

**State of South Carolina**  
**Integrated Report for 2008**  
**Part II: *Section 305(b) Assessment and Reporting***

March 31, 2008





## **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 Management Assessments (WWQA), that 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 Probability-Based, or random sampling, 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 probability-based monitoring design is a type of a survey design in that the population of interest is sampled in a fashion that allows statements to be made about the whole population based on a subsample. The advantage of the probability-based 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 probability site selection validation, South Carolina has an estimated 21,782 miles of freshwater rivers and streams representing the stream sampling design frame, and 318,033 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 probability site selection validation, South Carolina has an estimated 267 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 probability network from 2002 through 2006 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.

### Aquatic Life Use Support

<b>Waterbody Type</b>	<b>Fully Supported</b>	<b>Partially Supported</b>	<b>Not Supported</b>	<b>Predominant Cause</b>
Rivers	67%	21%	12%	Macroinvertebrate Community
Lakes	89%	4%	6%	pH
Estuaries	85%	4%	12%	Turbidity

### Recreational Use Support

<b>Waterbody Type</b>	<b>Fully Supported</b>	<b>Partially Supported</b>	<b>Not Supported</b>	<b>Predominant Cause</b>
Rivers	42%	19%	39%	Fecal Coliform
Lakes	>99%	<1%	0%	Fecal Coliform
Estuaries	>99%	<1%	<1%	Fecal Coliform



## BACKGROUND

### 1. Resource Overview

The following table gives a representation of state population and geographical information.

**Table 1. Atlas**

Topic	Value
State Population	4,321,429
State Surface Area (square miles)	30,203
Total miles of rivers and streams	29,794
- Border Miles	408
- Border Rivers: Chattooga, Tugaloo, Savannah, Catawba	
- Border Lakes: Hartwell, Thurmond, Russell, Wylie	
Number of lakes/reservoirs/ponds	
- 10 - 1000 acres (total acreage of 60,335)	1,598
- >1000 acres (total acreage of 461,402)	19
Estuarine waters (square miles)	401
Total miles of Ocean Coast	190
Freshwater wetlands (acreage)	4,146,510
Tidal wetlands (acreage)	512,490

### 2. Total Waters

The United States Environmental Protection Agency (USEPA) 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.

This system is based on the Digital Line Graph (DLG) database and the USEPA National Hydrography Dataset (NHD), that are in turn based on the United States Geological Survey (USGS) 1:100,000 scale topographic maps. The original DLG database was missing several lakes of relatively recent construction as well as a significant number of streams. Many of these missing features have been added by SCDHEC, with the cooperation and oversight of the USEPA. This revised system was utilized in this §305(b) report to estimate the sizes of the different use support categories and cause sizes for the Rivers and Streams, and Lakes summary statistics. Other base maps were used to estimate sizes for the Clean Lakes Program, Estuaries, and Shellfish Restrictions/Closures. These alternative databases are identified in the appropriate sections.

### 3. Water Pollution Control Program

#### A. Watershed Approach

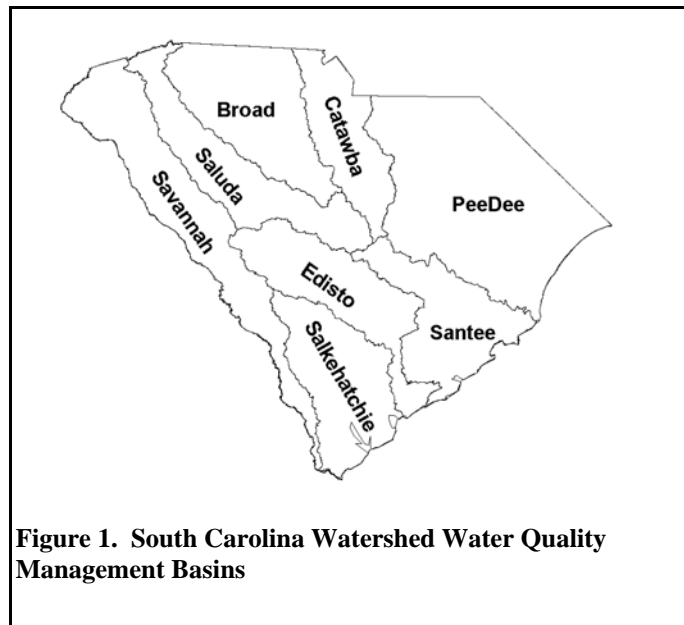
SCDHEC conducts water quality assessment and protection on a watershed basis in order to promote a coordinated approach to river basin development and water quality maintenance or improvement, to better address congressional and legislative mandates, to better utilize current resources, and to better 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, water quality modeling, planning, permitting, and other activities. In the Watershed Water Quality Assessments (WWQA), these activities are integrated by basin leading to watershed management plans and implementation strategies and serve to appropriately refocus water quality protection efforts.

Watershed water quality management planning and strategy development provides SCDHEC with the tools and information necessary for program implementation. The planning process and the resulting strategy provide a structured and predictable schedule for carrying out program elements to ensure the protection of the State's water resources. While an important aspect of the program is water quality problem identification and problem solving, the emphasis of the program is on problem prevention.

