



South Carolina Department of Transportation



# SCDOT STORMWATER QUALITY DESIGN MANUAL

December 2014

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## List of Acronyms

BMP	Best Management Practice
cfs	Cubic feet per second
CECP	Contractors Erosion Control Plan
CGP	Construction General Permit
COD	Chemical Oxygen Demand
CWA	Clean Water Act
DO	Dissolved Oxygen
ECB	Erosion Control Blanket
EPSC	Erosion Protection and Sediment Control
ft <sup>3</sup>	Cubic feet
GAPC	Geographic Areas of Particular Concern
H&H	Hydrology and Hydraulics
HECP	Hydraulic Erosion Control Product
MEP	Maximum Extent Practicable
MS4	Municipal Separate Storm Sewer System
MTD	Manufactured Treatment Device
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NURP	National Urban Runoff Program
OCRM	Office of Coastal Resource Management
ORW	Outstanding Resource Waters
PCASC	Pollution Control Act of South Carolina
QPL	Qualified Products List
RECP	Rolled Erosion Control Product
ROW	Right-of-Way
SCDHEC	South Carolina Department of Health and Environmental Control
SCDOT	South Carolina Department of Transportation
SMSRA	Stormwater Management and Sediment Reduction Act
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TRM	Turf Reinforcement Mat
TSS	Total Suspended Solids
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USLE	Universal Soil Loss Equation
WQA	Water Quality Act
WLA	Waste Load Allocations

## **CHAPTER 1 - INTRODUCTION**

### **1.1 Purpose and Objectives of the Manual**

The purpose of this Stormwater Quality Design Manual is to provide engineers, plan reviewers, inspectors, and contractors involved in South Carolina Department of Transportation (SCDOT) construction projects with the following information:

- Stormwater quality management requirements for SCDOT construction projects including a summary of the National Pollutant Discharge Elimination System (NPDES) construction permit application and submittal process;
- Stormwater quality management and submittal requirements related to post-construction (long-term) water quality control for SCDOT owned properties; and,
- Guidelines and direction for designing stormwater best management practices (BMPs) to be used on SCDOT projects, both during and after construction, to improve water quality and to minimize stormwater runoff quality impacts due to road and bridge construction projects.

This Stormwater Quality Design Manual has been prepared in fulfillment of the requirements of NPDES Permit No. SCS040001; South Carolina Regulation 63-380, Standard Plan for Erosion, Sediment, and Stormwater Runoff Control; and the South Carolina Stormwater Management and Sediment Reduction Act of 1983 (Title 48, Chapter 18 of the South Carolina Code of Laws, 1983, as amended).

The overall objective for use of this Stormwater Quality Design Manual is to minimize short- and long-term water quality impacts on receiving streams from SCDOT roadway construction projects and other land disturbing activities. Receiving streams are defined as any watercourse, or bodies of water, into which runoff or treated effluent is discharged.

### **1.2 Use of the Design Manual**

Before the design engineer develops a design approach, they are expected to possess a basic understanding of stormwater quality control design and be familiar with the different design procedures given in the reference list. Users of this Stormwater Quality Design Manual who are not justly qualified by education or experience in the fields of stormwater quality control design or construction should consult with a qualified professional in one or more of these areas prior to implementing the requirements contained within this Stormwater Quality Design Manual.

This Stormwater Quality Design Manual is not intended to be a systematic design methodology that addresses every SCDOT construction Project situation. The application of engineering principles and judgment combined with the information contained within this Stormwater Quality Design Manual are required to successfully complete the planning, design, and preparation of documents for stormwater quality management plan and permit submittal.

This Stormwater Quality Design Manual is not intended to restrain or inhibit engineering creativity, freedom of design choices, or the need for engineering judgment. When shown to be

applicable, new procedures, techniques, and innovative stormwater quality BMPs are acceptable with supporting documentation. The documentation submitted by design professionals should show that these procedures are equal to, or exceed, the procedures and/or controls contained in this Stormwater Quality Design Manual.

### 1.3 Design Manual Organization

The Stormwater Quality Design Manual contains six chapters (a Table of Contents is found at the beginning of the Manual). This Design Manual is organized to present technical and engineering procedures along with the criteria needed to comply with SCDOT NPDES Stormwater Permit requirements. The individual chapters present the following information:

**Chapter 1 – Introduction:** Describes the purpose and objectives of the Manual; describes the use and organization of the Manual; and provides background information regarding federal, state, and local stormwater regulation and policies.

**Chapter 2 – Water Quantity Design:** Provides information related to SCDOT existing hydrologic and hydraulic (H&H) design procedures as they apply to stormwater quality controls. H&H design procedures specifically related to water quantity issues can be found in the SCDOT *Requirements for Hydraulic Design Studies* manual.

**Chapter 3 – Stormwater Quality Control Requirements:** Provides the information that is needed to meet SCDOT’s water quality design standards. There are design standards to be met both during construction and over the useful life of the treatment system. This Chapter discusses the standards and describes the overall design requirements for stormwater quality control for both during construction and post-construction. Exemptions are noted. The water quality permitting process, including roles and responsibilities of SCDOT staff, is also defined.

**Chapter 4 – Erosion Prevention and Sediment Control BMPs:** Presents detailed guidelines for designing temporary during construction stormwater Best Management Practices (BMPs) on SCDOT construction projects and corresponding documentation to be included when submitting a Stormwater Pollution Prevention Plan (SWPPP).

**Chapter 5 – Post-Construction Water Quality BMPs:** Provides detailed guidelines for designing permanent post-construction stormwater BMPs on SCDOT construction projects, as well as a brief discussion of common stormwater pollutants.

**Chapter 6 – SCDOT Post-Construction Rationale:** Provides the Post-Construction Rationale identified in the Stormwater Management Program.

**Chapter 7 – References:** Provides a list of the references used in the development of this Stormwater Quality Design Manual.

**Chapter 8 – Errata Sheet**

**Appendix A – Surface Outlet and Baffle Sediment Basins and Multipurpose Basins:** Contains requirements for the design and construction of temporary Surface Outlet and Baffle Sediment Basins and Multipurpose Basins.

**Appendix B - Design Criteria for Temporary Water Quality BMPs Used During Construction:** Provides design requirements for temporary (during construction) water quality BMPs.

**Appendix C – During Construction BMP Tables:** Provides tables with a general description, appropriate application, general design, and additional considerations for erosion prevention BMPs and sediment control BMPs.

**Appendix D - Pollutant Removal Mechanics:** Provides information on the processes used in pollutant removal in stormwater runoff.

**Appendix E – Design Criteria for Post-Construction Water Quality BMPs:** Provides design criteria for post-construction water quality BMPs for use on SCDOT projects.

**Appendix F – Post-Construction BMP Tables:** Provides tables with a general description, appropriate application, general design, and additional considerations for permanent structural control BMPs and limited structural control BMPs.

**Appendix G – Erosion Related Information for South Carolina Soils:** Provides erosion related information based on soil type for soils found in South Carolina.

**Appendix H – Rainfall and Universal Soil Loss Equation (USLE) Data:** Provides tables for Distribution of Rainfall Erosion Index (EI Curves), 24-hour storm event rainfall data, and USLE CP and LS factors.

**Appendix I - Calculations and Design Aids for Non-Standard SCDOT Sediment Controls:** Provides design aids for designing non-standard SCDOT temporary during construction BMPs.

**Appendix J – Standards for Stormwater Management and Sediment Reduction Regulation 72-405 thru 72-445.**

## **1.4 Stormwater Management Regulations and Policies**

To address the adverse impacts of urbanization and land development, federal, state, and local regulations have been adopted to protect the quantity and quality of stormwater runoff received by natural receiving waterbodies.



## **1.4.1 Federal and State Regulations**

### **1.4.1.1 Clean Water Act**

The Federal Water Pollution Control Act of 1972, referred to as the Clean Water Act (CWA) (PL 92-500), as amended, 33 U.S.C. 1251 et seq.), states that it is illegal to discharge any pollutant to the “waters of the United States” without an NPDES Permit. The initial efforts to improve the nation’s water quality after passage of the CWA focused on reducing pollutants of industrial process wastewater and municipal sewage and required an NPDES permit for these types of point source discharges. Several nationwide studies during the 1970's and 1980's identified stormwater discharges as a significant source of water pollution.

The 1987 amendments to the CWA (also referred to as the Water Quality Act or WQA) established a framework for regulating municipal and industrial stormwater discharges under the NPDES permit program. They required a NPDES permit for industrial stormwater discharges, including stormwater runoff associated with land disturbing activity (typically land development and construction) of five acres or greater. The threshold five-acre area was challenged and the federal NPDES regulations were amended in accordance with a court order for stormwater discharges in December 1999. These amendments lowered the acreage for when an NPDES permit is required for construction or land clearing to one acre while allowing a case-by-case determination for sites less than one acre.

