and enforce proper hazardous waste management procedures and practices.

Storage Procedures

Buy and use only what is needed. Leftovers need to be stored, reused, given away, recycled, or disposed of safely. Look for nontoxic or less toxic options (check with SCDOT hazardous materials specialists).

Try to keep products in original containers and always keep them well-labeled. If the product must be transferred to smaller containers, use the proper size funnel and avoid spills.

Labels can fall off with weathering. To prevent this, cover labels with transparent tape. To re-label, use a metal tag attached to the container or use a stencil and spray paint.

Keep corrosive liquids away from flammable liquids.

Wastes should be stored in sealed containers constructed of a suitable material and should be labeled as required federal regulations.

All hazardous waste should be stored, transported, and disposed as required by federal regulations.

Waste containers should be stored in temporary containment facilities that should comply with the following requirements:

- Temporary containment facility should be impervious to the materials stored there for a minimum contact time of 72 hours.

- Temporary containment facilities should be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills should be placed into drums after each rainfall. These liquids should be handled as a hazardous waste unless testing determines them to be non-hazardous. Non-hazardous liquids should be sent to an approved disposal site.

- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.

- Incompatible materials, such as chlorine and ammonia, should not be stored in the same temporary containment facility.

- Temporary containment facilities should be covered during non-working days and prior to rain events. Covered facilities may include use of plastic tarps for small facilities or constructed roofs with overhangs. A storage facility having a solid cover and sides is preferred to a temporary tarp. Storage facilities should be equipped with adequate ventilation.

Drums should not be overfilled and wastes should not be mixed.

Unless watertight, containers of dry waste should be stored on pallets.

Paint brushes and equipment for water and oil based paints should be cleaned within a contained area and should not be allowed to contaminate site soils, watercourses, or drainage systems. Waste paints, thinners, solvents, residues, and sludges that cannot be recycled or reused should be disposed of as hazardous waste.

When thoroughly dry, latex paint and paint cans, used brushes, rags, absorbent materials, and drop cloths should be disposed of as solid waste with other construction debris.

For water-based paint, clean brushes to the extent practical and rinse to a drain leading to a sanitary sewer, where permitted, or into a concrete washout pit. For oil-base paints, clean brushes to the extent practical and filter and reuse thinners and solvents.

Ensure that adequate hazardous waste storage volume is available.

Ensure that hazardous waste collection containers are conveniently located.

Designate hazardous waste storage areas on site away from storm drains or watercourses and away from moving vehicles and equipment to prevent accidental spills.

Minimize production or generation of hazardous materials and hazardous waste on the job site.

Use containment berms in fueling and maintenance areas and where the potential for spills is high.

Segregate potentially hazardous waste from non-hazardous construction site debris.

Keep liquid or semi-liquid hazardous waste in appropriate containers (closed drums or similar) and under cover.

Clearly label all hazardous waste containers with the waste being stored and the date of accumulation.

Place hazardous waste containers in secondary containment.

Do not allow potentially hazardous waste materials to accumulate on the ground.

Do not mix wastes.

Disposal Procedures

Use all of the product before disposing of the container.

Waste should be disposed of outside the highway right-of-way within 90 days of being generated, or as directed by the RCE.

Waste should be disposed of by a licensed hazardous waste transporter at an authorized and licensed disposal facility or recycling facility utilizing properly completed Uniform Hazardous Waste Manifest forms.

A DHEC certified laboratory should sample waste and classify it to determine the appropriate disposal facility.

Make sure that toxic liquid wastes (e.g., used oils, solvents, and paints) and chemicals (e.g., acids, pesticides, additives, curing compounds) are not disposed of in dumpsters designated for solid waste construction debris.

Properly dispose of rainwater in secondary containment that may have mixed with hazardous waste.

Recycle any useful material such as used oil or water-based paint when practical.

Inspection and Maintenance:

A foreman and/or construction supervisor should monitor on-site hazardous waste storage and disposal procedures.

Waste storage areas should be kept clean, well organized, and equipped with ample clean-up supplies as appropriate for the materials being stored.

Storage areas should be inspected in conformance with the provisions in the contract documents.

Perimeter controls, containment structures, covers, and liners should be repaired or replaced as needed to maintain proper function.

Hazardous spills should be cleaned up and reported in conformance with the applicable MSDS and the instructions posted at the project site.

The National Response Center at (800) 424-8802 should be notified of spills of federal reportable quantities in conformance with the federal regulations.

Copy of the hazardous waste manifests should be provided to the RCE.

Poor Hazardous Waste Management

Good Hazardous Waste Management

8.4 SANITARY / SEPTIC WASTE MANAGEMENT

The BMPs provided in this section may be used to minimize or eliminate the discharge of construction site sanitary/septic waste materials to the storm drain system or to watercourses. Sanitary/septic waste management BMPs are applicable on all construction sites that use temporary or portable sanitary/septic waste systems.

BMPs:

Education

Educate employees, subcontractors, and suppliers on sanitary/septic waste storage and disposal procedures and the potential dangers to humans and the environment from sanitary/septic wastes.

Instruct employees, subcontractors, and suppliers in identification of sanitary/septic waste.

Discuss and reinforce disposal procedures during regular safety meetings.

Storage and Disposal Procedures

Locate temporary sanitary facilities away from drainage facilities, watercourses, and from traffic circulation.

Do not discharge or bury wastewater within the highway right-of-way.

Sanitary and septic systems that discharge directly into sanitary sewer systems, where permissible, should comply with the local health agency, city, county, and sewer district requirements.

If using an on-site disposal system, such as a septic system, comply with local health agency requirements.

Properly connect temporary sanitary facilities that discharge to the sanitary sewer system to avoid illicit discharges.

Ensure that sanitary/septic facilities are maintained in good working order by a licensed service. Use only reputable, licensed sanitary/septic waste haulers.

Inspection and Maintenance:

The RCE should monitor onsite sanitary/septic waste storage and disposal procedures at least weekly.

Sanitary and Septic Waste Management

8.5 CONCRETE WASTE MANAGEMENT

This section presents BMPs that are designed to minimize or eliminate the discharge of concrete waste materials to the storm drain systems or watercourses. Concrete waste management BMPs should be implemented on construction projects where:

- Concrete is used as a construction material or where concrete dust and debris result from demolition activities;
- Slurries containing Portland cement concrete (PCC) or asphalt concrete (AC) are generated (from saw cutting, coring, grinding, grooving, and hydro-concrete demolition). See *Section 7.1, Paving and Grinding Operations*;
- Concrete trucks and other concrete-coated equipment are washed on site, when approved by the RCE. See also *Section 6.1, Vehicle and Equipment Washing* and *Section 6.2, Concrete Truck Washout; and*
- Mortar-mixing stations exist.

BMPs:

Education

Educate employees, subcontractors, and suppliers on the concrete waste management BMPs described in this section.

Concrete Slurry Wastes

Do not allow PCC and AC waste to enter storm drains or watercourses.

Collect and properly dispose of PCC and AC slurry or hardened wastes outside of the right-of-way in conformance with SCDOT Standard Procedures or place in a temporary concrete washout facility.

Install a sign adjacent to each temporary concrete washout facility to inform concrete equipment operators to utilize the proper facilities.

The RCE monitors onsite concrete working tasks, such as saw cutting, coring, and grooving to ensure proper methods are implemented.

Do not allow saw-cut PCC slurry to enter storm drains or watercourses. See *Section 7.1, Paving and Grinding Operations* and *Section 8.2, Liquid Waste Management*. Pick up residue from grinding operations by means of a vacuum attachment to the grinding machine. Do not allow saw cutting residue to flow across the pavement, or allow it to remain on the pavement surface.

Vacuum slurry residue and dispose in a temporary facility (as describe below) and allow slurry to dry. Dispose of dry slurry residue in accordance with *Section 8.1, Solid Waste Management*.

Collect and dispose of residue from grooving and grinding operations in accordance with *Section 8.1, Solid Waste Management.*

Onsite Temporary Concrete Washout Facility, Concrete Transit Truck Washout Procedures

Locate temporary concrete washout facilities a minimum of 50 feet from storm drain inlets, open drainage facilities, and watercourses, unless determined infeasible by the RCE. Locate each facility away from construction traffic or access areas to prevent disturbance or tracking.

Install a sign adjacent to each washout facility to inform concrete equipment operators to utilize the proper facilities.

Construct temporary concrete washout facilities above grade or below grade at the option of the contractor. Construct and maintain temporary concrete washout facilities in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Ensure temporary washout facilities have a temporary pit or bermed areas of sufficient volume to completely contain all liquid and waste concrete materials generated during washout procedures.

Perform washout of concrete mixer trucks in designated areas only. Washout may be collected in an impermeable bag for disposal. See also *Section 6.2, Concrete Truck Washout*.

Once concrete wastes are washed into the designated area and allowed to harden, the concrete is broken up, removed, and disposed of per *Section 8.1, Solid Waste Management*.

Inspection and Maintenance:

The RCE should monitor on site concrete waste storage and disposal procedures at least weekly.

The RCE should monitor concrete working tasks, such as saw cutting, coring, grinding, and grooving daily to ensure proper methods are employed.

Temporary concrete washout facilities should be maintained to provide adequate holding capacity with a minimum freeboard of 4 inches for above grade facilities and 12 inches for below grade facilities. Maintaining temporary concrete washout facilities should include removing and disposing of hardened concrete and returning the facilities to a functional condition.

Existing facilities should be cleaned or new facilities should be constructed and ready for use once the washout is 75% full.

Inspect temporary concrete washout facilities for damage (i.e., tears in PVC liner, missing sandbags, etc.). Repair damaged facilities immediately.

Concrete Waste Management

8.6 SPILL PREVENTION, CONTROL, AND CLEANUP

Implement the BMPs in this section to prevent and control spills in a manner that minimizes or prevents the discharge of spilled material to the drainage system or watercourses. They apply to all construction projects and should be utilized anytime chemicals and/or hazardous substances are stored on site. Substances may include, but are not limited to:

- Soil stabilizers/binders
- Dust palliatives
- Herbicides
- Growth inhibitors
- Fertilizers;
- Deicing/anti-icing chemicals
- Fuels
- Lubricants
- Other petroleum distillates

To the extent that the work can be accomplished safely, spills of oil, petroleum products, substances listed under 40 CFR parts 110, 117, and 302 and sanitary and septic wastes should be contained and cleaned up immediately.

SCDOT may be required to develop and implement a SPCC Plan as part of the SWPPP if appropriate for the construction site involved. The SPCC Plan will identify persons responsible for implementing the plan if a spill of a dangerous or hazardous waste should occur.

If a spill, regardless of size, of a hazardous substance could reach surface waters, DHEC must be notified. When reporting a spill, the following information must be provided:

- Reporting party
- Material released
- Concentration of material
- Contact phone number(s)
- Resource damages (e.g., dead fish)
- Location
- Responsible party
- Quantity of spill
- Cleanup status

Procedures and practices presented in this BMP are general. The site contractor should identify appropriate practices for the specific materials used or stored on-site.

BMPs:

Education

Educate employees and subcontractors on what a “significant spill” is for each material they use and what is an appropriate response for “significant” and “insignificant” spills.

Educate employees and subcontractors on potential dangers to humans and the environment from spills and leaks.

Hold regular meetings to discuss and reinforce appropriate disposal procedures (incorporate into regular safety meetings).

Provide specific cleanup instructions for different products handled on-site.

Assign a person to be in charge of cleanup assistance.

Prepare spill containment and cleanup lists that are easy to find and use.

Post a summary of the cleanup plan at appropriate locations.

Cleanup and Storage Procedures

If a spill occurs, demobilize it as soon as possible.

If there is a chance that the spill could enter a storm drain or sewer, plug the inlet and turn off or divert any incoming water.

Cover the spill with absorbent material, such kitty litter or sawdust. Do not use straw. Dispose of the used absorbent per manufacturer’s instructions. If the spill is flammable, dispose of as directed by the local fire marshal.

Keep the area well ventilated.

Minor Spills – Minor spills typically involve small quantities of oil, gasoline, paint, etc., which can be controlled by the first responder at the discovery of the spill. Use absorbent materials on small spills rather than hosing down or burying the spill.

Semi-Significant Spills – Semi-significant spills still can be controlled by the first responder along with the aid of other personnel such as laborers and the foreman, etc. This response may require the cessation of all other activities.

Contain spills immediately:

- If the spill occurs on paved or impermeable surfaces, clean up using “dry” methods (absorbent materials, cat litter and/or rags). Contain the spill by encircling with absorbent materials and do not let the spill spread widely.

- If the spill occurs in dirt areas, immediately contain the spill by constructing an earthen dike.

- If the spill occurs during rain, to the extent that it doesn’t compromise clean up activities, cover spill with tarps or other material to prevent contaminating runoff.

Significant/Hazardous Spills – For significant or hazardous spills that cannot be controlled by personnel in the immediate vicinity, the services of a spills contractor or a Haz-Mat team should be obtained immediately. Construction personnel should not attempt to clean up the spill until the appropriate and qualified staff has arrived at the job site.

Spills should not be buried or washed with water.

Store and properly dispose of used clean up materials, contaminated materials, and recovered spill material that are no longer suitable for the intended purpose.

Do not allow water used for cleaning and decontamination to enter storm drains or watercourses and collect and dispose of as described in *Section 8.2, Liquid Waste Management*.

Post proper storage, clean-up, and spill reporting instructions for hazardous materials stored or used on the project site at all times in an open, conspicuous, and accessible location.

Keep waste storage areas clean, well-organized, and equipped with ample clean-up supplies as appropriate for the materials being stored. Repair or replace perimeter controls, containment structures, covers, and liners as needed to maintain proper function.

Inspection and Maintenance:

Verify weekly that spill control clean-up materials are located near material storage, unloading, and use areas.

Update SPCC plans and stock appropriate clean-up materials whenever changes occur in the types of chemicals used or stored on-site.

Spill Prevention, Control and Cleanup

9.0 INSPECTION AND REPORTING REQUIREMENTS

SCDOT's current National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) requires that qualified personnel provided by SCDOT or the contractor inspect the following areas of a SCDOT construction site at least once every 7 calendar days:

1. Disturbed areas and areas used for storage of materials that are exposed to precipitation;

2. Erosion prevention and sediment control and structural control measures identified in the SWPPP;

3. Accessible discharge locations or points; and

4. Locations where vehicles enter or exit the site.

Where sites have been finally stabilized, such inspections may be conducted at least once every month. The table below identifies what the inspector should look for at each inspection location.

Inspection Area	What to Look For
Disturbed areas and material storage areas	Inspect for evidence of, or the potential for, pollutants entering the drainage system.
EPSC and structural control measures	Observe to ensure that they are operating correctly.
Discharge locations or points	Inspect to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters and in meeting the performance standards set forth in the CGP and any other stormwater permitting regulations, including all applicable State or local plans.
Vehicle entry and exit locations	Inspect for evidence of offsite sediment tracking.

If the CGP is revised to require a different inspection frequency, the revised frequency shall be the requirement. The latest CGP can be found online at: http://www.scdhec.gov/Environment/docs/CGP-permit.pdf

10.0 REFERENCES

Acknowledgement

This manual was prepared for SCDOT by Woolpert, Inc.

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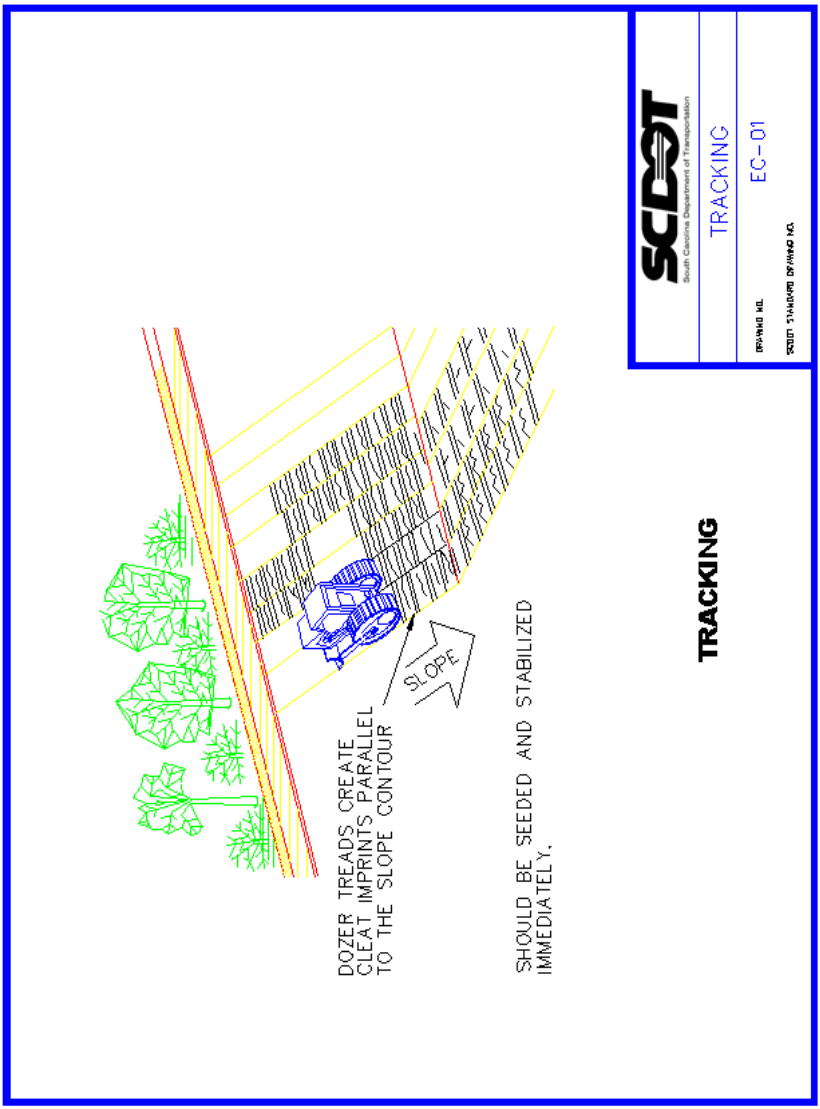
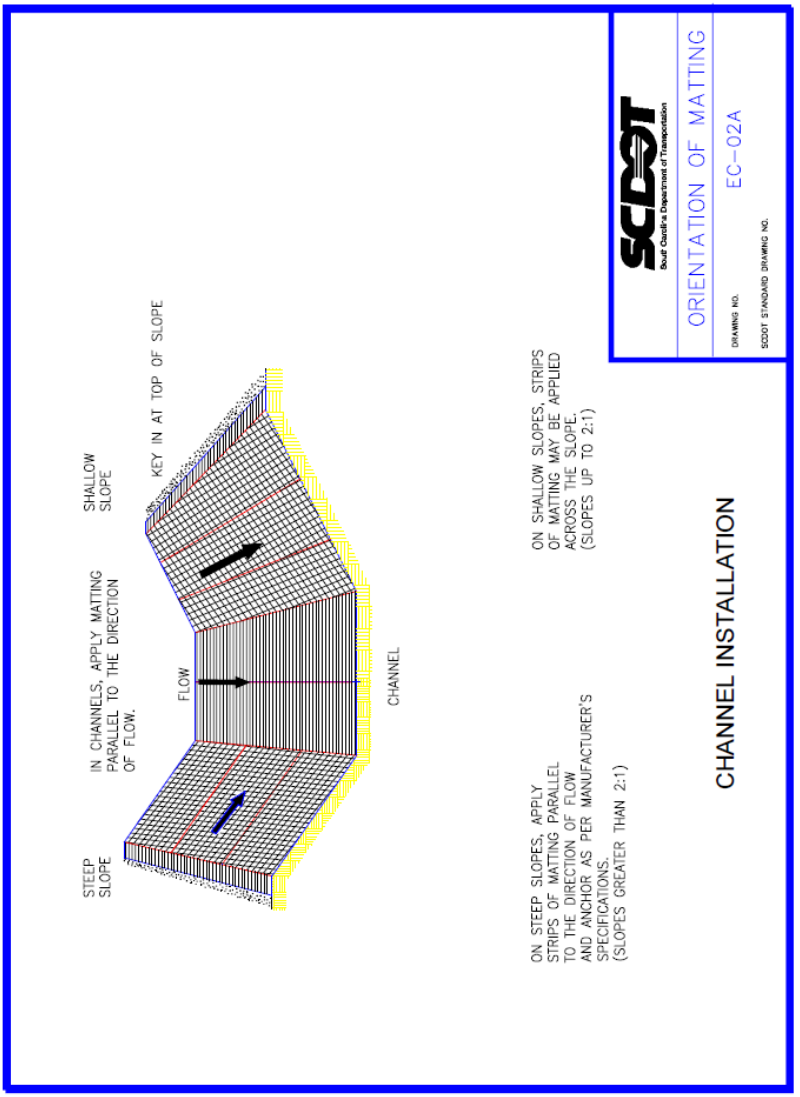
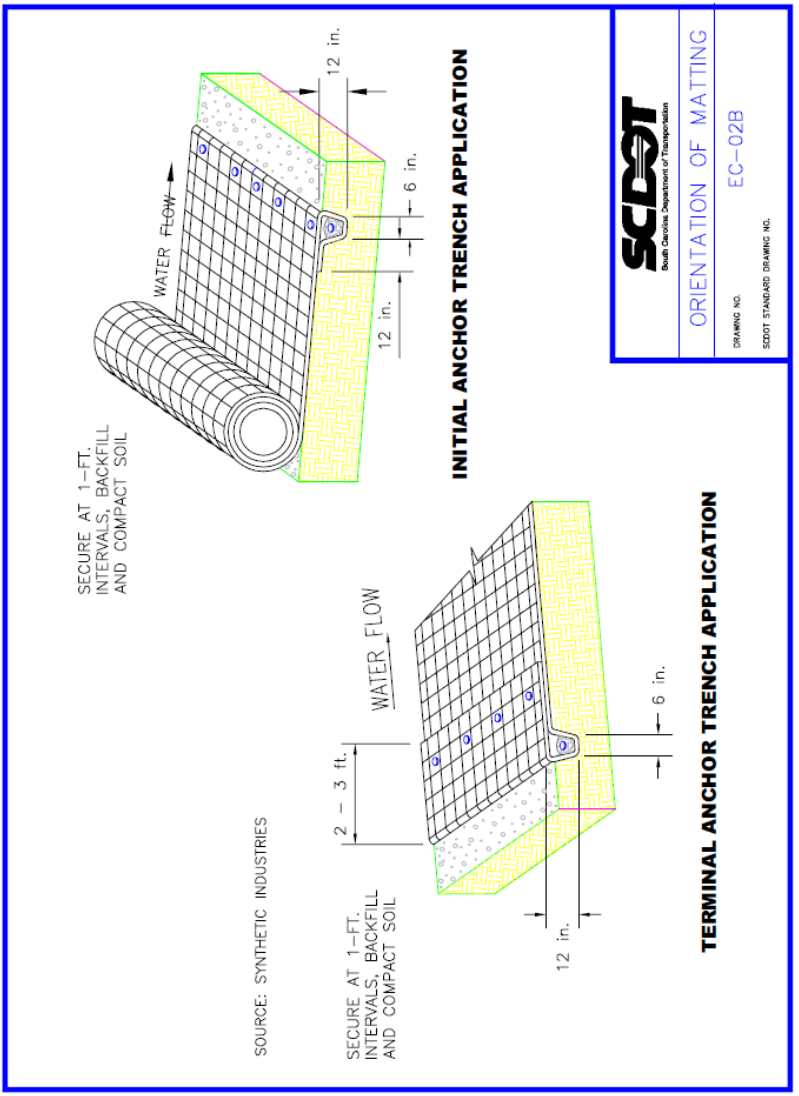
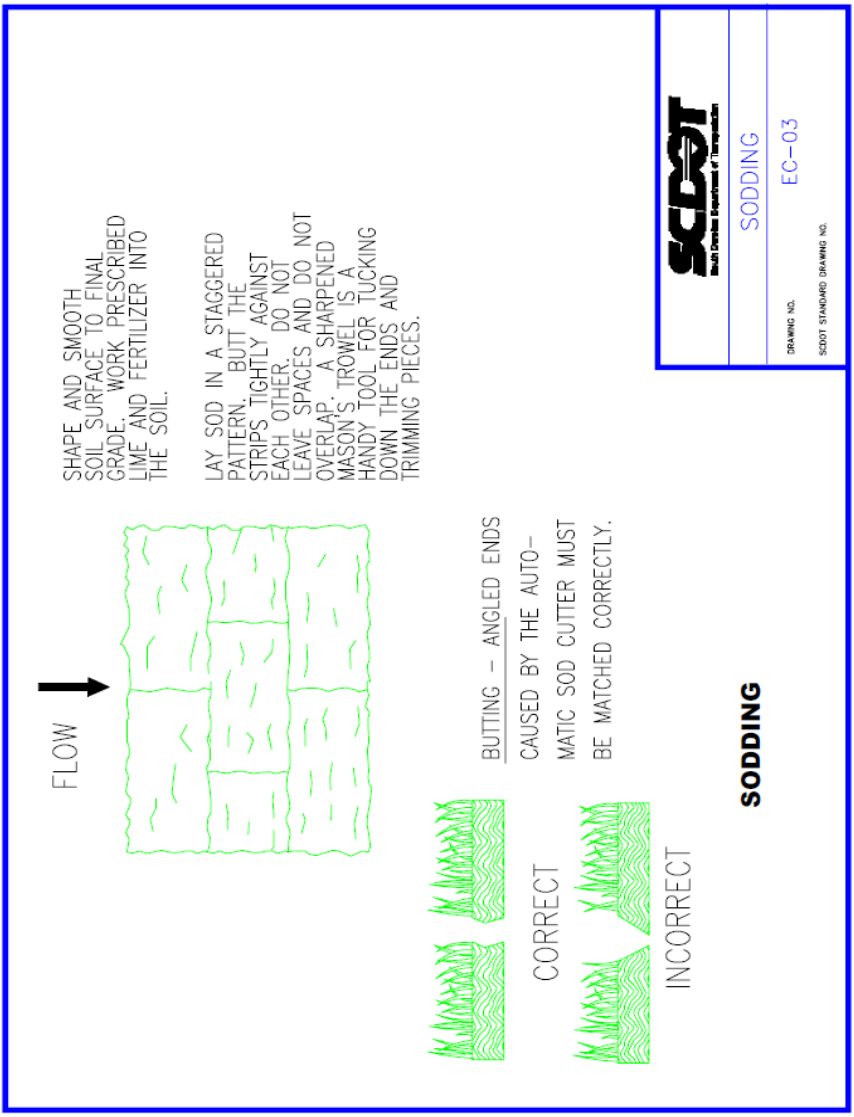
USEPA, National Menu of Best Management Practices, EPA Construction Site Storm Water Runoff Control BMPs, www.epa.gov/npdes/menuofbmps.

