

# State of South Carolina

## Integrated Report for 2014

### Part II: *Section 305(b) Assessment and Reporting*





## **PREFACE**

The South Carolina Department of Health and Environmental Control (SCDHEC) prepared this report as a requirement of Section 305(b) of Public Law 100-4, last reauthorized and commonly known as The Clean Water Act (CWA) of 1987, and as a public information document. The report presents a general assessment of water quality conditions and water pollution control programs in South Carolina. SCDHEC has published Watershed Water Quality Assessments (WWQA), which contain information pertaining to the specific watersheds and give a more complete picture of the waters referenced in this document. While the title page states that this is an integrated report, Section 303(d) of the CWA requirements are submitted separately as a companion document.

The determinations of surface water quality were based on data collected by SCDHEC at ambient water quality monitoring stations, point source permit required monitoring, and evaluation of nonpoint source (NPS) data. Other information in this report was obtained from SCDHEC programs associated with water quality monitoring and water pollution control.

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## EXECUTIVE SUMMARY

The Clean Water Act (CWA) states “it is the national goal that wherever attainable, an interim goal of water quality that provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water shall be achieved by July 1, 1983.”

The State of South Carolina has promulgated S.C. Regulation 61-68, *Water Classifications and Standards* and S.C. Regulation 61-69, *Classified Waters* that establish specific standards and general rules to protect and maintain these uses and designate classified uses for each waterbody. It is the intent and purpose of the regulations that waters that meet standards shall be maintained and waters that do not meet standards shall be improved.

The statewide statistical survey component of the ambient monitoring program is designed to make statewide estimates of water quality. The data derived from those monitoring activities is used to develop the stream, lake/reservoir, and estuarine summary information presented in this report. A statistical survey monitoring design samples the population of interest in a fashion that allows statements to be made about the whole population based on a subsample from the population of interest. The advantage of the statistical survey sampling design is that statistically valid statements about water quality can be made about large areas based on a relatively small subsample. Based on the modified USEPA National Hydrography Dataset (NHD) and the results of survey site selection validation, South Carolina has an estimated 24,436 miles of freshwater rivers and streams representing the stream sampling design frame, and 393,430 acres of lake and reservoir representing the lake/reservoir sampling design frame. Based on a hydrographic GIS cover developed jointly by SCDHEC and the South Carolina Department of Natural Resources and the results of survey site selection validation, South Carolina has an estimated 289 combined square miles of tide creek and open water habitat representing the estuarine sampling design frame.

Quality assured water quality data collected as part of the survey network from 2008 through 2012 provided the database for this assessment. Evaluation of these data determines if water quality in rivers, lakes, and estuaries is suitable to support State classified uses. The tables on the following page include the level of use support for the waters of South Carolina and the cause of nonattainment affecting the largest size in each waterbody type for aquatic life and primary contact recreation uses.

## BACKGROUND

### Water Pollution Control Program

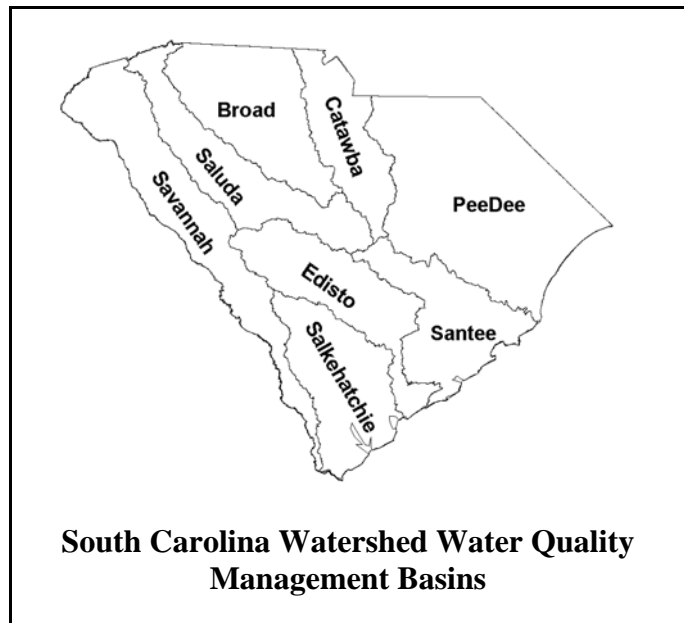
#### A. Watershed Approach

SCDHEC conducts water quality assessment and protection on a watershed basis in order to promote a coordinated approach to river basin development and water quality maintenance or improvement, to better address congressional and legislative mandates, to better utilize current resources, and to better inform the public and regulated community of existing and future water quality issues. Watershed water quality management recognizes the interdependence of water quality and all the activities that occur in the associated drainage basin including: monitoring, assessment, problem identification and prioritization, TMDL development, water quality modeling, planning, permitting, and other activities

SCDHEC has divided the state into eight major drainage basins along USGS hydrologic units (Figure 1), encompassing approximately 185, 10-digit National Watershed Boundary Data Set watersheds. These watersheds serve as the hydrologic boundaries that guide SCDHEC water quality activities.

Watershed Water Quality Assessments are developed for each basin on a rotating schedule. The watershed assessments serve to appropriately focus watershed management plans and implementation strategies. These watershed assessments serve as a starting point to fulfill a number of EPA reporting requirements. EPA requires various reporting activities under §303(d), §305(b), §314, and §319 of the Clean Water Act (CWA).

Planning on a watershed basis is consistent with basic ecological principles of watershed management. It allows the coordination of implementation activities so that all actual and potential impacts on water quality can be evaluated. Both point source and nonpoint source impacts can be evaluated when making water quality protection decisions. Problem areas in a particular drainage basin can be identified and existing and potential contributors can be examined. Subsequently, waste assimilative capacities can be determined and allocated in a more equitable fashion.





## **B. Water Quality Standards and Classifications**

S.C. Regulations 61-68, *Water Classifications and Standards* (R.61-68) and S.C. Regulation 61-69, *Classified Waters* (R.61-69) were promulgated by SCDHEC pursuant to the South Carolina Pollution Control Act (48-1-10, *et seq.*, S.C. Code of Laws, 1976) and the South Carolina Administrative Procedures Act.

The water quality standards regulation contains provisions that provide for the protection and maintenance of the existing and classified uses of the waters of the State. The water quality standards include general rules and specific water quality criteria, both narrative and numeric, to protect those classified and existing uses as well as antidegradation rules to protect the public health and welfare, and maintain and enhance water quality.

The water quality standards also serve as the basis for decisions in the other water quality program areas. NPDES permit limitations for waste discharges are determined according to the classification and standards of the receiving water. The standards and classifications also affect the control of toxic substances, thermal discharges, stormwater discharges, dredge and fill activities, and other water related activities. SCDHEC implements the antidegradation rules through its regulatory programs. R.61-69 alphabetically lists the waterbodies in South Carolina that have been specifically classified by name, gives the classification, describes the boundaries of the use classification, the county of location, and any applicable site-specific standards.

Revisions to water quality standards and any reclassification of waters of the State require a public hearing process, approval by the SCDHEC Board, approval by the General Assembly, publication in the State Register, and approval by the U.S.EPA. R.61-68 was last amended on January 9, 2014 and is still awaiting legislative and EPA approval. R. 61-69 was last amended June 22, 2012.

**1. Surface Water Classes – Freshwaters**

**Table 1. Freshwater Classifications and Descriptions**

<b>Freshwaters</b>	<b>Description</b>
Outstanding National Resource Waters	Exceptional national recreational and/or ecological resource.
Outstanding Resource Waters	Exceptional recreational and/or ecological resource and suitable for drinking water source with minimal treatment.
Trout Waters - (3 types) Natural Put, Grow and Take  Put and Take	Suitable for supporting reproducing and/or stocked trout populations and cold water indigenous aquatic community and the survival and propagation of aquatic life. Primary and secondary recreational contact including fishing and as drinking water source. Suitable for industrial and agricultural uses.
Freshwater	Suitable for the survival and propagation of aquatic life; fishing and primary and secondary recreational contact and as drinking water source. Suitable also for industrial and agricultural uses.

**2. Surface Water Classes – Saltwater**

**Table 2. Saltwater Classifications and Descriptions**

<b>Saltwater</b>	<b>Description</b>
Outstanding National Resource Waters	Exceptional national recreational and/or ecological resource.
Outstanding Resource Waters	Exceptional recreational and/or ecological resource.
Shellfish Harvesting Waters	Suitable for survival and propagation of aquatic life; primary and secondary contact recreation. Suitable for harvesting of shellfish, crabbing, and fishing for market purposes and/or for human consumption.
Class SA	Suitable for survival and propagation of aquatic life; primary and secondary contact recreation; crabbing and fishing for market purposes and/or human consumption.
Class SB	Suitable for survival and propagation of aquatic life; primary and secondary contact recreation; crabbing and fishing for market purposes and/or human consumption.

### 3. Groundwater Classes

**Table 3. Groundwater Classifications and Descriptions**

<b>Groundwater Type</b>	<b>Description</b>
Class GA	Vulnerable to contamination due to hydrological characteristics.
Class GB	Suitable as an underground source of drinking water. All groundwaters of the State unless otherwise classified.
Class GC	Not suitable for underground drinking water source.

The following table summarizes the uses of each of the surface water classifications. No degradation of existing uses is permitted regardless of classification and no degradation of natural conditions is allowed in Outstanding Resource Waters or Outstanding National Resource Waters.

**Table 4. Summary of Supported Classified Uses for South Carolina**

<b>Uses</b>	<b>Description</b>
Fish and wildlife	All classes
Domestic water supply	All freshwater classes
Primary contact recreation	All classes
Secondary contact recreation	All classes
Industrial	All freshwater classes
Agriculture	All freshwater classes
Navigation	All classes

### 4. Reclassifications and Site-Specific Criteria

SCDHEC is currently reviewing a waterbody for possible reclassification. Most reclassifications are initiated after receiving a written request from an individual, special interest group, or organization. SCDHEC also proposes waters for reclassification where existing water quality is better than required to protect the classified uses or if there is an existing use not recognized by the present classification. Also added to the classification system is the designation of No Discharge Zones (NDZs). NDZs relate specifically to the discharge of treated waste from Marine Sanitation Devices (MSDs) and are authorized pursuant to §312 of the Federal Clean Water Act. Waters of the State

designated as NDZ prohibit any discharge from MSDs into these waters and require that the MSDs be pumped out at an appropriate facility. SCDHEC has designated seven waterbodies as NDZs. All of South Carolina's site-specific criteria are found in R.61-69.

### **C. Point Source Program – Domestic Facilities**

The EPA has delegated the authority to SCDHEC for administering the National Pollutant Discharge Elimination System (NPDES) Program within the State. As a functional part of this NPDES program, all municipal and private domestic wastewater treatment works that discharge to surface water in South Carolina are monitored by the Bureau of Water (BOW). Permit effluent limits of each surface water discharge are derived using water quality models and other tools.

#### **1. Loan Program**

Beginning with fiscal year 1989, the state established a Clean Water State Revolving Loan Fund (CWSRF) program, with EPA providing annual capitalization grants to seed the CWSRF program. This program is a low-interest, revolving loan program established pursuant to Public Law (P.L. 100-4), Water Quality Act of 1987. The State, in accordance with EPA requirements, has established a project priority rating system. The State's priority list ranks each wastewater treatment project need as well as other projects based on water quality and sludge disposal needs.

Projects receiving CWSRF loans since fiscal year 1989 have totaled over \$909,027,399 through June 30, 2013.

The result of the newly constructed or upgraded treatment works using these funding sources has been improved wastewater treatment resulting in favorable water quality benefits. This construction has eliminated poorly treated effluent from many streams and provided improvements to facility capacity. The improvement of water quality has been seen by routine monthly discharge monitoring reports (DMRs) submitted by each treatment plant owner to SCDHEC. As an overall result, the CWSRF helps to improve and maintain water quality.

#### **2. Pretreatment and Toxicity Program**

The implementation of SCDHEC pretreatment program continues. The State approves implementation pretreatment programs for Publicly Owned Treatment Works (POTWs). The pretreatment programs are typically updated upon permit renewal or when the facility expands the discharge. An assessment of program requirements is conducted to insure that the latest pretreatment regulation requirements are in place. This benefits water quality. With the implementation of approved programs many industries previously discharging untreated wastewater to a POTW must pretreat their discharges. This has resulted in a significant reduction in the amounts of materials (contaminants) that POTWs are now receiving from the industries. This allows the POTW to adequately treat all wastewater prior to discharging to a State stream, resulting in the ability to better maintain the existing stream water quality standards.

Since FY 89 appropriate majors, significant minors (minors with pretreatment programs) and

selected other permits have been issued or reissued with effluent toxicity monitoring requirements to be performed as appropriate based on the information related to the discharge characteristics. Depending on the in-stream waste concentration and presence or absence of a diffuser, there can be either an acute test, chronic test, or both required. The toxicity testing typically will be multi concentration tests that will allow an assessment of the potential toxicity of the effluent at varying concentrations.

### **3. Stormwater Controls**

South Carolina has no known combined stormwater/sanitary sewer discharges associated with POTWs. Combined sewers are usually prohibited by local ordinance to preclude overloading treatment systems with stormwater. Stormwater runoff control on POTW sites is mandatory in some areas of the State.

SCDHEC is implementing a state stormwater permitting program policy in support of EPA guidelines of requirements required by the 1987 amendments to the Clean Water Act. See the Section on Stormwater Permits under “D. Point Source Program - Industrial and Agricultural Facilities.”

### **4. Land Application of Treated Wastewater**

SCDHEC issues State discharge permits to facilities that discharge directly to land (e.g., spray irrigation). This involves the application of treated wastewater to land surfaces with the applied effluent being further treated as it percolates through the plant-soil matrix. A portion of the applied effluent percolates to groundwater, some is absorbed by vegetation, and some evaporates to the atmosphere.

The primary objectives of this program are:

- (a) Treatment and disposal of applied wastewater without exceeding groundwater quality standards as specified in S.C. Regulation 61-68 *Water Classifications and Standards*.
- (b) Economic return from use of treated effluent, water and nutrients, in lieu of using other sources of water.
- (c) Water conservation by replacing potable water with treated effluent.
- (d) Preservation of open space through vegetation.

As a permit requirement, a program for monitoring the quality of groundwater is typically established and implemented. Proper placement of groundwater monitoring wells will provide a check on the effectiveness of the wastewater renovation and will serve as an early warning system for groundwater quality protection for nearby groundwater users. The direction of groundwater flow determines the placement of groundwater monitoring wells.