The 1987 CWA amendments also require NPDES permits for stormwater runoff from urbanized areas. A municipal separate storm sewer system (MS4) NPDES permit is required based on population. MS4s are divided into three categories: large (population of 250,000 or greater); medium (population less than 250,000 but equal to or greater than 100,000); and small (population greater than 50,000). Phase I regulations issued in 1990 required large and medium MS4s to obtain and implement their NPDES stormwater permits beginning in 1992. Phase II regulations which apply to small MS4s were issued in 1999.

For both the industrial/land disturbing and MS4 NPDES permits, preventing the pollution at the source through the use of source control BMPs is the preferred and most practical method for reducing pollution. Additional BMPs can be used as needed to address capture, control, and treatment of pollutants after they have been generated or released from a source area. Authority to administer the NPDES permit program was delegated in South Carolina to the Department of Health and Environmental Control (SCDHEC) in accordance with the CWA by the United States Environmental Protection Agency (USEPA).

### **1.4.1.2 NPDES Permit for Stormwater Runoff**

Stormwater runoff from land disturbance activities is considered an illegal discharge without an NPDES Stormwater Permit. SCDOT’s latest version of the NPDES General Permit for Stormwater Discharges from Construction Activities is Permit No. SCR160000, effective January 1, 2013.

These permits require certain industries to develop and implement a SWPPP, which must include appropriate BMPs to minimize pollution to the receiving natural waterbodies. In general, a Construction General Permit (CGP) is required for all SCDOT construction Projects that disturb one or more acres of land. The requirements for obtaining and complying with the CGP are covered within this Stormwater Quality Design Manual.

#### **1.4.1.3 NPDES MS4 Permit**

SCDOT is required to obtain an NPDES MS4 (Municipal Separate Storm Sewer System) Permit from the SCDHEC for stormwater discharges. SCDHEC has issued NPDES Permit No. SCS040001 to SCDOT. This permit allows SCDOT to discharge stormwater from its MS4 to all receiving waters of South Carolina. The permit requires SCDOT to develop and implement a Stormwater Management Program (SWMP) to control the discharge of pollutants from its MS4 to the maximum extent practicable (MEP). This Stormwater Quality Design Manual has been developed as a requirement of SCDOT's SWMP. The requirements of this permit as they relate to the control of stormwater discharges from SCDOT projects both during and after construction are covered within this Stormwater Quality Design Manual.

#### **1.4.1.4 South Carolina Pollution Control Act**

The Pollution Control Act of South Carolina (PCA) (S.C. Code Sections 48-1-10 *et seq.*, 1976), Regulation 61-9 was originally enacted in 1950 and was last amended in 1970 during the initial stages of the environmental movement. It was written very broadly and is applicable to essentially any activity.

The most important provision of the statute is Section 48-1-90, which states that it is “unlawful for any person, directly or indirectly, to throw, drain, run, allow to seep, or otherwise discharge into the environment...[any] wastes, except as in compliance with a permit” issued by SCDHEC.

SCDOT's NPDES MS4 permit as described in Section 1.4.1.3 of this Stormwater Quality Design Manual was issued in accordance with the provisions of the PCA as well as the provisions of the CWA.

#### **1.4.1.5 South Carolina Stormwater Management and Sediment Reduction Act**

The South Carolina Stormwater Management and Sediment Reduction Act (SMSRA) of 1991 (S.C. Code Ann. §§ 48-18 -17 *et seq.*) was enacted to address the increase in stormwater runoff rate and quantity, the decrease of rainwater infiltration, and the increase in erosion associated with the extensive urban development that has been occurring throughout the state. SCDOT has the authority to implement the requirements of this Act and its associated regulations. The Act requires that a stormwater management plan (SWMP) in compliance with the requirements of existing regulations be submitted for most land disturbing activities in South Carolina.

## **1.4.2 Impaired Waters and Total Maximum Daily Loads (TMDLs)**

SCDHEC conducts an extensive sampling program across the state to establish water quality levels and associated improving or deteriorating trends. Results are compared against state water quality standards for a variety of parameters (bacteria, nutrients, sediments, etc.) This effort leads to the bi-annual development of the 303(d) Impaired Waters List, which is reported to the USEPA. The 303(d) list identifies each impaired waterbody by name, monitoring station number, hydrologic unit, and basin. Waterbodies in which improvement is not realized by the SCDHEC are slated for the TMDL process.

Some SCDOT projects may directly contribute runoff to waterbodies listed on the 303(d) list or that have an established and effective TMDL as defined in Chapter 3. For these projects, if the pollutant of concern can be associated with SCDOT runoff, the design must demonstrate that the projects' discharges will not further contribute to an impairment, or will comply with the TMDL by following the design requirements of this Stormwater Quality Design Manual.

## **1.4.3 Effluent Limitations**

Effluent limitations refer to any restrictions imposed by SCDHEC on quantities, discharge rates, and concentrations of pollutants which are discharged from a point source into waters of the State. Effluent limitation guidelines can incorporate both numeric effluent limits and non-numeric effluent limits, in the form of BMP's designed to be implemented throughout the life of a project.

## **1.4.4 Anti-Degradation Rules**

The Anti-degradation Rules created by SCDHEC are specifically intended to ensure that no new activities will further degrade waterbodies which are not presently meeting water quality standards (303(d) list). The activities of primary concern are land development projects which are immediately adjacent to and discharge runoff into impaired waters. SCDHEC has established that large scale projects with more than 25 acres of disturbed land draining to a single outfall, which have stormwater discharges directly into an impaired waterbody, have the ability to further degrade the quality of that waterbody and are susceptible to this rule. For more information on this subject, please see the SCDHEC publication entitled *Antidegradation for Activities Contributing to Nonpoint Source Pollution to Impaired Waters*.

This publication can be downloaded from the SCDHEC website.

In applicable situations, SCDHEC may require the determination of whether runoff from a proposed land disturbance is expected to contain pollutants which are already causing impairment of the adjacent waterbody. These pollutant discharges will vary from Project to Project depending on the proposed land use. If stormwater runoff from the proposed land development will contribute pollutants that already cause water quality impairment, the design professional (SWPPP Preparer) must provide assurance (i.e. written quantitative and qualitative assessments of the BMPs selected) to the Department that the Project will not add further to the impairment. There is no specific methodology which must be followed; however, the

demonstration must show that the BMPs to be implemented will ensure that runoff from the Project will not cause or contribute to further degradation of the waterbody.

#### **1.4.5 Maximum Extent Practicable (MEP)**

SCDOT's NPDES permit requires that its SWMP elements meet the Maximum Extent Practicable (MEP). MEP, as used in this Stormwater Quality Design Manual, describes the level of effort SCDOT has deemed necessary to comply with state and federal water quality goals. The level of effort and cost, or performance standard, is the technology based standard that considers common knowledge of pollutants in discharges, the impact on water quality, and commonly used engineering design standards.

The water quality requirements in this Stormwater Quality Design Manual address two types of performance standards for construction and post-construction application:

- 1) During construction, water quality is addressed by selecting appropriate BMPs in Chapter 4 and evaluating their performance to minimize pollutants in the stormwater discharges.
- 2) Post-construction, long-term water quality is addressed by selecting appropriate BMPs in Chapter 5 and evaluating their performance to minimize pollutants in the stormwater discharges.

#### **1.4.6 Outfall or Single Point**

For the purpose of this Water Quality Manual, outfall or single point means a single outlet of stormwater discharge at the location of exit at the Project property or rights-of-way boundary.

## **CHAPTER 2 - WATER QUANTITY DESIGN**

### **2.1 Existing SCDOT H&H Design Methodology and Procedures**

The hydrologic and hydraulic design guidelines given in the latest version of the SCDOT *Requirements for Hydraulic Design Studies*, give general hydrologic and hydraulic procedures in developing all SCDOT drainage designs.

Perform hydrologic and hydraulic analyses for the design of SCDOT water quality structures using the methodologies and procedures described in this Stormwater Quality Design Manual and in compliance with the requirements of the South Carolina Stormwater Management and Sediment Control Regulations (26 S.C. Code Ann. Regs. 72-405 (Supp. 1995) et. seq.) and the latest version of the NPDES General Permit for Stormwater Discharges from South Carolina Department of Transportation Construction Activities, Permit No. SCR160000.