11.0 DRAWINGS AND DETAILS


SCDOT
South Carolina Department of Transportation
TRACKING
DRAWING NO.
EC-01
SCDOT STANDARD DRAWING NO.
TRACKING
DOZER TREADS CREATE CLEAT IMPRINTS PARALLEL TO THE SLOPE CONTOUR
SLOPE
SHOULD BE SEEDED AND STABILIZED IMMEDIATELY.


STEEP SLOPE
IN CHANNELS, APPLY MATTING PARALLEL TO THE DIRECTION OF FLOW.
SHALLOW SLOPE
KEY IN AT TOP OF SLOPE
FLOW
CHANNEL
ON STEEP SLOPES, APPLY STRIPS OF MATTING PARALLEL TO THE DIRECTION OF FLOW AND ANCHOR AS PER MANUFACTURER'S SPECIFICATIONS. (SLOPES GREATER THAN 2:1)
ON SHALLOW SLOPES, STRIPS OF MATTING MAY BE APPLIED ACROSS THE SLOPE. (SLOPES UP TO 2:1)
CHANNEL INSTALLATION
SCDOT
South Carolina Department of Transportation
ORIENTATION OF MATTING
DRAWING NO. EC-02A
SCDOT STANDARD DRAWING NO.


INITIAL ANCHOR TRENCH APPLICATION
WATER FLOW
12 in.
6 in.
12 in.
SECURE AT 1-FT. INTERVALS, BACKFILL AND COMPACT SOIL
TERMINAL ANCHOR TRENCH APPLICATION
WATER FLOW
2 - 3 ft.
6 in.
12 in.
SECURE AT 1-FT. INTERVALS, BACKFILL AND COMPACT SOIL
SOURCE: SYNTHETIC INDUSTRIES
SCDOT
South Carolina Department of Transportation
ORIENTATION OF MATTING
DRAWING NO. EC-02B
SCDOT STANDARD DRAWING NO.


SHAPE AND SMOOTH
SOIL SURFACE TO FINAL
GRADE. WORK PRESCRIBED
LIME AND FERTILIZER INTO
THE SOIL.
LAY SOD IN A STAGGERED
PATTERN. BUTT THE
STRIPS TIGHTLY AGAINST
EACH OTHER. DO NOT
LEAVE SPACES AND DO NOT
OVERLAP. A SHARPENED
MASON'S TROWEL IS A
HANDY TOOL FOR TUCKING
DOWN THE ENDS AND
TRIMMING PIECES.
FLOW
BUTTING - ANGLED ENDS
CAUSED BY THE AUTO-
MATIC SOD CUTTER MUST
BE MATCHED CORRECTLY.
CORRECT
INCORRECT
SODDING
SCDOT
SODDING
DRAWING NO.
EC-03
SCDOT STANDARD DRAWING NO.

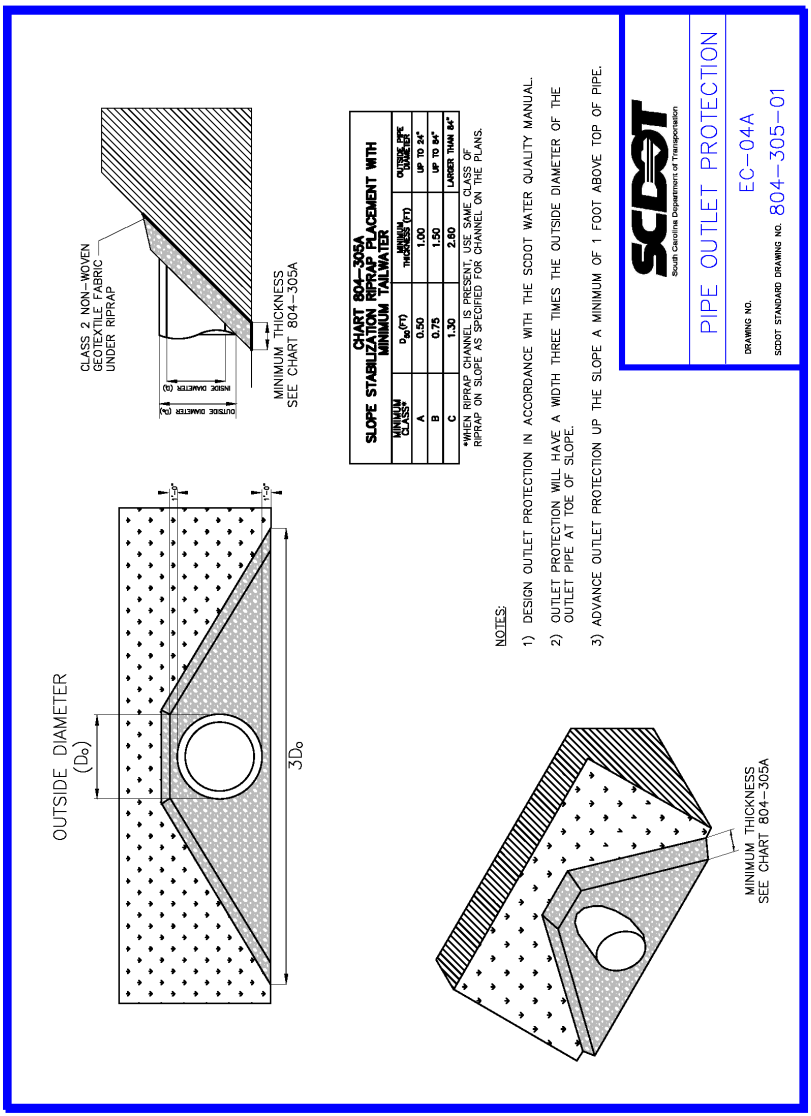


CHART 804-305A
SLOPE STABILIZATION RIPRAP PLACEMENT WITH MINIMUM TAILWATER

MINIMUM CLASS*	D_{50} (FT)	MINIMUM THICKNESS (FT)	OUTSIDE DIAMETER (Do)
A	0.50	1.00	UP TO 24"
B	0.75	1.50	UP TO 84"
C	1.30	2.60	LARGER THAN 84"

*WHEN RIPRAP CHANNEL IS PRESENT, USE SAME CLASS OF RIPRAP ON SLOPE AS SPECIFIED FOR CHANNEL ON THE PLANS.

NOTES:

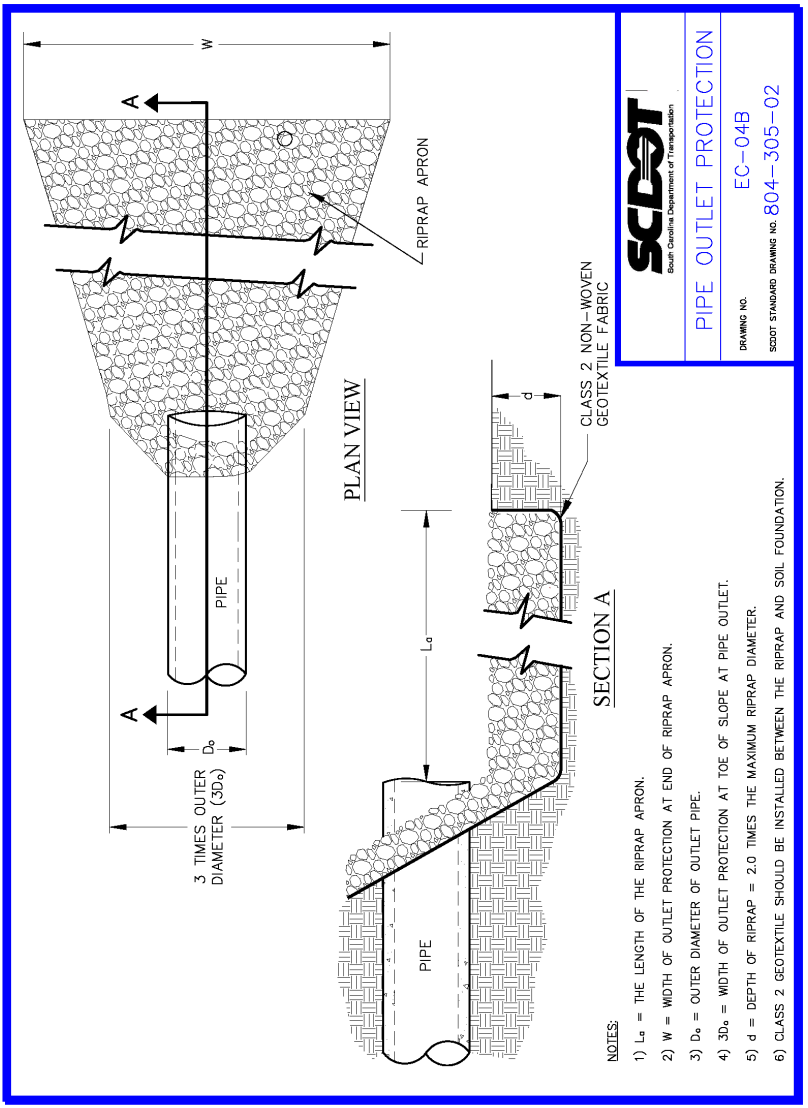
1) DESIGN OUTLET PROTECTION IN ACCORDANCE WITH THE SCDOT WATER QUALITY MANUAL.
2) OUTLET PROTECTION WILL HAVE A WIDTH THREE TIMES THE OUTSIDE DIAMETER OF THE OUTLET PIPE AT TOE OF SLOPE.
3) ADVANCE OUTLET PROTECTION UP THE SLOPE A MINIMUM OF 1 FOOT ABOVE TOP OF PIPE.

SCDOT
South Carolina Department of Transportation

PIPE OUTLET PROTECTION

DRAWING NO. EC-04A

SCDOT STANDARD DRAWING NO. 804-305-01


W
A
A
PIPE
D_o
3 TIMES OUTER DIAMETER ($3D_o$)
RIPRAP APRON
PLAN VIEW
L_a
PIPE
CLASS 2 NON-WOVEN GEOTEXTILE FABRIC
d
SECTION A
NOTES:
1) L_a = THE LENGTH OF THE RIPRAP APRON.
2) W = WIDTH OF OUTLET PROTECTION AT END OF RIPRAP APRON.
3) D_o = OUTER DIAMETER OF OUTLET PIPE.
4) $3D_o$ = WIDTH OF OUTLET PROTECTION AT TOE OF SLOPE AT PIPE OUTLET.
5) d = DEPTH OF RIPRAP = 2.0 TIMES THE MAXIMUM RIPRAP DIAMETER.
6) CLASS 2 GEOTEXTILE SHOULD BE INSTALLED BETWEEN THE RIPRAP AND SOIL FOUNDATION.
SCDOT
South Carolina Department of Transportation
PIPE OUTLET PROTECTION
DRAWING NO. EC-04B
SCDOT STANDARD DRAWING NO. 804-305-02

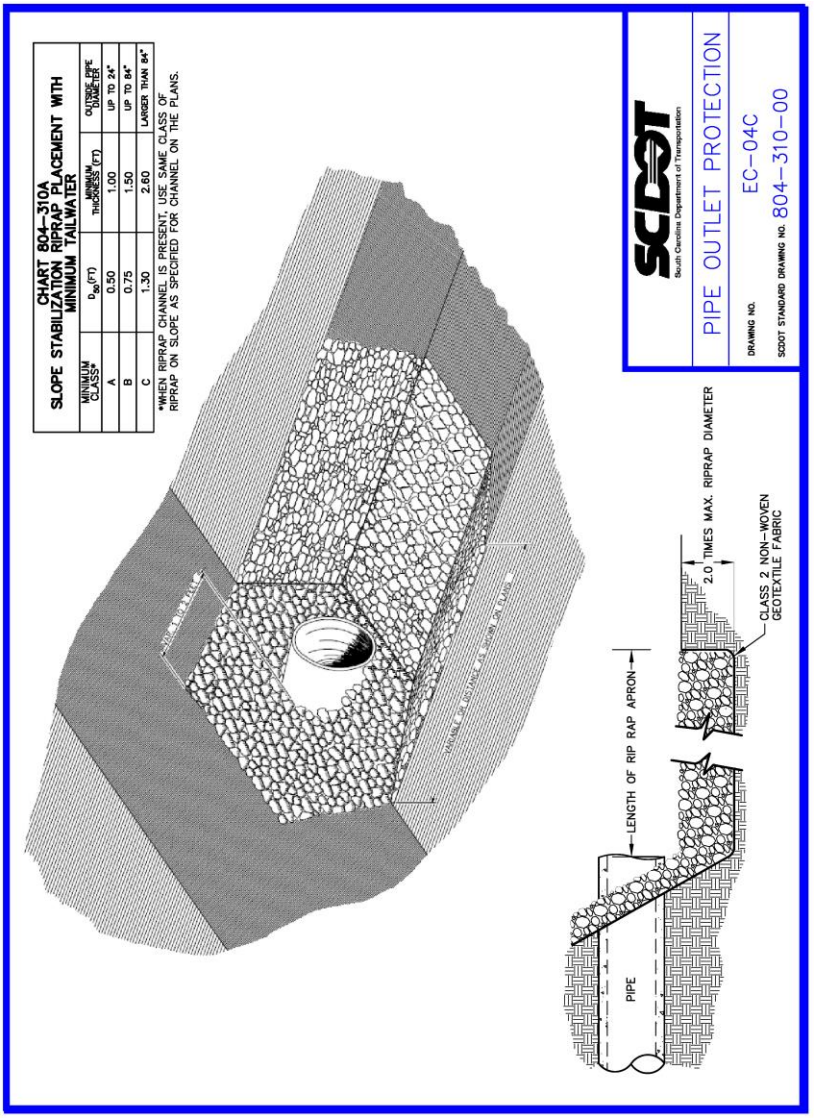
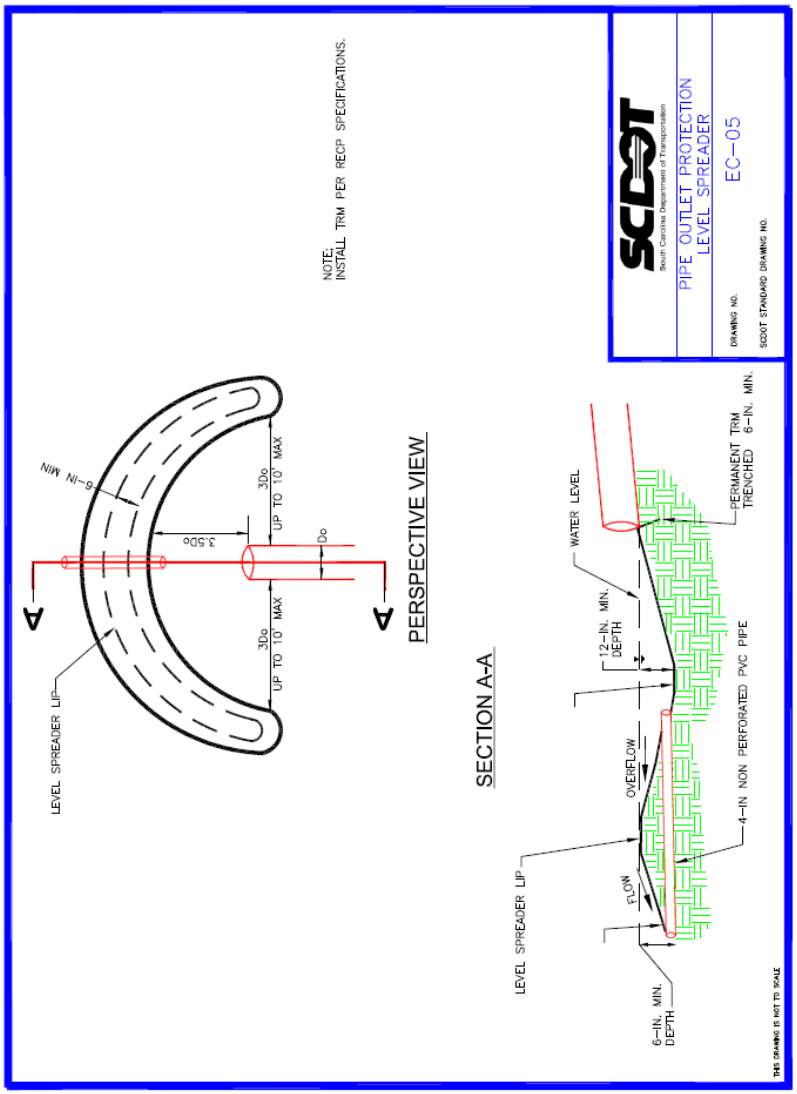
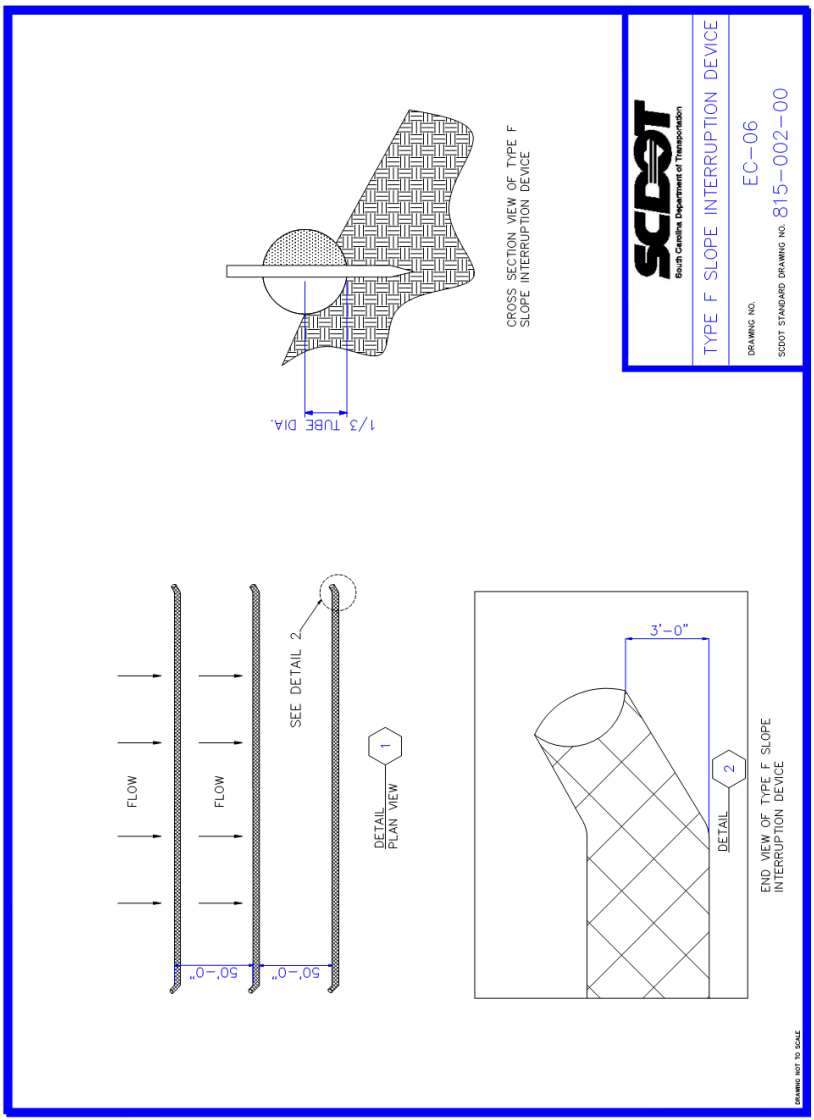
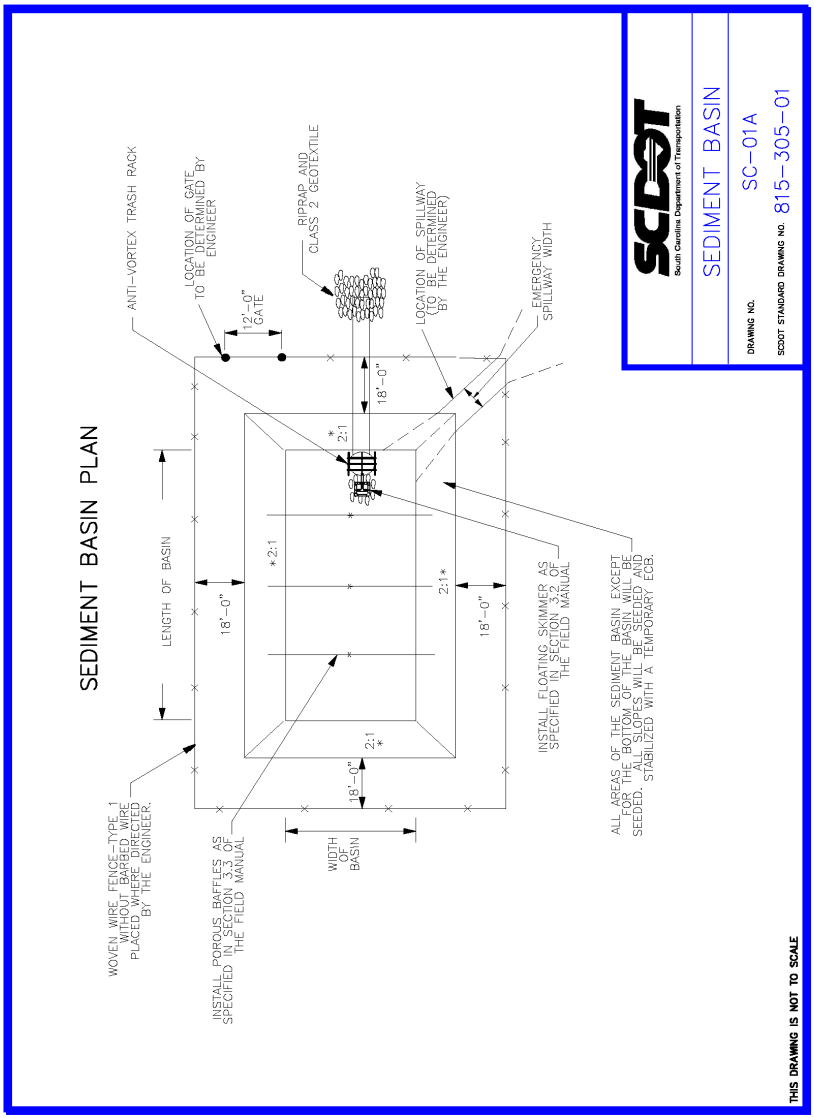


CHART 804-310A
SLOPE STABILIZATION RIPRAP PLACEMENT WITH MINIMUM TAILWATER
MINIMUM CLASS*
D_{50}(FT)
MINIMUM THICKNESS (FT)
OUTSIDE PIPE DIAMETER
A 0.50 1.00 UP TO 24"
B 0.75 1.50 UP TO 84"
C 1.30 2.60 LARGER THAN 84"
*WHEN RIPRAP CHANNEL IS PRESENT USE SAME CLASS OF RIPRAP ON SLOPE AS SPECIFIED FOR CHANNEL ON THE PLANS.
SCDOT
South Carolina Department of Transportation
PIPE OUTLET PROTECTION
DRAWING NO. EC-04C
SCDOT STANDARD DRAWING NO. 804-310-00
LENGTH OF RIP RAP APRON
PIPE
2.0 TIMES MAX. RIPRAP DIAMETER
CLASS 2 NON-WOVEN GEOTEXTILE FABRIC


NOTE:
INSTALL TRM PER RECP SPECIFICATIONS.
PERSPECTIVE VIEW
LEVEL SPREADER LIP
6-IN MIN
3.5Do
30o
UP TO 10' MAX
Do
SECTION A-A
WATER LEVEL
12-IN. MIN. DEPTH
PERMANENT TRM TRENCHED 6-IN. MIN.
OVERFLOW
FLOW
4-IN NON PERFORATED PVC PIPE
6-IN. MIN. DEPTH
THIS DRAWING IS NOT TO SCALE
SCDOT
South Carolina Department of Transportation
PIPE OUTLET PROTECTION
LEVEL SPREADER
DRAWING NO.
EC-05
SCDOT STANDARD DRAWING NO.