## **5. Strategies to Improve the Domestic Permitting Program**

SCDHEC regional personnel inspect the operation and maintenance programs of POTWs on a routine basis. Deficiencies noted during inspections are conveyed to the POTW and may require SCDHEC to take formal enforcement action. Operational advice is provided on a limited basis by SCDHEC staff. The South Carolina Environmental Training Center at Sumter Area Technical College also provides training for treatment plant operators.

SCDHEC has developed sludge management regulations and guidance for permittees. All NPDES permits issued or reissued have sludge disposal requirements. The permit typically requires the sludge generator to monitor the content of its sludge and to dispose of it in an environmentally acceptable manner. The permit authorizes specific methods (e.g., land application, land filling, etc.) and procedures to be fully implemented.

### **D. Point Source Program - Industrial and Agricultural Facilities**

#### **1. Industrial Facilities**

SCDHEC reviews NPDES permit applications for new and existing facilities and determines whether treatment must be technology-based or based on water quality standards. The more stringent of these derived numbers are used as the applicable permit limits. Effluent guidelines, where promulgated by EPA, are used to determine technology-based limits. If EPA effluent guidelines have not been developed, best professional judgment of technology-based limits is used. Water quality limits are developed using computerized water quality modeling procedures, which result in wasteload allocations for constituents affecting in-stream oxygen levels. South Carolina water quality standards and/or biological monitoring are used to determine limits for potentially toxic constituents. Where appropriate, permit limits are developed using a combination of water quality limitations for specific constituents, whole effluent toxicity limits, and in-stream biological monitoring to insure no adverse impacts from industrial point source dischargers.

#### **2. Agricultural Facilities**

Unregulated wastewater discharges from agricultural animal facilities or fruit and vegetable processing facilities may affect water quality. Additionally, South Carolina does not allow surface water discharges from these facilities under any circumstances. To ensure these wastes do not enter the waters of the State, SCDHEC requires that both solid and liquid agricultural wastes from these facilities be collected, treated, and disposed in an environmentally acceptable manner. This is accomplished through a State permitting and inspection program requiring recycling or land application of agricultural wastes. Land application of wastes to viable crops at agronomic rates eliminates direct surface water discharges of agricultural wastes and is effective in insuring water quality.

### **3. Toxics Controls**

Toxic pollutants are generally defined as substances that by themselves or in combination with other chemicals are harmful to animal life or human health. They include some of the metals, pesticides, and other synthetic organic pollutants that have the potential to impact water, fish tissue, and bottom sediments. Each NPDES permit application is reviewed for potential toxic pollutants. These pollutants are evaluated for aquatic life and human health concerns. If determined to be potentially toxic, a limitation is placed in the NPDES permit for that specific pollutant using South Carolina water quality standards. SCDHEC has EPA-approved standards for specific pollutants. Whole effluent toxicity testing is placed in many NPDES permits; those tests being for acute and/or chronic monitoring as appropriate. In-stream biological assessments are also being utilized in some cases (e.g., to evaluate stormwater runoff).

### **4. Land Application of Treated Wastewater**

The process utilized for industrial and agricultural facilities is the same as that for municipal facilities. However, limitations for the spray effluent are based on site-specific requirements.

### **5. Stormwater Permits- Industrial**

SCDHEC regulates stormwater discharges associated with industrial activities. The State has issued three general NPDES permits for activities associated with industry. These permits are the Construction Activity NPDES Permit, the Construction Activity for SCDOT NPDES Permit and the Associated with Industrial Activity, except construction, NPDES Permit.

The general permits require permittees to develop and implement Storm Water Pollution Prevention Plans (SWPPPs) that will minimize pollutants in their storm water discharges. Some industrial activities, except construction, must monitor on either an annual or semiannual basis while all industrial activities, except construction, are required to update their SWPPPs on an annual basis. Where appropriate, individual NPDES permits will be issued in accordance with EPA's tiered permitting strategy. Water quality monitoring will help identify the industrial activities that must receive individual permits instead of general permits. In the watershed approach, the individual permits will be tailored to address the water quality concerns of the stormwater discharges from industrial activity.

### **6. Stormwater Permits -Construction**

In addition to regulating stormwater discharges associated with industrial activities, SCDHEC is charged with regulation of stormwater discharges originating from construction sites. This is done through the NPDES General Permit for Stormwater Discharges from Construction Activities (SCR100000) and the NPDES General Permit for Stormwater Discharges from South Carolina Department of Transportation Construction Activities (SCR160000). The permit was updated to include additional requirements from the non-numeric stormwater rule. SWPPPs are to be prepared and submitted to the Department for review. Plans are to be updated and must reflect the activities,

from initial clearing to final stabilization, that are to take place on the construction site. Plans must also reflect any controls necessary to keep the site in compliance with existing TMDLs or other water quality concerns.

## **7. Stormwater Permits- MS4**

SCDHEC also regulates Municipal Separate Storm Sewer Systems (MS4s) in the overall stormwater program. There are one large and three medium-sized MS4s in SC and all of these permits have been issued. There are over 70 small MS4s. Most of these are covered under the Small MS4 NPDES Permit. Some of the small MS4s are being covered under the Medium individual permits. The Small MS4 General Permit was reissued and effective on January 1, 2014. All of these programs are working on practices to improve water quality on a local basis.

### **E. Permit Compliance and Enforcement**

Compliance tracking is a complex activity that involves various program elements and activities within the Bureau of Water. Regulatory functions require ongoing monitoring of all permits, inspection activities, and investigatory work. A computer based tracking system, the Environmental Facility Information System (EFIS), is maintained for the storage, retrieval, and management of permit compliance information for individual permits, including all effluent limits and compliance schedule data, facility operation and maintenance and pretreatment status. The availability of this information and ability to manage the data electronically enhances the Bureau information base providing greater program management capabilities.

All data necessary for issuing permits and tracking the compliance of those individual permits is maintained on the Bureau's network. Staff has access to information on permitting status, compliance monitoring, enforcement status, etc.

The EFIS Network is designed to interface with EPA's Permit Compliance System (PCS). Updated compliance data is batched to PCS weekly. The Bureau is continuing its efforts to improve its utilization of the computer generated EPA Quarterly Noncompliance Report (QNCR).

Enforcement activities are performed in order to identify and appropriately respond to facilities in permit noncompliance and other entities found to be in violation of state statutes and regulations. Data accessibility through the Bureau's networking system, as well as organizational changes, have greatly enhanced enforcement staff capabilities for efficient case development and management. Improvements in entry of limits and data will further improve tracking and enforcement efficiency.

An emphasis on enforcement activity will continue in accordance with implementation of the Bureau's Watershed Water Quality Management Program. Appropriate and timely enforcement responses in conjunction with the activities of other program areas are expected to contribute significantly to accomplishment of this program's goals through the development of TMDLs.

Enforcement staff will become more involved in the referral of cases for criminal investigation and providing assistance to criminal investigators. A greater emphasis has been placed upon pursuing



prosecution of violators under the criminal statutes and the support and assistance of enforcement staff in this process will continue to be invaluable; however, criminal and administrative investigations must be conducted separately.

It is recognized that aggressive enforcement activity encourages compliance. In this regard, enforcement staff are committed to secure for South Carolina the benefits from these activities to protect our water resources through implementation of appropriate enforcement strategies. The development and continued improvement of automated tools and methodology to accomplish this is considered to be vital to this function and will be given priority.

## **F. Nonpoint Source Program**

Nonpoint Source (NPS) water pollution generally comes from numerous diffuse sources. Runoff occurring after a rain event may transport sediment from plowed fields, construction sites, or logging operations, pesticides and fertilizers from farms and lawns, motor oil and grease deposited on roads and parking lots, or bacteria containing waste from agricultural animal facilities or malfunctioning septic systems. The rain moves the pollutants across the land to the nearest water body or storm drain where they may impact the water quality in creeks, rivers, lakes, estuaries and wetlands. Nonpoint source pollution may also impact groundwaters when it is allowed to seep or percolate into aquifers. The adverse effects of NPS pollution include physical destruction of aquatic habitat, fish die-offs, interference with or elimination of recreational uses of a water body (particularly lakes), closure of shellfish beds, reduced water supply or taste and odor problems in drinking water, potential human health problems due to bacteria and toxic chemicals in NPS runoff, and increased potential for flooding because water bodies become choked with sediment.

The *South Carolina Nonpoint Source Management Program, 1999 Update* outlines the state's strategic plan for addressing statewide water quality impairments attributable to nonpoint source pollution discharges. To accomplish this strategy, 17 long-term goals for reducing or preventing NPS pollution are enumerated. Throughout the document, five-year action strategies are described that lead to attainment of the long-term goals, and annual milestones leading to attainment of the action strategies are further described. The Program is two-pronged; focusing on reducing NPS impacts in priority watersheds, and implementing activities statewide in order to prevent NPS pollution. Components include both regulatory and voluntary approaches.

To facilitate success in achieving water quality improvements, South Carolina's NPS program prioritizes federal Clean Water Act §319 funding and state resources on impaired §303(d) listed waterbodies in priority watersheds through the implementation of approved NPS Total Maximum Daily Loads (TMDLs). The State's Coastal Nonpoint Pollution Control Program under federal Coastal Zone Management legislation is also implemented.

Nine categories of NPS pollution that impact South Carolina's waters are identified and described: agriculture, forestry, urban areas, marinas and recreational boating, mining, hydrologic modification, wetlands disturbance, land disposal/groundwater impacts, and atmospheric deposition. Technology based controls, or management measures, are employed to address these categorical impacts. The program describes specific management measures for each category as well as implementation schedules. South Carolina has the legal authority to implement all of the necessary management

measures.

SCDHEC is responsible for program implementation, but is dependent upon the cooperation of all levels of government, private sector stakeholders, and especially the citizens of the State in order to realize positive results. Many organizations have expertise that can be beneficial to the NPS pollution management program. For example, trade and environmental organizations have program delivery mechanisms that reach persons capable of implementing NPS controls, e.g., farmers, contractors, mine operators, and homeowners. These partnership roles are described in the program.

A system of evaluation/monitoring techniques is a necessary component of the NPS Management Program, in order to evaluate its progress and success. Evaluation will show whether the program is attaining the state's overall water quality vision, stated long-term goals, and five-year action strategies. In South Carolina, several monitoring and tracking efforts are described that address available information on improvements in water quality, implementation milestones, and available information on reductions in NPS pollution. Evaluation techniques include water quality monitoring, level of participation in management measure implementation, and stakeholder feedback.

This *South Carolina NPS Management Program Update* fulfills the requirements of both Section 319 of the Clean Water Act Amendments of 1987, and Section 6217 of the Coastal Zone Act Reauthorization Amendments (CZARA) of 1990. It comprehensively describes a framework for agency coordination and cooperation and serves to implement a strategy for employing effective management measures and programs to control NPS pollution statewide.

It incorporates nine key elements that are iterated in Environmental Protection Agency NPS guidance. Through the use of a framework that addresses these key elements, South Carolina will continue to have an effective NPS program that is designed to achieve and maintain beneficial uses of water. The USEPA has also designated South Carolina as an "Enhanced Benefits" State. In keeping with national guidelines, South Carolina will begin a revision to the NPS Management Program document in 2012.

South Carolina receives funding in excess of \$2 million annually for implementation of projects to reduce or eliminate NPS pollution through section 319 of the Clean Water Act. Some of these projects are statewide or regional in scope and include activities such as water quality monitoring, NPS outreach and education, and best management practice (BMP) compliance. Other projects are watershed based, aimed at remediation of NPS related problems from the State's §303(d) list. The current focus for §319 funding is the development and implementation of watershed-based plans. Highest priority is given to watershed-based plans for waterbodies with approved total maximum daily loads (TMDLs). Since FY 2003, approximately one-half of the state's allocation has been used for this purpose.

## **G. Wasteload Allocations and Total Maximum Daily Loads**

A total maximum daily load (TMDL) is the maximum load of a pollutant that can be assimilated by a waterbody without contravening water quality standards. Section 303(d) of the Clean Water Act requires that TMDLs be developed for waters that are determined to be impaired, that is, not meeting applicable water quality standards. A TMDL is made up of a wasteload allocation (WLA) that is the portion of the assimilative capacity allocated to point sources, a load allocation (LA) that is the portion of the assimilative capacity allocated to nonpoint sources, plus a margin of safety. A TMDL can be developed for an individual pollutant, such as bacteria, or for a category of pollutants, such as oxygen demanding substances. In addition to developing WLAs in conjunction with TMDLs for waters on the State's 303(d) list of impaired waters, SCDHEC also develops WLAs as part of the routine review required for new discharges or for permit reissuance for existing discharges to impaired waters.

Various techniques, ranging from simple mathematical models to complex computer based models, are used by SCDHEC to determine the ability of a waterbody to assimilate various pollutants. TMDLs and WLAs developed using these techniques allow use of the assimilative capacity of a waterbody while ensuring that a level of water quality to protect existing and classified uses is maintained. WLAs are now developed as part of the basin review process as well as in response to proposals for new and expanded projects throughout the State. WLAs for oxygen demanding substances (carbonaceous and nitrogenous oxygen demand), and ammonia toxicity are determined by the Water Quality Modeling Section. WLAs for metals, organic pollutants, and most toxicants are determined by the individual permitting sections.

Wasteload allocations fall into one of two categories. In instances when the assimilative capacity of a waterbody exceeds the existing or proposed pollutant loading, the waterbody is said to be effluent limited. Effluent limitations for discharges to such waters are determined by the minimum standards required for the type of discharge involved. In instances where the permitted loading is equal to or a proposed loading is greater than the assimilative capacity, the stream is said to be water quality limited. The limits on the discharges to such waters are determined by the water quality of the receiving stream, rather than the minimum standards. TMDLs are not required for water quality limited streams that meet applicable standards. In cases where the water body is meeting standards but a previously permitted or proposed loading would cause the waterbody to be impaired, the new wasteload allocation is a maximum allowable loading. In multiple discharge situations, the load must be divided or allocated among the discharges.