## **CHAPTER 3 - STORMWATER QUALITY CONTROL REQUIREMENTS**

This chapter defines the specific regulatory requirements and review processes associated with stormwater quality control from SCDOT construction projects. “New development” means new location roadway construction projects. “Redevelopment” means any construction (not maintenance) on an existing roadway for improving capacity or drainage. Maintenance activities (such as resurfacing projects) do not require permit coverage as long as the maintenance activities are performed to maintain the original line and grade, hydraulic capacity, or original purpose of the facility. Appropriate BMPs should be implemented for these activities. Projects that fall under the authority for maintenance by SCDOT, but that are constructed by others, must meet these same criteria.

### **3.1 Permitting and Submittal Requirements**

#### **3.1.1 SCDOT Construction General Permit**

Projects that meet the criteria in Section 3.2.1 of this Stormwater Quality Design Manual must apply for and obtain a permit in compliance with the latest version of the NPDES General Permit for Stormwater Discharges from South Carolina Department of Transportation Construction Activities, Permit No. SCR160000. Application and submittal requirements generally include an SCDOT Construction General Permit Notice of Intent Application and a Stormwater Pollution Prevention Plan.

##### **3.1.1.1 SCDOT CGP NOI Application**

The Notice of Intent (NOI) is the application that must be completed and signed in blue ink by SCDOT or its representative and submitted to SCDHEC.

##### **3.1.1.2 Water Quality Plan Review Checklist**

The *Water Quality Plan Review Approval Checklist for Land Disturbance and Construction Projects*, located on the SCDOT webpage, must be completed by the RPG Hydraulic Team Leader, the Environmental Permit Coordinator, or Consultant. This checklist supports the NOI application.

##### **3.1.1.3 Stormwater Pollution Prevention Plan (SWPPP)**

The SWPPP is the document that contains all the necessary engineering calculations and construction plans used to support the NOI application. The calculations demonstrate that the BMPs used to manage runoff quality during and post-construction meet the design requirements specified in the SCDOT CGP. Acceptable during construction BMPs are listed in Chapter 4 and acceptable post-construction BMPS are listed in Chapter 5.

The SWPPP must also contain specific instructions to the contractor responsible for day-to-day operations for installing and maintaining BMPs and for controlling construction waste and debris. See the SCDOT CGP for more information.

The construction plans should include an Erosion Control Data Sheet(s) showing the BMPs used during construction and the quantity of temporary and permanent BMPs.

A checklist to assist in meeting the requirements of the SCDOT CGP is provided in SCDOT's *Water Quality Plan Review Approval Checklist for Land Disturbance and Construction Projects* located on the SCDOT webpage.

### **3.1.2 Water Quality Permitting**

Projects which directly discharge to impaired waterbodies applicable to stormwater construction discharges, or a waterbody for which a TMDL that has been established and is in effect, must comply with the requirements of latest version of the NPDES General Permit for Stormwater Discharges from South Carolina Department of Transportation Construction Activities, Permit No. 160000.

### **3.1.3 US Army Corps of Engineers (USACE) Permits**

The US Army Corps of Engineers regulates the discharge of fill material in wetlands and other waters of the US. If a project requires fill material in wetlands or waters of the US, a permit from the USACE must be obtained. Three types of permits are applicable to SCDOT projects.

#### **3.1.3.1 404 Individual Permits**

Individual permits are issued for each application of a USACE permit. A public notice is distributed to all known interested persons. After evaluating all comments and information received, the final decision on the application is made. The permit decision is generally based on the outcome of a public interest balancing process where the benefits of the project are balanced against the detriments. A permit will be granted unless the proposal is found to be contrary to the public interest.

Individual permits are applicable for SCDOT projects that do not meet the conditions or limitations of either a Nationwide Permit or the Regional General Permit.

#### **3.1.3.2 Nationwide Permits**

A Nationwide Permit is a general permit which authorizes a category of activities throughout the nation. These permits are valid only if the conditions applicable to the permits are met. If the conditions cannot be met, a regional or individual permit will be required.

There are 52 different Nationwide Permits (NWP) that are authorized by the USACE. Each NWP has different permit conditions and limitations. The most common Nationwide Permits

used by SCDOT are the NWP 3 for maintenance, and the NWP 14 for linear transportation projects. The NWP authorizes up to 0.5 acres of fill in freshwaters, 0.3 acres in tidal waters, and 300 linear feet to jurisdictional waters. The specific limitations and conditions that apply to each NWP are listed on the Charleston District Regulatory website at:

<http://www.sac.usace.army.mil/Missions/Regulatory/PermittingProcess>

### **3.1.3.3 Regional General Permits**

Regional General Permits are issued by the USACE District Engineer for a general category of activities when the activities are similar in nature and cause minimal environmental impact (both individually and cumulatively), and the Regional General Permit reduces duplication of regulatory control by State and Federal agencies.

The USACE has developed Regional General Permits for specific geographical areas and/or specific activities. These Regional General Permits are issued to, or administered by, either agencies of the State of South Carolina or corporations licensed by the Federal Energy Regulatory Commission. The SCDOT is a state agency that has a general permit that covers many highway projects.

General Permits are the most common type of USACE permits utilized by SCDOT. The SCDOT General Permit authorizes the discharge of dredge and/or fill material in waters of the United States for the construction, expansion, modification, or improvement of existing linear transportation projects. Projects authorized by the General Permit must not exceed 3.0 acres of freshwater impacts, 0.5 acres of tidal water impacts, and/or 300 linear feet of jurisdictional waters of the US.

### **3.1.4 401 Water Quality Certification from SCDHEC**

This certification is required for any project that requires a federal permit. The 401 Water Quality Certification ensures that water resources of a state are not impacted due to any nature of activity associated with daily activities or operations. It may be required in such cases when the project directly discharges runoff to an impaired waterbody. The Department must have reasonable assurance that the water quality standards of any state regulation (South Carolina is Regulation 61-68) will not be contravened as a result of the proposed work and that the activity will result in no change or enhancement of classified uses with no degradation to the aquatic ecosystem. Water quality impacts of a waterbody must be temporary and water quality standards must not be contravened. Existing and classified uses of the waterbody must be maintained. Certification is obtained from SCDHEC Water Quality Division. The intent and application requirements are the same as the water quality certification discussed in Section 3.1.2 of this Stormwater Quality Design Manual.

### **3.1.5 SCDHEC Office of Ocean and Coastal Resource Management**

SCDHEC Ocean and Coastal Resource Management (SCDHEC-OCRM) section also enforces the CWA. Section 307 of the Coastal Zone Management Act of 1972, as amended (16 U.S.C.



1458(c)), requires the applicant certify that the project is in compliance with an approved State Coastal Zone Management Program and that the State concurs with the applicant's certification prior to the issuance of a Corps permit. OCRM reviews all projects located in the State's Coastal Zone (Beaufort, Berkeley, Charleston, Colleton, Dorchester, Georgetown, Horry, and Jasper Counties). For projects in these counties but outside of the critical area, a Coastal Zone Consistency (CZC) certification must be obtained. This certification is typically obtained during the 401 Certification process for projects requiring a federal permit. A direct Critical Area Permit from OCRM is required for projects that require alteration to the critical area. The critical area is defined as coastal waters, tidelands, beaches, and beach/dune system. The application for the Critical Area Permit is available on the SCDHEC website.

### **3.1.6 Coastal Zone Consistency (CZC)**

In the Coastal Zone, NOI submissions must include an application for Coastal Zone Consistency (CZC). An individual CZC certification provided by SCDHEC-OCRM is required for proposed construction activities as part of the NOI unless the proposed construction activities are covered under a General Coastal Zone Consistency (GCZC) Certification issued by SCDHEC-OCRM.

In the Coastal Zone, the SCDOT CGP authorizes point source discharges of stormwater from construction activities including clearing, grading, and excavating that result in the land disturbance of greater than 0.5 acres located within one-half mile of a coastal receiving water body. Projects located in the Coastal Zone that are not part of a larger common plan of development, that disturb 0.5 acres or less, and that are located within one-half mile of a coastal receiving water body are automatically granted coverage under the SCDOT CGP without submitting an NOI to the Department, provided the appropriate BMPs are being used and the land disturbing activity is covered under a GCZC Certification issued by SCDHEC-OCRM.

A comprehensive list of GCZC Certifications and CZC application information is available on the SCDHEC website.

## **3.2 Temporary Stormwater Quality Control During Construction**

### **3.2.1 Applicability**

This Section of the Stormwater Quality Design Manual contains the minimum requirements and standards for temporary stormwater quality management during construction that applies to all land disturbance activities on SCDOT property and right-of-way.