SCDOT
South Carolina Department of Transportation
TYPE F SLOPE INTERRUPTION DEVICE
DRAWING NO. EC-06
SCDOT STANDARD DRAWING NO. 815-002-00
CROSS SECTION VIEW OF TYPE F SLOPE INTERRUPTION DEVICE
1/3 TUBE DIA.
FLOW
FLOW
SEE DETAIL 2
50'-0"
50'-0"
1
DETAIL
PLAN VIEW
3'-0"
2
DETAIL
END VIEW OF TYPE F SLOPE INTERRUPTION DEVICE
DRAWING NOT TO SCALE


SEDIMENT BASIN PLAN
ANTI-VORTEX TRASH RACK
LOCATION OF GATE TO BE DETERMINED BY ENGINEER
12'-0" GATE
RIPRAP AND CLASS 2 GEOTEXTILE
LOCATION OF SPILLWAY (TO BE DETERMINED BY THE ENGINEER)
EMERGENCY SPILLWAY WIDTH
LENGTH OF BASIN
18'-0"
*2:1
2:1*
WOVEN WIRE FENCE-TYPE 1 WITHOUT BARBED WIRE PLACED WHERE DIRECTED BY THE ENGINEER.
INSTALL POROUS BAFFLES AS SPECIFIED IN SECTION 3.2 OF THE FIELD MANUAL
WIDTH OF BASIN
INSTALL FLOATING SKIMMER AS SPECIFIED IN SECTION 3.2 OF THE FIELD MANUAL
ALL AREAS OF THE SEDIMENT BASIN EXCEPT FOR THE BOTTOM OF THE BASIN WILL BE SEEDED. ALL SLOPES WILL BE SEEDED AND STABILIZED WITH A TEMPORARY ECB.
SCDOT
South Carolina Department of Transportation
SEDIMENT BASIN
DRAWING NO. SC-01A
SCDOT STANDARD DRAWING NO. 815-305-01
THIS DRAWING IS NOT TO SCALE

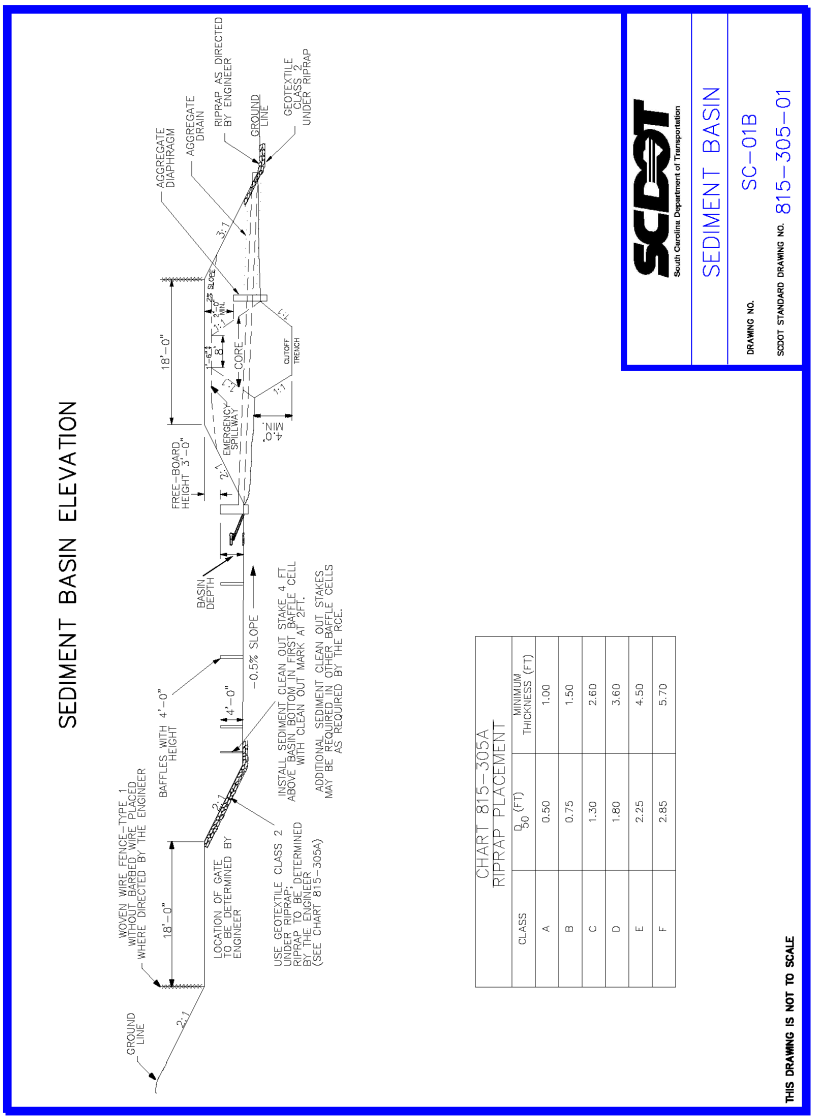


CHART 815-305A
RIPRAP PLACEMENT

CLASS	D_{50} (FT)	MINIMUM THICKNESS (FT)
A	0.50	1.00
B	0.75	1.50
C	1.30	2.60
D	1.80	3.60
E	2.25	4.50
F	2.85	5.70

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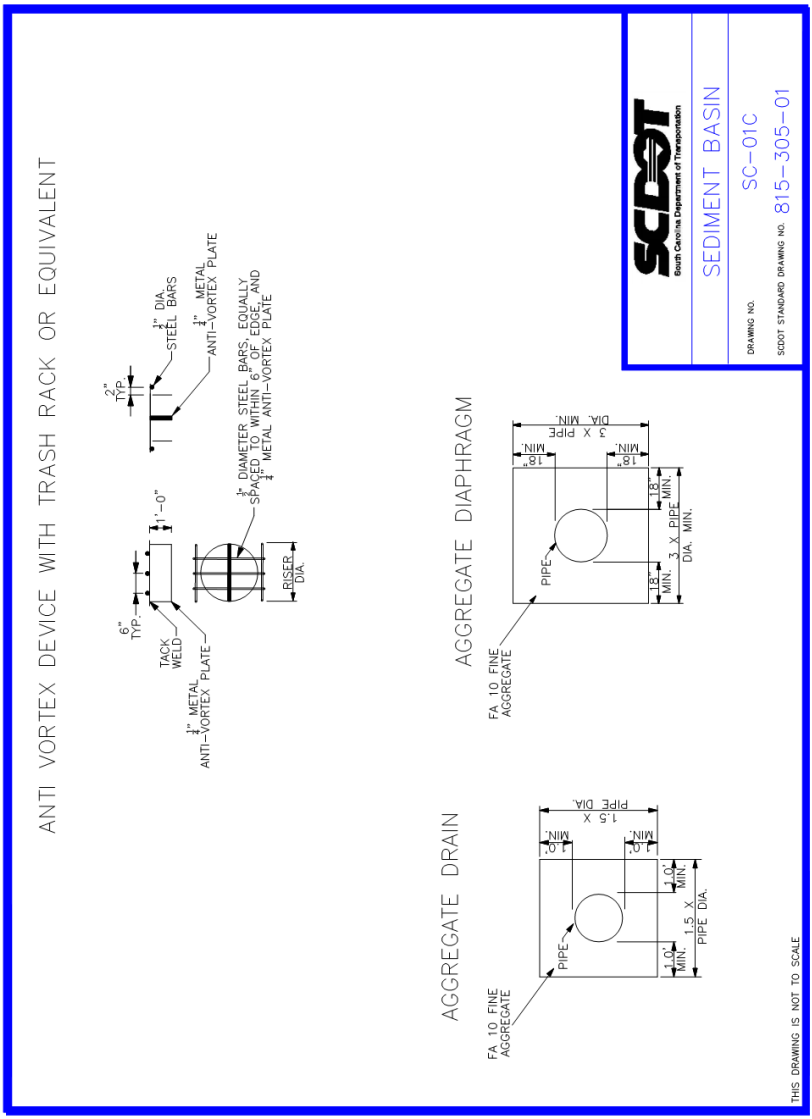
SEDIMENT BASIN

DRAWING NO. SC-01B

SCDOT STANDARD DRAWING NO. 815-305-01

THIS DRAWING IS NOT TO SCALE


ANTI VORTEX DEVICE WITH TRASH RACK OR EQUIVALENT
2" TYP.
1" DIA. STEEL BARS
1" METAL ANTI-VORTEX PLATE
1'-0"
6" TYP.
TACK WELD
1" METAL ANTI-VORTEX PLATE
1" DIAMETER STEEL BARS, EQUALLY SPACED WITHIN 6" OF EDGE AND 4" METAL ANTI-VORTEX PLATE
RISER DIA.
AGGREGATE DRAIN
FA 10 FINE AGGREGATE
PIPE
1.5 X PIPE DIA.
1.0' MIN.
1.5 X PIPE DIA.
AGGREGATE DIAPHRAGM
FA 10 FINE AGGREGATE
PIPE
3 X PIPE DIA. MIN.
18" MIN.
3 X PIPE DIA. MIN.
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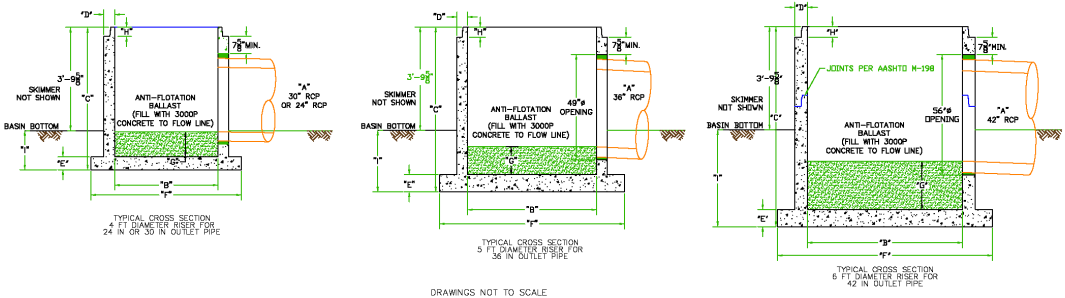
SEDIMENT BASIN
DRAWING NO. SC-01C
SCDOT STANDARD DRAWING NO. 815-305-01
THIS DRAWING IS NOT TO SCALE



DRAWINGS NOT TO SCALE

OUTLET PIPE DIAMETER (A) inches	RISER DIAMETER (B) FT	RISER HEIGHT (C) inches	WALL THICKNESS (D) inches MIN	BASE THICKNESS (E) inches MIN	BASE DIAMETER (F) inches MIN	ANTI FLOAT BALLAST (G) IN	TOP JOINT (H) inches	RISER RECESS (I) inches
24 and 30	4	66	5	6	70	12	4	18
36	5	76	5	8	86	13	5	28
42	6	93	6	8	100	23	5	45

*VALUES IN TABLE ARE TYPICAL AND MAY VARY BY SPECIFIC PRECASTER

ENSURE ALL RISER (MANHOLE) MATERIALS, MANUFACTURING, TESTING AND PRODUCT PERFORMANCE FOR PRECAST CONCRETE COMPONENTS AND ACCESSORIES ARE IN ACCORDANCE WITH AASHTO M199 AND SECTION 719 OF THE SCDOT STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, 2007 EDITION, OR LATEST REVISION.

USE PRECAST CONCRETE COMPONENTS DESIGNED IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS.

USE PRECAST CONCRETE MANHOLES WITH A HL-93 DESIGN LIVE LOADING.

USE CLASS 4000P CONCRETE (MINIMUM) FOR ALL PRECAST CONCRETE ELEMENTS.

USE REINFORCING BARS CONFORMING TO THE REQUIREMENTS OF ASTM A706, GRADE 60.

USE WELDED WIRE FABRIC MEETING THE REQUIREMENTS OF AASHTO M55 AND AASHTO M221.

USE WATER TIGHT PIPE BARREL TO RISER CONNECTORS

FILL CLASS 3000P (MINIMUM) CONCRETE TO THE FLOW LINE OF OUTLET PIPE TO SERVE AS ANTI-FLOTATION BALLAST

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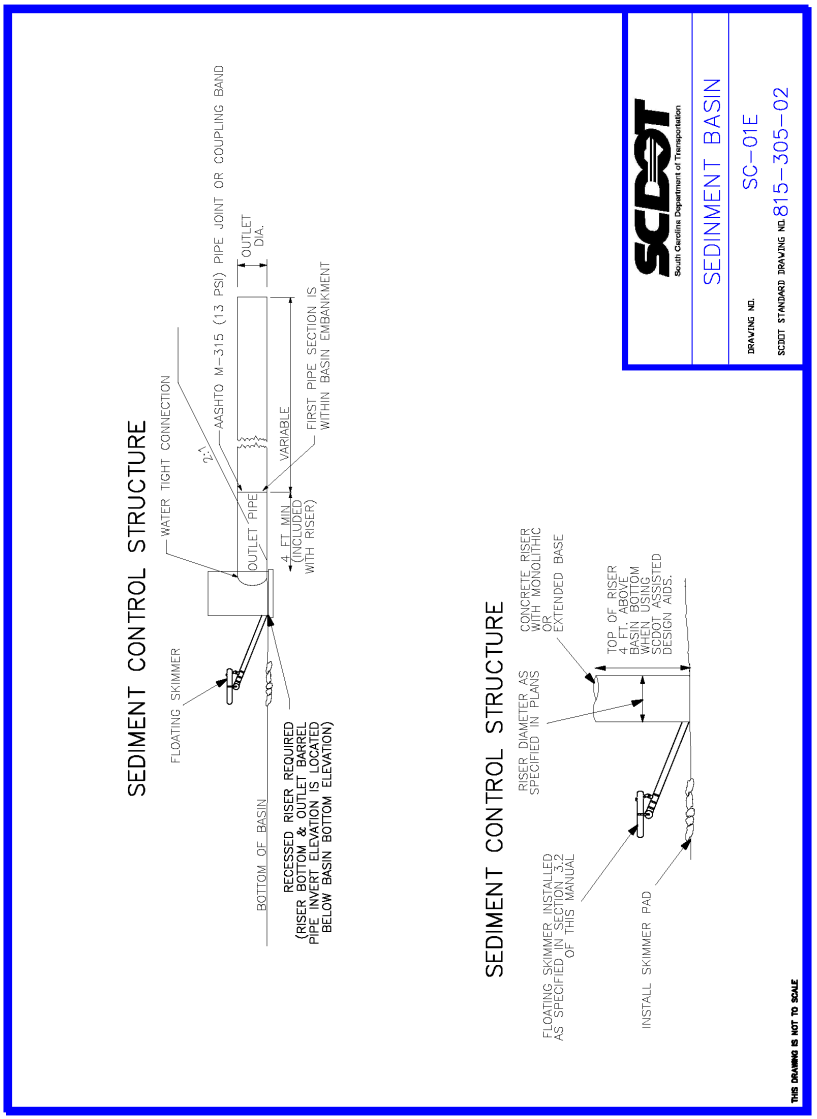
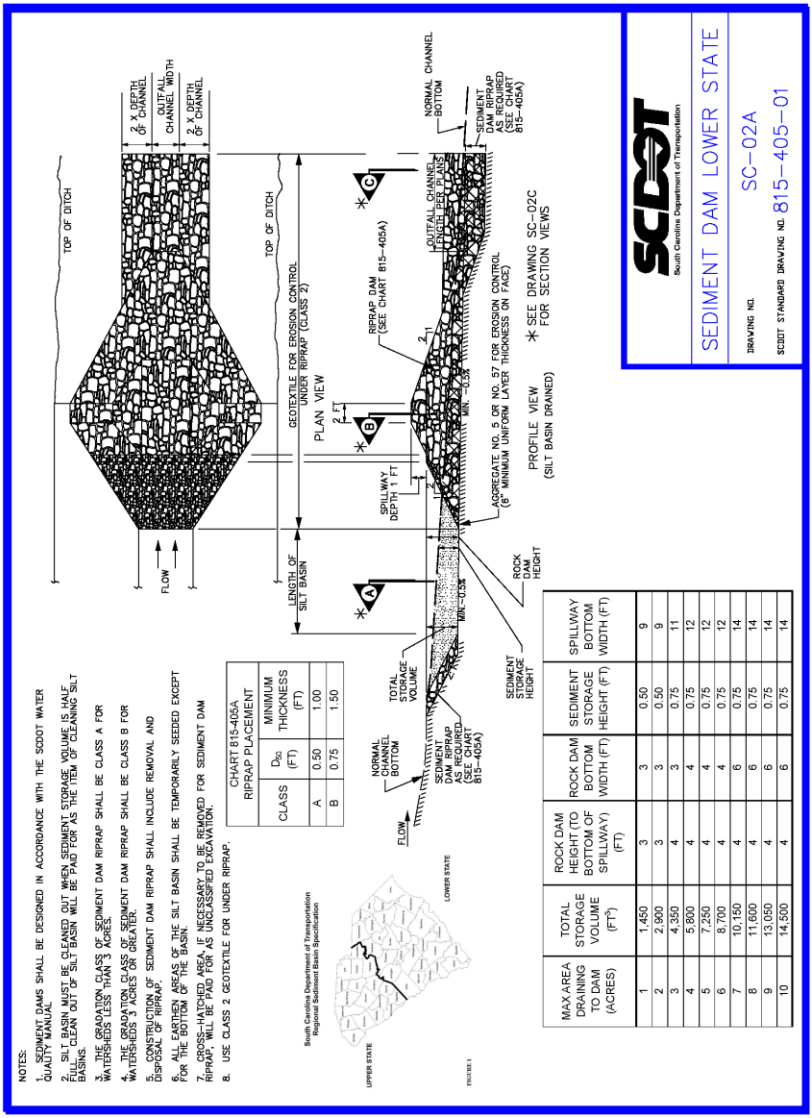
SEDIMENT BASIN

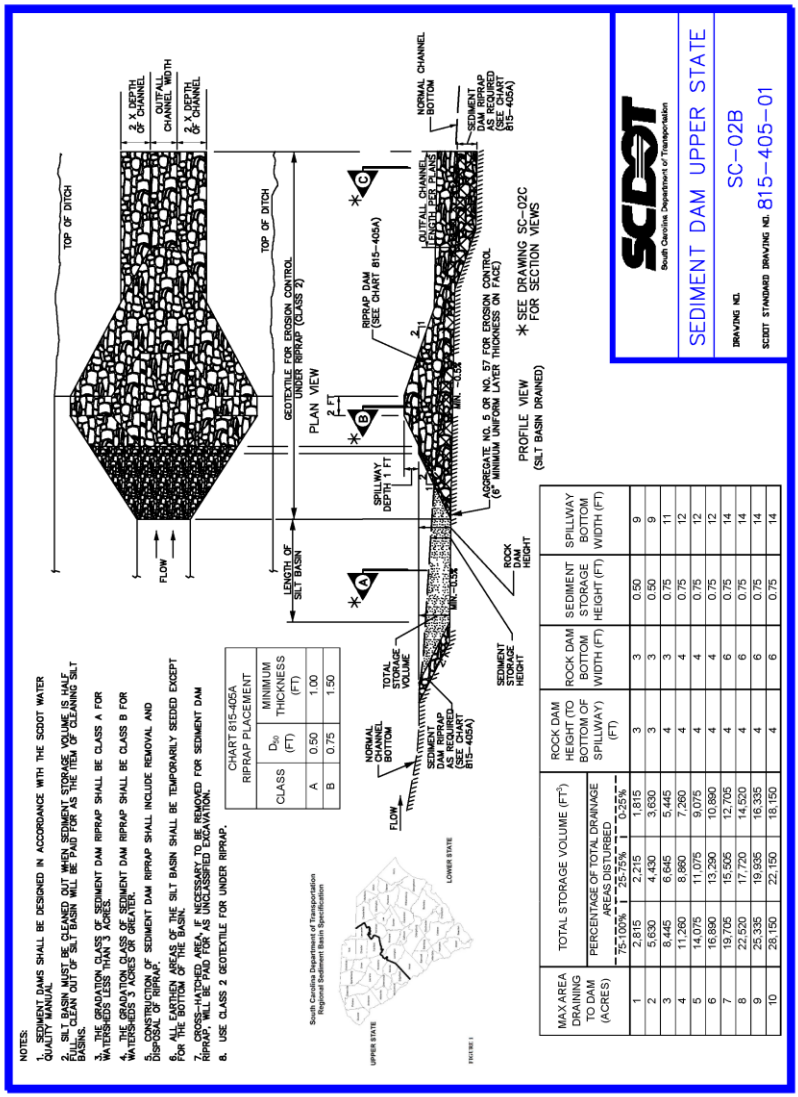
DRAWING NO. SC-01D

SCDOT STANDARD DRAWING NO. 815-305-02


SEDIMENT CONTROL STRUCTURE
FLOATING SKIMMER
WATER TIGHT CONNECTION
2:1
AASHTO M-315 (13 PSI) PIPE JOINT OR COUPLING BAND
OUTLET DIA.
OUTLET PIPE
VARIABLE
4 FT. MIN. (INCLUDED WITH RISER)
FIRST PIPE SECTION IS WITHIN BASIN EMBANKMENT
BOTTOM OF BASIN
RECESSED RISER REQUIRED (RISER BOTTOM & OUTLET BARREL PIPE INVERT ELEVATION IS LOCATED BELOW BASIN BOTTOM ELEVATION)
SEDIMENT CONTROL STRUCTURE
RISER DIAMETER AS SPECIFIED IN PLANS
CONCRETE RISER WITH MONOLITHIC OR EXTENDED BASE
TOP OF RISER 4 FT. ABOVE BASIN BOTTOM WHEN USING SCDOT ASSISTED DESIGN AIDS.
FLOATING SKIMMER INSTALLED AS SPECIFIED IN SECTION 3.2 OF THIS MANUAL
INSTALL SKIMMER PAD
THIS DRAWING IS NOT TO SCALE
SCDOT
South Carolina Department of Transportation
SEDINMENT BASIN
DRAWING NO. SC-01E
SCDOT STANDARD DRAWING NO. 815-305-02



MAX AREA DRAINING TO DAM (ACRES)	TOTAL STORAGE VOLUME (FT^3)	ROCK DAM HEIGHT (TO BOTTOM OF SPILLWAY) (FT)	ROCK DAM BOTTOM WIDTH (FT)	SEDIMENT STORAGE HEIGHT (FT)	SPILLWAY BOTTOM WIDTH (FT)
1	1,450	3	3	0.50	9
2	2,900	3	3	0.50	9
3	4,350	4	3	0.75	11
4	5,800	4	4	0.75	12
5	7,250	4	4	0.75	12
6	8,700	4	4	0.75	12
7	10,150	4	6	0.75	14
8	11,600	4	6	0.75	14
9	13,050	4	6	0.75	14
10	14,500	4	6	0.75	14



MAX AREA DRAINING TO DAM (ACRES)	TOTAL STORAGE VOLUME (FT^3)			ROCK DAM HEIGHT (TO BOTTOM OF SPILLWAY) (FT)	ROCK DAM BOTTOM WIDTH (FT)	SEDIMENT STORAGE HEIGHT (FT)	SPILLWAY BOTTOM WIDTH (FT)
	PERCENTAGE OF TOTAL DRAINAGE AREAS DISTURBED						
	75-100%	25-75%	0-25%				
1	2,815	2,215	1,815	3	3	0.50	9
2	5,630	4,430	3,630	3	3	0.50	9
3	8,445	6,645	5,445	4	3	0.75	11
4	11,260	8,860	7,260	4	4	0.75	12
5	14,075	11,075	9,075	4	4	0.75	12
6	16,890	13,290	10,890	4	4	0.75	12
7	19,705	15,505	12,705	4	6	0.75	14
8	22,520	17,720	14,520	4	6	0.75	14
9	25,335	19,935	16,335	4	6	0.75	14
10	28,150	22,150	18,150	4	6	0.75	14

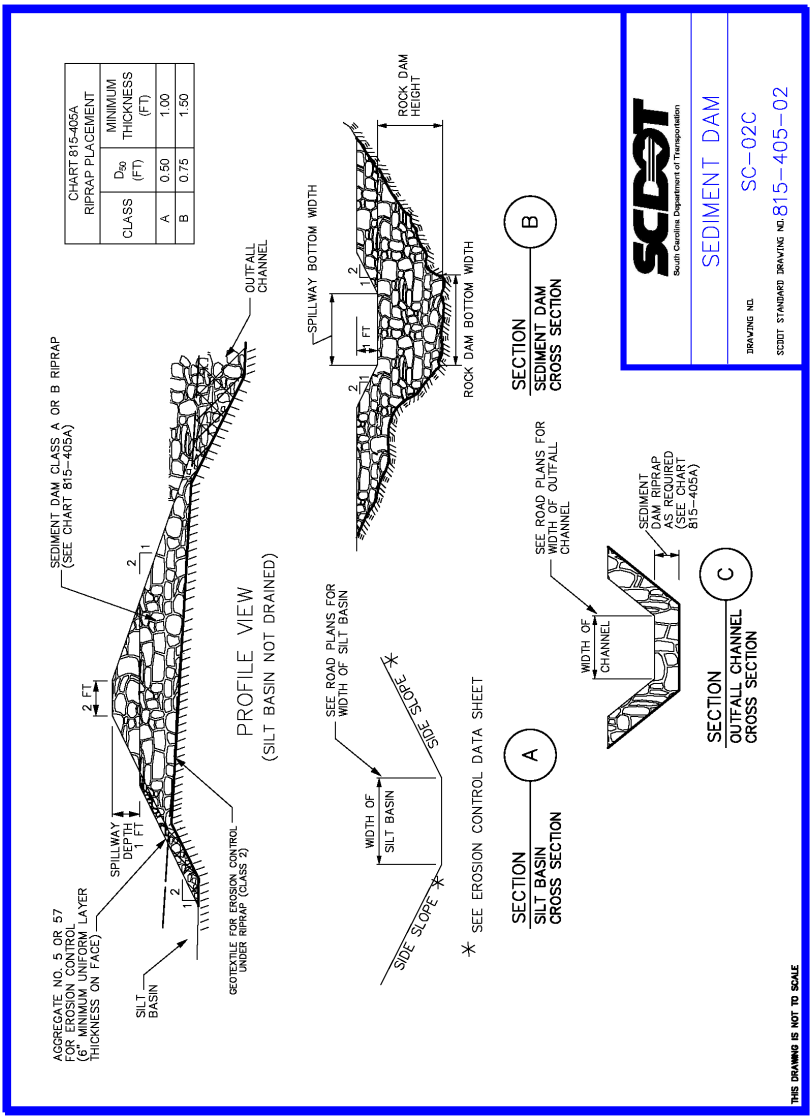
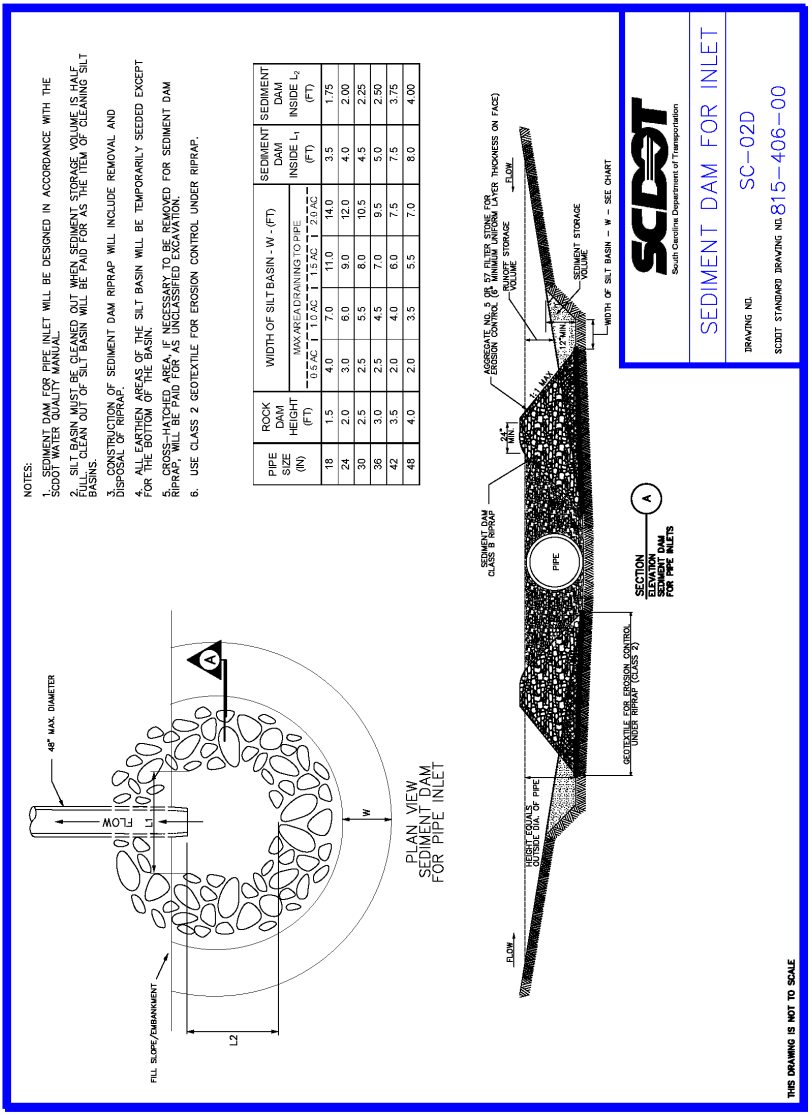
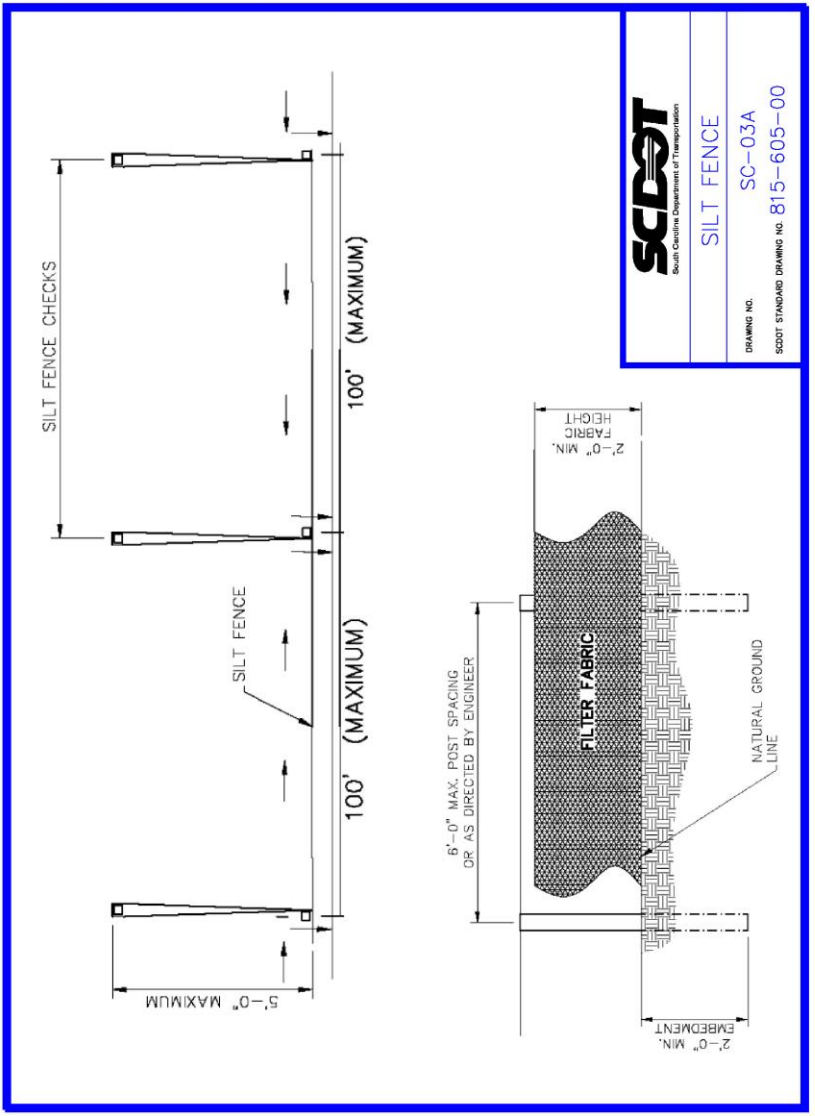