To date, TMDLs have been developed for fecal coliform bacteria, phosphorus, pH, and oxygen demanding substances for many waterbodies. Development of additional TMDLs is currently underway. Wasteload allocations have been developed for numerous waterbodies for ammonia and oxygen demanding substances. While not TMDLs, these WLAs in many cases constitute the maximum allowable loading to the waterbody. Wasteload allocations for metals and other toxicants, that in many cases can be considered the maximum available loading to the stream, are now developed on a routine basis. WLAs for phosphorus have been developed for several streams including Eighteen Mile Creek, Reedy River, Bush River, Saluda River above Lake Greenwood, and Catawba River. There are efforts underway for development of formal nutrient TMDLs for the Reedy River and the Catawba River. Development of new TMDLs is expected to play an

increasingly important part in the overall wasteload allocation process as SCDHEC continues implementation of the basin planning and permitting strategy with emphasis on restoring the State's impaired waters.

## **SURFACE WATER ASSESSMENTS**

### **1. Surface Water Monitoring Program**

#### **A. Purpose and Design**

State administrators need to assess the quality of the aquatic environment so that they can make decisions concerning water program priorities and provide reports to the public on the state of the environment, important trends over time, and accomplishments. They also need to evaluate the effectiveness of control measures. Water quality monitoring data provide information necessary to meet these needs.

The SCDHEC operates and collects data from a statewide network of ambient monitoring sites. The ambient monitoring network is directed toward determining long-term water quality trends, assessing attainment of water quality standards, identifying locations in need of additional attention, and providing background data for planning and evaluating stream classifications and standards. The ambient monitoring network, as a program, involves sampling a wide range of physical and chemical parameters and analyzing them for the presence or effects of contaminants and comparing them to criteria to determine use support.

There are several major components to SCDHEC's ambient water quality monitoring activities, including ongoing fixed-location monitoring and statewide statistical survey monitoring, each designed to provide data for water quality assessment of major water resource types at different spatial and temporal scales. For a detailed discussion of each of these components, please see the most recent version of the State of South Carolina Monitoring Strategy at <http://www.scdhec.gov/environment/water/docs/strategy.pdf>.

#### **B. Networks and Programs**

The statewide statistical survey component of the ambient monitoring program is designed to make statewide estimates of water quality. The data derived from those monitoring activities is used to develop the stream, lake/reservoir, and estuarine summary information presented in this report. A statistical survey monitoring design is where the population of interest is sampled in a fashion that allows statements to be made about the whole population based on a subsample, and produces an estimate of the accuracy of the assessment results. The advantage of the statistical survey sampling design is that statistically valid statements about water quality can be made about large areas based on a relatively small subsample.

Separate monitoring schemes have been developed for stream, lake/reservoir, and estuarine resources. Site selection is done by the Water Quality Monitoring and Modeling Section using tools developed in cooperation with the U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, Oregon. Survey Sites are

sampled once a month for one year, and a new statewide set of statistical survey sites is selected for each waterbody type every year.

Please refer to the State of South Carolina Monitoring Strategy for details of parameters sampled at <http://www.scdhec.gov/environment/water/docs/strategy.pdf>.

Although statements about resource conditions can theoretically be made based on data from a single year, the compilation of data from multiple years increases the confidence and accuracy of statements about water quality. An additional advantage of the statistical survey approach is that it presents the opportunity for previously unsampled locations to be selected for data collection.

### **C. Laboratory Analytical Support**

The Analytical and Radiological Environmental Services Division (ARESD) in the Bureau of Environmental Health Services (BEHS) provides laboratory services to the Bureaus of Water, Land and Waste Management, and the Milk and Dairy Program. The analytical services offered include bacteriological, chemical, and physical analyses. The types of samples analyzed include water, wastewater, leachate, soil, sediment, chemical waste, fish, shellfish, and milk/dairy products.

The BEHS organizational structure encompasses the Central Laboratory, seven regional laboratories (each of these regional labs also has a field lab), and five additional field labs. ARESD, also known as the Central Laboratory includes the following laboratories: Sample Characterization/Environmental Microbiology, Inorganic Chemistry which includes the Sample Data Management Section, Organic Chemistry, Radiochemistry, and Milk/Dairy. These five laboratories are located in the Hayne Building in Columbia. The seven regional laboratories are located in Aiken, Beaufort, North Charleston, Florence, Greenville, Lancaster, and Myrtle Beach. Other field labs which only collect samples and perform field analyses (pH, conductivity, temperature, residual chlorine, and dissolved oxygen) are located in Anderson, Greenwood, Spartanburg, Columbia, and Sumter. The Columbia facility is separate from ARESD, but collects samples for this lab. ARESD, in turn, performs similar functions as the other regional laboratories for the Columbia facility

The field laboratories initiate all stream and wastewater analysis. The Central Laboratory provides support analyses, i.e., metals, nutrient, toxic extraction procedures, and organic analyses. The Beaufort and Myrtle Beach regional laboratories analyze microbiological samples only. Drinking water chemical analysis is essentially a Central Laboratory program with support from the regional labs. All regional laboratories perform microbiological analyses for the Drinking Water Program.

### **D. Quality Assurance**

SCDHEC's Quality System is the means by which the Department implements the quality management process. The Quality System encompasses a variety of technical and administrative elements, which are outlined in the SCDHEC Quality Management Plan. This plan describes how programs within Environmental Quality Control (EQC) will plan, implement, and assess the quality of environmental work to be performed as part of the various programs' functions within the Agency.

The Director of Environmental Affairs has the overall responsibility for the development, implementation, and continued operation of EQC's QA Program. To insure that EQC's QA policy is uniformly applied to the generating and processing of all environmental data, a State Quality Assurance Management Officer (SQAMO) has been established.

This office is responsible for the Quality Assurance Program. Environmentally-related measurement activities conducted by or for EQC shall be done only with the approval of the State Quality Assurance Management Officer (SQAMO) after assuring that adequate quality assurance guidelines and procedures have been incorporated. This includes study-planning, sample collection, preservation and analysis, data handling, and use of physical, chemical, biological, and other data related to the effects, sources, transport and control of pollution, as well as personnel review and training.

To accomplish the QA objectives cited above, the Water Quality Monitoring and Modeling Section and Water Pollution Compliance Section have developed and instituted SQAMO- approved field study procedures and documentation, data review, and routine EPA operating overview. Some specifics of these Sections' QA/QC activities include:

- Submission of all study plans to SQAMO or designee for review and approval prior to implementation.
- Regular reviews and updates of SCDHEC's Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (SOP) and Procedures Manual for Stream and Wastewater Facility Flow Measurement.
- At least once yearly all water quality monitoring personnel are accompanied on sample collection activities by the Water Quality Monitoring and Modeling Section quality assurance officer for evaluation of adherence to standard operating procedures (SOP) for QA/QC.
- Water Pollution Compliance Section program staff routinely accompany facility compliance monitoring personnel to ensure adherence to standard operating procedures (SOP) during sample collection activities for QA/QC.
- All SC DHEC EQC laboratories in the State are expected to participate in Proficiency Testing as a requirement for their Certification.
- Field staff are also required to participate in either analyzing blind QC samples or PT samples if they perform field analysis for residual chlorine, conductivity and/or pH.
- Approximately every three years, EPA Region 4 Office conducts an on-site routine audit of the Analytical and Radiological Environmental Services Division (ARESD), the Central

Laboratory in Columbia and also reviews the Laboratory SOPs.

- Internal assessments are also performed on ARES D Laboratories. These are conducted by the SQAMO or designee or via the peer review process; but these are not certifying audits. EPA Region 4 is the certifying authority over the ARES D Laboratories.

Analytical Services has four quality control manuals which detail the day-to-day operation of the quality assurance program: (1) Procedures and Quality Control Manual for Chemistry Laboratories - Analytical Services, (2) Laboratory Procedures Manual for Environmental Microbiology -- Analytical Services, (3) Procedures and Quality Control Manual For the Radiochemistry Laboratory -- Analytical Services, and (4) Standard Operating Procedures for Milk and Dairy -- Analytical Services. The elements addressed in the manuals include organization; sample chain of custody; personnel training; quality control of laboratory services, scope and application, equipment and supplies, reagents, standards, methodology, preservation and storage, calibration, performance criteria and quality assurance, and waste management.

The overall laboratory quality assurance program, which includes the previously discussed elements, requires a minimum of 25% of allocated resources. The frequency for analysis of replicates and spike recovery samples is noted in the manuals and is in compliance with U.S. EPA guidelines. Acceptance criteria for each QC check is detailed in each procedure of the SOP Manual. The Environmental Microbiology Laboratories perform replicate analyses, positive test controls, media control tests, equipment control tests, etc., as required by EPA Laboratory Certification and Evaluation guidelines. In addition, Analytical Services and the regional laboratories participate in annual Water Supply and Water Pollution Proficiency Testing Programs. All regional personnel who collect samples that require field testing participate in either the yearly Water Supply or Water Pollution Proficiency Testing Program, whichever is appropriate. Occasionally, field or other non-laboratory staff may assist the Microbiologist in setting up samples or reading them. Anyone participating in this way must demonstrate proficiency in any activity they will perform. Their proficiency is assessed through use of a blind sample obtained from either a QC Sample Vendor or made in-house. This proficiency is documented and kept in the Regional Office.

The laboratory analyses for water quality monitoring are conducted according to 40 CFR Parts 141, 136, and 503. The Analytical Services quality control manuals include a section on methodology designed to reduce variations in applied techniques among the State laboratories where methods permit analyst interpretation, and thus provide a more uniform approach which will increase the reproducibility of results reported from the laboratory system. Analytical SOPs are identified by number and date of revision. Each SOP includes the approved method reference. SOPs are reviewed annually.

SOPs include instrument calibration and maintenance procedures as well as corrective actions for any deficiencies or problems encountered.

## **E. Data Storage, Management and Interpretation**

Routine ambient stream samples are collected by Regional Office personnel with some analyses

conducted in the Regional Laboratories and others by the Central Laboratory. Data for samples that are analyzed in the Regional Laboratories are reported on the appropriate data sheets and released by the sample custodian for the region. These data sheets are sent to the Analytical and Radiological Environmental Services Division in Columbia where they are sent to the appropriate program areas.

All Ambient Surface Water Physical & Chemical Monitoring data are received by Water Quality Monitoring and Modeling Section from the Inorganic Chemistry and Data Management Section, Bureau of Environmental Health Services. The data are reviewed, edited and stored into the IMAP database. The Water Quality Monitoring and Modeling Section performs a 10 percent review of all data to ensure quality assurance of the data. The data are uploaded to the EPA's STORET water quality database. Data sheets are kept on file in the Water Quality Monitoring and Modeling Section.

Macroinvertebrate and habitat data are entered into an in-house relational database program. This database program generates metric calculations and reports. All data are available to the public through the Freedom of Information Act. Coverage of the macroinvertebrate monitoring stations is available through an in-house Geographic Information System.

## **2. Assessment Methodology**

### **A. Statistical Survey §305(b) Assessment Approach**

The initial selection of prospective statistical survey sites is conducted by the Water Quality Monitoring and Modeling Section using tools developed in cooperation with the U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, Oregon. Independently for each waterbody type, rivers and streams, lakes and reservoirs, and estuarine habitat, a statewide computer selection program is used to randomly select a statewide spatial distribution of specific locations according to the specifics of each waterbody design.

The basic starting hydrographic GIS cover for stream and lake site selection is the USEPA National Hydrography Dataset (NHD) coverage at a scale of 1:100,000, which is based on the U.S. Geological Survey (USGS) Digital Line Graph map base. Because of stream density inconsistencies in NHD, some missing stream reaches in part of the state were added by digitization for a more consistent statewide representation. Similarly some important reservoirs that are missing in NHD were also added.

Estuarine sites selection uses a hydrographic GIS cover developed jointly by SCDHEC and the South Carolina Department of Natural Resources from the National Wetlands Inventory (NWI) digital files at a scale of 1:24,000.

#### **1. Rivers and Streams**

Streams of different sizes may be more or less sensitive to different types of environmental perturbations. Because of this, three stream size classes have been specifically targeted to ensure



they are represented in the selected survey sites. Approximately 30 total stream survey sites are sampled each year. Each site is sampled monthly for one year.

- a. First Order streams, or headwater streams, are targeted because these represent streams with the least dilution capacity and therefore are most immediately impacted by adjacent land use activities and associated runoff. These streams may also serve as spawning areas for fish and refuge areas for young from larger aquatic predators.
- b. Second and Third Order streams are also streams with relatively small dilution capacity and represent important habitat for reproduction and survival of aquatic life. They may also reflect the direct impacts of major land use activities.
- c. Fourth Order and larger streams include the major rivers of the State. In general these streams have greater dilution capacity and are less affected by small scale land use perturbations and may be heavily utilized for contact recreation.

These different size classes do not occur in equal proportions in the state, therefore an unequal weighting procedure is used in the site selection process to guarantee inclusion of sites in all three stream classes. These differential weights are based on the relative proportions of these three size classes in the streams of the state and are used in the assessment to adjust the contribution of each stream site to the statewide resource size.

## **2. Lakes and Reservoirs**

Eligible lakes/reservoirs are restricted to “significant lakes,” defined as those freshwater lakes/reservoirs with at least 40 acres surface area that offer unrestricted public access and that are not managed primarily for recreational fishing using fertilization. The size of significant lakes/reservoirs varies immensely; therefore two size classes of lakes/reservoirs have been specifically targeted to ensure that the smaller lakes/reservoirs are represented in the selected survey sites. Approximately 30 total lake and reservoir survey sites are sampled each year. Each site is sampled monthly for one year.

- a. Major Lakes/Reservoirs greater than 850 acres surface area.
- b. Minor Lakes/Reservoirs greater than 40 acres surface area, but less than or equal to 850 acres.

These different size classes do not occur in equal proportions in the state, therefore an unequal weighting procedure is used in the site selection process to guarantee inclusion of approximately 20 sites in major lakes and 10 sites in minor lakes. These differential weights are based on the relative proportions of these two size classes in the lakes and reservoirs of the state and are used in the assessment to adjust the contribution of each lake site to the statewide resource size.

## **3. Estuaries**

The coastal estuarine statistical survey monitoring scheme has been developed jointly by SCDHEC,

Bureau of Water, and the South Carolina Department of Natural Resources (SCDNR), Marine Resources Research Institute (MRRI). This effort has been named the South Carolina Estuarine and Coastal Assessment Program (SCECAP) and sampling of the statistical survey coastal estuarine sites is a cooperative venture between SCDHEC and SCDNR-MRRI. To ensure inclusion of a variety of estuarine ecosystems and habitats, the coastal estuaries have been divided into two discrete categories (strata) based on a common GIS cover developed and utilized by both agencies.