### **3.2.2 Design Requirements**

Chapter 4 provides information on acceptable BMPs to be used during construction and specifications for the construction of these BMPs. Design guidance in meeting these requirements is located in the Standards for Stormwater Management and Sediment Reduction Regulation 72-405 thru 72-445 (*Appendix J*) and the requirements and recommendations contained in the most current edition of the South Carolina Highway Design Manual, SCDOT Standard Specifications for Highway Construction, SCDOT Supplemental Technical

Specifications, SCDOT Stormwater Quality Design Manual, and SCDOT Stormwater Quality Field Manual.

### **3.2.2.1 Design Removal Efficiency Goal**

Design sediment control structures to accommodate the anticipated sediment loading from all land disturbing activities and meet a design removal efficiency of 80% total suspended solids (TSS) for disturbed conditions for the 10-year, 24-hour storm event. When selecting Standard SCDOT BMPs with an applicable SCDOT Supplemental Technical Specification, SCDOT Standard Drawing, or BMPs included on an applicable SCDOT QPL list, the BMP meets the 80% TSS trapping requirement and maintenance requirements are already established.

### **3.2.2.2 Sediment Basin**

A sediment basin, or an acceptable alternative BMP when ROW is unavailable, is required for stormwater runoff that drains to a single outfall from land disturbing activities which disturb ten (10) acres or more. Design and construct sediment basins or alternative BMPs to accommodate the anticipated sediment loading from the land disturbing activity and meet a removal efficiency of 80% suspended solids (TSS). Calculate the efficiency for disturbed conditions for the 10-year, 24-hour design event. The sediment basin outfall device or system design must take into account the total drainage area flowing through the disturbed area to be served by the basin and must successfully pass the 100-year, 24-hour storm event through the emergency spillway.

Design Surface Outlet and Baffle Sediment Basins in accordance with *Appendix A*.

Alternative sediment control BMPs may be used if they achieve an equivalent removal efficiency of 80% for suspended solids, or 3,600 cubic feet of sediment storage volume per disturbed acre that drains to a single point, excluding off-site flows, whichever is less. Calculate the efficiency for disturbed conditions for the 10-year, 24-hour design event.

When designing non-standard SCDOT sediment control BMPs, calculate sediment storage volumes for all sediment controls to determine the required clean-out frequencies and maintenance schedules in accordance with *Appendix I*. The Universal Soil Loss Equation (USLE) or other acceptable methods that determine sediment yield may be used to predict the required sediment storage volumes for specific sediment control structures.

### **3.2.2.3 Stormwater Pollution Prevention Plan (SWPPP) Requirements**

The SCDOT CGP requires the preparation and implementation of a SWPPP for each construction site covered by the permit. The requirements of the construction site SWPPP and guidelines for the selection, design, construction, and maintenance of various BMPs available for water quality protection during construction projects can be found in the latest version of the NPDES General Permit for Stormwater Discharges from South Carolina Department of Transportation Construction Activities, Permit No. SCR160000.

## **Design Procedures**

The following is a list of steps that can be used to develop a sediment and erosion control plan for a proposed Project:

- 1) Design the Project per the most current version of the South Carolina Highway Design Manual (HDM).
- 2) Determine the Project drainage areas.
- 3) Study the site topography to understand existing and proposed changes.
- 4) Determine soil types, infiltration rates, and other site characteristics from soil survey.
- 5) Determine hydrologic characteristics for the area contributing to each BMP.
- 6) Based on the contributing drainage area, select appropriate BMPs. Sections 4.2.2 and 4.2.3 of this Stormwater Quality Design Manual list standard SCDOT during construction BMPs. *Appendix A, B, and C* provide additional guidance on BMP selection.
- 7) Design the BMPs. The Standards for Stormwater Management and Sediment Reduction Regulation 72-405 thru 72-445 (*Appendix J*) and the requirements and recommendations contained in the most current edition of the SCDOT Standard Specifications for Highway Construction, SCDOT Supplemental Technical Specifications, SCDOT Stormwater Quality Design Manual, and SCDOT Stormwater Quality Field Manual provide detail on the design of the BMPs.
- 8) Determine if the BMPs meet the design requirements.
  - a. When selecting standard SCDOT BMPs with an applicable SCDOT Supplemental Technical Specification, SCDOT Standard Drawing, or BMPs included on an applicable SCDOT QPL list, the BMPs meet the 80% TSS trapping requirement.
  - b. When using non-standard SCDOT BMPs, use engineering modeling software (such as SEDIMOT and SEDCAD) or design aids. *Appendix I* provides additional design guidance for non-standard SCDOT BMPs.
- 9) Refine BMP selection and redesign as necessary.

### **3.3 Requirements for Post-Construction Stormwater Quality Control**

Post-construction stormwater quality management requirements and standards apply to SCDOT new development and redevelopment projects including roadway construction projects and land disturbance activities on SCDOT property and right-of-way.

#### **3.3.1 SCDOT Stormwater (MS4) Review Policy**

The review policy for SCDOT on projects identified as ‘other projects’ including County or City Sales Tax Projects, Local Program Administrator projects, and those projects under encroachment permits is as follows:

- Projects that identify SCDOT as the permittee and the Construction Letting is conducted by SCDOT's construction office will be reviewed for water quality by SCDOT staff or assigned entity.
- Projects that identify an entity other than SCDOT as the permittee and the Construction Letting is **not** by SCDOT will be reviewed for water quality according to SCDOT standards and requirements by the other entity seeking the permit from SCDHEC.

### 3.3.2 SCDOT Post-Construction BMP Policy

The SCDOT Post Construction BMP Policy is:

- 1) Safety of the traveling public is the primary factor in the BMP decision making process of SCDOT.
- 2) Water quality is addressed for each project and adequate treatment is provided to MEP.
- 3) Vegetated channels, swales, and filter strips (which are determined to be an effective treatment of roadway runoff) are the primary water quality BMPs utilized by SCDOT. Vegetated channels and swales must be a minimum of 100 feet long with 0.5-foot high earthen flow control structures installed to provide effective treatment. If site constraints do not allow 100 feet, vegetated channels and swales with a slope less than or equal to 1% may be 75 feet long with a minimum of four 0.5-foot high earthen flow control structures installed.
- 4) Manufactured Treatment Devices (MTDs) will only be utilized after the Project evaluation when the MTD directly provides treatment:
  - a. For impaired water bodies with an impairment that is caused by roadway constituents, or
  - b. At select significant outfalls and after Project evaluation that discharge to sensitive waters such as outstanding resource waters, shellfish beds, trout streams, or water bodies of significant importance when vegetative practices are not applicable.
- 5) SCDOT prohibits the use of unnecessary MTDs due to the associated high ongoing maintenance costs with little added water quality benefit.
- 6) Long-term maintenance has been addressed by SCDOT through a post-construction BMP maintenance program to ensure proper working conditions of BMPs are retained.
- 7) If a local entity requires additional post-construction BMPs above and beyond SCDOT's Post-Construction BMP policy, then that entity will be responsible for the ongoing post-construction maintenance of the installed BMPs.

### 3.3.3 Design Requirements

#### 3.3.3.1 Design Removal Efficiency Goal/Performance Standard

The *performance standard* for permanent stormwater quality controls at all applicable SCDOT projects in order to reduce pollutants to the MEP is **80% removal efficiency of the average**

annual post-development TSS load. Permanent water quality controls should also be designed to meet any other additional watershed or site-specific water quality requirements. The BMPs listed in Table 1 in Section 5.2 of this Stormwater Quality Design Manual meet the 80% TSS trapping requirement when designed according to this Section and *Appendix E*.

In order to meet the *performance standard* of 80% TSS removal efficiency, permanent water quality control structures should be designed using one of the following *design standards* (note: Coastal Zone requirements differ):

- Design permanent water quality ponds and detention structures having a permanent pool elevation to store and release the first ½ inch of runoff from the entire Project site over a minimum period of 24 hours. Design the permanent storage volume of these water quality structures to accommodate at least ½ inch of runoff from the contributing drainage area.
- Design permanent water quality structures not having a permanent pool elevation (dry structures) to store and release the first one (1) inch of runoff from the Project site over a minimum period of 24 hours.
- Design permanent water quality infiltration practices to accommodate, at a minimum, the first one (1) inch of runoff from impervious areas located on the Project site.
- Design MTDs to treat at a minimum the peak flow rate of the stormwater runoff from the 1.8-inch, 1-year, 24-hour storm event for the entire drainage area to the BMP. Refer to *SCDOT Supplemental Technical Specification for Manufactured Stormwater Treatment Devices (MTDs) SC-M-815-13* or latest revision for design requirements.
- Design permanent water quality ponds and detention structures within one-half mile of a receiving water body in the Coastal Zone to store a volume of ½ inch of runoff from the entire Project site or the first one (1) inch of runoff from the built-upon portions of the Project, whichever is greater.
- Design projects within 1,000 feet of shellfish beds with permanent water quality ponds and detention structures to retain the first 1½ inches of runoff from built-upon portions of the Project.