CHART 815-405A
RIPRAP PLACEMENT
CLASS
D_{50} (FT)
MINIMUM THICKNESS (FT)
A 0.50 1.00
B 0.75 1.50
SEDIMENT DAM CLASS A OR B RIPRAP (SEE CHART 815-405A)
AGGREGATE NO. 5 OR 57 FOR EROSION CONTROL (6" MINIMUM UNIFORM LAYER THICKNESS ON FACE)
SPILLWAY DEPTH 1 FT
2 FT
SILT BASIN
GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)
OUTFALL CHANNEL
PROFILE VIEW
(SILT BASIN NOT DRAINED)
SPILLWAY BOTTOM WIDTH
4 FT
ROCK DAM HEIGHT
ROCK DAM BOTTOM WIDTH
SEE ROAD PLANS FOR WIDTH OF SILT BASIN
WIDTH OF SILT BASIN
SIDE SLOPE
SIDE SLOPE
* SEE EROSION CONTROL DATA SHEET
SECTION A
SILT BASIN CROSS SECTION
SEE ROAD PLANS FOR WIDTH OF OUTFALL CHANNEL
WIDTH OF CHANNEL
SEDIMENT DAM RIPRAP AS REQUIRED (SEE CHART 815-405A)
SECTION C
OUTFALL CHANNEL CROSS SECTION
SECTION B
SEDIMENT DAM CROSS SECTION
SCDOT
South Carolina Department of Transportation
SEDIMENT DAM
DRAWING NO. SC-02C
SCDOT STANDARD DRAWING NO. 815-405-02
THIS DRAWING IS NOT TO SCALE


NOTES:
1. SEDIMENT DAM FOR PIPE INLET WILL BE DESIGNED IN ACCORDANCE WITH THE SCDOT WATER QUALITY MANUAL.
2. SILT BASIN MUST BE CLEANED OUT WHEN SEDIMENT STORAGE VOLUME IS HALF FULL. CLEAN OUT OF SILT BASIN WILL BE PAID FOR AS THE ITEM OF CLEANING SILT BASINS.
3. CONSTRUCTION OF SEDIMENT DAM RIPRAP WILL INCLUDE REMOVAL AND DISPOSAL OF RIPRAP.
4. ALL EARTHEN AREAS OF THE SILT BASIN WILL BE TEMPORARILY SEEDED EXCEPT FOR THE BOTTOM OF THE BASIN.
5. CROSS-HATCHED AREA, IF NECESSARY TO BE REMOVED FOR SEDIMENT DAM RIPRAP, WILL BE PAID FOR AS UNCLASSIFIED EXCAVATION.
6. USE CLASS 2 GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP.
PIPE SIZE (IN)
ROCK DAM HEIGHT (FT)
WIDTH OF SILT BASIN - W - (FT)
MAX AREA DRAINING TO PIPE
0.5 AC
1.0 AC
1.5 AC
2.0 AC
SEDIMENT DAM INSIDE L1 (FT)
SEDIMENT DAM INSIDE L2 (FT)
18 1.5 4.0 7.0 11.0 14.0 3.5 1.75
24 2.0 3.0 6.0 9.0 12.0 4.0 2.00
30 2.5 2.5 5.5 8.0 10.5 4.5 2.25
36 3.0 2.5 4.5 7.0 9.5 5.0 2.50
42 3.5 2.0 4.0 6.0 7.5 7.5 3.75
48 4.0 2.0 3.5 5.5 7.0 8.0 4.00
48" MAX. DIAMETER
FLOW
L1
W
L2
FILL SLOPE/EMBANKMENT
A
PLAN VIEW
SEDIMENT DAM
FOR PIPE INLET
AGGREGATE NO. 3 OR 57 FILTER STONE FOR EROSION CONTROL (6" MINIMUM UNIFORM LAYER THICKNESS ON FACE)
24" MIN.
1:1 MAX.
SEDIMENT DAM CLASS B RIPRAP
PIPE
HEIGHT EQUALS OUTSIDE DIA. OF PIPE
GEOTEXTILE FOR EROSION CONTROL UNDER RIPRAP (CLASS 2)
SEDIMENT STORAGE VOLUME
WIDTH OF SILT BASIN - W - SEE CHART
SECTION
ELEVATION
SEDIMENT DAM
FOR PIPE INLETS
SCDOT
South Carolina Department of Transportation
SEDIMENT DAM FOR INLET
DRAWING NO. SC-02D
SCDOT STANDARD DRAWING NO. 815-406-00
THIS DRAWING IS NOT TO SCALE


SCDOT
South Carolina Department of Transportation
SILT FENCE
DRAWING NO. SC-03A
SCDOT STANDARD DRAWING NO. 815-605-00
SILT FENCE CHECKS
100' (MAXIMUM)
100' (MAXIMUM)
SILT FENCE
5'-0" MAXIMUM
2'-0" MIN. FABRIC HEIGHT
6'-0" MAX. POST SPACING OR AS DIRECTED BY ENGINEER
FILTER FABRIC
NATURAL GROUND LINE
2'-0" MIN. EMBEDMENT

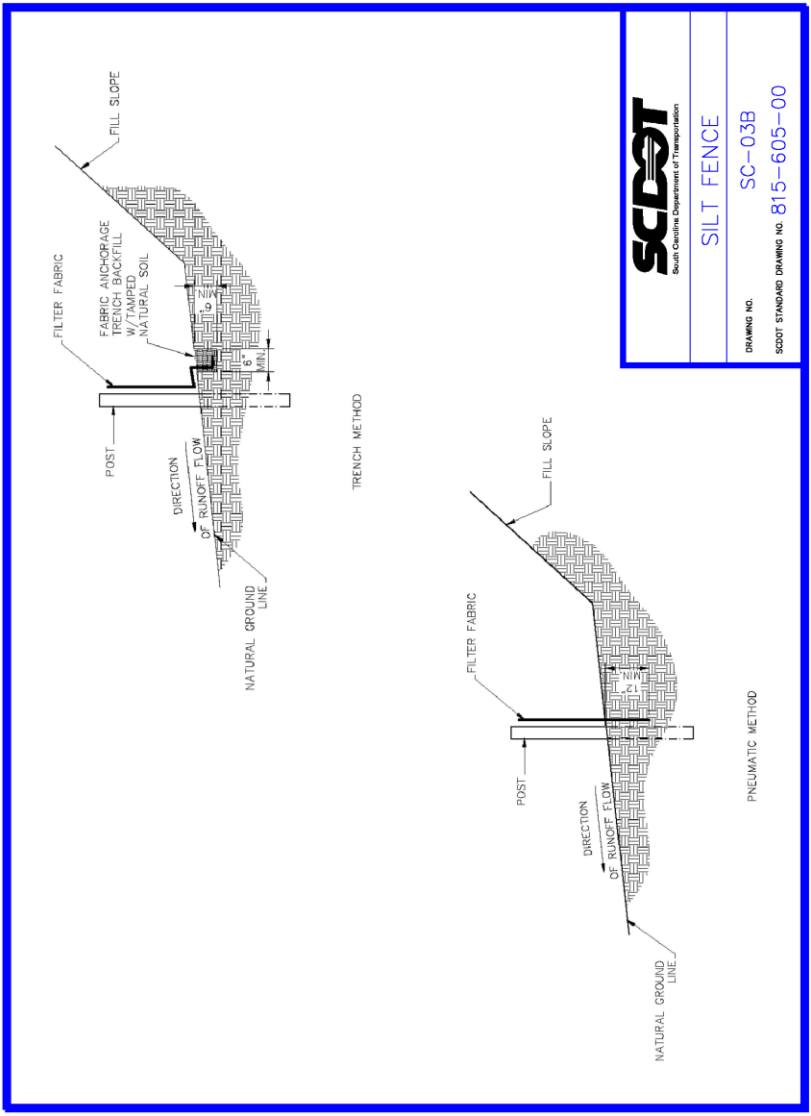
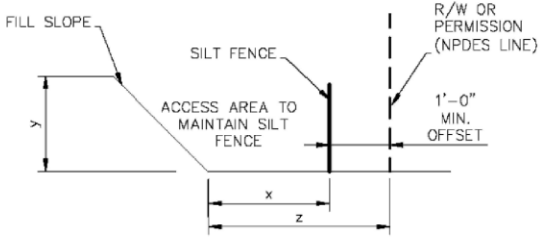

SCDOT
South Carolina Department of Transportation
SILT FENCE
DRAWING NO. SC-03B
SCDOT STANDARD DRAWING NO. 815-605-00
FILL SLOPE
FILTER FABRIC
FABRIC ANCHORAGE TRENCH BACKFILL W/TAMPED NATURAL SOIL
NIM
9"
6" MIN
POST
DIRECTION OF RUNOFF FLOW
NATURAL GROUND LINE
TRENCH METHOD
FILL SLOPE
FILTER FABRIC
NIM
12"
POST
DIRECTION OF RUNOFF FLOW
NATURAL GROUND LINE
PNEUMATIC METHOD

TABLE 815-605A

HEIGHT OF FILL (y) IN FEET	FILL SLOPE	MINIMUM SILT FENCE OFFSET FROM TOE OF SLOPE (x) IN FEET	MINIMUM RIGHT OF WAY OFFSET FROM TOE OF SLOPE (NPDES LINE) (z) IN FEET	CHECK LENGTH IN FEET**
<6	2:1 4:1 6:1	2	3	2
6-10	2:1	12*	13*	5
	4:1 6:1	3	4	3
>10	2:1	12*	13*	5
	4:1 6:1	4	5	4

*THESE MINIMUM OFFSETS MAY BE REDUCED WHEN CURB AND GUTTER OR SOME OTHER FEATURE REDUCES THE FLOW OF WATER DOWN THE SLOPE. THE SMALL OFFSETS OF EACH GROUP OF HEIGHT OF FILL CANNOT BE REDUCED.

**SILT FENCE CHECKS WILL HAVE A MAXIMUM LENGTH OF FIVE (5) FEET OR UNTIL THEY TIE BACK INTO THE SLOPE.

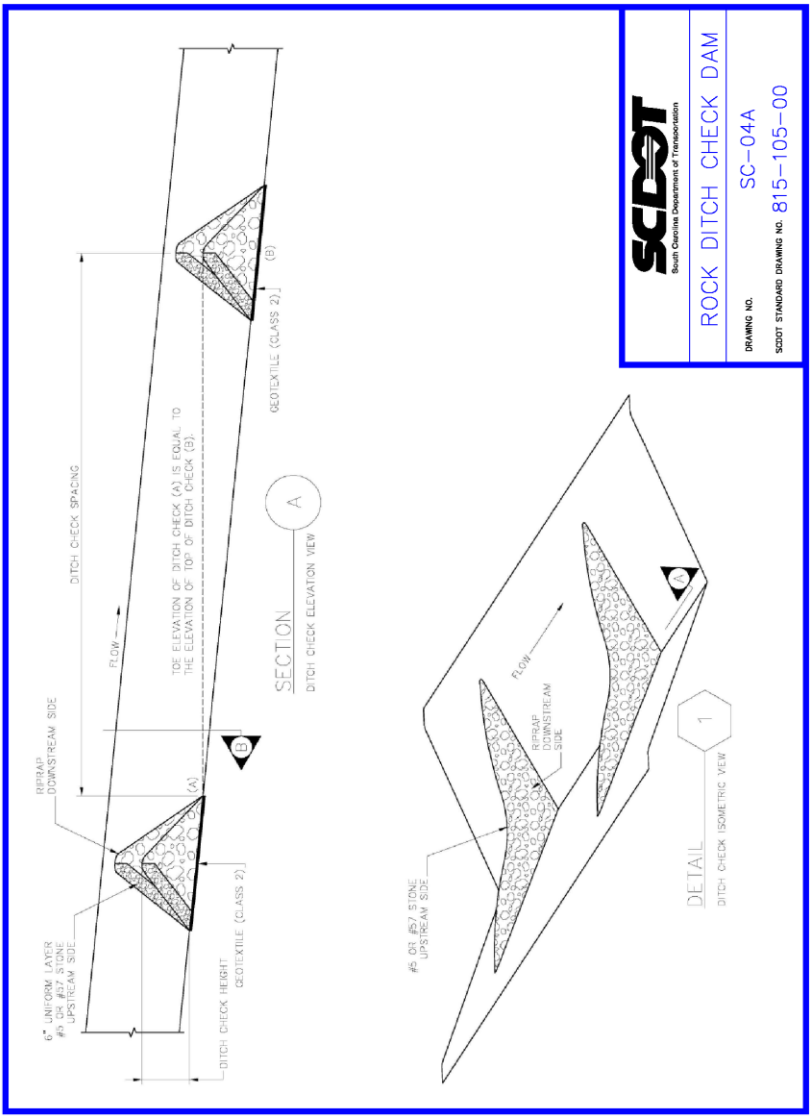


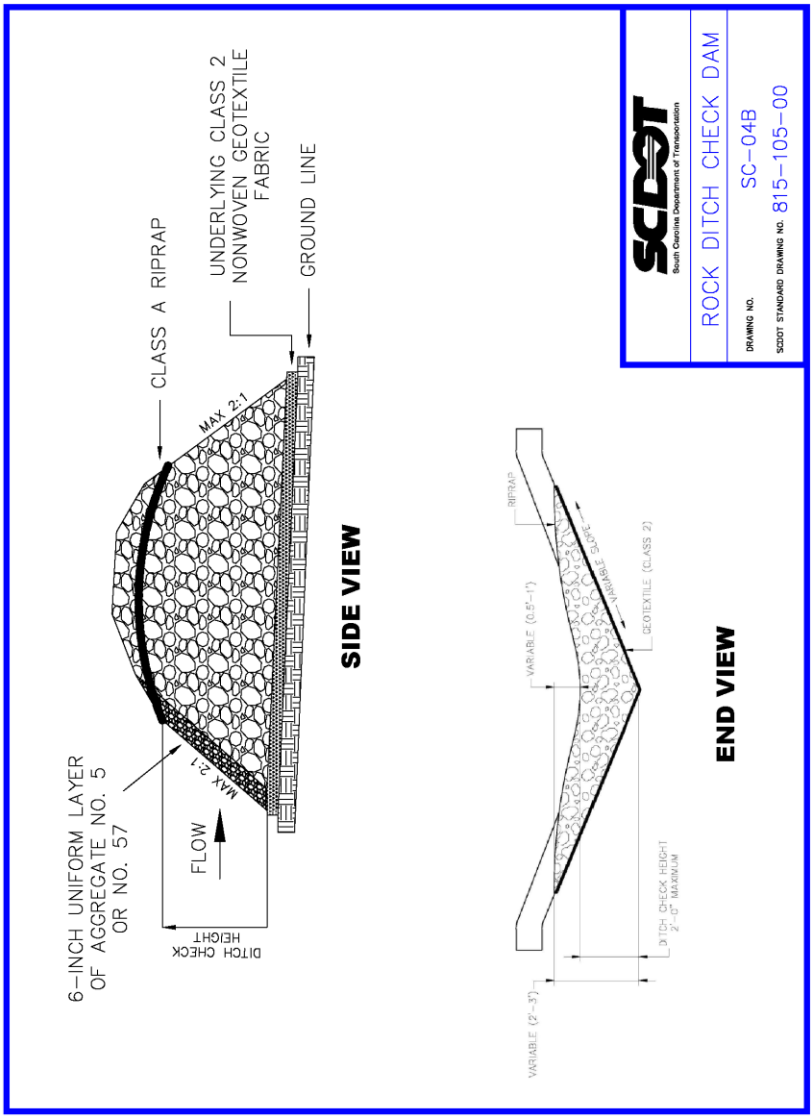
SCDOT
South Carolina Department of Transportation

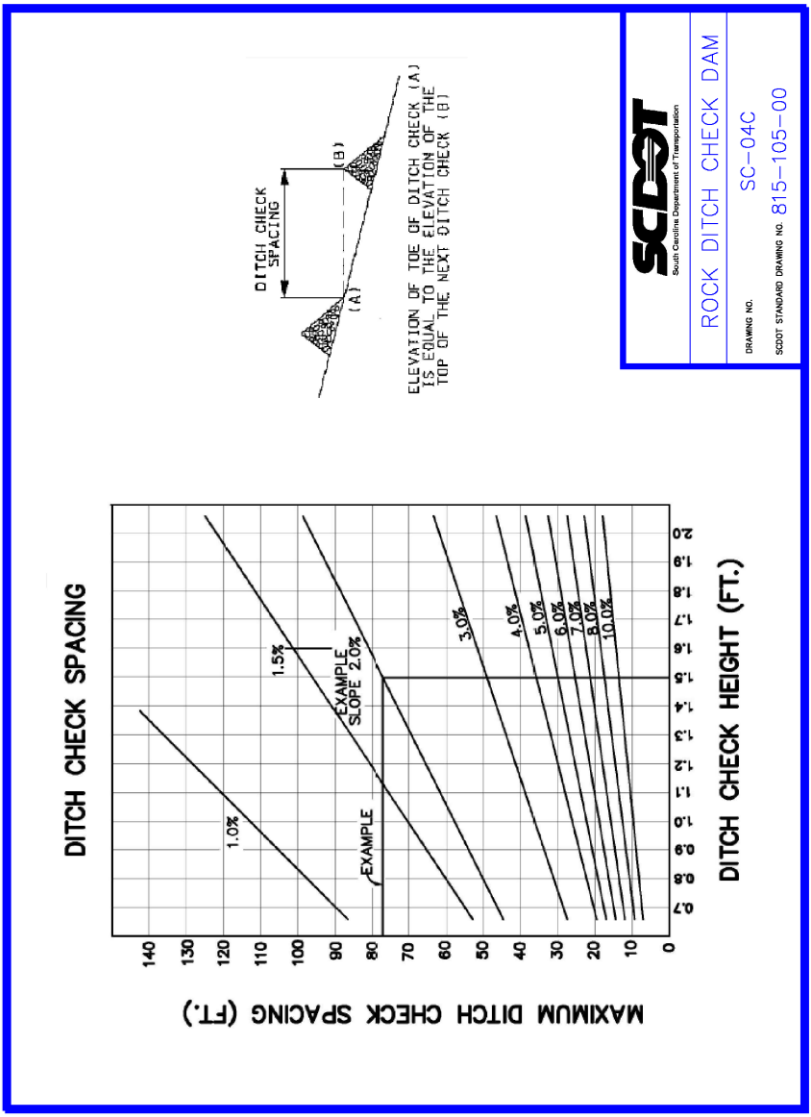
SILT FENCE

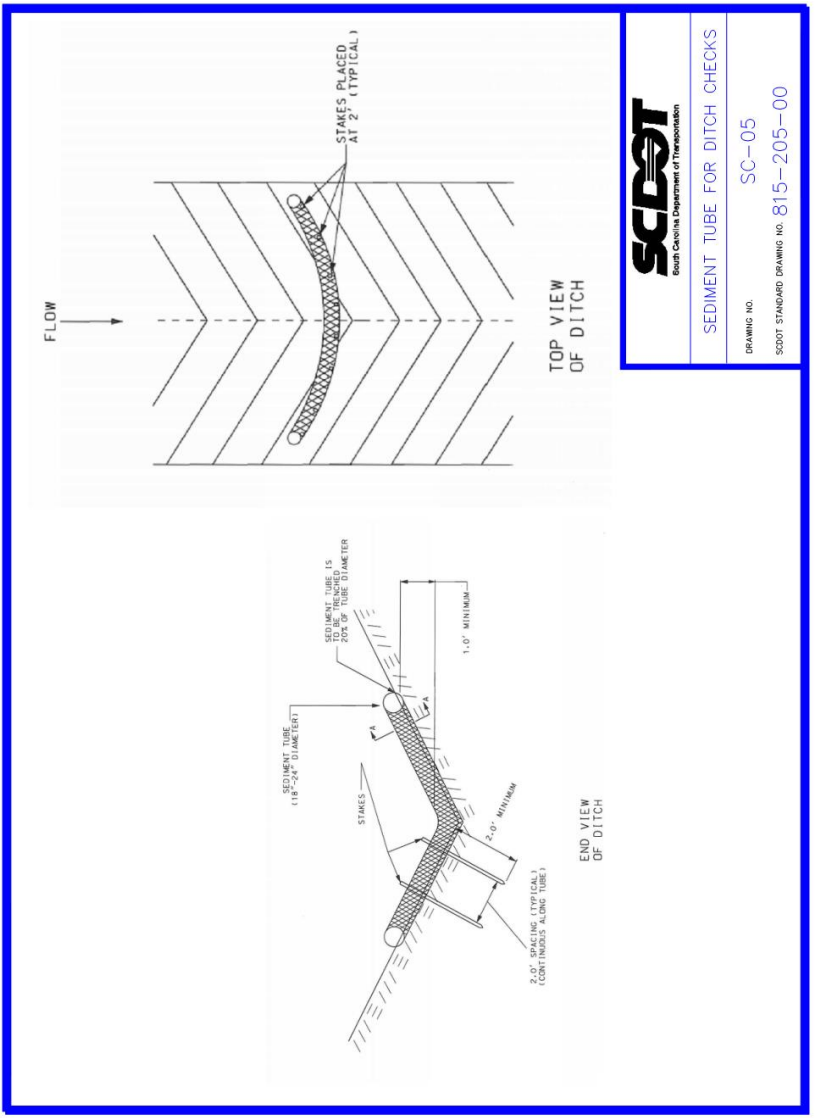
DRAWING NO. SC-03C

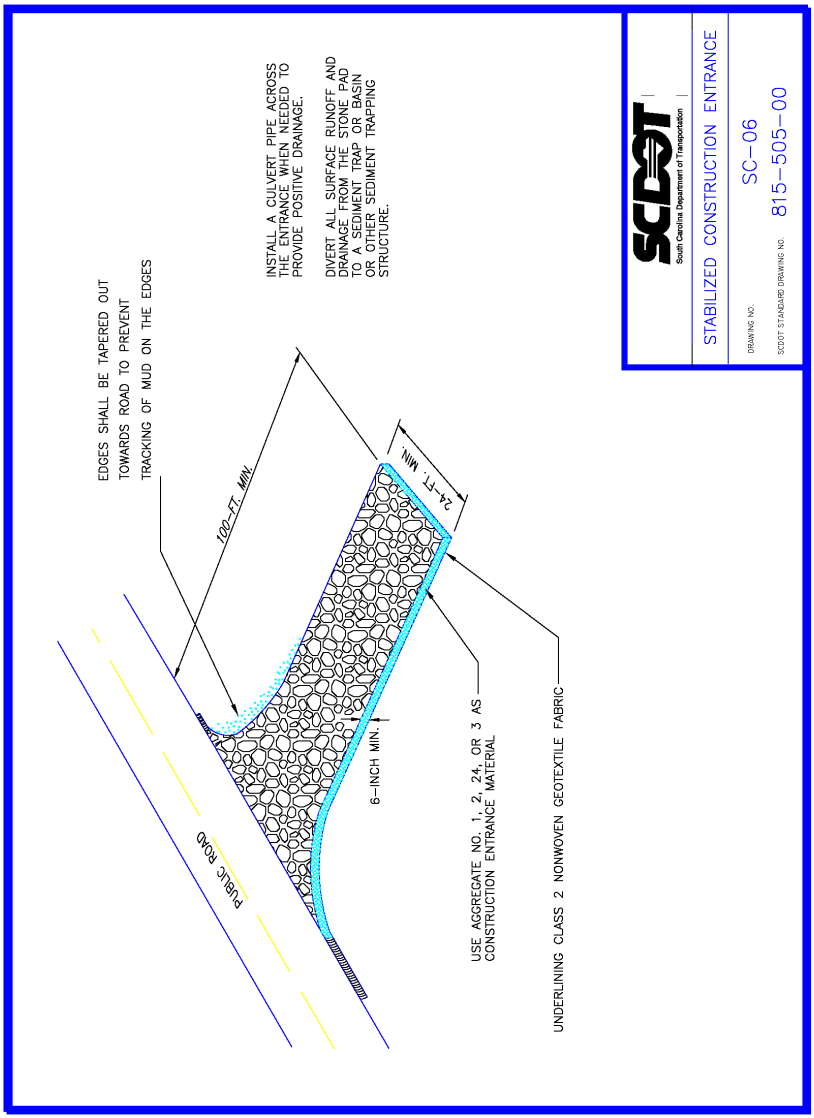
SCDOT STANDARD DRAWING NO. 815-605-00

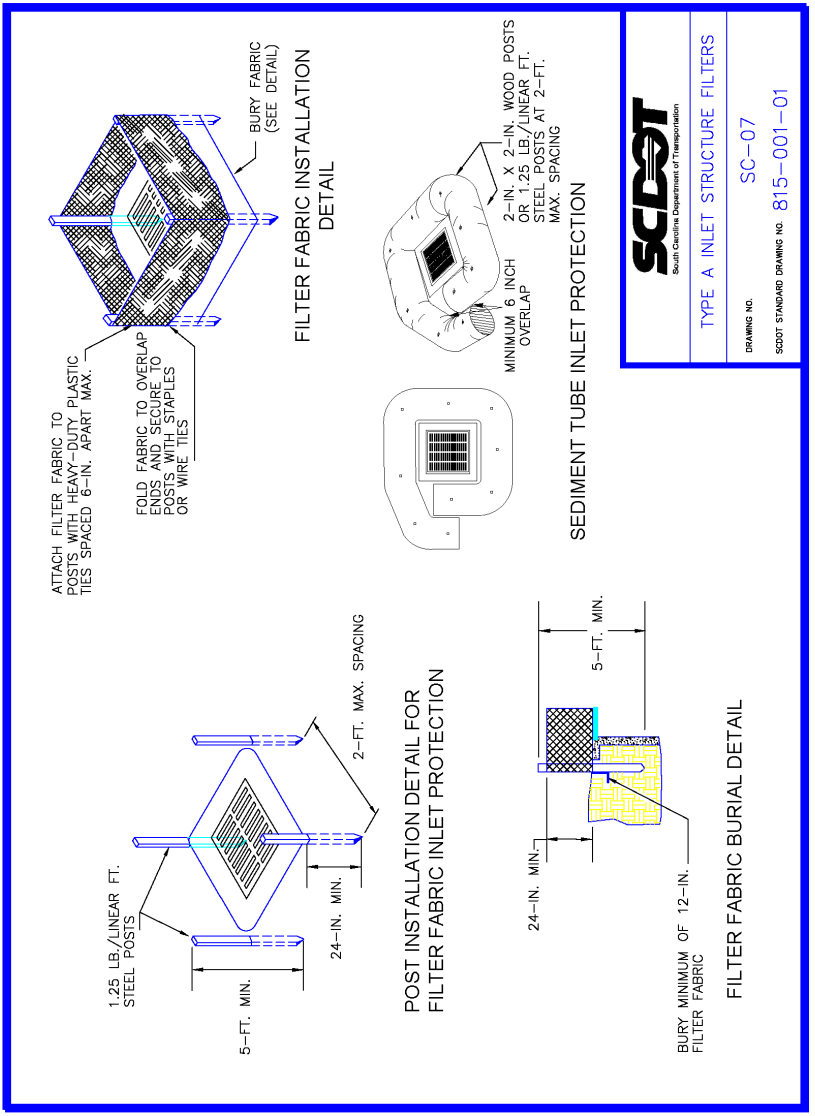

SCDOT
South Carolina Department of Transportation
ROCK DITCH CHECK DAM
DRAWING NO. SC-04A
SCDOT STANDARD DRAWING NO. 815-105-00
SECTION A
DITCH CHECK ELEVATION VIEW
DETAIL 1
DITCH CHECK ISOMETRIC VIEW
DITCH CHECK SPACING
DITCH CHECK HEIGHT
GEOTEXTILE (CLASS 2)
TOE ELEVATION OF DITCH CHECK (A) IS EQUAL TO THE ELEVATION OF TOP OF DITCH CHECK (B).
FLOW
RIPRAP DOWNSTREAM SIDE
6" UNIFORM LAYER #5 OR #57 STONE UPSTREAM SIDE
#5 OR #57 STONE UPSTREAM SIDE