- a. Tidal Creeks, identified as less than 100 meters wide on the GIS cover, serve as nursery areas for important marine species and are most immediately affected by upland land use activities and associated runoff.
- b. Open Water areas, identified as greater than 100 meters wide on the GIS cover, represent larger estuarine rivers and sounds.

Sites are sampled monthly for one year by SCDHEC for water column physical and chemical parameters and are used for §305(b) reporting purposes.

Each year approximately 15 Tidal Creek sites and 15 Open Water sites are selected. Differential weights are based on the relative proportions of these two size classes in the estuarine areas of the state and are used in the assessment to adjust the contribution of each estuary site to the statewide resource size.

## **B. Determination of Attainment of Classified Uses**

### **1. General Considerations**

Physical, chemical and biological data were evaluated, as described below, to determine if water quality met the water quality criteria established to protect the State classified uses promulgated in S.C. Regulation 61-68, *Water Classifications and Standards*. These regulations are subject to a triennial review as required in section 303 of the Clean Water Act. To determine the appropriate classified uses and water quality criteria for specific waterbodies and locations, refer to Regulation 61-69, *Classified Waters*, in conjunction with Regulation 61-68. These regulations are located on the Internet at: <http://www.scdhec.gov/environment/water/reg.htm> under State Regulations. In compliance with water quality standards (SC Regulation 61-68), waterbodies with standards excursions attributable solely to natural conditions are not included on South Carolina's §303(d) list.

Water samples for analysis are collected as surface grab samples once per month, every other month, quarter, or year, depending on the parameter and station type. Grab samples collected at a depth of 0.3 meters are considered to be a surface measurement. At many stations sampled by boat, dissolved oxygen, pH, and temperature are sampled as a water column profile, with measurements being made at a depth of 0.3 meters below the water surface and at one meter intervals to the bottom for select lake sites or at 0.3 meters, bottom and mid-depth for estuarine sites. At stations sampled from bridges, these parameters are measured only at a depth of 0.3 meters. For the purpose of assessment, only surface samples are used in standards compliance. Because of the inability to target individual high or low flow events on a statewide basis these data are considered to represent typical physical conditions and chemical concentrations in the waterbodies sampled. All samples are collected and

analyzed according to the most current standard operating procedures (SCDHEC, EQC Environmental Investigations Standard Operating Procedures and Quality Assurance Manual).

Results from water quality samples can be compared to State and USEPA criteria, with some restrictions due to time of collection and sampling frequency. For certain parameters, the monthly or bi-monthly sampling frequency employed is insufficient for strict interpretation of the standards. The grab sample method is considered to be representative for the purpose of indicating excursions relative to criteria, within certain considerations. A single grab sample is more representative of a one-hour average than a four-day average, more representative of a one-day average than a one-month average, and so on; thus, when inferences are drawn from grab samples relative to criteria, sampling frequency and the intent of the criteria must be weighed. When the sampling method or frequency does not agree with the intent of the particular standard, any conclusion about water quality should be considered as only an indication of conditions, not as a proven circumstance.

The following statewide assessment information is based on the available quality assured physical, chemical and biological water quality data collected through the statistical survey monitoring design from 2008-2012.

## **2. Aquatic Life Use Support**

One important goal of the Clean Water Act, the South Carolina Pollution Control Act, and the State Water Quality Classifications and Standards is to maintain the quality of surface waters to provide for the survival and propagation of a balanced indigenous aquatic community of fauna and flora. Aquatic life use support is assessed by comparing important water quality characteristics to criteria.

Support of aquatic life uses is determined based on the percentage of numeric criteria exceedances and, where data are available, the composition and functional integrity of the biological community.

The term exceedance is used to describe a measured pollutant concentration that is outside of the acceptable range as defined by the appropriate criterion. Some waters may exhibit characteristics outside the appropriate criteria due to natural conditions. Such natural conditions do not constitute a violation of the water quality criteria. A number of waterbodies have been given waterbody-specific criteria for pH and dissolved oxygen (DO), to reflect natural conditions. To determine the appropriate numeric criteria and classified uses for specific waterbodies and locations, please refer to S.C. Regulation 61-68, *Water Classifications and Standards* and S.C. Regulation 61-69, *Classified Waters*.

For DO and pH, if 10 percent or less of the samples contravenes the appropriate criterion, then the criterion is said to be fully supported. If the percentage of criterion exceedances is greater than 10 percent, but less than or equal to 25 percent, the criterion is partially supported, unless excursions are due to natural conditions. If there are more than 25 percent exceedances, the criterion is not supported, unless excursions are due to natural conditions. The decision that criteria excursions are due to natural conditions is determined by consensus and/or the professional judgment of SCDHEC staff with specific local knowledge.

For toxicants (heavy metals, priority pollutants, chlorine, ammonia), for any individual pollutant, if the appropriate acute and/or chronic aquatic life criterion is exceeded more than once in three years,

the waterbody is listed as impaired for the pollutant of concern. The Department also used discretion, considering factors other than excursion magnitude and frequency, in order to determine the impairment status due to toxicants. If the appropriate acute or chronic aquatic life criterion is exceeded more than once, representing more than 10 percent of the samples collected, the criterion is not supported. If the acute or chronic aquatic life criterion is exceeded more than once, but in less than or equal to 10 percent of the samples, the criterion is partially supported.

The total recoverable metals criteria for heavy metals are adjusted to account for solids partitioning following the approach set forth in the Office of Water Policy and Technical Guidance on Interpretation and Implementation of Aquatic Life Metals Criteria, October 1, 1993, by Martha G. Prothro, Acting Assistant Administrator for Water, available from the Water Resource center, USEPA, 401 M St., SW, mail code RC4100, Washington, DC 20460; and 40CFR§131.36(b)(1). Under this approach, a default TSS value of 1 mg/L is used. Where the metals criteria are hardness based, a default value of 25 mg/L is used for waters where hardness is 25 mg/l or less.

For ammonia, the calculation of the appropriate criterion value requires the values of several associated field parameters measured concurrent with the ammonia sample collection. Where direct measurements of any of the parameters are lacking the ammonia value will not be used to determine compliance with the standards.

For turbidity in all waters, and for waters with numeric total phosphorus, total nitrogen, and chlorophyll-a criteria, if the appropriate criterion is exceeded in more than 25 percent of the samples, the criterion is not supported. For waters with exceedances of standards between 10% and 25%, further site specific evaluation is necessary to determine if standards violations indicate actual aquatic life use impairment.

If the conclusion for any single parameter is that the criterion is “not supported”, then it is concluded that aquatic life uses are not supported in the waterbody, at that monitoring location. If there are no criteria that are “not supported”, but the conclusion for at least one parameter criterion is “partially supported”, then it is concluded that aquatic life uses are partially supported. Regardless of the number of samples, no monitoring site will be listed as partially or not supporting for any pollutant based a single water chemistry sample result because of the possibility of an anomalous event.

For aquatic life uses, the goal of the standards is the protection of a balanced indigenous aquatic community. South Carolina Regulation 61-68 Section E. 14 d. (2) states that if the ambient concentration is higher than the numeric criterion for toxic pollutants, the criterion is not considered violated if biological monitoring has demonstrated that the in-stream indigenous biological community is not adversely impacted. Therefore, biological data are the ultimate deciding factor, regardless of chemical conditions. If biological data shows a healthy, balanced community, the use is considered supported even if chemical parameters do not meet the applicable criteria.

### **3. Macroinvertebrate Data Interpretation**

Macroinvertebrate community assessment data are used to directly determine Aquatic Life Use Support and to support determinations based on water chemistry data. Macroinvertebrate community data may also be used to evaluate potential impacts from the presence of sediment contaminants.

Aquatic and semi-aquatic macroinvertebrates are identified to the lowest practical taxonomic level depending on the condition and maturity of specimens collected.

The EPT Index and the North Carolina Biotic Index (BI) are the main indices used in analyzing macroinvertebrate data. To a lesser extent, taxa richness and sometimes total abundances may be used to help interpret data. The EPT Index or the Ephemeroptera (mayflies) - Plecoptera (stoneflies) - Trichoptera (caddisflies) Index is the total taxa richness of these three generally pollution-sensitive orders. EPT values are compared with least impacted regional sites. The Biotic Index for a sample is the average tolerance of all organisms collected, based on assigned taxonomic tolerance values.

Taxa richness is the number of distinct taxa collected and is the simplest measure of diversity. High taxa richness is generally associated with high water quality. Increasing levels of pollution progressively eliminate the more sensitive taxa, resulting in lower taxa richness. Total abundance is the enumeration of all macroinvertebrates collected at a sampling location. When gross differences in abundance occur between stations, this metric may be considered as a potential indicator.

#### **4. Recreational Use Support**

The degree to which the swimmable goal of the Clean Water Act is attained (Recreational Use Support) is based on the concentration of indicator bacteria present in a waterbody. Standards for primary contact recreation were derived from public health data that estimate the potential risks to humans of contracting waterborne illnesses after swimming due to exposure to sewage-related pathogens. As previously mentioned, all water quality standards are promulgated in Regulation 61-68, Water Classifications & Standards.

##### *Freshwater:*

South Carolina's current water quality standard (WQS) for primary contact recreational use in freshwaters is *Escherichia coli*, "Not to exceed a geometric mean of 126/100 ml based on at least four samples collected from a given sampling site over a 30 day period, nor shall a single sample maximum exceed 349/100 ml".

Prior to February 28, 2013, South Carolina's WQS for primary contact recreational use in freshwaters was fecal coliform bacteria (FC), "Not to exceed a geometric mean of 200/100 mL, based on five consecutive samples during any 30 day period; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 ml."

Both the previous and current standards are protective of primary contact recreational use; therefore, secondary contact recreational use is also protected.

Because of the monthly sampling frequency of survey sites, insufficient data are collected to evaluate against the geometric mean component of the standard as prescribed in R. 61-68; therefore, evaluation against the single sample maximum (SSM) criterion is necessary.

In absence of sufficient data for evaluation of the geometric mean, only evaluation against the previous FC bacteria or current *E. coli* SSM is considered. For the purposes of this §305(b) report,

if 10 percent or less of the samples are greater than the SSM then recreational uses are said to be fully supported. A percentage of criteria excursions greater than 10 and less than or equal to 25 is considered partial support of recreational uses, and greater than 25 percent is considered to represent nonsupport of recreational uses. Where applicable, assessment results against the FC bacteria and *E. coli* SSM criteria will be evaluated independently to determine the overall attainment status. . Locations determined to be partially or not supporting recreational uses will be considered to be due to *E. coli*.

#### *Tidal Saltwater:*

South Carolina's current water quality standard (WQS) for primary contact recreational use in tidal saltwaters (Classes SA and SFH) is Enterococci, "Not to exceed a geometric mean of 35/100 ml based on at least four samples collected from a given sampling site over a 30 day period, nor shall a single sample maximum exceed 104/100 ml".

South Carolina's current water quality standard (WQS) for primary contact recreational use in tidal saltwaters (Class SB) is Enterococci, "Not to exceed a geometric mean of 35/100 ml based on at least four samples collected from a given sampling site over a 30 day period, nor shall a single sample maximum exceed 501/100 ml".

Prior to February 28, 2013, South Carolina's WQS for primary contact recreational use in tidal saltwaters included FC bacteria, in addition to the aforementioned Enterococci standard, "Not to exceed a geometric mean of 200/100 ml, based on five consecutive samples during any 30 day period; nor shall more than 10% of the total samples during any 30 day period exceed 400/100 ml."

South Carolina has removed FC bacteria as a primary contact recreational use standard in tidal saltwaters while maintaining the Enterococci recreational use standard as described above.

Because of the monthly sampling frequency of survey sites, insufficient data are collected to evaluate against the geometric mean component of the standard as prescribed in R. 61-68; therefore, evaluation against the single sample maximum (SSM) criterion is necessary.

In absence of sufficient data for evaluation of the geometric mean, only evaluation against the previous FC bacteria or current Enterococci SSM is considered. For the purposes of this §305(b) report, if 10 percent or less of the samples are greater than the SSM then recreational uses are said to be fully supported. A percentage of criteria excursions greater than 10 and less than or equal to 25 is considered partial support of recreational uses, and greater than 25 percent is considered to represent nonsupport of recreational uses. Where applicable, assessment results against the FC bacteria and Enterococci SSM criteria will be evaluated independently to determine the overall attainment status. Locations determined to be partially or not supporting recreational uses will be considered to be due to Enterococci.

### **3. Rivers and Streams Water Quality Assessment**

The U.S. Environmental Protection Agency has developed a system to determine estimates of total

river miles and total lake acres for the states to use in reporting for §305(b) reports. The estimates are based on the Digital Line Graph (DLG) database and the National Hydrography Dataset (NHD), that are in turn based on the U.S. Geological Survey 1:100,000 scale hydrologic maps. The original DLG database was missing a significant number of South Carolina streams. Many of these missing features have been added by SCDHEC, with the cooperation and oversight of the USEPA.

### A. Summary Statistics

Based on the modified USEPA National Hydrography Dataset (NHD) and the results of survey site selection validation, South Carolina has an estimated 24,436 miles of freshwater rivers and streams representing the stream sampling design frame previously described. Because of the state-scale statistically-valid survey design, the 149 statistical survey monitoring sites sampled from 2008-2012 represent the total stream miles.

A summary of classified use support statewide based on these data, along with causes for partial or nonattainment is presented below. The Lower and Upper 95 Percent Confidence Intervals for the statistical survey estimates signify that it is 95% certain that the true mileage is between the upper and lower confidence limits.