### 3.3.3.2 Impaired Waterbodies

For any new or redevelopment Project that discharges to impaired water bodies, the SWPPP must demonstrate that the Project does not allow stormwater discharges from the Project that will contribute to the violations of the water quality standards to the MEP. This requirement can be demonstrated through calculations, engineering models, and/or explanations of the proposed activities and BMPs. Implement the following steps for impaired water bodies:

- Determine the pollutant(s) of concern for the water body.
- Determine whether or not the stormwater discharge from the Project may contain the pollutant(s) of concern.
- If the stormwater discharges do not contain a pollutant(s) of concern, no additional requirements are necessary.

- If stormwater discharge contains a pollutant(s) of concern, evaluate and utilize potential BMPs from Appendix E, to minimize pollutants in the stormwater discharge to not cause or contribute to a violation of water quality standards to the MEP. Figures 1 and 2 will be utilized if applicable.

### 3.3.3.3 TMDLs

For any new or redevelopment Project that intersects or directly discharges runoff into a waterbody that has a TMDL that has been established and is in effect, the SWPPP must address the pollutant of concern to ensure compliance with the TMDL. This requirement can be demonstrated through negotiated TMDL Compliance Plans, calculations, engineering models, and/or citations of applicable research publications and/or explanation of the proposed activities and BMPs.

#### **Design Procedures**

Implement the following steps for a receiving waterbody with an established and effective TMDL (additional steps may be necessary):

- Determine the pollutants of concern for the receiving water body.
- Determine whether or not the stormwater discharge from the Project may contain the pollutant(s) of concern.
- If the stormwater discharges will not contain a pollutant(s) of concern, no additional requirements are necessary.
- Select BMPs. Use Section 5.3, *Appendix E* and *Appendix F* of this Stormwater Quality Design Manual to help select BMPs to treat the pollutants of concern and meet the minimum design criteria in Section 3.3.3 of this Stormwater Quality Design Manual.
- Design the BMPs.

#### **Other Considerations**

More considerations should be taken on Projects that drain to impaired waterbodies or are within TMDL watersheds. Figures 1 and 2 are TMDL Compliance Plans for bacteria and nutrients that clearly define how SCDOT will address water quality on road segments affected by TMDL waste load allocations (WLAs).

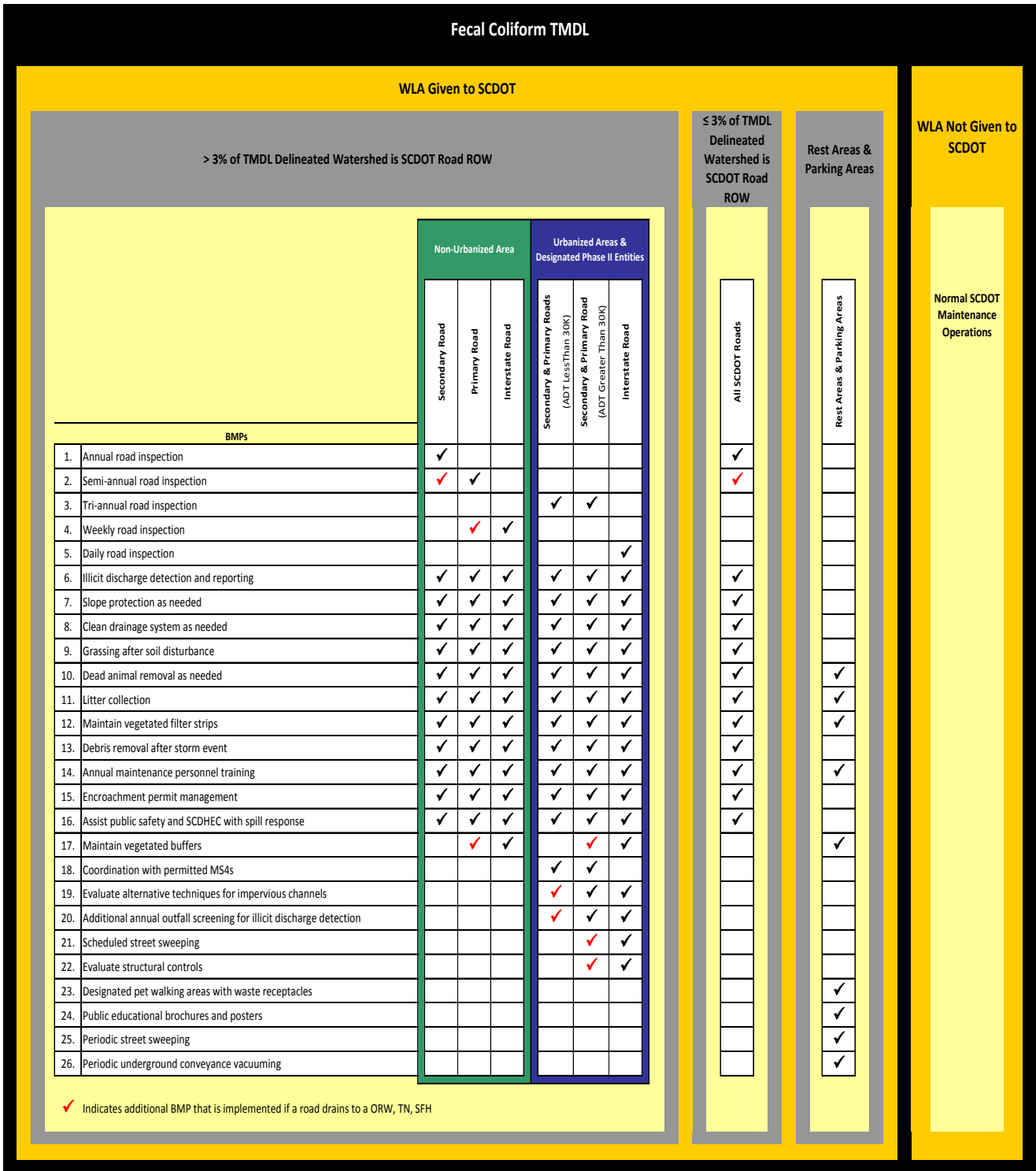
When SCDOT is given a WLA and the area of their ROW is less than 3% of the watershed area, SCDOT will complete the BMPs listed in that corresponding section of the TMDL Compliance Plan, but no specific reporting will be required by SCDHEC beyond what is already included in the MS4 annual report for the cumulative effectiveness of the stormwater management program. When SCDOT is given a WLA and the area of their ROW is greater than 3%, they will meet, to the MEP the requirements of the TMDL WLA, and the MS4 permit requirement by implementing the appropriate BMPs listed in the Compliance Plan within the SCDOT ROW. In addition, more detailed, supplemental reporting will be completed for these areas within the MS4 annual report. Further actions as listed in the Compliance Plan will be taken by SCDOT when a

road drains directly to Outstanding Resource Waters, Natural Trout Waters, and Shellfish Harvesting Waters. SCDOT rest areas and parking areas are broken out separately in the Compliance Plans to include BMPs specific to those locations.

Implementation of the TMDL Compliance Plans accomplishes the following:

- 1) Defines what the MEP is for SCDOT related to fecal coliform and nutrient TMDLs.
- 2) Achieves the effective implementation of the WLA assigned by the fecal coliform and nutrient TMDLs.
- 3) Provides compliance with the TMDL section of SCDOT's MS4 Permit.