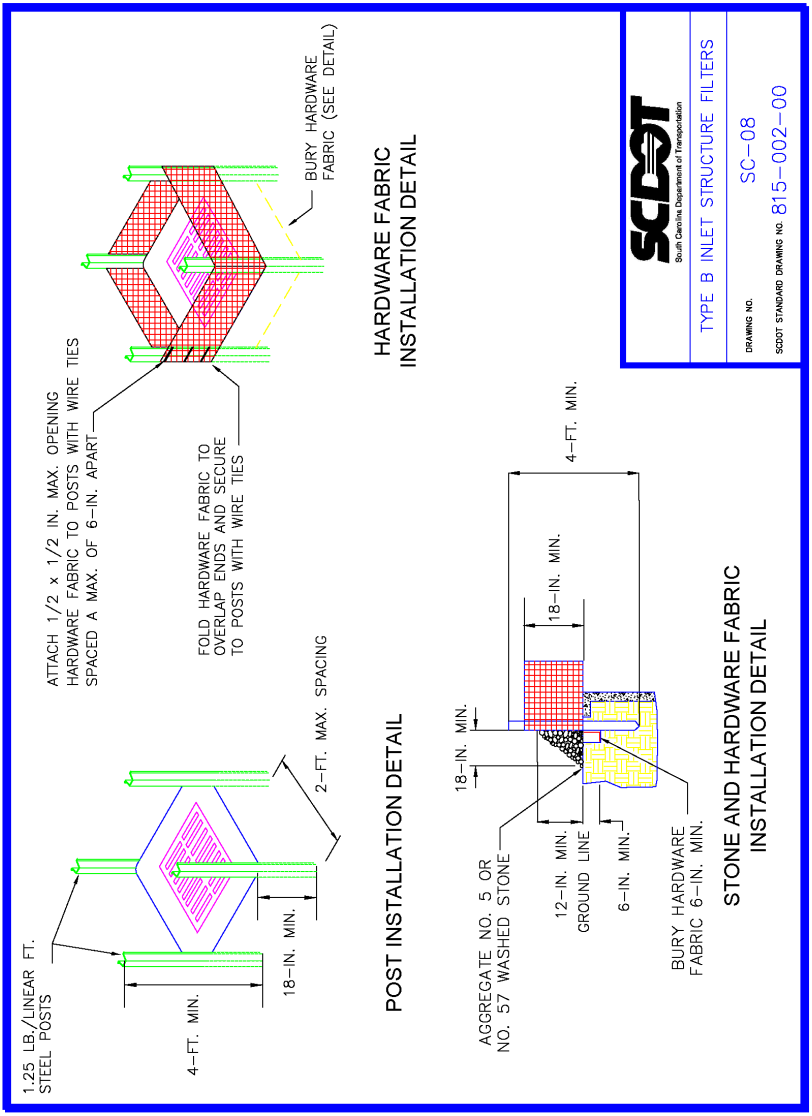

SCDOT
South Carolina Department of Transportation
ROCK DITCH CHECK DAM
DRAWING NO. SC-04B
SCDOT STANDARD DRAWING NO. 815-105-00
SIDE VIEW
CLASS A RIPRAP
UNDERLYING CLASS 2 NONWOVEN GEOTEXTILE FABRIC
GROUND LINE
MAX 2:1
MAX 2:1
6-INCH UNIFORM LAYER OF AGGREGATE NO. 5 OR NO. 57
FLOW
DITCH CHECK HEIGHT
END VIEW
RIPRAP
VARIABLE (0.5'-1')
VARIABLE SLOPE
GEOTEXTILE (CLASS 2)
DITCH CHECK HEIGHT 2'-0" MAXIMUM
VARIABLE (2'-3')

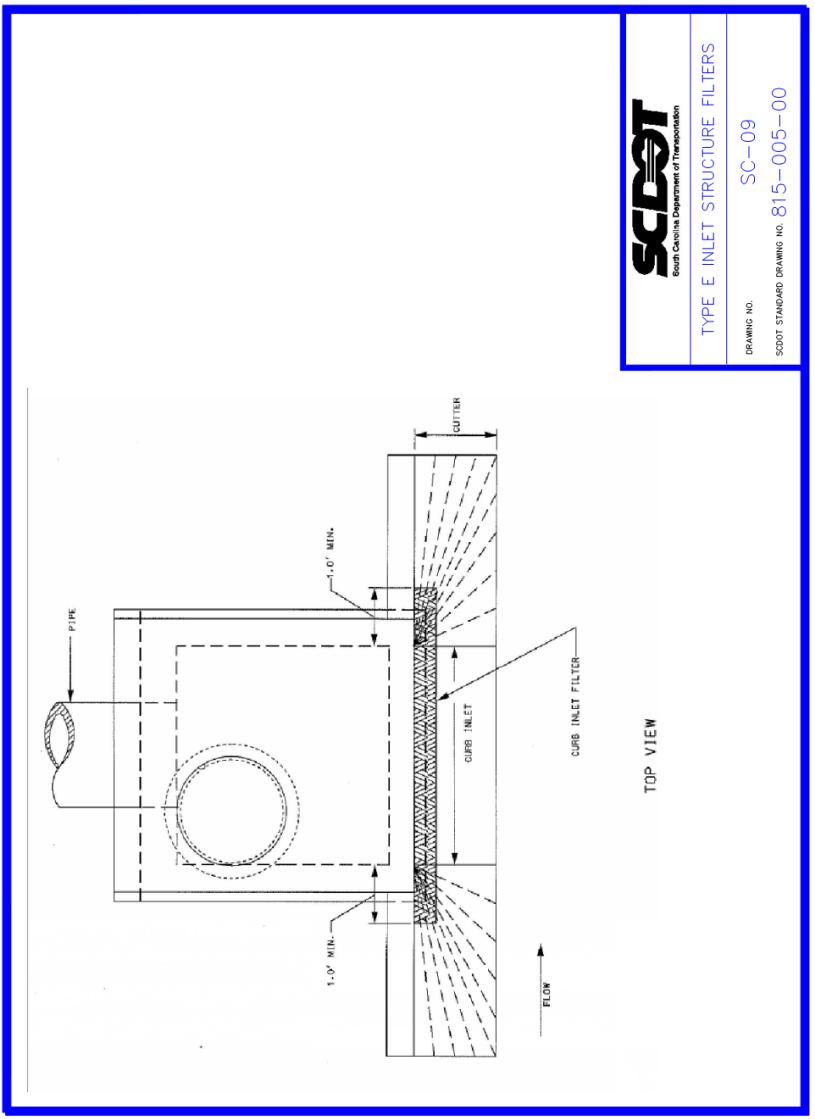

SCDOT
South Carolina Department of Transportation
ROCK DITCH CHECK DAM
DRAWING NO. SC-04C
SCDOT STANDARD DRAWING NO. 815-105-00
DITCH CHECK SPACING
(A)
(B)
ELEVATION OF TOE OF DITCH CHECK (A) IS EQUAL TO THE ELEVATION OF THE TOP OF THE NEXT DITCH CHECK (B)
DITCH CHECK SPACING
1.0%
1.5%
EXAMPLE SLOPE 2.0%
EXAMPLE
3.0%
4.0%
5.0%
6.0%
7.0%
8.0%
10.0%
MAXIMUM DITCH CHECK SPACING (FT.)
DITCH CHECK HEIGHT (FT.)

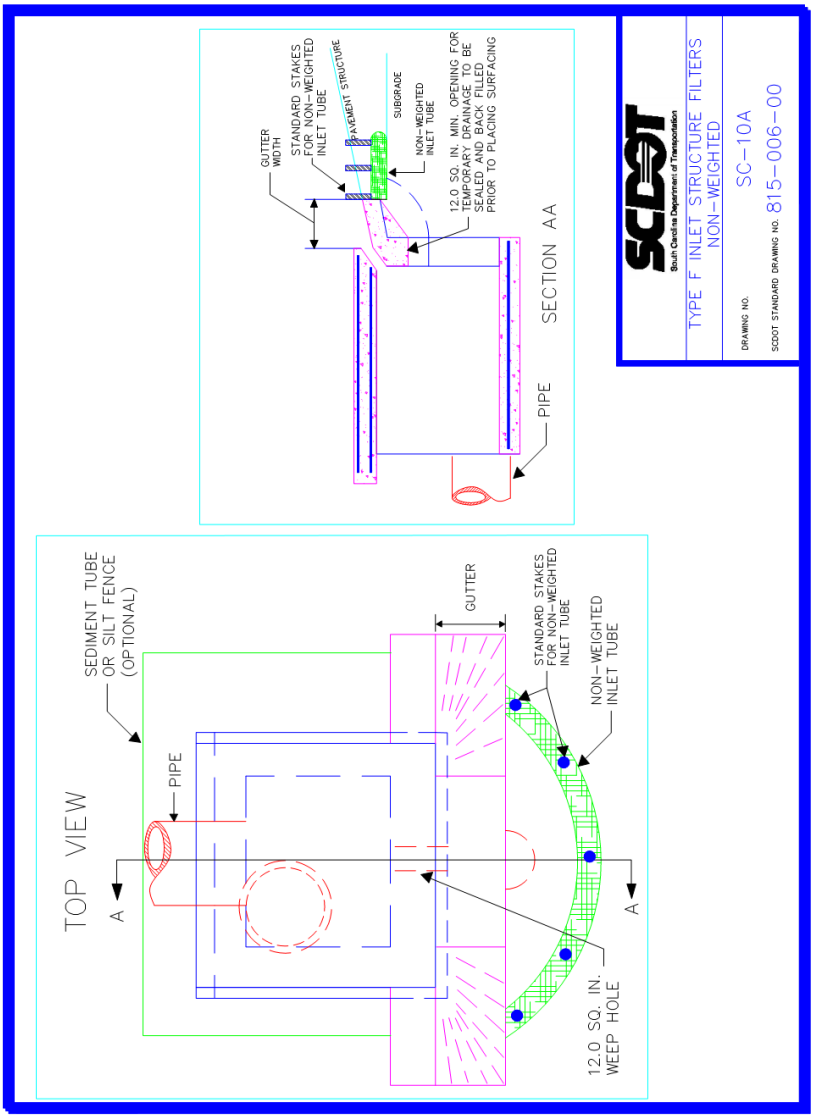

FLOW
STAKES PLACED AT 2' (TYPICAL)
TOP VIEW OF DITCH
SEDIMENT TUBE (18"-24" DIAMETER)
SEDIMENT TUBE IS TO BE ANCHORED 20% OF TUBE DIAMETER
1.0' MINIMUM
STAKES
2.0' MINIMUM
2.0' SPACING (TYPICAL) (CONTINUOUS ALONG TUBE)
END VIEW OF DITCH
SCDOT
South Carolina Department of Transportation
SEDIMENT TUBE FOR DITCH CHECKS
DRAWING NO. SC-05
SCDOT STANDARD DRAWING NO. 815-205-00

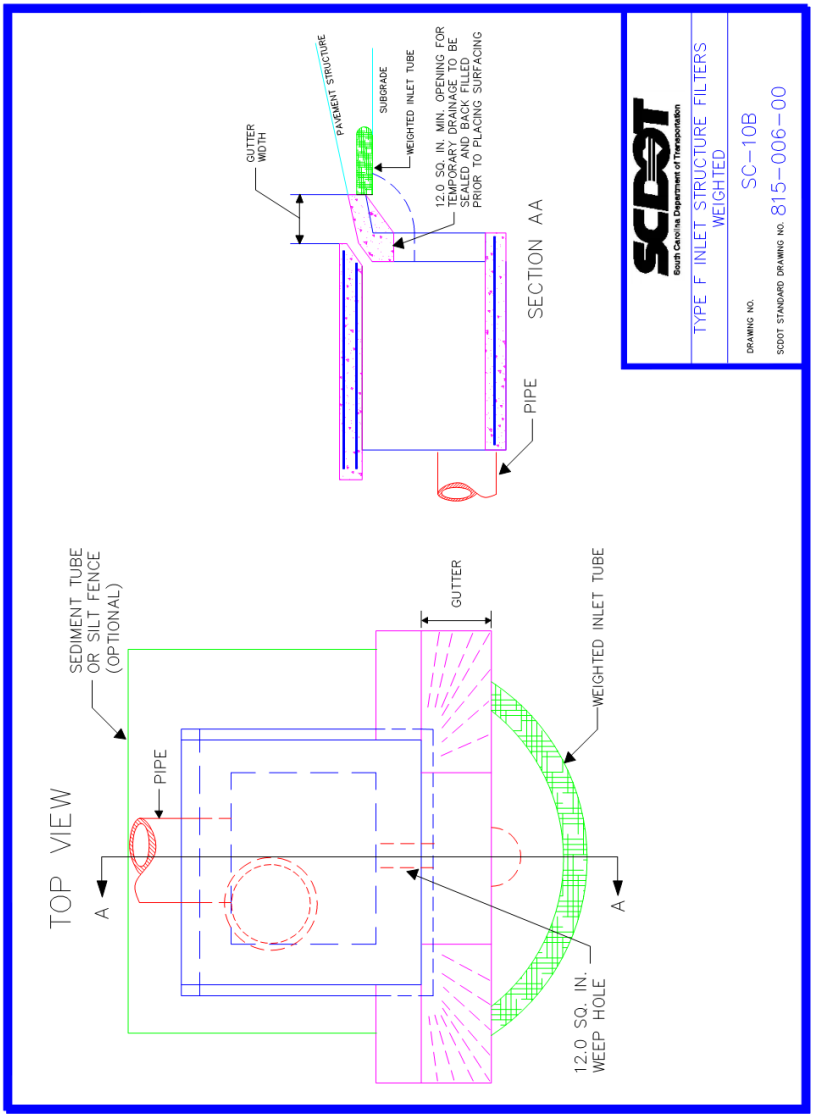

EDGES SHALL BE TAPERED OUT
TOWARDS ROAD TO PREVENT
TRACKING OF MUD ON THE EDGES
INSTALL A CULVERT PIPE ACROSS
THE ENTRANCE WHEN NEEDED TO
PROVIDE POSITIVE DRAINAGE.
DIVERT ALL SURFACE RUNOFF AND
DRAINAGE FROM THE STONE PAD
TO A SEDIMENT TRAP OR BASIN
OR OTHER SEDIMENT TRAPPING
STRUCTURE.
100-FT. MIN.
24-FT. MIN.
PUBLIC ROAD
6-INCH MIN.
USE AGGREGATE NO. 1, 2, 24, OR 3 AS
CONSTRUCTION ENTRANCE MATERIAL
UNDERLINING CLASS 2 NONWOVEN GEOTEXTILE FABRIC
SCDOT
South Carolina Department of Transportation
STABILIZED CONSTRUCTION ENTRANCE
DRAWING NO. SC-06
SCDOT STANDARD DRAWING NO. 815-505-00

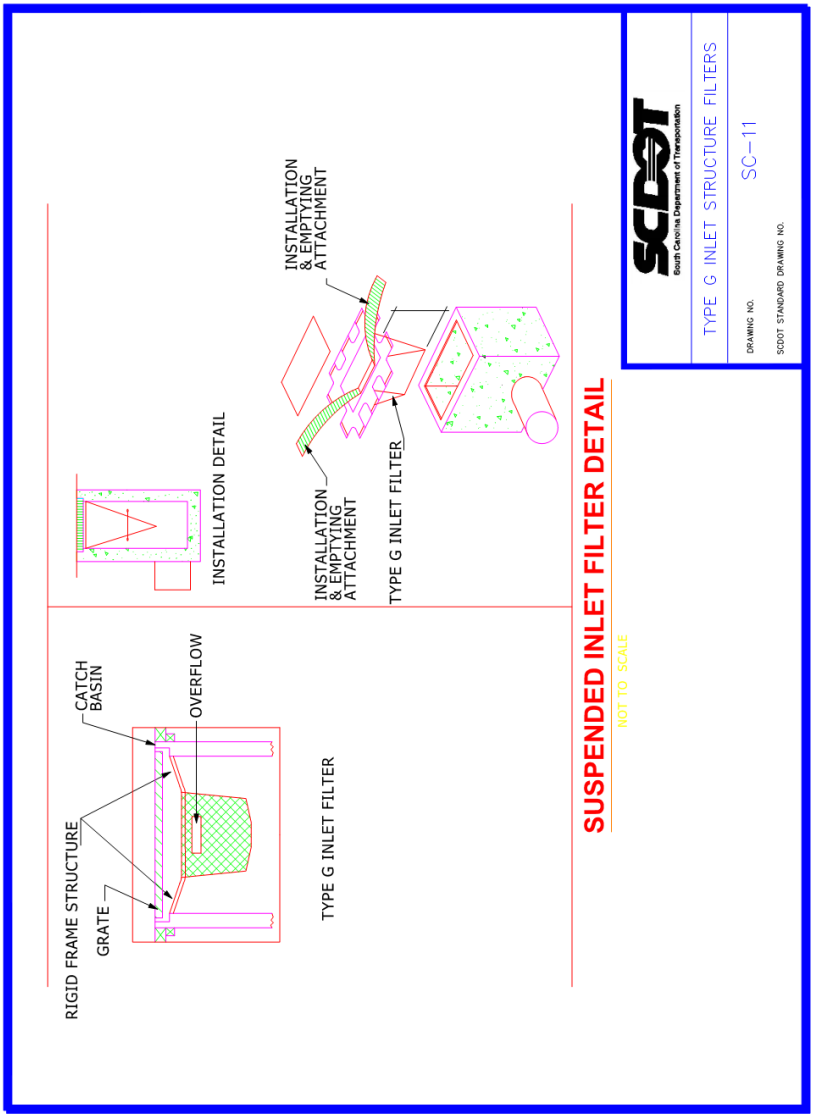

FILTER FABRIC INSTALLATION DETAIL
ATTACH FILTER FABRIC TO POSTS WITH HEAVY-DUTY PLASTIC TIES SPACED 6-IN. APART MAX.
FOLD FABRIC TO OVERLAP ENDS AND SECURE TO POSTS WITH STAPLES OR WIRE TIES
BURY FABRIC (SEE DETAIL)
SEDIMENT TUBE INLET PROTECTION
MINIMUM 6 INCH OVERLAP
2-IN. X 2-IN. WOOD POSTS OR 1.25 LB./LINEAR FT. STEEL POSTS AT 2-FT. MAX. SPACING
POST INSTALLATION DETAIL FOR FILTER FABRIC INLET PROTECTION
1.25 LB./LINEAR FT. STEEL POSTS
5-FT. MIN.
24-IN. MIN.
2-FT. MAX. SPACING
FILTER FABRIC BURIAL DETAIL
24-IN. MIN.
5-FT. MIN.
BURY MINIMUM OF 12-IN. FILTER FABRIC
SCDOT
South Carolina Department of Transportation
TYPE A INLET STRUCTURE FILTERS
DRAWING NO. SC-07
SCDOT STANDARD DRAWING NO. 815-001-01

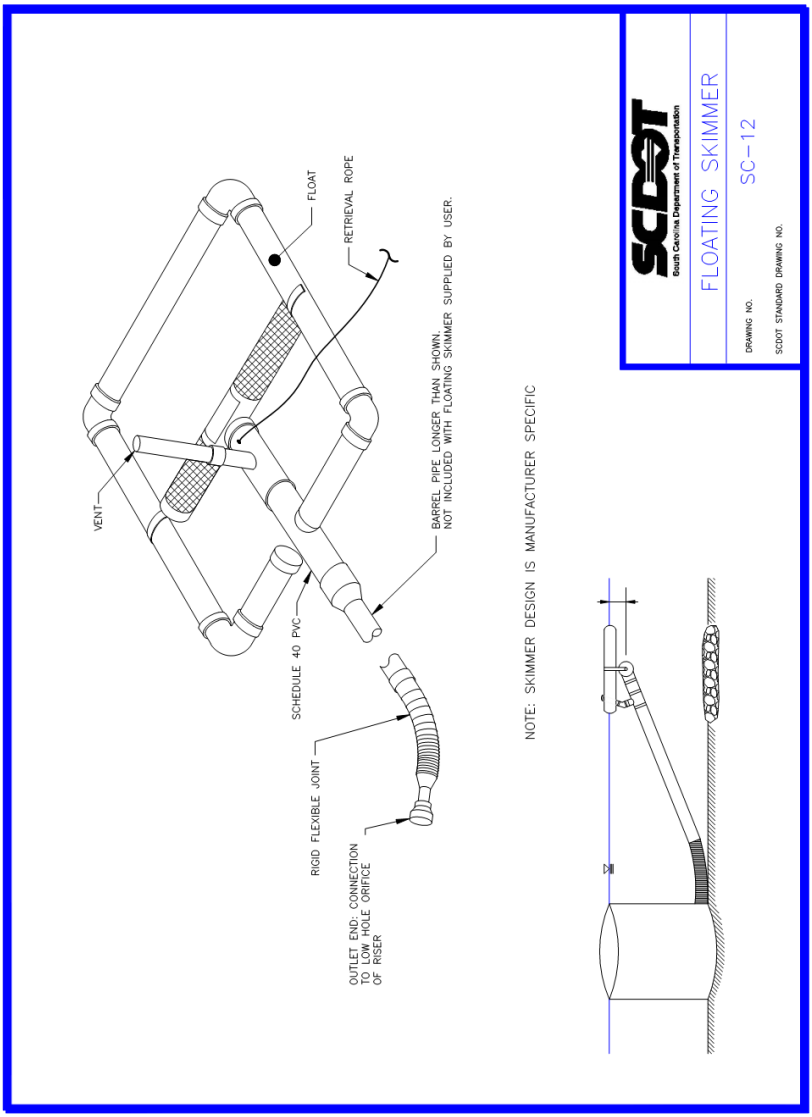

1.25 LB./LINEAR FT. STEEL POSTS
4–FT. MIN.
18–IN. MIN.
2–FT. MAX. SPACING
ATTACH 1/2 x 1/2 IN. MAX. OPENING HARDWARE FABRIC TO POSTS WITH WIRE TIES SPACED A MAX. OF 6–IN. APART
FOLD HARDWARE FABRIC TO OVERLAP ENDS AND SECURE TO POSTS WITH WIRE TIES
BURY HARDWARE FABRIC (SEE DETAIL)
POST INSTALLATION DETAIL
HARDWARE FABRIC INSTALLATION DETAIL
18–IN. MIN.
AGGREGATE NO. 5 OR NO. 57 WASHED STONE
12–IN. MIN. GROUND LINE
6–IN. MIN.
BURY HARDWARE FABRIC 6–IN. MIN.
18–IN. MIN.
4–FT. MIN.
STONE AND HARDWARE FABRIC INSTALLATION DETAIL
SCDOT
South Carolina Department of Transportation
TYPE B INLET STRUCTURE FILTERS
DRAWING NO. SC–08
SCDOT STANDARD DRAWING NO. 815–002–00