**Table 5. Rivers and Streams Use Support Summary (Miles)**

<b>Indicator</b>	<b>Category</b>	<b>Survey-Based Estimated Percent of Total Resource</b>	<b>Survey-Based Estimated Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Miles)</b>	<b>Upper 95 Percent Confidence Interval (Miles)</b>
Aquatic Life Use	Fully Supporting	86.5	21,127	19,663	22,591
	Partially Supporting	4.6	1,122	409	1,835
	Not Supporting	9.0	2,187	883	3,492
Recreational Use	Fully Supporting	45.2	11,038	8,931	13,145
	Partially Supporting	11.4	2,782	1,355	4,210
	Not Supporting	43.4	10,616	8,406	12,827

**Table 6. Summary of Fully Supporting and Impaired Rivers and Streams  
(Not including Fish Consumption Use)**

<b>Category</b>	<b>Survey- Based Estimated Percent of Total Resource</b>	<b>Survey- Based Estimated Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Miles)</b>	<b>Upper 95 Percent Confidence Interval (Miles)</b>
Fully Supporting All Assessed Uses	39.1	9,551	7,526	11,576
Impaired for One or More Use	60.9	14,886	12,861	16,911

**Table 7. Total Sizes of Rivers and Streams Impaired by  
Various Cause Categories (Miles)**

<b>Cause Category</b>	<b>Survey- Based Estimated Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Miles)</b>	<b>Upper 95 Percent Confidence Interval (Miles)</b>
Dissolved Oxygen	1,932	841	3,023
Macroinvertebrate Community	1,377	343	2,412
pH	350	0	779
Turbidity	175	0	479
Fecal Coliform Bacteria	13,399	11,292	15,505

#### **4. Lakes Water Quality Assessment**

##### **A. Summary Statistics**

Based on the modified USEPA National Hydrography Dataset (NHD) and the results of survey site selection validation, South Carolina has an estimated 393,430 acres of lake and reservoir representing the lake/reservoir sampling design frame previously described. Because of the state-scale statistically-valid survey design, the 139 statistical survey monitoring sites sampled from 2008-2012 represent the total acres. A summary of classified use support statewide based on these data, along with causes for partial or nonattainment is presented below. The Lower and Upper 95 Percent Confidence Intervals for the statistical survey estimates signify that it is 95% certain that the true acreage is between the upper and lower confidence limits.



**Table 8. Lake Use Support Summary (Acres)**

Indicator	Category	Survey-Based Estimated Percent of Total Resource	Survey- Based Estimated Acres of Total Resource	Lower 95 Percent Confidence Interval (Acres)	Upper 95 Percent Confidence Interval (Acres)
Aquatic Life Use	Fully Supporting	87.2	343,205	323,013	363,397
	Partially Supporting	1.6	6,393	0	13,710
	Not Supporting	11.1	43,832	22,796	64,868
Recreational Use	Fully Supporting	99.6	391,885	389,865	393,430
	Partially Supporting	0.4	1,546	0	3,565

**Table 9. Summary of Fully Supporting and Impaired Lakes (Not including Fish Consumption Use)**

Category	Survey-Based Estimated Percent of Total Resource	Survey- Based Estimated Acres of Total Resource	Lower 95 Percent Confidence Interval (Acres)	Upper 95 Percent Confidence Interval (Acres)
Fully Supporting All Assessed Uses	87.2	314,137	295,655	332,619
Impaired for One or More Use	12.8	45,972	27,490	64,453

**Table 10. Total Sizes of Lakes Impaired by Various Cause Categories (Acres)**

Cause Category	Survey- Based Estimated Acres of Total Resource	Lower 95 Percent Confidence Interval (Acres)	Upper 95 Percent Confidence Interval (Acres)
Total Phosphorus	32,192	14,184	50,199
pH	27,304	14,955	39,654
Chlorophyll <i>a</i>	8,605	0	17,927
Total Nitrogen	3,895	0	8,847
Dissolved Oxygen	659	286	1,032
Ammonia	55	0	148
Fecal Coliform Bacteria	1,396	0	3,219

## B. Section 314 Reporting

Section 314(a) of the Clean Water Act of 1987 directs each State to prepare or establish: (1) an

identification and classification according to trophic condition of publicly-owned freshwater lakes within such State; (2) procedures, processes, and methods to control sources of pollution of such lakes; (3) methods and procedures, in conjunction with appropriate Federal agencies, to restore the quality of such lakes; (4) a list and description of lakes for those uses that are known to be impaired; and (5) an assessment of the status and trends of water quality in lakes. Further, States are required to submit a biennial assessment of lake trophic condition as part of their §305(b) report.

## 1. Background

Sampling is conducted each year in lakes throughout the state as part of SCDHEC’s ambient water quality monitoring activities, including ongoing fixed-location monitoring and statewide statistical survey monitoring.

## 2. Trophic Status

In 2001, South Carolina adopted numeric nutrient criteria for lakes by ecoregion and beginning FY 2002, trophic condition assessment was based upon the criteria for Total Phosphorus (TP), Total Nitrogen (TN) and Chlorophyll *a* (CHL-A). Table 11 lists those lake sites that were identified as not meeting one or more of these numeric criteria as part of the current §303(d) assessment reported in *Part I: Listing of Impaired Waters* of this Integrated Report. The second part of the same table lists all other sites that were assessed and found to meet the numeric criteria.

**Table 11. Summary of Lake Conditions**

Lake Sites Not Attaining Numeric Nutrient Criteria		
PIEDMONT		
Station ID(s)	Location	Parameters
RL-11117	GREAT FALLS RESERVOIR 40 YARDS FROM DAM AND 70 YARDS WEST OF SHORE OF POINT	TN,TP
RL-11119	GREAT FALLS RESERVOIR 1.0 MILES SOUTH OF SC 97 IN THE MIDDLE OF THE RESERVOIR.	TN,TP
S-308	LAKE GREENWOOD, REEDY RVR ARM, 150 YDS US RABON CK	CHLA
SV-268	LAKE HARTWELL - EIGHTEEN MILE CK ARM AT S-04-1098	TN,TP
RL-11033	LAKE MURRAY, CLOUDS CREEK ARM, APPROXIMATELY 0.2 MI NNW OF S-41-59 BRIDGE. SITE 10 YARDS OFF W BANK	CHLA
S-309	LAKE MURRAY, BUSH RVR ARM, 4.6 KM US SC 391	TP,CHLA
CW-207	LAKE WATEREE AT END OF S-20-291	CHLA
CW-231	LAKE WATEREE HEADWATERS APPROX 50 YDS DS CONFL CEDAR CK	TP
RL-08035	DUTCHMANS CREEK ARM OF LAKE WATEREE 0.4 MI E OF S-20-101 BRIDGE	TP
RL-09099	WATEREE LAKE 1.9 MILES WEST OF THE CLEARWATER COVE BOAT LANDING AND 1.9 MILES NORTHEAST OF THE COLONEL CREEK BOAT LANDING. SITE IS LOCATED ABOUT MID CHANNEL OF THE LAKE.	TP
RL-12056	LAKE WATEREE, DUTCHMANS CREEK COVE NEAR MOUTH OF CUT BEHIND LAKE WATEREE STATE PARK ISLAND APPROX 0.4 MI NE OF CW-208	CHLA
RL-08047	BOYD MILL POND 0.22 MI NW OF DAM, NW OF HOUSE ON POINT	TN,TP
S-311	BOYD MILL POND .6 KM W DAM	TN
CW-033	CEDAR CK RESERVOIR 100 M N OF DAM	TP
RL-01007	CEDAR CK RES 2.15 M SE OF GREAT FALLS	TP

RL-08046	CEDAR CREEK RESERVOIR 0.27 MI SE OF S-12-141BELOW TAILRACE FROM GREAT FALLS DAM	TN,TP
RL-09094	CEDAR CREEK RESERVOIR 0.15 MILES SOUTHWEST OF THE DEBUTARY BOAT LANDING	TP
RL-10102	LAKE, CEDAR CK RESERVOIR 2.60MI SSE OF JCT OF US 21 AND SC-97 ON EAST SIDE OF GREAT FALL RESERVOIR	TP
CW-016F	FISHING CK RES 2 MI BL CANE CREEK	TP
CW-057	FISHING CK RES 75 FT AB DAM NR GREAT FALLS	TN,TP
RL-08062	GREAT FALLS RESERVOIR 0.9 MI E OF NITROLEE W SIDE OF CUT BTWN 2 ISLANDS	TN,TP
RL-10106	GREAT FALL RESERVOIR 155M SE OF JCT OF US 21 AND SC-97 ON WEST SIDE OF GREAT FALL RESERVOIR	TN,TP
RL-12049	PARR RESERVOIR APPROX 0.7 MI NNW OF B-346 AND APPROX 0.9 MI SE OF MOUTH OF HELLERS CREEK	TP
RL-11040	WATEREE LAKE ABOUT 1 MILE BELOW THE CONFLUENCE WITH THE CROOKED CREEK AND 1.3 MI ABOVE THE BIG WATEREE CREEK ARM ABOUT 120 YARDS EAST OF THE BANK	TN,TP
SOUTHEASTERN PLAINS		
Station ID(s)	Location	Parameters
RL-11120	LAKE EDGAR BROWN 0.12 MI NE OF S-06-488 (WELLINGTON DR) 30 YARDS FROM EASTERN SHORE	CHLA
RL-01011	LAKE MARION 1.10 M SSE OF SANTEE NAT. WILDLIFE REFUGE AND 1MI S OF EAGLE POINT (SC-035)	TP
RL-02306	LAKE MARION @ JACK'S CK EMBAYMENT; USE SANTEE COOPER SC-012	TP
RL-04388	LAKE MARION 0.5 MI NE OF CALHOUN LANDING (USE SC-044)	TP
RL-10010	LAKE MARION 0.65MI SSE OF SOUTHEAST END OF GREEN ISLAND	TP
RL-10019	LAKE MARION 4.5MI ESE OF JCT OF SC-33 AND SC-267	TP
SC-005	UPPER LAKE MARION NEAR PACK'S LANDING	TP
SC-010	UPPER LAKE MARION AT CHANNEL MARKER 150	TP
SC-014	UPPER LAKE MARION @ HEADWATERS OF CHAPEL BRANCH CREEK	TP
SC-019	LOWER LAKE MARION @ POTATO CREEK FLOODED EMBAYMENT	TP
SC-038	UPPER LAKE MARION @ THE MOUTH OF HALFWAY SWAMP CREEK	TP
SC-039	UPPER LAKE MARION 2.0 KM BELOW RIMINI RAILROAD TRESTLE	TP
SC-040	MID LAKE MARION @ CHANNEL MARKER 79	TP
SC-042	MID LAKE MARION @ NORTH END OF I-95 / U.S. 301 BRIDGES	TP
SC-048	Assigned to Santee-Cooper Project	TP
SC-049	Assigned to Santee-Cooper Project	TP
ST-025	LAKE MARION AT OLD US 301/15 BRDG AT SANTEE (SC-015)	TP
ST-034	LAKE MARION AT RR TRESTLE AT LONE STAR (SC-008)	TP
RL-05398	LAKE WALLACE EAST SHORE NEAR PICNIC AREA	TP,CHLA
RL-09100	LAKE WALLACE 0.6 MILES NORTH OF THE SKI IMPOUNDMENT BOAT LANDING. SITE IS LOCATED ABOUT MID CHANNEL OF THE LAKE.	TP,CHLA
MIDDLE ATLANTIC COASTAL PLAIN		
Station ID(s)	Location	Parameters
CSTL-075	LAKE WARREN, BLACK CK ARM, AT S-25-41 5 MI SW OF HAMPTON	TP,CHLA
RL-08049	LAKE WARREN IN SMALL BAY ALONG N SHORE APPROX 0.4 MI W OF DAM OUTFLOW	TP
RL-04390	GOOSE CREEK RESERVOIR 2.8 MI NW OF SPILLWAY NEAR OTRANTO	TP,CHLA
RL-08065	GOOSE CK RESERVOIR MIDLAKE IN LINE WITH NORTHBROOK BLVD	TP

RL-09081	GOOSE CREEK RESERVOIR 0.1 MILE NORTHEAST OF THE JOHN R. BETTIS BOAT LANDING AND 0.1 MILES SOUTHEAST OF ST-033 NEAR THE NORTHEAST BANK.	TP,CHLA
RL-10104	LAKE, GOOSE CK RESERVOIR 1.95MI WEST OF POPPENHEIM CROSSING	TP,CHLA
RL-10108	LAKE, GOOSE CK RESERVOIR 2.5MI SW OF POPPENHEIM CROSSING	TP,CHLA
RL-11118	GOOSE CREEK RESERVOIR APPROXIMATELY 1.3 MILES UPSTREAM FROM THE DAM. SITE IS LOCATED 100 YARDS SOUTH OF THE MAJOR POINT ON THE EAST BANK IN THE MIDDLE OF THE RESERVOIR.	TP,CHLA
ST-032	GOOSE CREEK RESERVOIR 100 M US OF DAM	TP,CHLA
<b>Lake Sites Attaining Numeric Nutrient Criteria</b>		
<b>BLUE RIDGE</b>		
Station ID(s)	Location	
CL-019	LAKE JOCASSEE IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES	
RL-09088	LAKE JOCASSEE 0.4 MILES SOUTHEAST OF SV-334	
RL-12048	LAKE JOCASSEE, LAUREL FORK CREEK ARM APPROX 0.3 MI E OF SV-335	
SV-335	LAKE JOCASSEE AT TOXAWAY, HORSE PASTURE, & LAUREL FORK CONFLUENCE	
SV-336	LAKE JOCASSEE AT CONFLUENCE OF THOMPSON AND WHITEWATER RVRS	
RL-11032	LAKE KEOWEE IN CANE CREEK COVE, PICKENS COUNTY, BELOW THE JOCASSEE DAM. APPROXIMATELY 0.9 MI NW OF MCKINNEY CHAPEL , 10 YARDS FROM BANK	
RL-12052	LAKE KEOWEE, ESTATOE CREEK ARM 0.6 MI SE OF MCKINNEY CHAPEL	
RL-08044	LAKE YONAH 125 YDS BELOW BATTLE CREEK	
SV-358	LAKE YONAH, 50% BETWEEN CENTER OF SPILLWAY AND OPPOSITE SHORE	
RL-12128	TUGALOO LAKE APPROX 0.6 MI N OF DAM	
<b>PIEDMONT</b>		
Station ID(s)	Location	
B-347	LAKE BLALOCK IN FOREBAY NEAR DAM	
RL-04363	LAKE BLALOCK 0.3 MI UPLAKE OF US 221	
RL-08053	LAKE BLALOCK 0.9 MI NW OF S-42-189 NEAR N SHORELINE	
RL-09073	LITTLE BUCK CREEK ARM OF TAYLOR BLALOCK LAKE 0.25 MILES SOUTHEAST OF BUCK CREEK ROAD BRIDGE CROSSING NEAR THE EAST SIDE OF THE LAKE.	
RL-09089	TAYLOR BLALOCK LAKE ABOUT 80 % AT THE BACK OF THE FIRST LARGE COVE PAST THE BRIDGE ON US 221 WHILE LOOKING DOWNSTREAM FROM THE BRIDGE NEAR THE WEST BANK.	
RL-10103	LAKE BLALOCK 450M ENE OF BUCK CREEK CHURCH	
RL-12126	LAKE BLALOCK APPROX 230 YDS WNW OF CENTER OF BRIDGE ON S-42-189 (CASEY CREEK RD)	
B-339	LAKE BOWEN 0.3 MI W OF SC 9	
B-340	LAKE BOWEN NEAR HEADWATERS, 0.4 KM W OF S-42-37	
RL-10015	LAKE BOWEN 2.65MI NE OF JCT OF US 26 AND SC-292	
RL-12067	LAKE BOWEN 0.9 MI SW OF SC 9 OFF END OF COVE RD	
RL-08048	LAKE BROADWAY 0.14 MI SE OF W SHORELINE COVE 0.7 MI NW OF DAM 0.1 MI E OF HAMMOND CIRCLE	
B-348	LAKE COOLEY IN FOREBAY NEAR DAM	
RL-10110	LAKE COOLEY 2.75MI SSW OF JCT OF US 176 AND SC-292	
RL-12122	LAKE COOLEY 0.1 MI NE END OF HICKORY HILL RD	
CL-033	LAKE CRAIG 45 M NORTHWEST OF DAM	
B-341	LAKE CUNNINGHAM IN FOREBAY NEAR DAM	
RL-10107	LAKE CUNNINGHAM 2.1MI NNE OF JCT OF SC-101 AND SC-290	
RL-08063	LAKE GREENWOOD NEXT SMALL ARM EAST OF CANE CREEK ARM IN SMALL EMBAYMENT SW OF POINT OFF S-30-742	
RL-10001	LAKE GREENWOOD 1.9MI WSW OF JCT OF SC-39 AND SC-56	
RL-10017	LAKE GREENWOOD 2.95MI WSW OF LAURENS/NEWBERRY COUNTY LINE ON SC-39	
RL-12061	LAKE GREENWOOD IN LARGE ARM TO NORTH BETWEEN US 221 AND RAILROAD TRESTLE	