**Figure 1: Bacteria Compliance Plan**





### Figure 2: Nutrient Compliance Plan

SCDOT MS4 Permit Compliance with Nutrient TMDLs																	
WLA Given to SCDOT																	
> 3% of TMDL Delineated Watershed is SCDOT Road ROW																	
	Non-Urbanized Area			Urbanized Areas & Designated Phase II Entities			All SCDOT Roads	Rest Areas & Parking Areas	WLA Not Given to SCDOT								
	Secondary Road	Primary Road	Interstate Road	Secondary & Primary Road (ADT Less Than 300)	Secondary & Primary Road (ADT Greater Than 300)	Interstate Road											
<b>Post-Construction BMPs</b>																	
1.	Annual road inspection	✓					✓		Normal SCDOT Maintenance Operations								
2.	Semi-annual road inspection	✓	✓				✓										
3.	Tri-annual road inspection				✓	✓											
4.	Weekly road inspection		✓	✓													
5.	Illicit discharge detection and reporting	✓	✓	✓	✓	✓	✓										
6.	Clean drainage system as needed	✓	✓	✓	✓	✓	✓										
7.	Grassing after soil disturbance, when necessary and in accordance with SCDOT specifications	✓	✓	✓	✓	✓	✓										
8.	Litter collection	✓	✓	✓	✓	✓	✓	✓									
9.	Debris removal after storm event as necessary	✓	✓	✓	✓	✓	✓										
10.	Annual maintenance personnel training	✓	✓	✓	✓	✓	✓										
11.	Encroachment permit management, including enforcement of SCDOT seeding specs in beautification efforts made by other entities within the SCDOT ROW	✓	✓	✓	✓	✓	✓	✓									
12.	Coordination with permitted MS4s				✓	✓											
13.	No additional fertilizer application after vegetative stabilization	✓	✓	✓	✓	✓	✓	✓									
14.	Scheduled street sweeping					✓		✓									
15.	Designated pet walking areas with waste receptacles					✓		✓									
16.	Public education campaign							✓									
17.	Periodic street sweeping							✓									
18.	Periodic underground conveyance vacuuming							✓									
<b>Construction BMPs</b>																	
1.	Temporary cover (stabilization) by mulch/seeding on disturbed areas that will not be worked for 21 days or more	✓	✓	✓	✓	✓	✓	✓	Normal SCDOT Construction Operations								
2.	Erosion control blanket & turf reinforcement mat installation, where appropriate	✓	✓	✓	✓	✓	✓	✓									
3.	Inlet and outlet protection, where appropriate	✓	✓	✓	✓	✓	✓	✓									
4.	Stabilize construction entrances where one has been designated	✓	✓	✓	✓	✓	✓	✓									
5.	Silt fence installation, where appropriate	✓	✓	✓	✓	✓	✓	✓									
6.	BMP Inspections every 7 calendar days	✓	✓	✓	✓	✓	✓	✓									
<b>Seeding BMPs</b>																	
1.	Prepare & submit a seeding plan in accordance with SCDOT specifications	✓	✓	✓	✓	✓	✓	✓	Normal SCDOT Seeding Operations								
2.	Select seed types based on planting location and planting date	✓	✓	✓	✓	✓	✓	✓									
3.	Conduct a soil analysis to determine the need & rate of lime & fertilizer applications	✓	✓	✓	✓	✓	✓	✓									
4.	Only apply lime & fertilizer at rates determined from soil analysis. Use fertilizer that incorporates a minimum of 50% water insoluble (slow release) nitrogen	✓	✓	✓	✓	✓	✓	✓									
5.	Apply mulch according to SCDOT mulch specifications	✓	✓	✓	✓	✓	✓	✓									
6.	Inspectors complete seeding inspection form to verify soil analysis and all materials applied during seeding operations	✓	✓	✓	✓	✓	✓	✓									

✓ Indicates additional BMP that is implemented if a road drains to a ORW, TN, SFH

### **3.4 Permanent BMP Maintenance**

All permanent BMPs must have a maintenance plan. The maintenance of permanent post-construction water quality BMPs located in the ROW under the jurisdiction of the SCDOT in which SCDOT is the owner or operator which issues or manages the land disturbing activity is addressed by SCDOT through a post-construction BMP maintenance program to ensure proper working conditions of BMPs are retained.

### **3.5 Bridge Deck Runoff**

For any new or redevelopment Project that includes bridge deck runoff at sensitive waterbodies the designer should contact the SCDOT Environmental Management Office for guidance.

## **CHAPTER 4 - EROSION PREVENTION AND SEDIMENT CONTROL BMPS**

Ensure the SWPPP and Comprehensive SWPPP requirements of the latest version of the NPDES General Permit for Stormwater Discharges from South Carolina Department of Transportation Construction Activities, Permit No. SCR160000 are met.

### **4.1 General Project Information**

Each SWPPP must provide the following general Project information:

- A description of the nature of the construction activity;
- Estimates of the total area of the Project that is expected to be disturbed by excavation, grading, or other activities;
- Identification of prior uses of the Project site or potential sources of pollution that may reasonably be expected to cause or contribute to a violation of any applicable water quality standard based upon the existing condition of the Project site;
- The name of the receiving water(s) and wetland acreage on-site (provided in the permit documents, not necessarily on the plan sheets); and
- Distance to the nearest receiving water body.

In addition, legible plan sheets must be provided identifying information listed below:

- Direction(s) of stormwater flow and approximate slopes anticipated after major grading activities as depicted by the profile and cross section plan sheets;
- Areas of soil disturbance and areas that will not be disturbed;
- Locations of BMPs identified in the SWPPP;
- Locations of all Surface Waters of the State (including wetlands); and
- Location of stormwater outfalls.

### **4.2 Erosion Prevention and Sediment Control (EPSC)**

Erosion Prevention and Sediment Control are in fact two distinct objectives of any SWPPP. Erosion Prevention is source control, minimizing the movement of sediment in the moving water. Sediment Control is an “end of pipe solution” that minimizes the discharge of sediments that have eroded from a watershed due to stormwater runoff. The BMPs that can be used to meet these objectives are further discussed in this section.

#### **4.2.1 Construction Considerations**

The following construction considerations must be applied for applicable SCDOT projects:

- Route all stormwater runoff into, through, across, etc. an EPSC BMP before it is discharged.

- Minimize the crossings of waterways during construction. A stream crossing may require approval from the appropriate federal, state, and/or local agencies. Avoid encroachment into stream buffers, riparian areas, and wetlands when possible.
- Locate and use stabilized construction entrances at all points of ingress/egress on a construction site. Prevent the transfer of soil, mud, and dust onto existing roadways to the MEP.
- Stockpile and preserve topsoil from erosion or dispersal both during and after site grading operations when applicable.
- Where construction or land disturbance activity will or has temporarily ceased on any portion of a site, perform temporary site stabilization as soon as practicable, but no later than 14 calendar days after the activity has ceased.
- Final stabilization of the site is required within 14 calendar days of construction completion.
- Consider providing subsurface drainage in areas having a high water table to intercept seepage that would affect slope stability, bearing strength, or create undesirable wetness.
- Do not place fill adjacent to channel banks where it can create bank failure, reduce the capacity of the stream, or result in downstream sediment deposition.
- Grade the site to direct flows to appropriate EPSC controls.

#### **4.2.2 Standard Erosion Prevention BMPs**

Use Erosion Prevention measures during construction activities to minimize erosion and sediment-laden runoff. Utilize one or more measures during the project's construction phase.

The following erosion prevention BMPs are presented in more detail in *Appendix B* and *Appendix C*:

- Temporary and Permanent Seeding (SC-M-810-2 or latest revision)
- Hydraulic Erosion Control Products (HECPs) (SC-M-815-11 or latest revision)
- Rolled Erosion Control Products (RECPs) (SC-M-815-9 or latest revision)
- Riprap for Channel Stabilization
- Outlet Protection (Standard Drawing 804-205-00, 804-305-01, 804-305-02, and 804-310-00)
- Compost (SC-M-815-3 or latest revision)
- Pipe Slope Drains
- Runoff Diversion Measures (Standard Drawing 815-605-00)
- Level Spreader for Pipe Outfalls

Erosion Prevention on SCDOT construction sites is not limited to the use of these BMPs. Alternative BMPs are discussed in section 4.2.4 of this Stormwater Quality Design Manual.

### 4.2.3 Standard Sediment Control BMPs

Sediment control structures are designed to keep eroded soils from having adverse impacts on adjacent properties and receiving waters. There are three major types of sediment control structures:

- 1) Detention structures that provide enough surface area and storage volume to slow the flow of the sediment-laden runoff and will allow the desired particle sizes to settle in an effort to achieve a desired trapping efficiency;
- 2) Structures that filter out eroded sediment particles; and,
- 3) Structures that add chemical agents to promote particle flocculation and settling. (Note: These are not typically utilized on SCDOT projects)

Most all of the sediment control BMPs employed function primarily by Stokes Law of quiescent settling. Filtering is not an efficient control because of sediment particle size variations and clogging of filter media. Chemical treatment is generally the least desirable sediment control method, but may be necessary in some cases to meet regulatory effluent discharge limits.