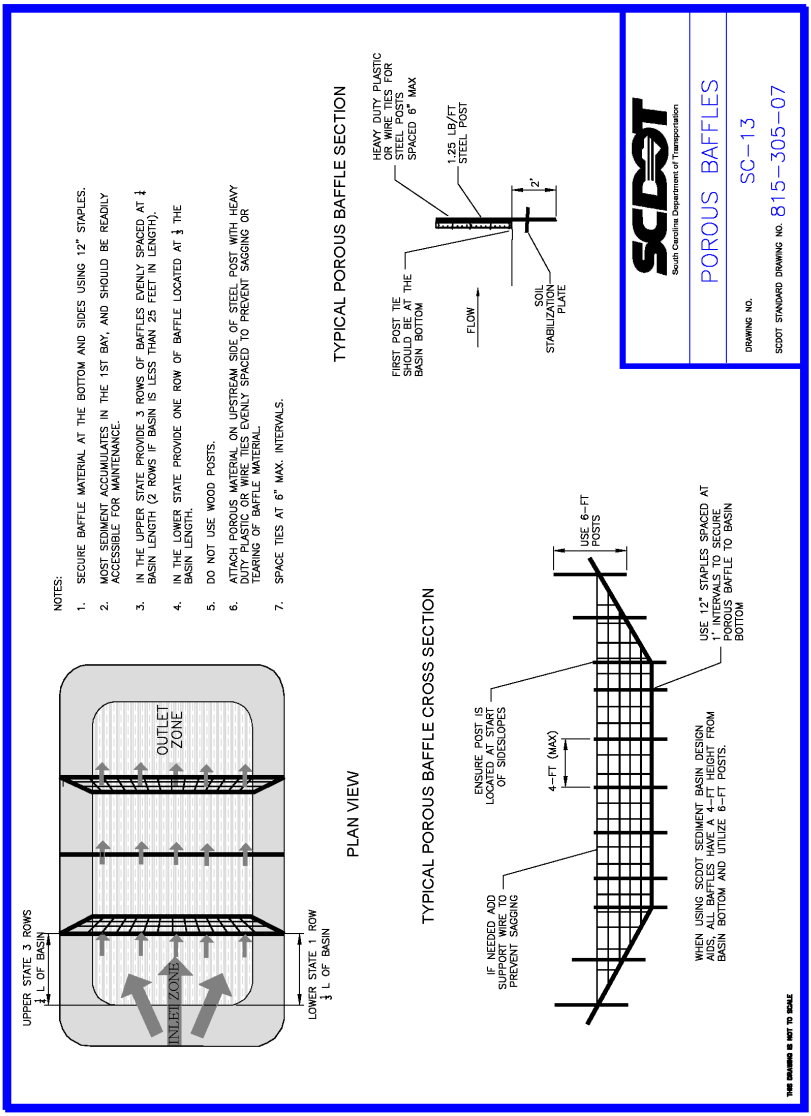

SCDOT
South Carolina Department of Transportation
TYPE E INLET STRUCTURE FILTERS
DRAWING NO. SC-09
SCDOT STANDARD DRAWING NO. 815-005-00
GUTTER
1.0' MIN.
PIPE
CURB INLET
CURB INLET FILTER
1.0' MIN.
FLOW
TOP VIEW

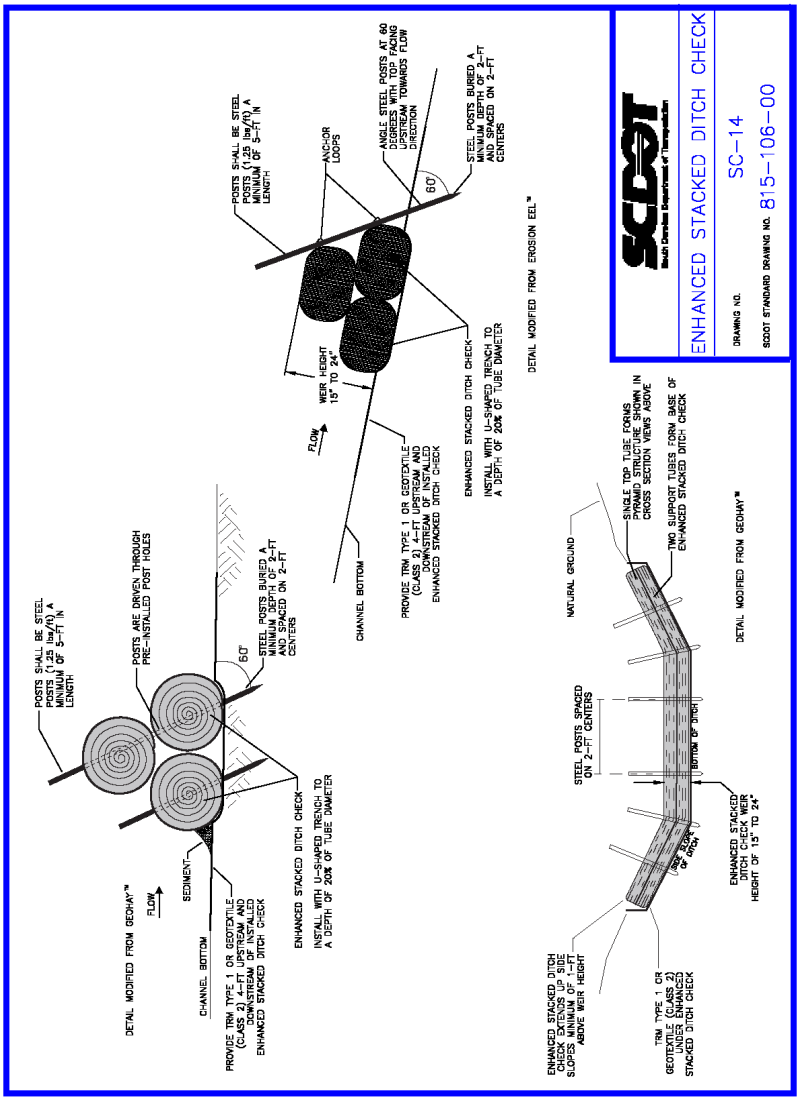

SCDOT
South Carolina Department of Transportation
TYPE F INLET STRUCTURE FILTERS
NON-WEIGHTED
DRAWING NO. SC-10A
SCDOT STANDARD DRAWING NO. 815-006-00
SECTION AA
GUTTER WIDTH
STANDARD STAKES FOR NON-WEIGHTED INLET TUBE
PAVEMENT STRUCTURE
SUBGRADE
NON-WEIGHTED INLET TUBE
12.0 SQ. IN. MIN. OPENING FOR TEMPORARY DRAINAGE TO BE SAWED AND BACKFILLED PRIOR TO PLACING SURFACING
PIPE
TOP VIEW
SEDIMENT TUBE OR SILT FENCE (OPTIONAL)
PIPE
A
A
GUTTER
STANDARD STAKES FOR NON-WEIGHTED INLET TUBE
NON-WEIGHTED INLET TUBE
12.0 SQ. IN. WEEP HOLE

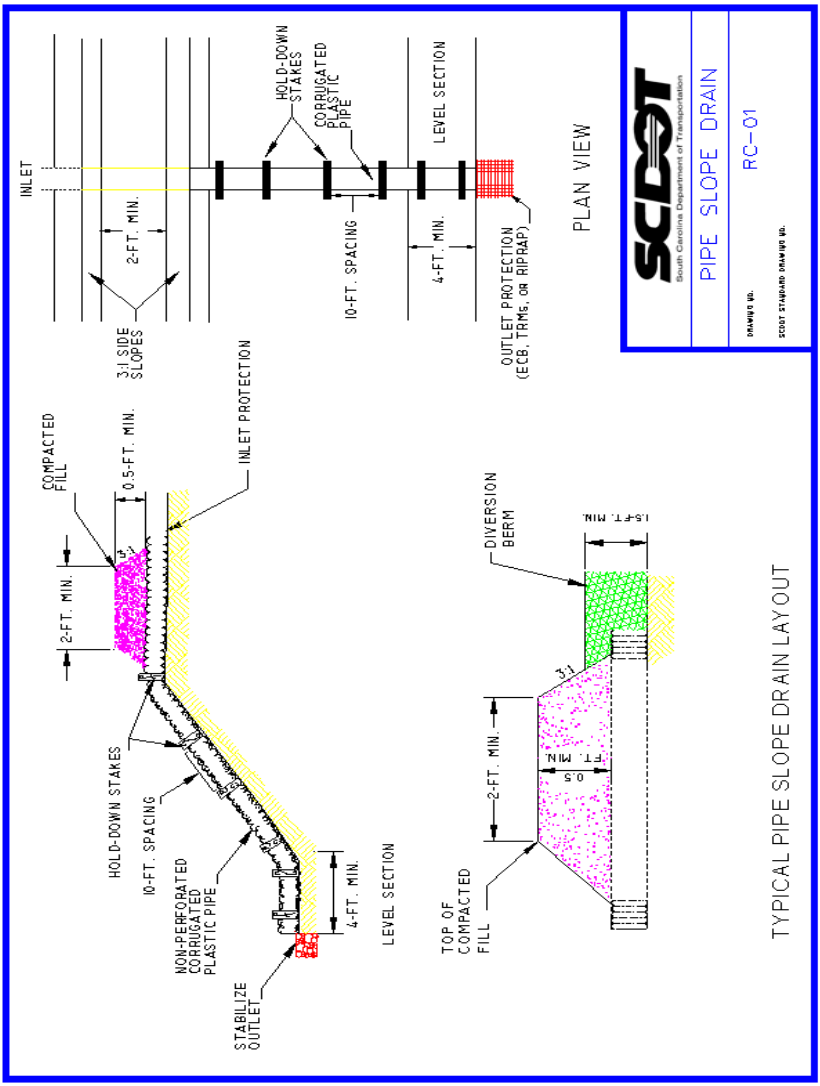

SCDOT
South Carolina Department of Transportation
TYPE F INLET STRUCTURE FILTERS
WEIGHTED
DRAWING NO. SC-10B
SCDOT STANDARD DRAWING NO. 815-006-00
SECTION AA
GUTTER WIDTH
PAVEMENT STRUCTURE
SUBGRADE
WEIGHTED INLET TUBE
12.0 SQ. IN. MIN. OPENING FOR TEMPORARY DRAINAGE TO BE SEALED AND BACK FILLED PRIOR TO PLACING SURFACING
PIPE
TOP VIEW
SEDIMENT TUBE OR SILT FENCE (OPTIONAL)
PIPE
GUTTER
WEIGHTED INLET TUBE
A
A
12.0 SQ. IN. WEEP HOLE

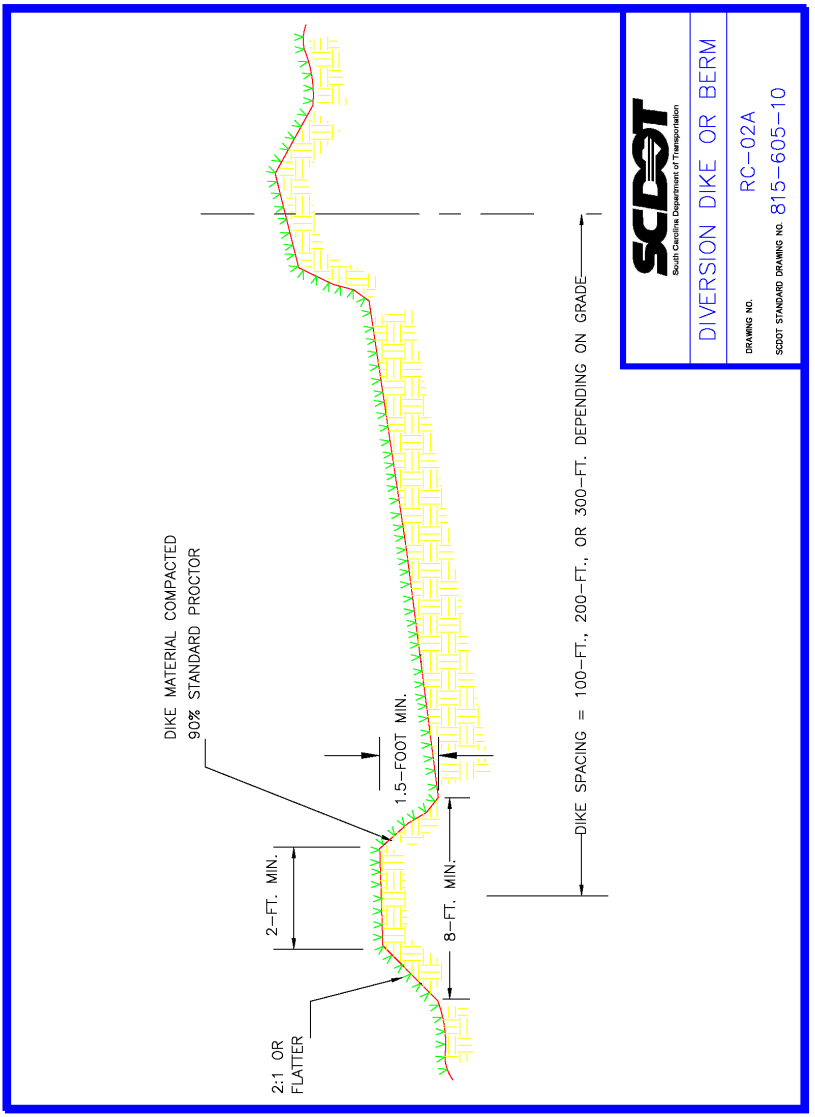

SUSPENDED INLET FILTER DETAIL
NOT TO SCALE
TYPE G INLET FILTER
RIGID FRAME STRUCTURE
GRATE
CATCH BASIN
OVERFLOW
INSTALLATION DETAIL
INSTALLATION & EMPTYING ATTACHMENT
TYPE G INLET FILTER
INSTALLATION & EMPTYING ATTACHMENT
SCDOT
South Carolina Department of Transportation
TYPE G INLET STRUCTURE FILTERS
DRAWING NO.
SC-11
SCDOT STANDARD DRAWING NO.

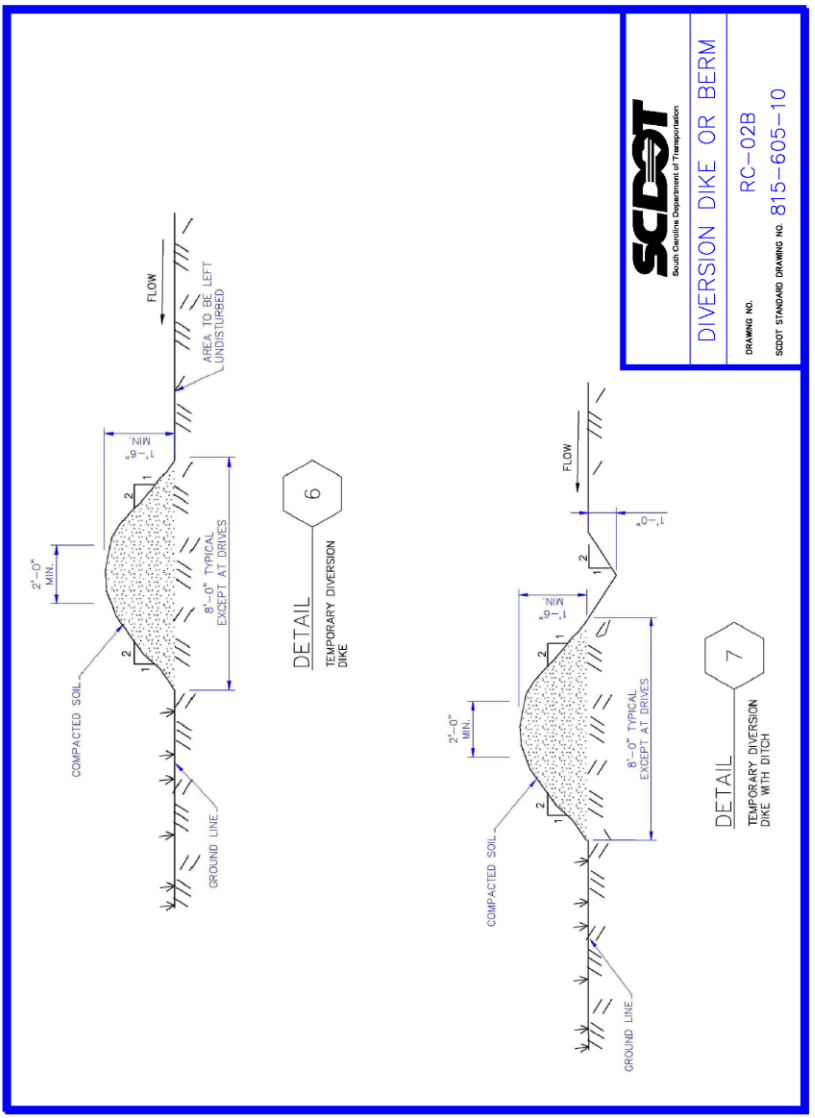

SCDOT
South Carolina Department of Transportation
FLOATING SKIMMER
DRAWING NO. SC-12
SCDOT STANDARD DRAWING NO.
FLOAT
RETRIEVAL ROPE
VENT
BARREL PIPE LONGER THAN SHOWN.
NOT INCLUDED WITH FLOATING SKIMMER SUPPLIED BY USER.
SCHEDULE 40 PVC
RIGID FLEXIBLE JOINT
OUTLET END: CONNECTION
TO LOW HOLE ORIFICE
OF RISER
NOTE: SKIMMER DESIGN IS MANUFACTURER SPECIFIC

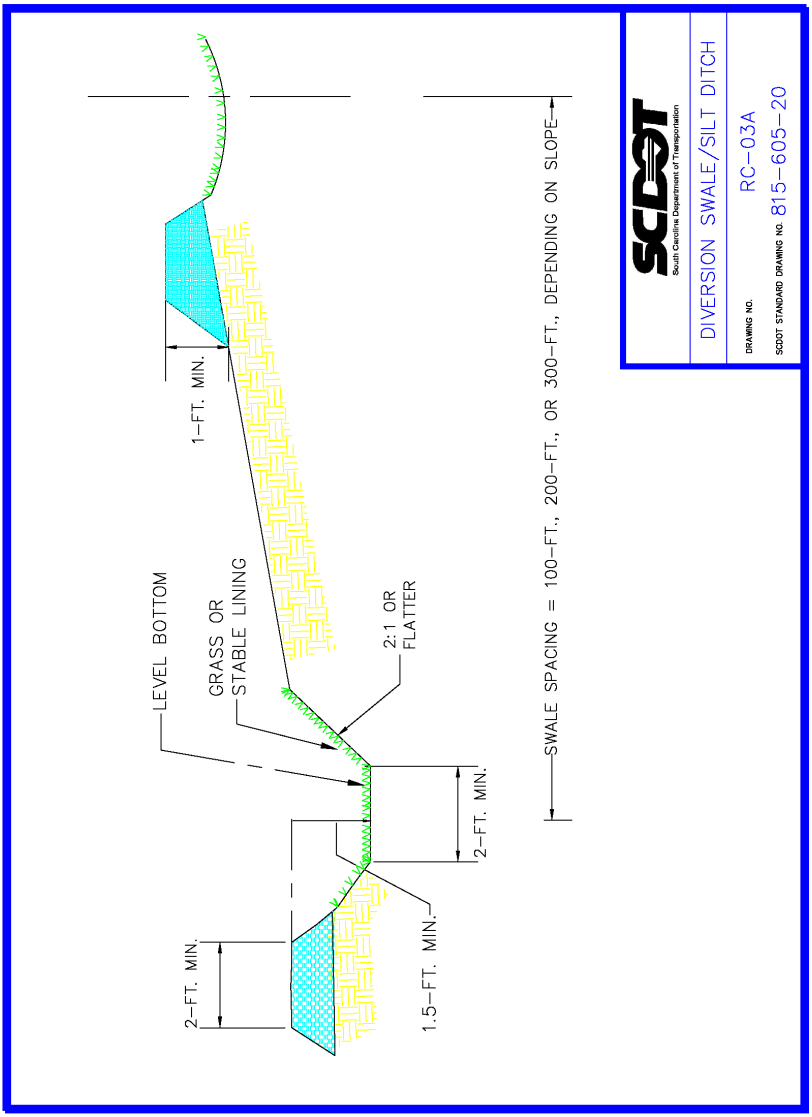

NOTES:
1. SECURE BAFFLE MATERIAL AT THE BOTTOM AND SIDES USING 12" STAPLES.
2. MOST SEDIMENT ACCUMULATES IN THE 1ST BAY, AND SHOULD BE READILY ACCESSIBLE FOR MAINTENANCE.
3. IN THE UPPER STATE PROVIDE 3 ROWS OF BAFFLES EVENLY SPACED AT ⅓ BASIN LENGTH (2 ROWS IF BASIN IS LESS THAN 25 FEET IN LENGTH).
4. IN THE LOWER STATE PROVIDE ONE ROW OF BAFFLE LOCATED AT ⅓ THE BASIN LENGTH.
5. DO NOT USE WOOD POSTS.
6. ATTACH POROUS MATERIAL ON UPSTREAM SIDE OF STEEL POST WITH HEAVY DUTY PLASTIC OR WIRE TIES EVENLY SPACED TO PREVENT SAGGING OR TEARING OF BAFFLE MATERIAL.
7. SPACE TIES AT 6" MAX. INTERVALS.
PLAN VIEW
UPPER STATE 3 ROWS ⅓ L OF BASIN
OUTLET ZONE
INLET ZONE
LOWER STATE 1 ROW ⅓ L OF BASIN
TYPICAL POROUS BAFFLE CROSS SECTION
IF NEEDED ADD SUPPORT WIRE TO PREVENT SAGGING
ENSURE POST IS LOCATED AT START OF SIDESLOPES
4-FT (MAX)
USE 6-FT POSTS
USE 12" STAPLES SPACED AT 1' INTERVALS TO SECURE POROUS BAFFLE TO BASIN BOTTOM
WHEN USING SCDOT SEDIMENT BASIN DESIGN AIDS, ALL BAFFLES HAVE A 4-FT HEIGHT FROM BASIN BOTTOM AND UTILIZE 6-FT POSTS.
THIS DRAWING IS NOT TO SCALE
TYPICAL POROUS BAFFLE SECTION
HEAVY DUTY PLASTIC OR WIRE TIES FOR STEEL POSTS SPACED 6" MAX
1.25 LB/FT STEEL POST
FIRST POST TIE SHOULD BE AT THE BASIN BOTTOM
FLOW
2'
SOIL STABILIZATION PLATE
SCDOT
South Carolina Department of Transportation
POROUS BAFFLES
DRAWING NO. SC-13
SCDOT STANDARD DRAWING NO. 815-305-07

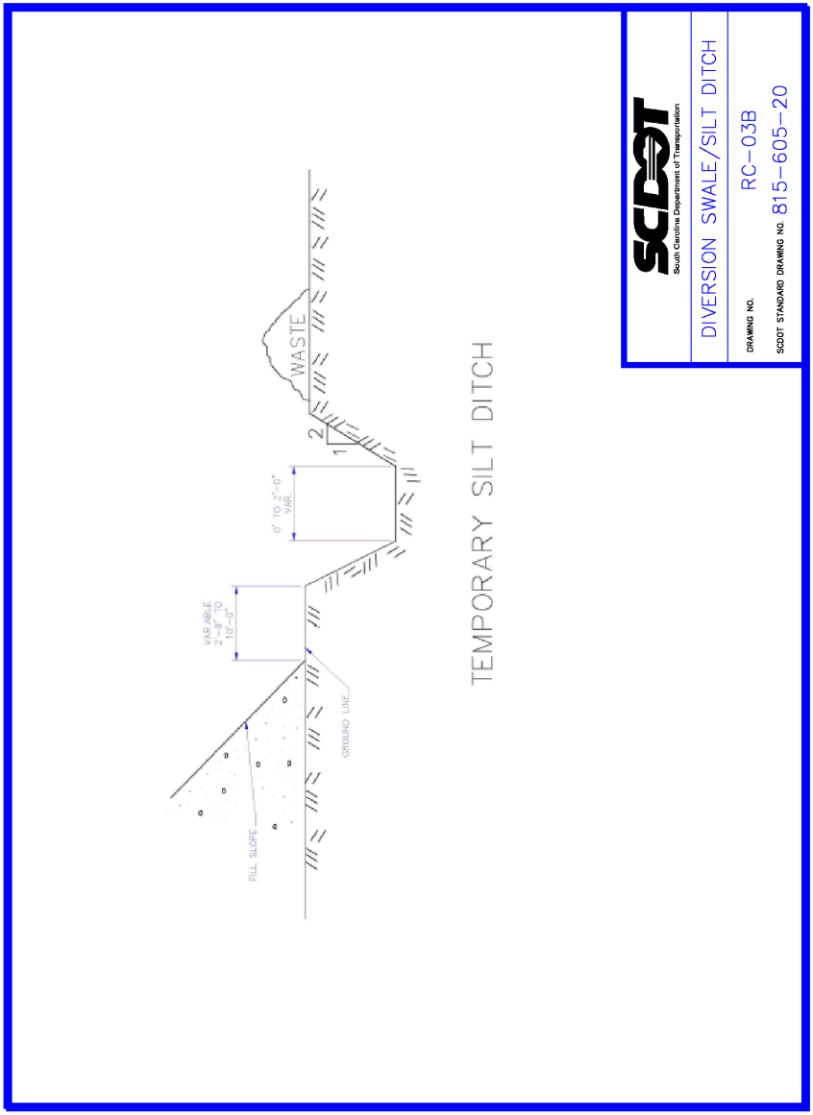

POSTS SHALL BE STEEL POSTS (1.25 lbs/ft) A MINIMUM OF 5-FT IN LENGTH
POSTS ARE DRIVEN THROUGH PRE-INSTALLED POST HOLES
STEEL POSTS BURIED A MINIMUM DEPTH OF 2-FT AND SPACED ON 2-FT CENTERS
60°
ENHANCED STACKED DITCH CHECK
INSTALL WITH U-SHAPED TRENCH TO A DEPTH OF 20% OF TUBE DIAMETER
DETAIL MODIFIED FROM GEOHAY™
FLOW
SEDIMENT
CHANNEL BOTTOM
PROVIDE TRM TYPE 1 OR GEOTEXTILE (CLASS 2) 4-FT UPSTREAM AND 2-FT DOWNSTREAM OF INSTALLED ENHANCED STACKED DITCH CHECK
POSTS SHALL BE STEEL POSTS (1.25 lbs/ft) A MINIMUM OF 5-FT IN LENGTH
ANCHOR LOOPS
ANGLE STEEL POSTS AT 60 DEGREES WITH TOP FACING UPSTREAM TOWARDS FLOW DIRECTION
60°
STEEL POSTS BURIED A MINIMUM DEPTH OF 2-FT AND SPACED ON 2-FT CENTERS
FLOW
WEIR HEIGHT 15" TO 24"
CHANNEL BOTTOM
PROVIDE TRM TYPE 1 OR GEOTEXTILE (CLASS 2) 4-FT UPSTREAM AND 2-FT DOWNSTREAM OF INSTALLED ENHANCED STACKED DITCH CHECK
ENHANCED STACKED DITCH CHECK
INSTALL WITH U-SHAPED TRENCH TO A DEPTH OF 20% OF TUBE DIAMETER
DETAIL MODIFIED FROM EROSION EEL™
ENHANCED STACKED DITCH CHECK EXTENDS UP SIDE SLOPES MINIMUM OF 1-FT ABOVE WEIR HEIGHT
NATURAL GROUND
STEEL POSTS SPACED ON 2-FT CENTERS
BOTTOM OF DITCH
TRM TYPE 1 OR GEOTEXTILE (CLASS 2) UNDER ENHANCED STACKED DITCH CHECK
ENHANCED STACKED DITCH CHECK WEIR HEIGHT OF 15" TO 24"
DETAIL MODIFIED FROM GEOHAY™
SINGLE TOP TUBE FORMS PYRAMID STRUCTURE SHOWN IN CROSS SECTION VIEWS ABOVE
TWO SUPPORT TUBES FORM BASE OF ENHANCED STACKED DITCH CHECK
SCDOT
South Carolina Department of Transportation
ENHANCED STACKED DITCH CHECK
DRAWING NO. SC-14
SCDOT STANDARD DRAWING NO. 815-106-00