S-022	REEDY FORK OF LK GREENWOOD AT S-30-29
S-024	LAKE GREENWOOD, HEADWATERS, JUST US S-30-33
S-131	LAKE GREENWOOD AT US 221 7.6 MI NNW 96
S-303	LAKE GREENWOOD 200 FT US OF DAM
RL-08060	EMBAYMENT ON TUGALOO RIVER ARM OF LAKE HARTWELL N SIDE OF SMALL ISLAND OFF END OF DURHAM RD 1.7 MI SE OF FAIR PLAY
RL-09080	LAKE HARTWELL BETWEEN I-85 AND THE 18 MILE CREEK BOAT LANDING. THE SITE IS ABOUT 0.8 MILES NORTHWEST OF I-85.
RL-09092	TUGALOO ARM OF HARTWELL LAKE 2 MILES WEST OF SV-200 AND 1.5 MILES EAST OF THE CONFLUENCE OF THE CHUGA RIVER NEAR THE NORTH SHORELINE.
RL-10020	LAKE HARTWELL 4.25MI SW OF INTERCHANGE OF US 85 AND SC-187
RL-11036	LAKE HARTWELL SENECA RIVER ARM 1.2 MI SSE OF LAKE ISSAQUEENA ACROSS ARM FROM BAY SHORES DEVELOPMENT NEAR MOUTH INTO COVE
RL-12047	LAKE HARTWELL, SIX AND TWENTY CREEK ARM IN COVE APPROX 0.1 MI N OF DARWIN A WRIGHT PARK LANDING
RL-12063	LAKE HARTWELL, IN COVE ACROSS FROM (ENE OF) OCONEE POINT LANDING
SV-200	TUGALOO RVR ARM OF LAKE HARTWELL AT US 123
SV-236	LAKE HARTWELL AT S-37-184 6.5 MI SSE OF SENECA
SV-339	LAKE HARTWELL, SENECA RVR ARM AT USACE BUOY BTWN S-14 AND S-15
SV-340	LAKE HARTWELL, MAIN BODY AT USACE WQ BUOY BTWN MRKRS 11 & 12
SV-363	LAKE HARTWELL OFF GLENN FORD LANDING US BEAVERDAM CK COVE
RL-02321	LAKE J. ROBINSON 6.3 MI NNW OF GREER
RL-05395	LAKE J. ROBINSON 0.77 MI NNW OF BRIDGE OVER BEAVERDAM CREEK ON S-23-92
RL-09085	J. ROBINSON LAKE 1.2 MILES SOUTHEAST FROM THE BRIDGE AT S-23-113 AND 1.3 MILES NORTHWEST OF CL-100
RL-12123	LAKE J. ROBINSON 0.2 MI W OF END OF LAKE ROBINSON POINTE RD (GOOGLE EARTH)
RL-08069	LAKE JOHNSON 35 YARDS SOUTH OF THE LAKE EDWIN JOHNSON BOAT LANDING 25 YARDS OFF THE RIGHT BANK WHILE FACING DOWNSTREAM
RL-09076	LAKE KEOWEE BETWEEN STATIONS SV-311 AND SV-361 JUST ENTERING A COVE ON THE SOUTHWESTERN SIDE OF THE LAKE. THIS SITE IS 0.5 MILES NORTHEAST OF THE SOUTH COVE BOAT LANDING.
RL-10016	LAKE KEOWEE 1.25MI SE OF NEW HOPE CHURCH
RL-11044	LAKE KEOWEE NEAR MILE CREEK ARM, APPROX 0.8 MI WSW OF END OF S-39-157. THIS SITE SHOULD BE SAMPLED 300 YARDS WEST OF SOUTH TIP OF LARGE ISLAND
RL-12060	LAKE KEOWEE, W OF POINT OF OLD SALEM RD, APPROX 0.9 MI ENE OF SOUTH COVE LANDING
RL-12068	LAKE KEOWEE IN COVE NEAR END OF OCONEE BELL CT - IF DISTRICT STAFF CAN GET PERMISSION TO SAMPLE OFF ONE OF THE DOCKS, THAT WOULD BE ACCEPTABLE NEAR JUNCTION OF 3 SMALL FINGER COVES
SV-338	LAKE KEOWEE ABOVE SC ROUTE 130 AND DAM
SV-361	LAKE KEOWEE IN FOREBAY OF LITTLE RIVER DAM
CL-083	LAKE MURRAY IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-07023	LAKE MURRAY 1.5 MI NNE OF END OF S-32-690
RL-08039	MIDDLE FINGER OF COVE IN BEAR CREEK ARM OF LAKE MURRAY 0.25 MI SW OF END OF ISLE OF PINES DR OFF S-32-51 (AMICKS FERRY ROAD)
RL-08051	LAKE MURRAY 0.4 MI SE OF E TIP OF DREHER ISL 0.5 MI ENE OF S-280
RL-09071	COVE OF LAKE MURRAY BETWEEN WISE FERRY ROAD AND BRADY PORTH ROAD 0.75 MILES SOUTH OF THE TIP OF BUNDRICK ISLAND. ON THE BUNDRICK ISLAND SIDE OF THE COVE JUST OFF THE WEST BANK.
RL-09084	SALUDA RIVER ARM OF LAKE MURRAY 1.2 MILES SOUTHEAST OF S-223 JUST BEFORE THE CONFLUENCE WITH THE LITTLE SALUDIA RIVER ARM.
RL-09087	LAKE MURRAY 1 MILE WEST OF S-273, 0.4 MILES NORTHEAST OF COUNTS ISLAND AND 0.9 MILES NORTH OF LUNCH ISLAND.
RL-10009	LAKE MURRAY 5.75MI EAST OF NORTH END OF SC-391 BRIDGE OVER LAKE MURRAY

RL-10021	LAKE MURRAY 3.65MI SSE OF EASTERN MOST END OF DREHER ISLAND
RL-11037	LAKE MURRAY IN SMALL COVE WEST OF S-32-877 (LAKE TIDE DR) BETWEEN GREEN VALLY ESTATES AND SHADY ACRES SUBDIVISIONS ABOUT 10 YARDS WEST OF THE BANK
RL-11041	LAKE MURRAY 0.15 MILES NORTHEAST OF JIM SPENCE ISLAND.
RL-12053	LAKE MURRAY 0.1 MI W OF SMALL ISLAND WEST OF DREHER ISLAND, 1.3 MI NW OF S-280
RL-12057	LAKE MURRAY OFF ENDS OF PEBBLE SHORE AND MARINA RDS APPROX 0.6 MI NNE OF S-274
RL-12069	LAKE MURRAY IN COVE SW OF BUNDRICK ISLAND NEAR END OF BUNDRICK RD
S-211	HOLLANDS LANDING LK MURRAY OFF S-36-26 AT END OF S-36-3
S-213	LAKE MURRAY AT S-36-15
S-222	LAKE MURRAY, LITTLE SALUDA ARM AT SC 391
S-310	LAKE MURRAY, SALUDA RVR ARM, US BUSH RVR, 3.8 KM US SC 391
RL-02305	LAKE RABON NEAR BOAT LANDING ON UNN CNTY RD OFF S-30-54
RL-09079	LAKE RABON ABOUT 0.3 MILES NORTHEAST OF S-296
RL-09095	LAKE RABON ABOUT 0.3 MILES SOUTHEAST OF S-312.
RL-10109	LAKE RABON 3.75MI SE OF HICKORY TAVERN AT JCT OF US 76 AND SC-101
RL-11113	LAKE RABON NEAR NORTH RABON CREEK INFLOW
S-296	LAKE RABON 300 FT US OF DAM
RL-08064	LAKE RUSSELL IN SMALL FINGER EMBAYMENT NW OF MOHAWK IND ROCKY RVR PLANT
RL-10004	LAKE RUSSELL 100M WNW OF SC END OF US 29 BRIDGE OVER LAKE RUSSELL
RL-10006	LAKE RUSSELL 6MI WSW OF BROWN OAKS CHURCH AT JCT OF SC-81 AND S-01-900
RL-12050	LAKE RUSSELL IN SMALL COVE APPROX 0.75 MI E OF SV-098
SV-098	LAKE RUSSELL AT SC 72 3.1 MI SW CALHOUN FALLS
SV-357	LAKE RUSSELL, ROCKY RVR ARM BETWEEN MARKERS 48 & 49, DS FELKEL
RL-09096	SECESSION LAKE 0.17 MILES NORTHWEST OF THE DAM AT THE POWER PLANT.
RL-10002	LAKE SECESSION 3.5MI WSW OF JCT OF SC-28 AND SC-284
RL-10018	LAKE SECESSION 4.75MI WSW OF JCT OF SC-28 AND SC-284
SV-331	LAKE SECESSION, 1 1/4 MI BELOW SC ROUTE 28
SV-332	LAKE SECESSION APPROX 400 YDS ABOVE DAM
RL-09101	LAKE THICKETTY 0.5 MILES NORTHWEST OF THE THICKETTY CREEK BOAT LANDING. SITE IS LOCATED MID CHANNEL OF THE LAKE.
CL-089	LAKE WATEREE IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-10008	LAKE WATEREE 4.3MI NW OF WEST END OF WATEREE DAM
RL-12127	LAKE WHELCHER APPROX 0.5 MI N OF I-85/SC 18/PLEASANT SCHOOL RD INTERCHANGE, APPROX 100 YDS OFF LARGE POINT
CW-197	LAKE WYLIE AB MILL CK ARM AT END OF S-46-557
CW-201	LAKE WYLIE N LAKEWOODS S/D AT EBENEZER ACCESS
CW-230	LAKE WYLIE AT DAM, UNDER POWERLINES
RL-10012	LAKE WYLIE 1.15MI NE OF ENDING OF S-46-154 AT SOUTH POINT
RL-08061	CLARK FORK (WESTERN) ARM OF LAKE YORK 0.4 MI SE OF CAMP YORK CK RD XSING
RL-10105	LAKE, BROADWAY 1.3MI SW OF JCT OF US 76 AND US 178
RL-12125	CEDAR CK RESERVOIR APPROX 70 YDS SE OF EASTERN TIP OF GOAT ISLAND
CL-041	CLARKS HILL RESERVOIR IN FOREBAY NEAR DAM
RL-10013	LAKE, CLARKS HILL RESERVOIR 2.6MI NNW OF JCT OF US 221 AND SC-23
B-327	MONTICELLO LK-LOWER IMPOUNDMENT BETWEEN LARGE ISLANDS
RL-04370	MONTICELLO LAKE 1.7 MI NW OF MONTICELLO
RL-08055	LAKE MONTICELLO AS CLOSE TO OUTFLOW AT DAM AS POSSIBLE
B-345	PARR RESERVOIR IN FOREBAY NEAR DAM
RL-08045	SALUDA LAKE IN FOREBAY 65 YDS NE OF SAFETY BUOYS
RL-08056	SALUDA LAKE NEAR SHORE OF THE POINT NEAR THE END OF CLUB CIRCLE
SV-372	STEPHENS CREEK RESERVOIR/SAVANNAH RIVER AT SC 28, WALK IN FROM GA SIDE
RL-08068	STROM THURMOND LAKE 0.1 MILE SE OF PARKSVILLE BOAT LANDING