When selecting SCDOT sediment control BMPs with an applicable SCDOT Supplemental Technical Specification, SCDOT Standard Drawing, or included on an applicable SCDOLT QPL list, the BMP meets the 80% TSS trapping requirement and maintenance requirements are already established. Consider the following list of BMPs to control sediment that may be eroded and transported from a Project in a disturbed condition. These BMPs are presented in more detail in the Appendices.

- Temporary Sediment Basin (*Appendix A* and Standard Drawings 815-305-01 through 815-305-07 or latest revision)
  - Floating Skimmer (SC-M-815-14 or latest revision)
  - Porous Baffles (SC-M-815-16 or latest revision)
- Multi-Purpose Basin (*Appendix A* and Standard Drawing 815-305-00 or latest revision)
- Temporary Sediment Dam (*Appendix B* and Standard Drawings 815-405-01, 815-405-02 or latest revision)
- Silt Fence Systems (SC-M-815-2 or latest revision)
- Rock Ditch Check (*Appendix B* and Standard Drawing 815-105-00 or latest revision)
- Sediment Tubes for Ditch Checks (SC-M-815-12 or latest revision)
- Stabilized Construction Entrances (Standard Drawing 815-505-00 and SC-M-815-10 or latest revision)
- Inlet Structure Filters (SC-M-815-8 or latest revision)
- Perimeter Control (SC-M-815-17 or latest revision)
- Construction De-watering (SC-M-815-15 or latest revision)

- Temporary Sediment Dam for Pipe Inlet (*Appendix B* and Standard Drawing 815-406-00 or latest revision)

#### **4.2.4 Alternative EPSC BMPs**

To encourage the development and testing of innovative alternative EPSC BMPs, alternative management practices that are not included in this Stormwater Quality Design Manual may be allowed upon review and approval by the SCDOT New Products Committee. A new products submission form can be found on SCDOT's website.

## CHAPTER 5 - POST-CONSTRUCTION WATER QUALITY BMPS

The careful selection and design of the most appropriate post-construction water quality BMPS at SCDOT sites is imperative to provide significant protection to downstream receiving waters. The selection and design policy and guidelines set forth in this chapter are provided to aid the design professional with regulatory requirements on SCDOT projects relative to target pollutants, functionality, maintenance, aesthetics, and safety.

The proper selection and design of permanent BMPS requires knowledge of pollutant sources, parameters of concern, and pollutant removal mechanics as provided in *Appendix D*.

### 5.1 Post-Construction BMP Policy

The SCDOT Post-Construction BMP Policy is:

- 1) Safety of the traveling public is the primary factor in the BMP decision making process of SCDOT.
- 2) Water quality is addressed for each project and adequate treatment is provided when necessary.
- 3) Vegetated channels, swales, and filter strips (which are determined to be an effective treatment of roadway runoff) are the primary water quality BMPS utilized by SCDOT. Vegetated channels and swales must be a minimum of 100 feet long with 0.5-foot high earthen flow control structures installed to provide effective treatment. The maximum DOT right-of-way (ROW) drainage area to grassed channels and swales is 5 acres. If site constraints do not allow 100 feet, vegetated channels and 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 0.5-foot high earthen flow control structures installed.
- 4) Manufactured Treatment Devices (MTDs) will only be utilized after evaluation when the MTD directly provides treatment:
  - a. For impaired water bodies with an impairment that is caused by roadway constituents,  
or
  - b. At select significant outfalls after evaluation that discharge to sensitive waters such as outstanding resource waters, shellfish beds, trout streams, or water bodies of significant importance when vegetative practices are not applicable.
  - c. Due to high maintenance costs the use of MTDs should be limited.
- 5) SCDOT prohibits the use of unnecessary MTDs due to the associated high ongoing maintenance costs with little added water quality benefit.
- 6) Long-term maintenance has been addressed by SCDOT through a post-construction BMP maintenance program to ensure proper working conditions of BMPS are retained.
- 7) If a local entity requires additional post-construction BMPS above and beyond SCDOT's policy, then that entity will be responsible for the ongoing post-construction maintenance of the installed BMPS.

## 5.2 Post-Construction BMP Selection

For SCDOT projects, the pollutant of concern (POC) in the receiving water will likely be the driving factor for requiring a structural post-construction water quality BMP. If the site drains to a 303(d) listed impaired stream or if there is an established and effective TMDL for the receiving water body and the impairment is caused by roadway constituents, the most appropriate structural BMP(s) for the Project may be selected by using Table 1. BMPs acceptable for use on SCDOT projects are presented in Section 5.3 of this Stormwater Quality Design Manual.

**Table 1: Permanent Structural BMP Selection Matrix**

Class / Impairment/ POC	Post-Construction Design Scenario					
	Nonlinear		Linear			
	Rest Area	Maintenance Yard	Urban Interstate (Jersey Barrier)	Urban Curb & Gutter	Rural No Curb & Gutter	Rural Interstate / Divided Highways
<b>TSS</b>	1. Grassed Channel and/or Vegetated Filter Strip 2. MTD* 3. Ponds 4. Infiltration Trench 5. Bio-retention 6. Bio-Swale	1. Grassed Channel and/or Vegetated Filter Strip, 2. MTD* 3. Ponds 4. Infiltration Trench 5. Bio-retention 6. Bio-Swale	Grassed Channel  MTD*  Ponds	Grassed Channel  MTD*  Ponds	Vegetated Filter Strip and/or Grassed Channel  Ponds	Vegetated Filter Strip and/or Grassed Channel  Ponds
<b>Metals</b>	1. Grassed Channel and/or Vegetated Filter Strip 2. MTD* 3. Ponds 4. Infiltration Trench 5. Bio-retention 6. Bio-Swale	1. Grassed Channel and/or Vegetated Filter Strip 2. MTD* 3. Ponds 4. Infiltration Trench 5. Bio-retention 6. Bio-Swale	Grassed Channel  MTD*  Ponds	Grassed Channel  MTD*  Ponds	Grassed Channel and/or Vegetated Filter Strip  Ponds	Grassed Channel and/or Vegetated Filter Strip  Ponds
<b>DO</b>	DO Enhancement Structures	DO Enhancement Structures	DO Enhancement Structures	DO Enhancement Structures	DO Enhancement Structures	DO Enhancement Structures
<b>Trout, ORW or SFH</b>	Vegetated Filter Strip and DO Enhancement Structures	Vegetated Filter Strip and DO Enhancement Structures	Grassed Channel MTD* Ponds	Grassed Channel MTD* Ponds	Grassed Channel MTD* Ponds	Grassed Channel MTD* Ponds
<b>Nutrients (N, P)</b>	See Figure 2: Nutrient Compliance Plan					
<b>Bacteria</b> (See Figure 1)	Vegetated Filter Strip	Vegetated Filter Strip	Vegetated Filter Strip	Vegetated Filter Strip	Vegetated Filter Strip	Vegetated Filter Strip

\*Due to high maintenance costs the use of MTD's should be limited.

**NOTES:** 1. BMPs are numbered or listed in order of preference for their use in the various design situations.  
2. Use ponds as the preferred BMP when they are already required for storm water quantity control.



After a BMP is selected for a Project from Table 1 based on appropriate pollutant removal capabilities, the assessment of technical feasibility is the most explicit and therefore an appropriate place to continue the selection process. The size of a BMP is determined by the water quality volume. Determining this volume provides an estimation of the size of the proposed practices, and may narrow the field of candidate BMPs due to site size constraints. Other site elements such as slope, soil makeup, and flow conditions must be taken into consideration as well. If a BMP is too large to fit on the Project, cooperation with an adjacent jurisdiction contributing to drainage, purchase of an additional ROW, or installation of an undersized BMP may be considered with the approval from the SCDOT.

Once the effectiveness and the feasibility of the practice have been assessed relative to the Project requirements, the cost of the practice as well as legal and institutional limitations can be determined as well. Using all of these factors, the designer must determine which of the candidate design options is the most beneficial.

### **5.3 Post-Construction BMP Design**

Permanent post-construction water quality BMPs can be classified into two major categories: Standard Application and Limited Application BMPs. The BMPs within each category that are acceptable for use on SCDOT projects are described in detail in the following sections. Detailed descriptions of each of these BMPs including design considerations are provided in *Appendix E* and *Appendix F*.

#### **5.3.1 Standard Application Permanent Structural Controls**

Standard application structural controls are recommended for use in a wide variety of application situations. These structural controls have demonstrated the ability to effectively treat stormwater runoff for water quality and are presumed to be capable of removing 80% of the annual TSS load typically found in post-development runoff. Vegetated channels, swales, and vegetated filter strips are the primary water quality BMPs utilized by SCDOT. For any BMP selected, the design may meet the design requirements using the performance standard of trapping 80% of the annual TSS load. Computer models are available that can compute the trapping efficiency of many BMP types. Standard application permanent structural stormwater controls are shown in Table 2, and are provided in more detail in *Appendix E* and *Appendix F*.