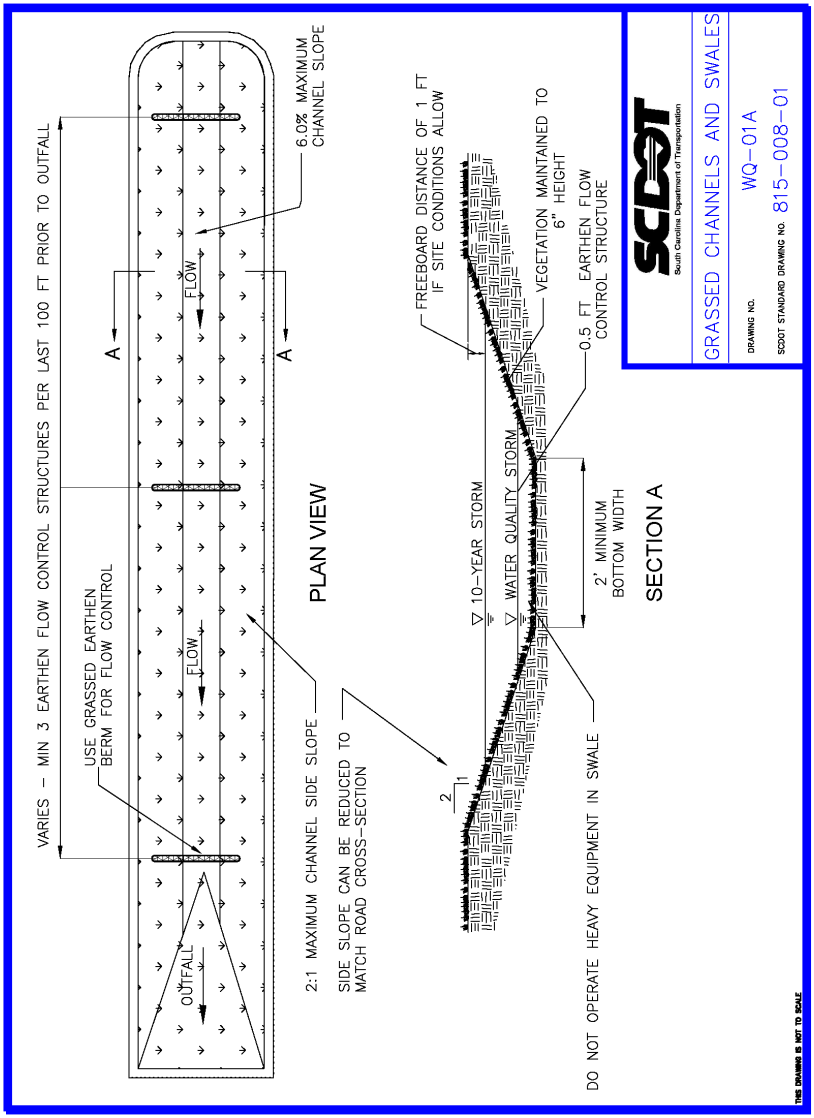

INLET
2-FT. MIN.
3:1 SIDE SLOPES
HOLD-DOWN STAKES
CORRUGATED PLASTIC PIPE
10-FT. SPACING
LEVEL SECTION
4-FT. MIN.
OUTLET PROTECTION (ECB, TRMs, OR RIPRAP)
PLAN VIEW
SCDOT
South Carolina Department of Transportation
PIPE SLOPE DRAIN
DRAWING NO. RC-01
SCDOT STANDARD DRAWING NO.
COMPACTED FILL
0.5-FT. MIN.
INLET PROTECTION
2-FT. MIN.
3:1
HOLD-DOWN STAKES
10-FT. SPACING
NON-PERFORATED CORRUGATED PLASTIC PIPE
4-FT. MIN.
LEVEL SECTION
STABILIZE OUTLET
DIVERSION BERM
1.5-FT. MIN.
2-FT. MIN.
TOP OF COMPACTED FILL
0.5 FT. MIN.
TYPICAL PIPE SLOPE DRAIN LAYOUT

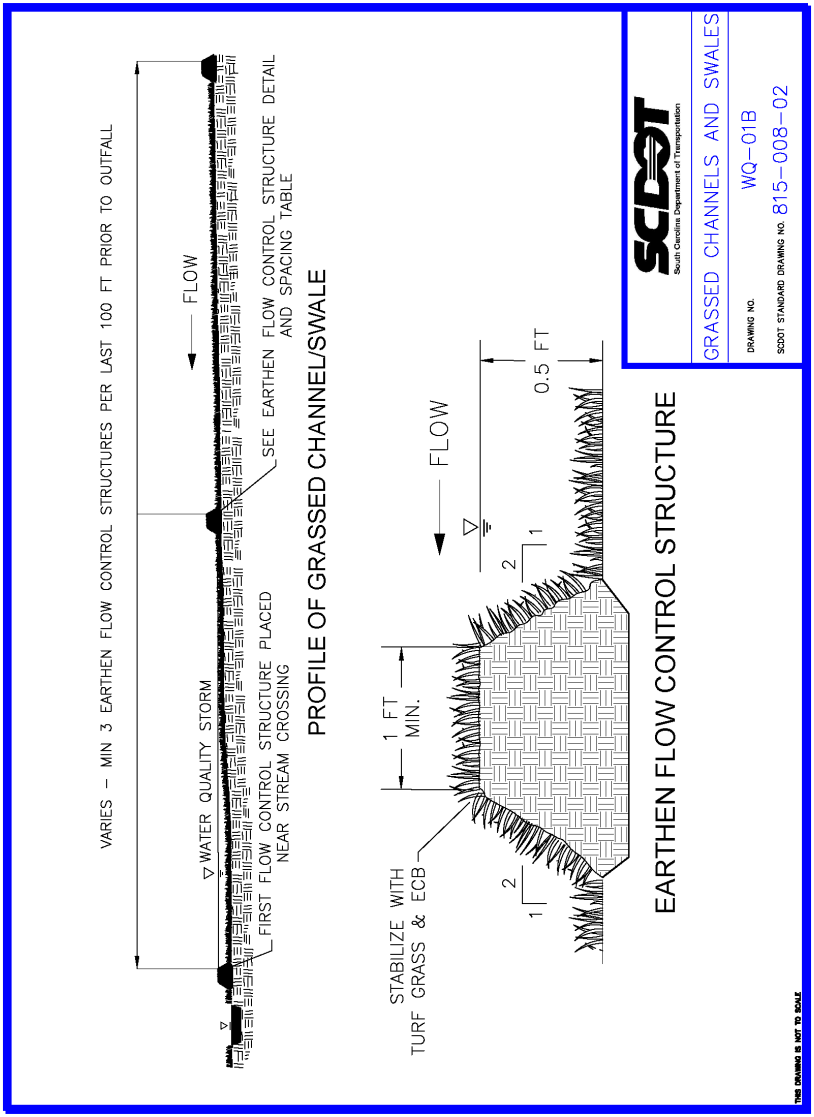

DIKE MATERIAL COMPACTED
90% STANDARD PROCTOR
1.5-FOOT MIN.
2-FT. MIN.
8-FT. MIN.
2:1 OR
FLATTER
DIKE SPACING = 100-FT., 200-FT., OR 300-FT. DEPENDING ON GRADE
SCDOT
South Carolina Department of Transportation
DIVERSION DIKE OR BERM
DRAWING NO. RC-02A
SCDOT STANDARD DRAWING NO. 815-605-10

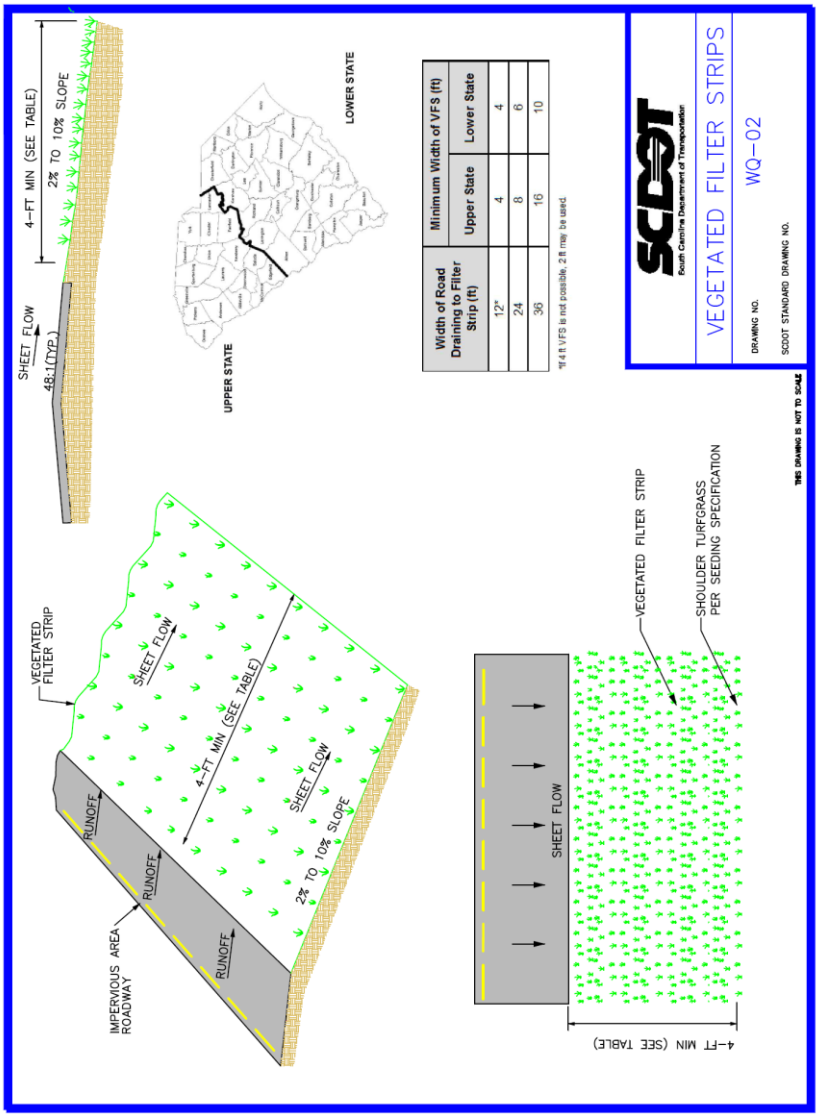

SCDOT
South Carolina Department of Transportation
DIVERSION DIKE OR BERM
DRAWING NO. RC-02B
SCDOT STANDARD DRAWING NO. 815-605-10
FLOW
AREA TO BE LEFT UNDISTURBED
1'-6" MIN.
2'-0" MIN.
8'-0" TYPICAL EXCEPT AT DRIVES
COMPACTED SOIL
GROUND LINE
DETAIL 6
TEMPORARY DIVERSION DIKE
FLOW
1'-0"
1'-6" MIN.
2'-0" MIN.
8'-0" TYPICAL EXCEPT AT DRIVES
COMPACTED SOIL
GROUND LINE
DETAIL 7
TEMPORARY DIVERSION DIKE WITH DITCH

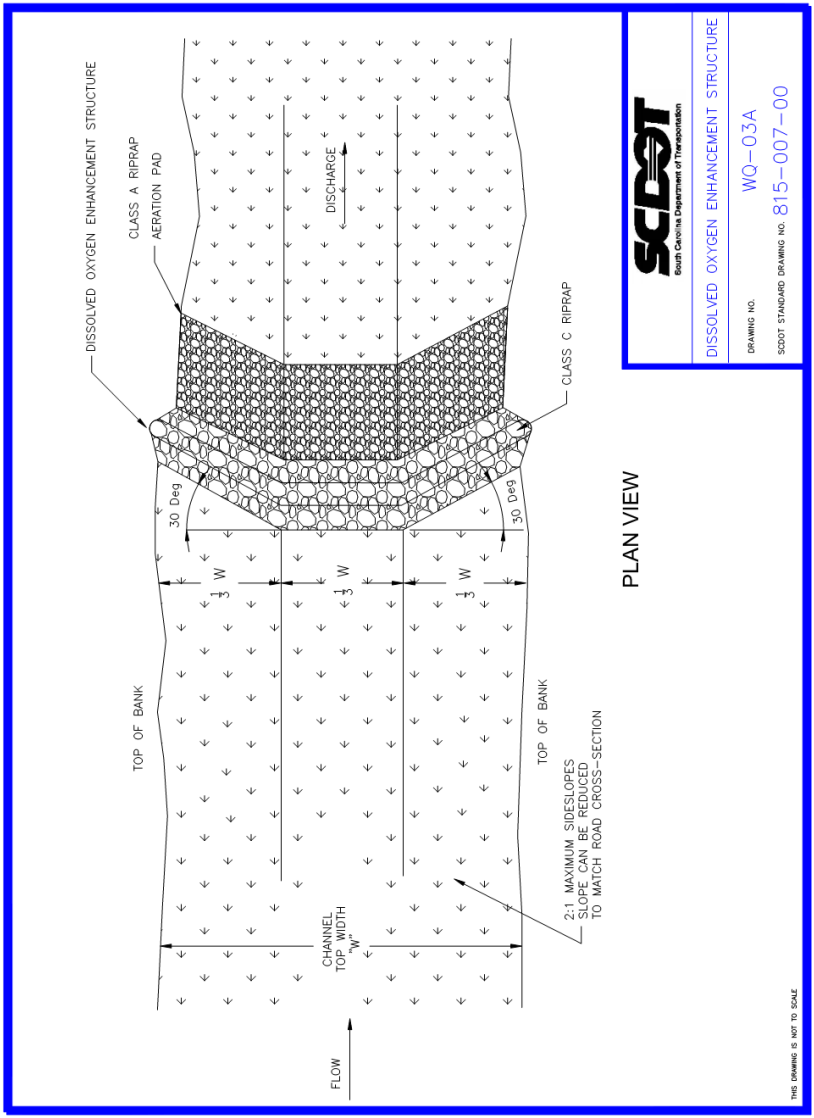

SCDOT
South Carolina Department of Transportation
DIVERSION SWALE/SILT DITCH
DRAWING NO. RC-03A
SCDOT STANDARD DRAWING NO. 815-605-20
SWALE SPACING = 100-FT., 200-FT., OR 300-FT., DEPENDING ON SLOPE
1-FT. MIN.
LEVEL BOTTOM
GRASS OR STABLE LINING
2:1 OR FLATTER
2-FT. MIN.
1.5-FT. MIN.
2-FT. MIN.


TEMPORARY SILT DITCH
WASTE
2
1
0" TO 2'-0" VAR.
VARIABLE 2'-6" TO 10'-0"
GROUND LINE
FILL SLOPE
SCDOT
South Carolina Department of Transportation
DIVERSION SWALE/SILT DITCH
DRAWING NO. RC-03B
SCDOT STANDARD DRAWING NO. 815-605-20

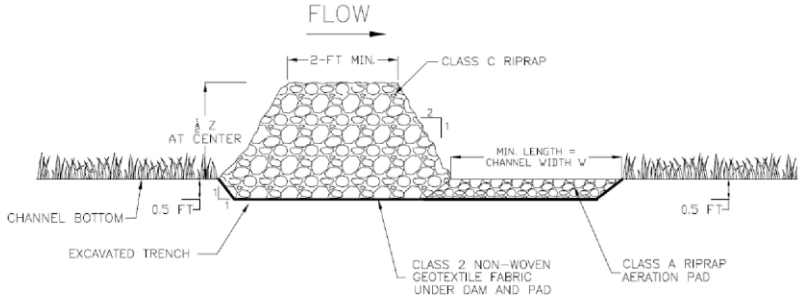

VARIES – MIN 3 EARTHEN FLOW CONTROL STRUCTURES PER LAST 100 FT PRIOR TO OUTFALL
USE GRASSED EARTHEN BERM FOR FLOW CONTROL
OUTFALL
FLOW
FLOW
A
A
6.0% MAXIMUM CHANNEL SLOPE
PLAN VIEW
2:1 MAXIMUM CHANNEL SIDE SLOPE
SIDE SLOPE CAN BE REDUCED TO MATCH ROAD CROSS-SECTION
DO NOT OPERATE HEAVY EQUIPMENT IN SWALE
FREEBOARD DISTANCE OF 1 FT IF SITE CONDITIONS ALLOW
10-YEAR STORM
WATER QUALITY STORM
VEGETATION MAINTAINED TO 6" HEIGHT
0.5 FT EARTHEN FLOW CONTROL STRUCTURE
2' MINIMUM BOTTOM WIDTH
SECTION A
2
1
SCDOT
South Carolina Department of Transportation
GRASSED CHANNELS AND SWALES
DRAWING NO. WQ-01A
SCDOT STANDARD DRAWING NO. 815-008-01
THIS DRAWING IS NOT TO SCALE


VARIES – MIN 3 EARTHEN FLOW CONTROL STRUCTURES PER LAST 100 FT PRIOR TO OUTFALL
FLOW
WATER QUALITY STORM
FIRST FLOW CONTROL STRUCTURE PLACED NEAR STREAM CROSSING
SEE EARTHEN FLOW CONTROL STRUCTURE DETAIL AND SPACING TABLE
PROFILE OF GRASSED CHANNEL/SWALE
STABILIZE WITH TURF GRASS & ECB
1 FT MIN.
FLOW
2
1
0.5 FT
EARTHEN FLOW CONTROL STRUCTURE
SCDOT
South Carolina Department of Transportation
GRASSED CHANNELS AND SWALES
DRAWING NO. WQ-01B
SCDOT STANDARD DRAWING NO. 815-008-02
THIS DRAWING IS NOT TO SCALE

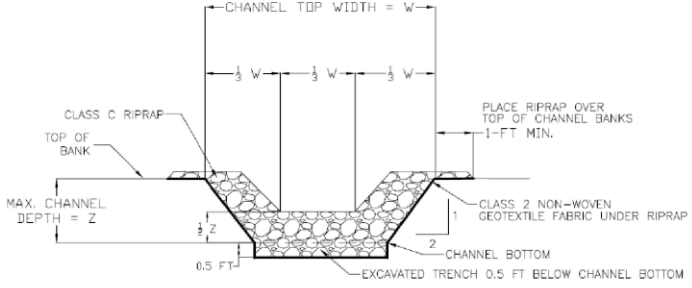

SHEET FLOW
48:1(TYP.)
4-FT MIN (SEE TABLE)
2% TO 10% SLOPE
UPPER STATE
LOWER STATE
Width of Road Draining to Filter Strip (ft)
Minimum Width of VFS (ft)
Upper State
Lower State
12*
4
4
24
8
6
36
16
10
*If 4 ft VFS is not possible, 2 ft may be used.
SCDOT
South Carolina Department of Transportation
VEGETATED FILTER STRIPS
DRAWING NO.
WQ-02
SCDOT STANDARD DRAWING NO.
THIS DRAWING IS NOT TO SCALE
VEGETATED FILTER STRIP
SHOULDER TURFGRASS PER SEEDING SPECIFICATION
SHEET FLOW
4-FT MIN (SEE TABLE)
IMPERVIOUS AREA ROADWAY
RUNOFF
RUNOFF
RUNOFF
SHEET FLOW
4-FT MIN (SEE TABLE)
SHEET FLOW
2% TO 10% SLOPE


DISSOLVED OXYGEN ENHANCEMENT STRUCTURE
CLASS A RIPRAP
AERATION PAD
DISCHARGE
CLASS C RIPRAP
30 Deg
30 Deg
1/3 W
1/3 W
1/3 W
TOP OF BANK
TOP OF BANK
CHANNEL TOP WIDTH "W"
2:1 MAXIMUM SIDESLOPES SLOPE CAN BE REDUCED TO MATCH ROAD CROSS-SECTION
FLOW
PLAN VIEW
SCDOT
South Carolina Department of Transportation
DISSOLVED OXYGEN ENHANCEMENT STRUCTURE
DRAWING NO. WQ-03A
SCDOT STANDARD DRAWING NO. 815-007-00
THIS DRAWING IS NOT TO SCALE

TYPICAL DISSOLVED OXYGEN ENHANCEMENT STRUCTURE PROFILE VIEW



DISSOLVED OXYGEN ENHANCEMENT STRUCTURE CROSS-SECTION



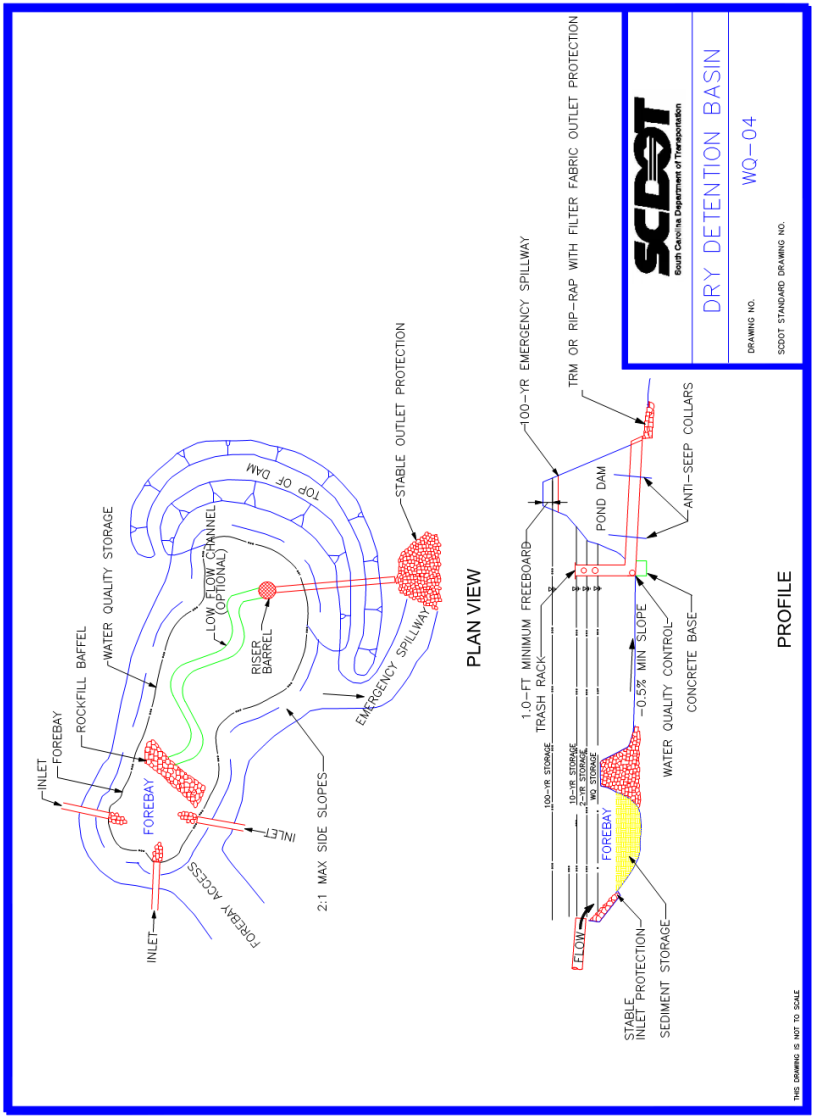
THIS DRAWING IS NOT TO SCALE

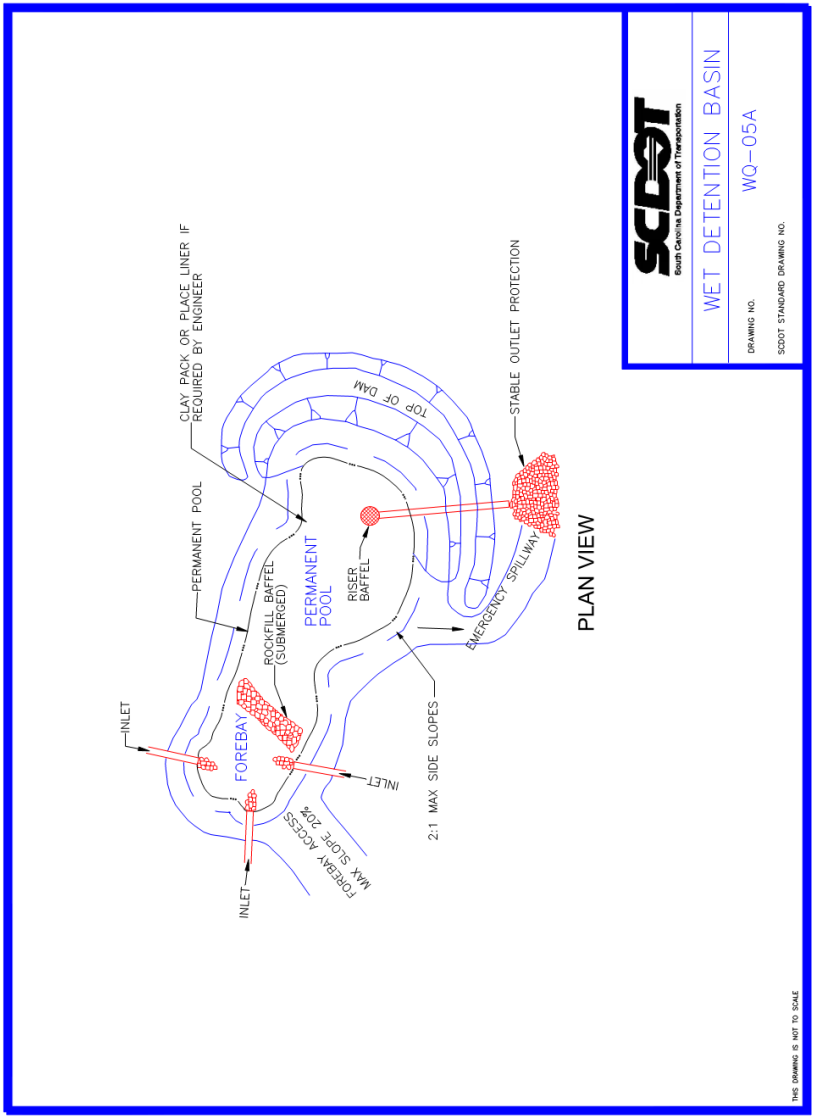
SCDOT
South Carolina Department of Transportation