RL-09091	STROM THURMOND LAKE 0.1 MILE WEST OF THE POINT AT HAMILTON BRANCH STATE PARK BOAT LANDING
RL-12045	THURMOND RESERVOIR IN COVE AROUND THE POINT FROM CLARK HILL MARINA BEHIND ISLAND, BETWEEN BENNINGFIELD CREEK AND LANDAM BRANCH ARMS
RL-12065	THURMOND RESERVOIR NEAR STATE LINE OUT FROM DORDAN CREEK COVE, 1.7 MI SW OF DORDON CREEK LANDING
RL-11034	LAKE RUSSELL 0.7 MI WEST OF LATIMER BOAT RAMP IN ABBEVILLE COUNTY
RL-11022	LAKE THURMOND DOWNSTREAM FROM PATTERSON CREEK 300 YARDS OFF THE POINT AT THE END OF S-33-167 AND PATTERSON CREEK PICNIC AREA
RL-11029	STROM THURMOND LAKE IN THE BENNINGFIELD CREEK ARM NEAR CONFLUENCE WITH THE LAKE. SITE IS 0.6 MI ACROSS ARM FROM THE END OF COUNT ROAD S-33-57, AND 140 YARDS FROM BANK
SOUTHEASTERN PLAINS	
Station ID(s)	Location
CL-077	LAKE ASHWOOD, FOREBAY MOVED TO CATWALK NEAR DAM
CL-042	LAKE MARION FOREBAY, SPILLWAY MARKER 44 (SC-022)
RL-02308	LAKE MARION @ CHANNEL MARKER 69; USE SANTEE COOPER SC-016
RL-08054	LAKE MARION APPROX 3 MI W OF CENTER OF DAM DOUBLE CHECK WITH SANTEE-COOPER
RL-10014	LAKE MARION 2MI NORTH OF WEST END OF I-95 BRIDGE OVER LAKE MARION
RL-11026	LAKE MARION COLLECTED BY SANTEE-COOPER
RL-11030	LAKE MARION COLLECTED BY SANTEE-COOPER
RL-11038	LAKE MARION COLLECTED BY SANTEE-COOPER
RL-12062	ASK SANTEE COOPER, LAKE MARION 0.7 MI S OF PARADISE POINT
SC-017	MID LAKE MARION @ TAW CAW CREEK EMBAYMENT
SC-021	LOWER LAKE MARION, 1.5 KM NE OF ROCK'S POND CAMPGROUND
SC-036	MID LAKE MARION @ THE MOUTH OF TAW CAW CREEK
SC-059	Assigned to Santee-Cooper Project
ST-036	LAKE MARION, WYBOO CREEK ARM DS OF CLUBHOUSE BR (SC-023A)
CL-094	LAKE ROBINSON IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES FROM PRIVATE ACCESS
PD-327	LAKE ROBINSON AT S-13-346 5 MI E MCBEE BY BOAT
RL-11028	LAKE ROBINSON 200 YARDS OFF THE POINT WHERE COUNTY ROAD S-13-752 ENDS
CL-086	LAKE WALLACE, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-06436	EUREKA LAKE 5 MI SW OF CHERAW
CL-088	JUNIPER LAKE, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-10101	LAKE, JUNIPER 1.4MI SSE OF JCT OF US 1 AND US 52
CL-069	LANGLEY POND IN FOREBAY NEAR DAM
RL-09075	LANGLEY POND 1.3 MILES NORTH EAST OF THE DAM. THIS SITE IS MIDLAKE ABOUT 2/3RDS OF THE WAY UPSTREAM FROM THE DAM.
RL-12124	LANGLEY POND NEAR HEADWATERS APPROX 90 YDS SE OF DOCK AT ORANGE ROOF BUILDING ON NW SHORE OF POND (GOOGLE EARTH)
PD-081	PRESTWOOD LK AT US 15
PD-268	SONOVISTA CLUB HARTSVILLE OFF DOCK OF PRESTWOOD LK
RL-11112	LANGLEY POND 0.3 MILES NORTHEAST OF THE DAM AND 20 YARDS OFF OF THE RIGHT BANK WHILE FACING UPSTREAM.
MIDDLE ATLANTIC COASTAL PLAIN	
Station ID(s)	Location
RL-01006	LAKE MOULTRIE 5.5 M N OF MONCK'S CORNER AND 1.5 M NW OF CAMP MOULTRIE
RL-02454	LAKE MOULTRIE SW IN OPEN WATER
RL-08066	LAKE MOULTRIE WESTERN SIDE 1 MI E OF FRED L DAY LANDING DOUBLE CHECK WITH SANTEE-COOPER

RL-09078	LAKE MOULTRIE BETWEEN THE PINOPOLIS DAM AND RICHARDSONS BOAT LANDING NEAR THE EAST BANK ABOUT 2.3 MILES FROM THE PINOPOLIS DAM.
RL-09098	LAKE MOULTRIE 3.2 MILES SOUTHWEST OF HENDERSON G GUERRY BOAT LANDING 0.2 MILES SOUTHWEST OF THE TIP OF A LARGE ARC SHAPED ISLAND.
RL-10007	LAKE MOULTRIE 6.9MI ESE OF JCT OF SC-6 AND SC-45
RL-10011	LAKE MOULTRIE 5.5MI NNW OF JCT OF US 17 AND US 52 (SAME AS OLD RL-06450?)
RL-11027	LAKE MOULTRIE COLLECTED BY SANTEE-COOPER
RL-11035	LAKE MOULTRIE COLLECTED BY SANTEE-COOPER
RL-11039	LAKE MOULTRIE COLLECTED BY SANTEE-COOPER
SC-027	SW QUADRANT OF LAKE MOULTRIE 1.2 KM EAST OF SHORELINE
SC-028	NW QUADRANT OF LAKE MOULTRIE NEAR ANGEL'S LANDING COVE
SC-031	NORTH QUADRANT OF LAKE MOULTRIE @ MOUTH OF REDIVERSION CANAL
SC-032	SE QUADRANT OF LAKE MOULTRIE @ CHANNEL MARKER 2
SC-046	SE QUADRANT OF LAKE MOULTRIE AT PINOPOLIS EMBAYMENT
ST-037	LAKE MOULTRIE AT CHANNEL MARKER 17 (SC-030)
CSTL-124	BACK RIVER RES IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES

## 5. Estuary and Coastal Assessment

### A. Summary Statistics

Based on a hydrographic GIS cover developed jointly by SCDHEC and the SC DNR and the results of survey site selection validation, South Carolina has an estimated 289 combined square miles of tide creek and open water habitat representing the estuarine sampling design frame previously described. Because of the state-scale statistically-valid survey design, the 149 statistical survey monitoring sites sampled from 2008-2012 represent the total square miles.

A summary of classified use support statewide based on these data, along with causes for partial or nonattainment, is presented below. The Lower and Upper 95 Percent Confidence Intervals for the statistical survey estimates signify that it is 95% certain that the true mileage is between the upper and lower confidence limits.

**Table 12. Estuaries Use Support Summary (Square Miles)**

Indicator	Category	Survey - Estimated Percent of Total Resource	Survey - Estimated Square Miles of Total Resource	Lower 95 Percent Confidence Interval (SquareMiles)	Upper 95 Percent Confidence Interval (SquareMiles)
Aquatic Life Use	Fully Supporting	81.0	234.3	218.6	249.9
	Partially Supporting	1.1	3.2	0	8.7
	Not Supporting	17.9	51.6	36.8	66.4
Recreational Use	Fully Supporting	95.7	276.8	267.2	286.4
	Partially Supporting	4.0	11.6	2.1	21.2
	Not Supporting	0.2	0.7	0	1.8

**Table 13. Summary of Fully Supporting and Impaired Estuaries (Not including Fish/Shellfish Consumption Use)**

Category	Survey-Based Estimated	Survey-Based Estimated	Lower 95 Percent Confidence	Upper 95 Percent Confidence
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	Percent of Total Resource	Square Miles of Total Resource	Interval (Square Miles)	Interval (Square Miles)
Fully Supporting All Assessed Uses	78.1	225.9	208.7	243.1
Impaired for One or More Use	21.9	63.2	46.0	80.5

**Table 14. Total Sizes of Estuaries Impaired by Various Cause Categories (Square Miles)**

Cause Category	Survey-Based Estimated Square Miles of Total Resource	Lower 95 Percent Confidence Interval (Square Miles)	Upper 95 Percent Confidence Interval (Square Miles)
Turbidity	47.7	34.2	61.3
Dissolved Oxygen	3.9	0	9.7
pH	3.2	0	8.7
Fecal Coliform Bacteria	10.3	0.9	19.7

## 6. Wetlands Assessment

### A. Extent of Wetland Resources

A tracking system called Environmental Facilities Information System or EFIS has been adopted agency-wide. The Water Quality Certification and Wetlands Section has developed a module into which all Section 10 and Section 404/401 projects are entered. This module includes information on project location (latitude/longitude, basin, and watershed unit), purpose, types of impacts, acreage of wetland and non-wetland impacts, compensation requirements and location (latitude/longitude, basin, and watershed unit) and remediation requirements. Information regarding projects from the years of 1983 to the present has been entered into this tracking system. The Bureau is currently working to get this system operational and the data verified. Once this data has been verified, statistics on the location and types of wetland impacts in South Carolina will be available. Currently, maps of compensatory mitigation sites (1990 to present) are being digitized and entered into GIS for future analyses.

### B. Integrity of Wetlands Resources

There is no specific legislation authorizing a statewide wetlands protection program. The primary mechanisms for wetlands protection in the state are federal and state regulatory programs for the discharge of dredged or fill material into waters of the state and for activities in the critical areas of

the coastal zone.

## **1. Section 404 Permit Program**

Section 404 of the Clean Water Act requires a permit for the discharge of dredged or fill material into navigable waters, including wetlands, throughout the United States. Certain activities, such as normal agriculture, silviculture and ranching activities, are exempt from such permit requirements. The United States Army Corps of Engineers (USACE) administers the Section 404 permitting program, but the EPA exercises final authority. The Agency can prohibit the use of a disposal area if the discharge will have an adverse impact on municipal water supplies, shellfish beds, fishing areas, wildlife, or recreational areas. No permit can be issued without a Section 401 Certification from SCDHEC's Division of Water Quality, and in coastal areas, a determination of consistency with the Coastal Zone Management Program (CZMP) from SCDHEC's Office of Ocean and Coastal Resource Management (OCRM) is required. Other state and federal natural resource agencies, such as DNR, U. S. Fish and Wildlife Service, and National Marine Fisheries Service, provide input to decisions of the federal permitting agency and the state certifying agencies on proposed activities.

Section 404 permit authority can be delegated to states but South Carolina has elected not to assume that authority. In 1986, SCDHEC completed a study to determine the feasibility of assuming the Section 404 program. The study concluded that although SCDHEC had the legal authority and the technical expertise, it was not advisable to assume that authority because of the limited area of the jurisdiction involved. Perhaps more importantly, there would be no new funding from Congress to support that assumption.

## **2. Section 401 Water Quality Certification**

Section 401 of the Clean Water Act requires any applicant for a federal permit or license involved in an activity that may result in a discharge to navigable waters to receive certification from the state that the discharge will not cause violations of the state's water quality standards. Consequently, 401 Certification is required for all activities requiring a Section 404 permit from the ACE. This mechanism provides a State position on wetlands alterations.

SCDHEC routinely requires compensation for wetland impacts at greater than a one to one basis. This compensation may be in the form of preservation, enhancement, or restoration.

SCDHEC administers certification programs using as guidance the South Carolina Pollution Control Act. S. C. Regulation 61-101, *Water Quality Certification*, guides the administration and technical review for the §401 Certification Program that determines if the standards of S. C. Regulation 61-68 will be met.

The S. C. Pollution Control Act provides authority for regulation of wetlands since it defines waters of the State as:

*“lakes, bays, sounds, ponds, impounding reservoirs, springs, wells, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic Ocean within the territorial limits of the State and all other bodies of surface or underground water, natural or artificial, public or private, inland or*

*coastal, fresh or salt, that are wholly or partially within or bordering the State or within its jurisdiction.”*

This definition does not specifically list wetlands, but wetlands are included through the generic use of the word “marshes” as well as within the broad inclusion of the phrase “all other bodies of surface or underground water.” Therefore, all water pollution control programs administered by SCDHEC apply to activities in wetlands.

During review of applications for §401 Certification, SCDHEC, with authority from S.C. Regulation 61-101, evaluates whether or not there are feasible alternatives to the activity that reduce adverse consequences on water quality and classified water uses, if the activity is water dependent, and the intended purpose of the activity. Certification is denied if the activity will adversely affect existing or designated uses. Certification is granted if water quality standards, that include protection of existing uses, will not be violated. The federal permit cannot be issued if certification is denied.

### **C. Development of Water Quality Standards for Wetlands**

S.C. Regulation 61-68 provides that waters not classified by name assume the classification of the waterbody to which they are adjacent. Wetlands contiguous to a stream or lake assume the classification of the waterbody to that they are contiguous. The standards allow variation from specific numeric standards if those variations are due to natural conditions. SCDHEC is continuing to evaluate the development of water quality classifications and standards specifically applicable to wetlands.

Before proceeding with regulation development for the proposed classifications and standards for wetlands, there is the need to gain general agreement regarding wetlands protection policy and mechanisms in the State. Consensus-building among Federal, State, and local regulators with developers, farmers, forestry industry, and environmental groups would ensure acceptance of a clearly defined South Carolina wetlands protection policy.

### **D. Additional Protection Activities**

SCDHEC also uses antidegradation rules in S.C. Regulation 61-68 to evaluate applications for Water Quality Certification. The basic tenet of antidegradation is:

*“...existing uses and the level of water quality necessary to protect existing uses in all segments of a water body must be maintained.”*

Strict application of this water quality standard is impossible if there is to be any fill in wetlands. Therefore, the federal government determined that some fill in wetlands may be allowed pursuant to Section 404 of the Clean Water Act. S.C. Regulation 61-68 provided for this by adding a provision that states,

*“Discharge of fill into waters of the State is not allowed unless the activity is consistent with Department regulations and will result in enhancement of classified uses with no significant*

*degradation to the aquatic ecosystem or water quality”.*

Fill may only be allowed if it does not cause or contribute to significant degradation of the aquatic environment that can be determined by whether or not the activity will cause adverse effects on:

1. Human health or welfare;
2. Life stages of aquatic life or wildlife dependent upon the aquatic ecosystem;
3. Ecosystem diversity, productivity, and stability;
4. Recreational, aesthetic, and economic values.

## **7. Public Health Concerns**

### **A. Public Health Impacts**

#### **1. Pollution Caused Fish Kills/Abnormalities**

There was a total of 54 fish kill investigations conducted by SCDHEC in 2010 and 49 in 2011. Dissolved oxygen depletion, weather conditions, and other natural causes accounted for approximately 67% in 2010 and 71% in 2011. In 2011 nearly 21% of the kills occurred in brackish ponds or lagoons and 41% in freshwater ponds. Also in 2011, 10% of the kills could not be determined and approximately 18% of the fish kills investigated in 2011 were from unnatural causes. Unnatural causes ranged from fish being caught and dumped back into lakes and streams to the runoff of pesticides and pollution. These numbers are consistent with kills investigated over the past 10 years  $\pm 2\%$ .

Most investigations were conducted a day or more after the initial occurrence of the fish kill. Late reporting of fish kills to SCDHEC investigators hinders accurate determination of the cause of the fish kills.