**Table 2: Standard Application Permanent Structural Controls**

<b>Standard Application Structural Control</b>	<b>Description</b>
<b>Grassed Channels and Swales</b>	<p>Grassed channels and swales provide filtering of stormwater runoff as it flows across the vegetation and are capable of achieving 80% TSS removal. The standard application for water quality applies only to the last 100 feet of grassed channels and swales prior to outfall and does not include the entire conveyance.</p> <p>Grassed channels and swales must be a minimum of 100 feet long with 0.5-foot high earthen flow control structures installed to provide effective treatment. The maximum DOT right-of-way (ROW) drainage area to grassed channels and swales is 5 acres. If site constraints do not allow 100 feet, grassed channels and 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 0.5-foot high earthen flow control structures installed.</p>
<b>Vegetated Filter Strips</b>	<p>Vegetated filter strips provide filtering of stormwater runoff as it flows across the vegetation and are capable of achieving 80% TSS removal.</p>
<b>Dissolved Oxygen Enhancement Structures</b>	<p>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 DO levels.</p>
<b>Dry Ponds</b>	<p>Dry stormwater ponds are constructed stormwater basins that <i>do not</i> have a permanent pool of water. The water quality volume from stormwater runoff from each rain event is temporarily detained and released at a designed rate to achieve 80% TSS removal.</p>
<b>Wet Ponds</b>	<p>Wet stormwater ponds are constructed stormwater basins that have a permanent pool or micro-pool of water. The water quality volume from stormwater runoff from each rain event is detained and treated in the pool and released at a designed rate to achieve 80% TSS removal.</p>
<b>Infiltration Trench</b>	<p>An infiltration trench is an excavated trench filled with stone aggregate used to capture and allow infiltration of water quality volume from stormwater runoff into the surrounding soils from the bottom and sides of the trench to achieve 80% TSS removal.</p>

### 5.3.2 Limited Application Permanent Structural Controls

Limited application structural controls are recommended only for limited use with special site or design conditions. Limited application structural controls may be used within a system of water quality controls. Limited application structural controls should be used only in situations where regular maintenance is practicable.

Limited structural controls demonstrate the ability to effectively treat stormwater runoff for water quality for annual TSS load removal efficiencies greater than 80%. Limited application structural controls are shown in Table 3, and the design is provided in more detail in *Appendix E* and *Appendix F*.

**Table 3: Limited Application Permanent Structural Control**

Limited Structural Control	Description
<b>Bioretention</b>	Bioretention Areas are shallow stormwater basins or landscaped areas that utilize engineered soils and vegetation to capture and treat stormwater runoff to achieve 80% TSS removal. Runoff may be returned to the conveyance system or partially exfiltration into the soil.
<b>Bio-Swales</b>	Bio-Swales are vegetated open channels that are explicitly designed and constructed to capture and treat stormwater runoff within dry or wet cells formed by flow control structures to achieve 80% TSS removal.
<b>Natural Infiltration</b>	Natural infiltration is a method in which an undisturbed land area covered with natural vegetation accepts runoff from and infiltrates the runoff into the soil to achieve 80% TSS removal.
<b>Manufactured Treatment Devices</b>	MTDs use the movement of stormwater runoff through a specially designed structure to achieve 80% TSS removal. MTDs are not designed, or are intended to store a water quality volume. MTD Pollutant removal efficiencies are variable and are highly dependent on storm size, influent pollutant concentrations, rainfall intensity, and other factors.

### 5.3.3 Post-Construction Water Quality BMP Maintenance

Long-term maintenance of post-construction water quality BMPs located in the ROW under the jurisdiction of the SCDOT in which SCDOT is the owner or operator is addressed by SCDOT through a post-construction BMP maintenance program to ensure proper working conditions of BMPs are retained. If a local entity requires additional post-construction BMPs above and beyond SCDOT's Post-Construction BMP Policy, then that entity will be responsible for the ongoing post-construction maintenance of the installed BMPs.

## CHAPTER 6 - SCDOT POST-CONSTRUCTION RATIONALE

This Section summarizes the SCDOT Post-Construction Rationale as identified in the Stormwater Management Plan.

Permit SCS0401PD requires that SCDOT prepare a rationale statement and document the decision process used in creating the post-construction stormwater program and the expected results. Further, the decision process must address all of the requirements of Part II.B.2 in accordance with Regulation 61-9, 122.26(d)(2)(iv)(A)(2) and 122.34(b)(5).

To comply with the above requirements, SCDOT must address runoff from new development and significant redevelopment, consider both structural and nonstructural controls as well as long-term maintenance of controls, and must incorporate stormwater quality considerations in the planning process.

SCDOT is a large and complex organization with a well-established hierarchy and structure. In order to effect change, the appropriate protocol and “chain of command” must be utilized. Even small changes in the planning, design, and construction process can impact many different areas within SCDOT and must be verified for accordance with Federal Highway Administration rules and requirements. Safety of the traveling public is, and must necessarily be, paramount in the decision making process.

There is also the matter of state and federal laws that limit certain SCDOT activities. For example, the SCDOT cannot create ordinances and does not have enforcement capabilities. The Department must rely on other state agencies, such as SCDHEC and the Department of Public Safety for assistance in these matters. Further, there is a law that restricts SCDOT from mowing beyond 30 feet from the edge of pavement. This impacts operation and maintenance of certain BMPs.

Unlike most MS4s which have a variety of new and redevelopment projects, SCDOT is focused primarily on roadway and bridge construction. Redevelopment projects are typically road repaving projects. Due to right-of-way constraints, safety considerations, specific project details, and post-construction access issues, the types of post-construction structural stormwater controls are limited. Nonstructural controls are likewise limited since many of the traveling public reside in other states and are simply “passing through” South Carolina.

Regardless of these factors, however, SCDOT considered a number of alternatives and developed a post-construction program to effectively manage stormwater quality from roadways. The following list of controls illustrates the extent of the program.

- 1) SCDOT’s *Project Development Process (July 2008)* requires a multi-disciplinary team to perform an initial review of each project. Stormwater runoff is a consideration in this review. This process also requires that all necessary local, state, and federal environmental permits be applied for by SCDOT’s Environmental Office and obtained prior to start of construction.
- 2) SCDOT has created a plan review checklist to ensure that proper consideration has been given to stormwater quality throughout the design process.

- 3) Contracts for construction contain an “environmental clause” requiring the contractor to adhere to all requirements contained within the environmental permits obtained by and for SCDOT. This mechanism allows SCDOT to hold its on-site contractors accountable for stormwater quality issues associated with construction.
- 4) SCDOT’s post-construction program includes providing treatment at select significant outfalls through vegetative practices and utilizing structural controls when vegetative practices are not applicable. Prior to determining if controls are needed, downstream waterbodies are evaluated to verify if the outfall discharges to outstanding resource waters, shellfish beds, trout streams or waterbodies of significant importance. Outfalls may be evaluated for post-construction treatment on a case specific basis against the MEP standard.

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## CHAPTER 8 - ERRATA SHEET

For the document titled:

### SCDOT Stormwater Quality Design Manual

This errata sheet logs both content errors and minor implementation errors that have been identified since the release of the 2013 Edition of SCDOT's Stormwater Quality Design Manual. All page numbers refer to those indicated on the document pages and not the PDF formatted text. The corrected pages are included in this document.

*If you downloaded or printed the document on or after the date of the latest erratum, the corrections have already been included in the main document.*

Errata Posted: *December 31, 2014*

Subsection	Page	Description of Correction
A.3	A-3	Removed Riprap as Porous Baffle material.
A.6	A-8	Added description of fence transition from Temporary to Multipurpose Basins.
B.1.3	B-8	Updated and clarified Outlet Protection language.
B.2.1.3	B-12	Updated Table B.3 Sediment Dam Design Guidelines
B.2.4, Table C.2	B-16, C-10	Sediment Dam for Pipe Inlet drawing number changed to 815-406-00
Table C.2	C-6	Temporary Sediment Basin updated to include surface outlet and baffle requirements.
E.1.3, 5.2, Table F.1	E-10 , E-11, E-12, 5-2, 5-4, F-2	Terminology for "Dissolved Oxygen Enhancement Structures" made consistent. Edited language to be consistent with change.
E.1.1, 5.1, 5.3, Table F.1	E-2, E-3, 5-1, 5-4, F-2	Updated design requirements for Grassed Channels and Swales.