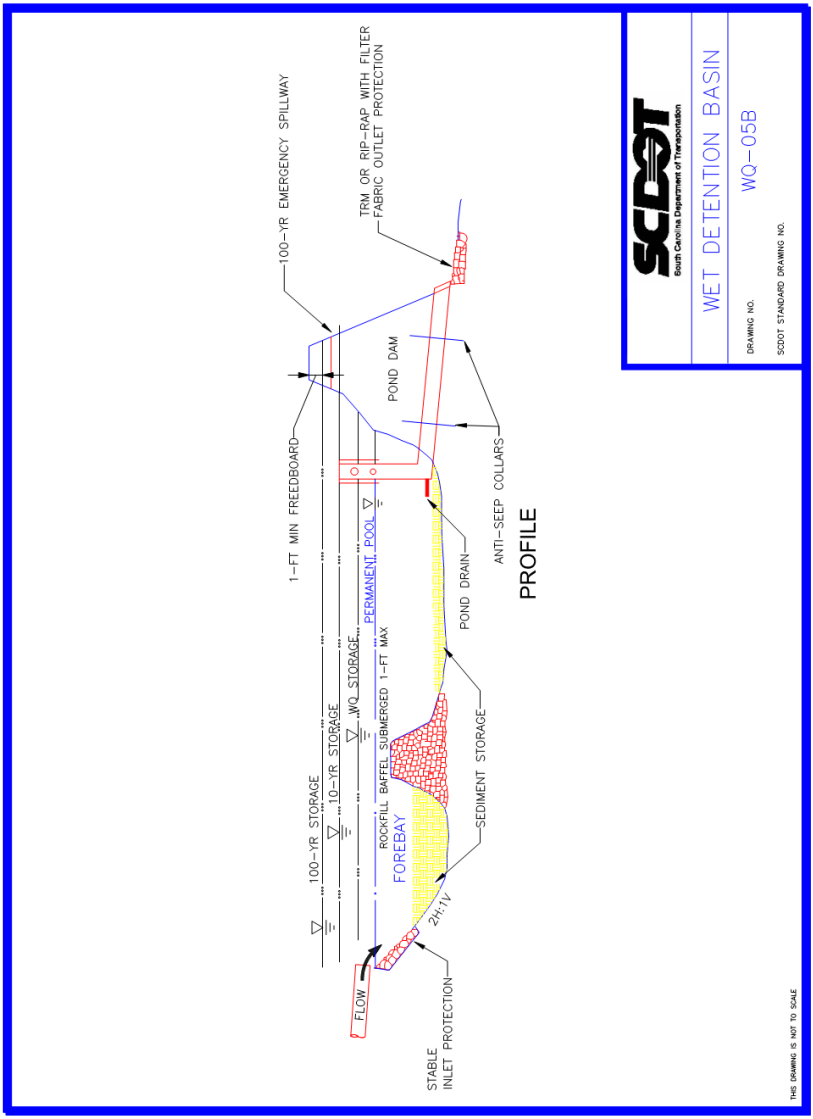
DISSOLVED OXYGEN ENHANCEMENT STRUCTURE

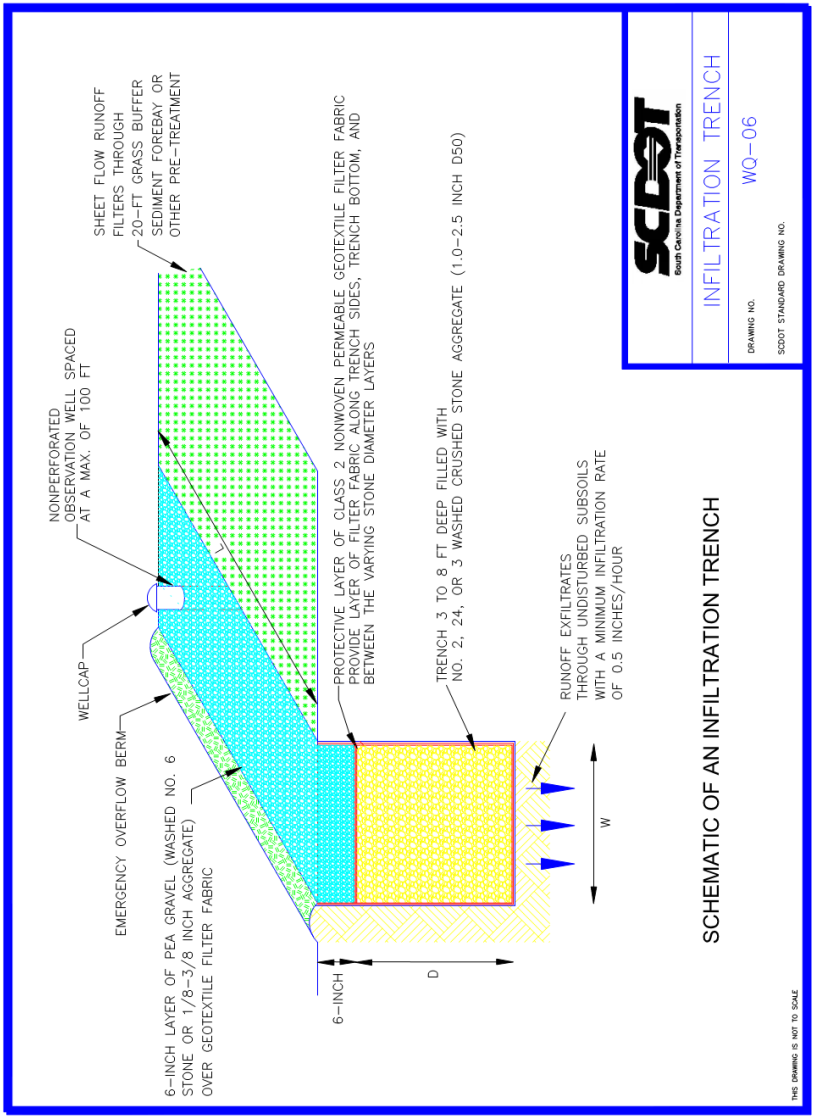
DRAWING NO. WQ-03B

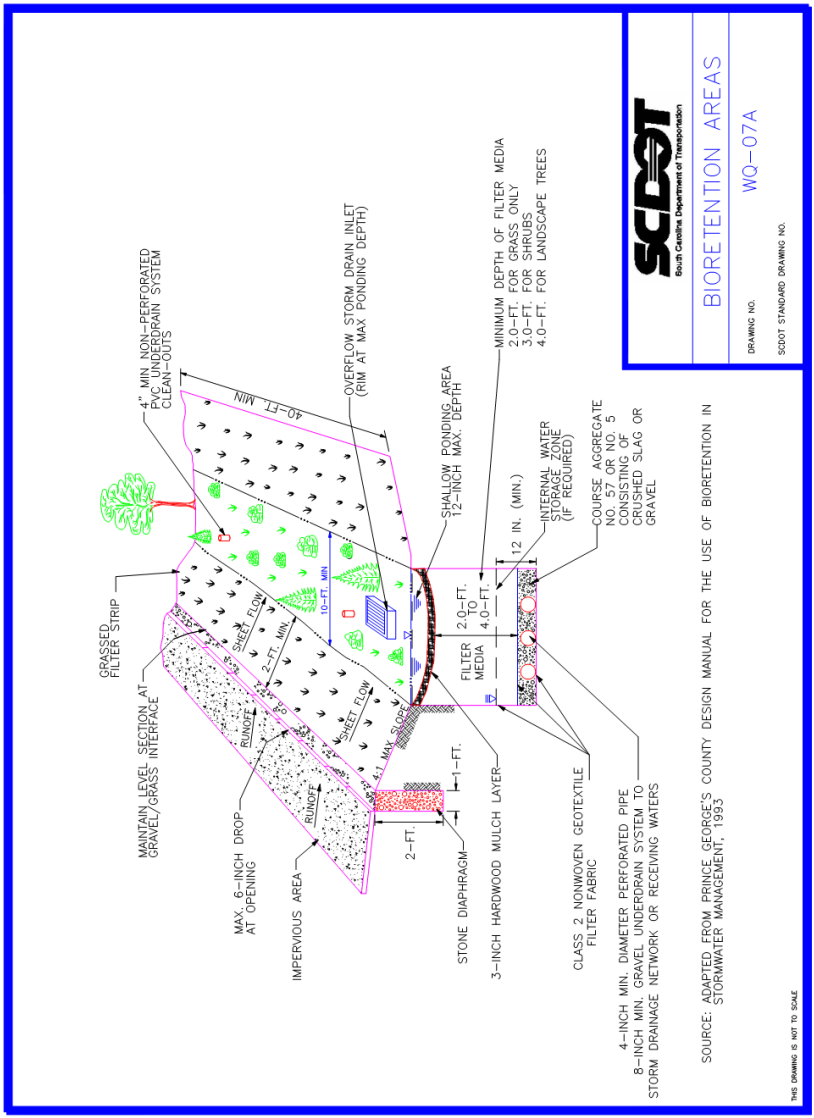
SCDOT STANDARD DRAWING NO. 815-007-00


INLET
FOREBAY
ROCKFILL BAFFEL
WATER QUALITY STORAGE
FOREBAY
INLET
FOREBAY ACCESS
INLET
LOW FLOW CHANNEL (OPTIONAL)
RISER BARREL
TOP OF DAM
EMERGENCY SPILLWAY
STABLE OUTLET PROTECTION
2:1 MAX SIDE SLOPES
PLAN VIEW
100-YR EMERGENCY SPILLWAY
TRM OR RIP-RAP WITH FILTER FABRIC OUTLET PROTECTION
1.0-FT MINIMUM FREEBOARD
TRASH RACK
POND DAM
ANTI-SEEP COLLARS
100-YR STORAGE
10-YR STORAGE
2-YR STORAGE
WQV
FOREBAY
FLOW
-0.5% MIN SLOPE
WATER QUALITY CONTROL
CONCRETE BASE
STABLE INLET PROTECTION
SEDIMENT STORAGE
PROFILE
SCDOT
South Carolina Department of Transportation
DRY DETENTION BASIN
DRAWING NO.
WQ-04
SCDOT STANDARD DRAWING NO.
THIS DRAWING IS NOT TO SCALE


SCDOT
South Carolina Department of Transportation
WET DETENTION BASIN
DRAWING NO. WQ-05A
SCDOT STANDARD DRAWING NO.
PLAN VIEW
CLAY PACK OR PLACE LINER IF REQUIRED BY ENGINEER
PERMANENT POOL
ROCKFILL BAFFEL (SUBMERGED)
PERMANENT POOL
RISER BAFFEL
TOP OF DAM
STABLE OUTLET PROTECTION
EMERGENCY SPILLWAY
INLET
FOREBAY
INLET
FOREBAY ACCESS MAX SLOPE 20%
INLET
2:1 MAX SIDE SLOPES
THIS DRAWING IS NOT TO SCALE


100-YR EMERGENCY SPILLWAY
TRM OR RIP-RAP WITH FILTER FABRIC OUTLET PROTECTION
1-FT MIN FREEBOARD
POND DAM
100-YR STORAGE
10-YR STORAGE
WQ STORAGE
PERMANENT POOL
ROCKFILL BAFFEL SUBMERGED 1-FT MAX
FOREBAY
ANTI-SEEP COLLARS
POND DRAIN
SEDIMENT STORAGE
2H:1V
FLOW
STABLE INLET PROTECTION
PROFILE
SCDOT
South Carolina Department of Transportation
WET DETENTION BASIN
DRAWING NO.
WQ-05B
SCDOT STANDARD DRAWING NO.
THIS DRAWING IS NOT TO SCALE


SCHEMATIC OF AN INFILTRATION TRENCH
SHEET FLOW RUNOFF FILTERS THROUGH 20-FT GRASS BUFFER SEDIMENT FOREBAY OR OTHER PRE-TREATMENT
NONPERFORATED OBSERVATION WELL SPACED AT A MAX. OF 100 FT
WELLCAP
EMERGENCY OVERFLOW BERM
6-INCH LAYER OF PEA GRAVEL (WASHED NO. 6 STONE OR 1/8-3/8 INCH AGGREGATE) OVER GEOTEXTILE FILTER FABRIC
PROTECTIVE LAYER OF CLASS 2 NONWOVEN PERMEABLE GEOTEXTILE FILTER FABRIC PROVIDE LAYER OF FILTER FABRIC ALONG TRENCH SIDES, TRENCH BOTTOM, AND BETWEEN THE VARYING STONE DIAMETER LAYERS
TRENCH 3 TO 8 FT DEEP FILLED WITH NO. 2, 24, OR 3 WASHED CRUSHED STONE AGGREGATE (1.0-2.5 INCH D50)
RUNOFF EXFILTRATES THROUGH UNDISTURBED SUBSOILS WITH A MINIMUM INFILTRATION RATE OF 0.5 INCHES/HOUR
6-INCH
D
W
SCDOT
South Carolina Department of Transportation
INFILTRATION TRENCH
DRAWING NO. WQ-06
SCDOT STANDARD DRAWING NO.
THIS DRAWING IS NOT TO SCALE


SCDOT
South Carolina Department of Transportation
BIORETENTION AREAS
DRAWING NO. WQ-07A
SCDOT STANDARD DRAWING NO.
GRASSED FILTER STRIP
MAINTAIN LEVEL SECTION AT GRAVEL/GRASS INTERFACE
4" MIN NON-PERFORATED PVC UNDERDRAIN SYSTEM CLEAN-OUTS
40-FT MIN
OVERFLOW STORM DRAIN INLET (RIM AT MAX PONDING DEPTH)
SHALLOW PONDING AREA 12-INCH MAX. DEPTH
MINIMUM DEPTH OF FILTER MEDIA
2.0-FT. FOR GRASS ONLY
3.0-FT. FOR SHRUBS
4.0-FT. FOR LANDSCAPE TREES
12 IN. (MIN.)
INTERNAL WATER STORAGE ZONE (IF REQUIRED)
COURSE AGGREGATE NO. 57 OR NO. 5 CONSISTING OF CRUSHED SLAG OR GRAVEL
FILTER MEDIA
2.0-FT. TO 4.0-FT.
SHEET FLOW
2-FT. MIN
10-FT. MIN
RUNOFF
MAX. 6-INCH DROP AT OPENING
IMPERVIOUS AREA
4:1 MAX SLOPE
2-FT.
1-FT.
STONE DIAPHRAGM
3-INCH HARDWOOD MULCH LAYER
CLASS 2 NONWOVEN GEOTEXTILE FILTER FABRIC
4-INCH MIN. DIAMETER PERFORATED PIPE
8-INCH MIN. GRAVEL UNDERDRAIN SYSTEM TO STORM DRAINAGE NETWORK OR RECEIVING WATERS
SOURCE: ADAPTED FROM PRINCE GEORGE'S COUNTY DESIGN MANUAL FOR THE USE OF BIORETENTION IN STORMWATER MANAGEMENT, 1993
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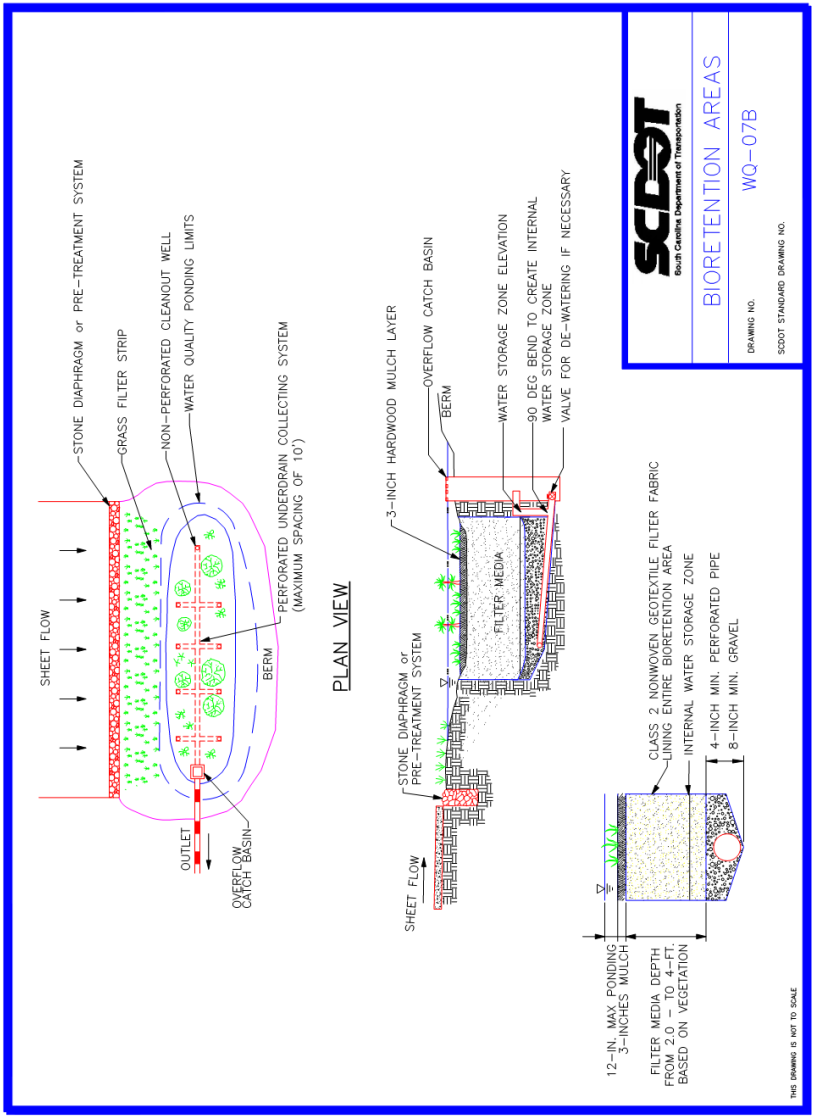
STONE DIAPHRAGM or PRE-TREATMENT SYSTEM
GRASS FILTER STRIP
NON-PERFORATED CLEANOUT WELL
WATER QUALITY PONDING LIMITS
PERFORATED UNDERDRAIN COLLECTING SYSTEM (MAXIMUM SPACING OF 10')
SHEET FLOW
BERM
OUTLET
OVERFLOW CATCH BASIN
PLAN VIEW
3-INCH HARDWOOD MULCH LAYER
OVERFLOW CATCH BASIN
BERM
WATER STORAGE ZONE ELEVATION
90 DEG BEND TO CREATE INTERNAL WATER STORAGE ZONE
VALVE FOR DE-WATERING IF NECESSARY
FILTER MEDIA
STONE DIAPHRAGM or PRE-TREATMENT SYSTEM
SHEET FLOW
CLASS 2 NONWOVEN GEOTEXTILE FILTER FABRIC LINING ENTIRE BIORETENTION AREA
INTERNAL WATER STORAGE ZONE
4-INCH MIN. PERFORATED PIPE
8-INCH MIN. GRAVEL
12-IN. MAX PONDING
3-INCHES MULCH
FILTER MEDIA DEPTH FROM 2.0 - TO 4-FT. BASED ON VEGETATION
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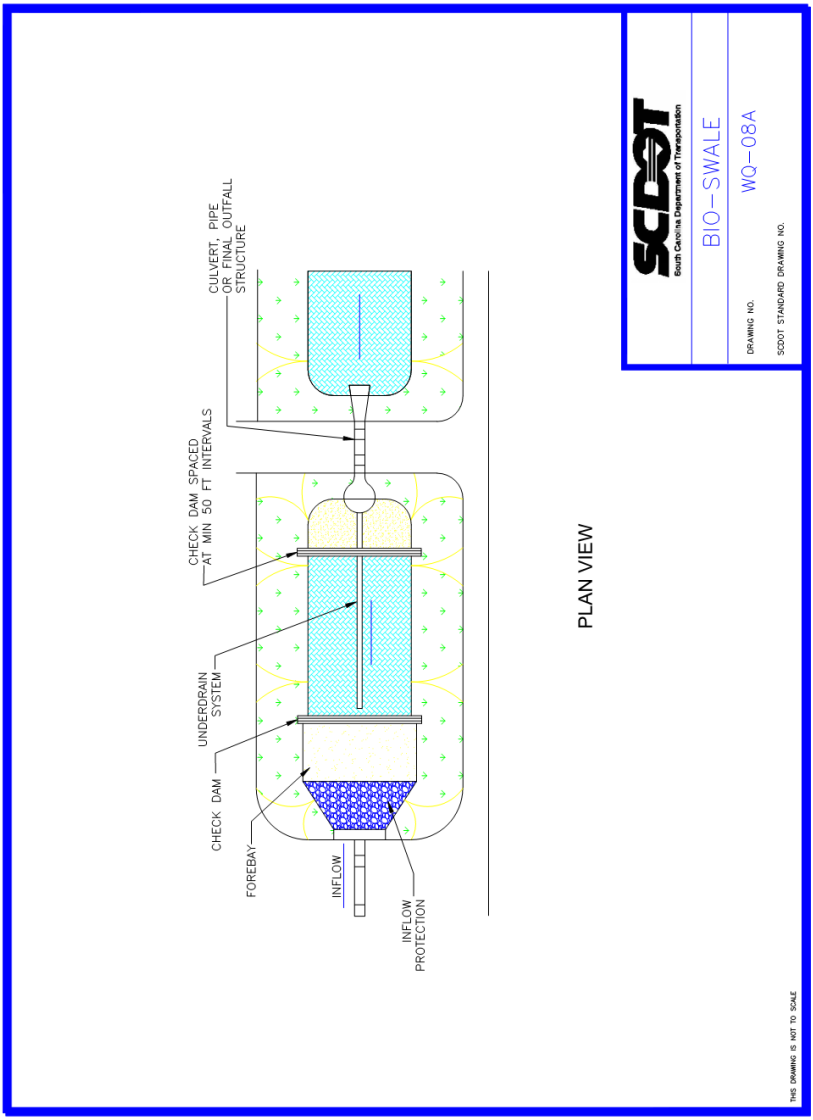
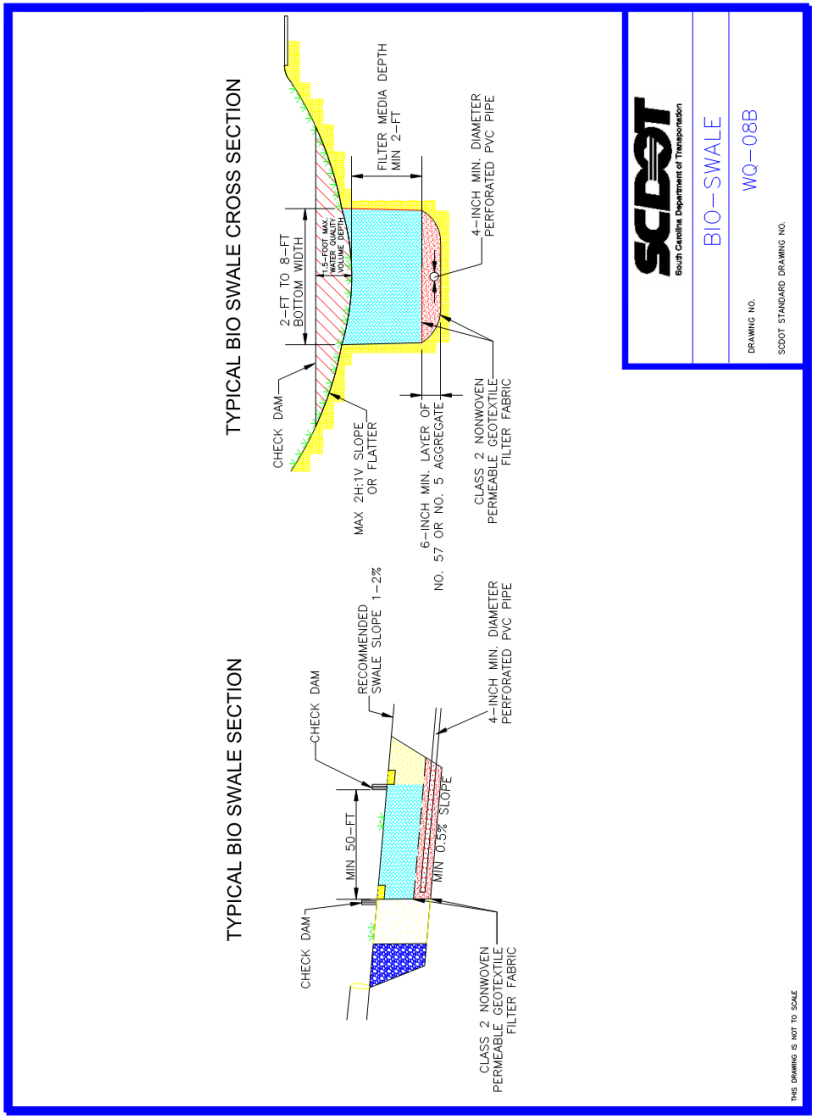
South Carolina Department of Transportation
BIORETENTION AREAS
DRAWING NO.
WQ-07B
SCDOT STANDARD DRAWING NO.


SCDOT
South Carolina Department of Transportation
BIO-SWALE
DRAWING NO.
WQ-08A
SCDOT STANDARD DRAWING NO.
THIS DRAWING IS NOT TO SCALE
PLAN VIEW
CULVERT, PIPE OR FINAL OUTFALL STRUCTURE
CHECK DAM SPACED AT MIN 50 FT INTERVALS
UNDERDRAIN SYSTEM
CHECK DAM
FOREBAY
INFLOW
INFLOW PROTECTION


TYPICAL BIO SWALE CROSS SECTION
CHECK DAM
2-FT TO 8-FT BOTTOM WIDTH
1.5-FOOT MAX WATER QUALITY VOLUME DEPTH
FILTER MEDIA DEPTH MIN 2-FT
4-INCH MIN. DIAMETER PERFORATED PVC PIPE
MAX 2H:1V SLOPE OR FLATTER
6-INCH MIN. LAYER OF NO. 57 OR NO. 5 AGGREGATE
CLASS 2 NONWOVEN PERMEABLE GEOTEXTILE FILTER FABRIC
TYPICAL BIO SWALE SECTION
CHECK DAM
RECOMMENDED SWALE SLOPE 1-2%
4-INCH MIN. DIAMETER PERFORATED PVC PIPE
MIN 50-FT
MIN 0.5% SLOPE
CHECK DAM
CLASS 2 NONWOVEN PERMEABLE GEOTEXTILE FILTER FABRIC
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