There are no waters in the State that routinely experience fish kills or fish abnormalities due to toxics. When fish kills do occur that can be attributed to other than natural causes, enforcement action is taken by SCDHEC. The action usually takes the form of an administrative order and includes penalties commensurate with the violation. Schedules for corrective actions are included in the order along with appropriate assessment of monetary damage of the fish killed. As of May 31, 2001, SCDHEC required that its entire staff use its Field Manual for Investigation of Fish Kills. SCDHEC's computer system, EFIS (Environmental Facility Information System) acts as the official fish kill report.

SCDHEC is now teaming up with NOAA in producing a Statewide Environmental Surveillance Network whereas all fish kill data are fed along with other environmental indicators for quick notification and review. It is now a SCDHEC policy to acquire GPS coordinates on all fish kills to pinpoint fish kill location.

#### **2. Fish Consumption Advisories**

The SCDHEC uses a risk-based approach to evaluate contaminant concentrations in fish tissue and

to issue consumption advisories in affected waterbodies. This approach contrasts the average daily exposure dose to the reference dose (RfD). Using these relationships, fish tissue data are interpreted by determining the consumption rates that would not be likely to pose a health threat to adult males and nonpregnant adult females. An acceptable RfD for developmental neurotoxicity has not been determined and scientific studies suggest that exposure before birth may have adverse effects on the developing fetus. For these reasons infants, pregnant women, nursing mothers, and children are advised to avoid consumption of fish from any waterbody where an advisory has been issued.

Fish consumption advisories are updated annually in April. For background information and the most current advisories, please visit the Bureau of Water homepage at <http://www.scdhec.gov/fish> or call SCDHEC's Division of Health Hazard Evaluation, toll-free, at (888) 849-7241.

### **3. Shellfish Restrictions/Closures**

The goal of SCDHEC's Shellfish Sanitation Program (SSP) is to ensure that mollusk and shellfish and areas from which they are harvested meet the health and environmental quality standards provided by federal and state regulations, laws, and guidelines. Additionally, SCDHEC promotes and encourages coastal quality management programs consistent with protected uses established through the S.C. Regulation 61-68, *Water Classifications and Standards*. SSP management policy is primarily determined by S.C. Regulation 61-47, *Shellfish*, as well as other State legislation. The National Shellfish Sanitation Program (NSSP) Model Ordinance, developed through participation in the Interstate Shellfish Sanitation Conference (ISSC) and endorsed by all shellfish producing states and the United States Food and Drug Administration (USFDA), is used as primary guidance for shellfish regulation development.

Sanitary surveys are conducted by SCDHEC to assess the quality of the coastal waters. These surveys result in shellfish harvesting classifications described as follows:

**Approved:** Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations that would render shellfish unsafe for human consumption. Approved area classification shall be determined upon a sanitary survey that includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, nor shall more than ten percent of the samples exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform Most Probable Number (MPN) shall not exceed fourteen per one hundred milliliters, nor shall the estimated ninetieth percentile exceed an MPN of forty-three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Guidelines.

**Conditionally**

**Approved:** Growing areas may be classified Conditionally Approved when they are subject to

temporary conditions of actual or potential pollution. When such events are predictable as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under that harvesting will be allowed shall be adopted by the Department, prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

**Restricted:** Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree that may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved area classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters nor shall more than ten percent of the samples exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters nor shall the estimated ninetieth percentile exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using National Shellfish Sanitation Guidelines.

**Prohibited:** Growing areas shall be classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities that could render shellfish unfit or unsafe for human consumption.

As a matter of SCDHEC policy, prohibited areas are established adjacent to all point source and/or marinas as a precaution to protect public health. These prohibited areas are not necessarily an indication of lesser water quality or that standards are not being met; rather, they are areas that have the potential for variable water quality.

South Carolina currently (March, 2012) is approximately 580,522 estuarine/riverine surface acres classified for the harvest of molluscan shellfish. Of this total, Approved accounts for 69.5% of total acreage, Conditionally Approved - 1.3%, Restricted - 17.0%, and Prohibited - 12.2%.

**Table 15. Summary of Shellfish Harvesting Status  
in South Carolina Shellfish Waters**

Harvesting Status	Acreage	Percent
Approved	403,440	69.5%
Conditionally Approved	7,440	1.3%
Restricted	98,720	17.0%
Prohibited	70,599	12.2%
Total Assessed	580,522	100.0%

**4. Ocean Water Quality Monitoring**

South Carolina's conducts an annual program for monitoring bacteria content of recreational waters along the Atlantic coast from May 1st to Oct. 1st. A partnership between the state's Department of Health and Environmental Control and local governments provides residents and visitors with specific and timely information about beach water quality along the state's coastline.

An annual report is prepared and submitted to the USEPA detailing number of monitoring locations, sampling frequency, action levels, and number of advisory days. More information regarding sample results for all monitored beaches and about the program's other activities is available at the S.C. Department of Health and Environmental Control's Web site at [www.scdhec.gov/beach](http://www.scdhec.gov/beach).

## **B. Public Health: Drinking Water**

The Drinking Water Enforcement program is charged with carrying out enforcement actions on those entities that are in violation of the State Safe Drinking Water Act (SDWA) or the State Recreational Waters Act (SRWA). For detailed information concerning enforcement orders issued within the Drinking Water Program and other areas of Environmental Quality Control, you may also wish to visit: [http://www.dhec.sc.gov/environment/admin/htm/enforcement\\_activities.htm](http://www.dhec.sc.gov/environment/admin/htm/enforcement_activities.htm).

To view information on a specific drinking water supplier in the state, you may visit: <http://dwwweb.dhec.sc.gov:8080/DWW/>.

### **GROUNDWATER ASSESSMENT**

Groundwater is the source of drinking water for approximately 35 percent of the population of the State. This resource is also used by agricultural, industrial, and commercial interests. The policy of the State of South Carolina, with respect to groundwater protection, is founded on the belief that there is a direct connection between land use and groundwater quality, and that at least some activities of man will always impact groundwater, regardless of the regulatory safeguards employed.

Because it is an expensive and technologically complex task to restore contaminated groundwater to its original pristine state within a reasonable time frame, a justifiable goal of any groundwater protection strategy is to protect the present and future uses of the resource.

SCDHEC maintains a primary long term objective for groundwater protection. As expressed in the S.C. Regulation 61-68, *Water Classifications and Standards*.

*“It is the goal of the Department to maintain or restore groundwater quality so it is suitable as a drinking water source without any treatment. Recognizing the technical and economic difficulty in restoring groundwater quality, the Department will emphasize a preventive approach in protecting groundwater.”*

This goal fulfills the Core Adequacy Criteria #1 of Strategic Activity 1 in the implementation of the Comprehensive State Groundwater Protection Program (CSGWPP).

The groundwater quality protection and restoration, when needed, relies heavily on regulatory mechanisms, most of which are founded in state and federal law. Groundwater sources are protected by requiring that state groundwater quality standards are maintained or restored, if needed, and by incorporating Drinking Water Source Protection principles into the Underground Storage Tank, State and Federal Superfund, Brownfields, Solid and Hazardous Waste, Mining, Emergency Spill Response, Concentrated Animal Feeding Operation, Wastewater Land Application, and Groundwater Use programs.

A primary tool for revealing the effectiveness of the overall strategy is the monthly review of compliance data from all public wells in the state to measure overall effectiveness, to identify wells



and systems with existing or potential drinking water problems, and to detect regional and/or temporal trends in water quality.

### 1. Overview of Groundwater Protection Programs

The state’s groundwater protection programs are summarized and characterized in Table 16. The Groundwater Working Group that is comprised of SCDHEC’s groundwater program managers was formed to provide consistency across the programs.

**Table 16. Summary of State Groundwater Protection Programs**

<b>Programs or Activities</b>	<b>Check (Y )</b>	<b>Implementation Status</b>	<b>Responsible State Agency</b>
Active SARA Title III Program	Y	Fully Established	SCDHEC/BLWM/BES
Ambient groundwater quantity monitoring system	Y	Continuing Efforts	DNR-SCDHEC/BOW
Aquifer vulnerability assessment	Y	Under Development	SCDHEC/BOW
Aquifer mapping	Y	Continuing Efforts	DNR-SCDHEC/BOW
Aquifer characterization	Y	Continuing Efforts	DNR-SCDHEC/BOW
Comprehensive data Management system	Y	Under Development	DNR-SCDHEC
EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP)	Y	Under Development	SCDHEC/BOW
Groundwater discharge permits	Y	Fully Established	SCDHEC/BOW
Groundwater Best Management Practices	Y	Under Development	SCDHEC/BOW
Groundwater legislation	Y	Continuing Efforts	SCDHEC-SCDNR
Groundwater classification	Y	Fully Established	SCDHEC/BOW
Groundwater quality standards	Y	Continuing Efforts	SCDHEC
Interagency coordination for groundwater protection initiatives	Y	Under Development	SCDHEC-SCDNR-Clemson Univ.
Nonpoint source controls	Y	Under Development	SCDHEC/BOW

<b>Programs or Activities</b>	<b>Check (Y)</b>	<b>Implementation Status</b>	<b>Responsible State Agency</b>
Pesticide State Management Plan	Y	Under Development	SCDHEC/BOW-Clemson Univ.
Pollution Prevention Program	Y	Fully Established	SCDHEC/BLWM
Resource Conservation and Recovery Act (RCRA) Primacy	Y	Fully Established	SCDHEC/BLWM
State Superfund	Y	Fully Established	SCDHEC/BLWM
State RCRA Program incorporating more stringent requirements than RCRA primacy		Not Applicable	
State septic system requirements	Y	Fully Established	SCDHEC/BOW
Underground storage tank installation requirements	Y	Fully Established	SCDHEC/BLWM/UST Program
Underground Storage Tank Remediation Fund	Y	Fully Established	SCDHEC/BLWM/UST Program
Underground Storage Tank Permit Program	Y	Fully Established	SCDHEC/BLWM/UST Program
Underground Injection Control Program	Y	Fully Established	SCDHEC/BOW
Vulnerability assessment for drinking water/wellhead protection	Y	Fully Established	SCDHEC/BOW
Well abandonment regulations	Y	Fully Established	SCDHEC/BOW
Wellhead Protection Program (EPA-approved)	Y	Fully Established	SCDHEC/BOW
Well installation regulations	Y	Fully Established	SCDHEC/BOW

Notes:

SCDEHC – South Carolina Department of Health and Environmental Control

SCDNR – South Carolina Department of Natural Resources

BOW – Bureau of Water

BLWM – Bureau of Land and Waste Management

BES – Bureau of Environmental Services

UST – Underground Storage Tank

Implementation of the Comprehensive State Ground-Water Protection Program (CSGWPP) is the major initiative undertaken since the last §305(b) report. The draft Core CSGWPP was completed and submitted to the Region IV EPA, Groundwater 106 Program, comments from EPA have been received. The Source Water Assessment and Protection Plan was approved to EPA Region IV.

## 2. Overview of Groundwater Contamination Sources

The major sources of contamination impacting groundwater are presented in Table 21. Underground storage tank (UST) releases account for the largest number of releases to groundwater in the state. The additional nine sources indicated were the next most numerous instances. Another factor indicated was human health and/or environmental risk for those sources for petroleum products and hazardous waste. The size of the population at risk was also indicated for USTs given the large number of releases. The next column on Table 17 indicates the contaminants associated with the highest priority sources. Petroleum compounds, halogenated solvents, metals and nitrates are the contaminants most frequently detected.

**Table 17. Major Sources of Groundwater Contamination**

<b>Contaminant Source</b>	<b>Ten Highest-Priority Sources (T)</b>	<b>Factors Considered in Selecting a Contaminant Source</b>	<b>Contaminants</b>
<i>Agricultural Activities</i>			
Agricultural chemical facilities			
Animal feedlots			
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
<i>Storage and Treatment Activities</i>			
Land application	T	D	E
Material stockpiles			
Storage tanks (above ground)	T	D,A	D
Storage tanks (underground)	T	D,A,B	D
Surface impoundments	T	D	C,E
Waste piles			
Waste tailing			
<i>Disposal Activities</i>			

Contaminant Source	Ten Highest-Priority Sources (T)	Factors Considered in Selecting a Contaminant Source	Contaminants
Deep injection wells			
Landfills	T	D	C,D,H
Septic systems			
Shallow injection wells			
<i>Other</i>			
Hazardous waste generators	T	D,A	C,H
Hazardous waste sites	T	D,A	C,H
Industrial facilities	T	D	C,E
Material transfer operations			
Mining and mine drainage	T	A,C	A,H,M Acid mine drainage
Pipeline and sewer lines			
Salt storage and road salting			
Salt water intrusion			
Spills	T	D	D
Transportation of materials			
Urban runoff			
Other sources (please specify)			
Other sources (please specify)			

1. Check (X) up to 10 contaminant sources identified as highest priority in your State.
2. Specify the factor(s) used to select each of the contaminant sources. Denote the following factors by their corresponding letter (A through G) and list in order of importance. Describe any additional or special factors that are important within your State in the accompanying narrative.  
A. Human health and/or environmental risk (toxicity)

- B. Size of the population at risk
- C. Location of the sources relative to drinking water sources
- D. Number and/or size of contaminant sources
- E. Hydrogeologic sensitivity
- F. State findings, other findings
- G. Other criteria (please add or describe in the narrative)

3. List the contaminants/classes of contaminants considered to be associated with each of the sources that was checked. Contaminants/contaminant classes should be selected based on data indicating that certain chemicals may be originating from an identified source. Denote contaminants/classes of contaminants by their corresponding letter (A through L).

- |                         |                  |
|-------------------------|------------------|
| A. Inorganic pesticides | H. Metals        |
| B. Organic pesticides   | I. Radionuclides |
| C. Halogenated solvents | J. Bacteria      |
| D. Petroleum compounds  | K. Protozoa      |
| E. Nitrate              | L. Viruses       |
| F. Fluoride             |                  |
| G. Salinity/brine       |                  |

### **3. Summary of Groundwater/Surface Water Interactions**

The Drinking Water Program reports that no Public Water Supply well is under the influence of surface water. Although there are anecdotal reports of groundwater in wells being heavily pumped showing signs of influence by surface water, no instance of groundwater being impacted by surface water has been confirmed.

As groundwater serves to recharge most of the streams in South Carolina, instances where contaminated groundwater impacts surface water are more prevalent. In the Groundwater Contamination Inventory 132 cases of contaminated groundwater discharging from the surficial aquifer to surface water have been noted. A table was not included in this report because contaminant concentration levels in both the aquifer and surface water are not available. It is surmised that, due to dilution, levels in the surface water are very low or not detectable in most cases.

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