SCDHEC has divided the state into eight major drainage basins along USGS hydrologic units (Figure 1), encompassing approximately 280 Natural Resources Conservation Service (NRCS) watersheds. These watersheds serve as the hydrologic boundaries that guide SCDHEC water quality activities. The majority of water quality activities in these watersheds are based on a five-year rotation.

For most activities the Savannah and Salkehatchie basins are addressed in the same year, as are the Saluda and Edisto basins, and the Catawba and Santee basins. Five years are required to assess all basins in the State, and National Pollutant Discharge Elimination System (NPDES) permits have a five-year lifespan. Each year SCDHEC revises the assessment for the targeted basin(s). 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



**Figure 1. South Carolina Watershed Water Quality Management Basins**

identified and existing and potential contributors can be examined. Subsequently, waste assimilative capacities can be determined and allocated in a more equitable fashion.

Proposed permit issuances within a watershed are consolidated and presented to the public in groups rather than one at a time. By issuing all the NPDES permits during the same period, SCDHEC will be able to realize a resource savings and the public will realize an information advantage since all of the permitting activity for a specific area will occur in a specified period of time when public notices and public meetings and hearings will be conducted.

The watershed management process also focuses resources. Limited resources require targeting work efforts in order to maximize useful results. Focusing on specific basins each year allows SCDHEC to coordinate staff activities to make efficient use of available resources. While the statewide ambient monitoring network is maintained, the monitoring strategy has been revised so the regional monitoring staff concentrate on the targeted basin(s). The monitoring activities support the development of wasteload allocations and total maximum daily loads (TMDLs). Developing wasteload allocations and TMDLs on a watershed basis allows for an equitable assessment of all actual and potential impacts on the water quality from both point sources and nonpoint sources. Focusing decision making efforts in a single watershed will highlight the need to examine water quality standards and use designation for the appropriate waterbodies. An examination of the water quality and use designations may point to the need for site specific standards or stream classification changes.

In preparing the eight watershed assessments and in updating and revising each one on a five-year rotation, SCDHEC will be able to respond more efficiently, and in a timely manner, to federal requirements. More importantly, SCDHEC will be better able to utilize available resources, coordinate water quality improvement efforts, and protect water quality in South Carolina. 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).

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

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

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.

S.C. Regulation 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 Board of SCDHEC, approval by the General Assembly, and publication in the State Register. S.C. Regulation 61-68 was last amended on June 25, 2004 and R. 61-69 was last amended June 23, 2006. Proposed amendments to R. 61-68 are awaiting approval by the General Assembly and will be adopted upon EPA approval.

**Surface Water Classes - Freshwaters**

**Table 2. 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	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.
Put and Take	(See Freshwater Description)
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.

**Surface Water Classes - Saltwaters**

**Table 3. Saltwater Classifications and Descriptions**

<b>Saltwaters</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.

**Groundwater Classes**

**Table 4. 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 5. 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

### **Reclassifications and Site-Specific Criteria**

SCDHEC is presently reclassifying several waterbodies to recognize their best and/or existing uses. 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 and is currently considering designating other coastal waters as NDZs. In 2006 SCDHEC completed reclassifying several waterbodies within the boundary of the Congaree National Park to Outstanding Resource Waters (ORWs) and a portion of Cedar Creek which is contained within the boundary of the park to an Outstanding National Resource Water (ONRW). Cedar Creek is the State’s first ONRW.

Water reclassifications, NDZ designations, and site-specific criteria are amendments to state regulation and, as such, are not effective until approved by the South Carolina General Assembly and published in the State Register.

### **C. Point Source Program - Municipal 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.

#### *Loan Program*

Beginning with fiscal year 1989, the state established a State Revolving Loan Fund (SRF) program, with EPA providing annual capitalization grants to seed the SRF 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 SRF loans since fiscal year 1989 have totaled over \$587,402,714.00 through June 30, 2007.

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 SRF helps to improve and maintain water quality.

#### *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. There has been a direct benefit to in-stream water quality demonstrated from many, if not all, of the implemented pretreatment programs. 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.

### *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."

### *Land Application of Treated Waste*

SCDHEC issues State discharge permits to facilities that discharge directly to land as spray irrigation. This involves the application of, at least, secondary-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 ground-water 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, to produce marketable crops.
- (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 ground-water monitoring wells will provide a check on the effectiveness of the wastewater renovation and will serve as an early warning system for ground-water quality protection for nearby ground-water users. The direction of groundwater flow determines the placement of ground-water monitoring wells.

### *Strategies to Improve the Municipal 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**

#### *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.

#### *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. South Carolina's state agricultural program is and will continue to be more stringent than the federal NPDES program for animal facilities.

### *Toxics Controls*

Toxic pollutants are generally defined as substances which 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 contaminate 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 (i.e., to evaluate stormwater runoff).

### *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 not permitted as secondary limits, but are based on site-specific requirements.

### *Stormwater Permits- Industrial*

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

The general permits require permittee's 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 SWPPP's on an annual basis. Industrial construction activities are required to conduct inspections weekly and after every rainfall event of 1 inch or greater.

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 storm water discharges from industrial activity.

### *Stormwater Permits – Construction*

In addition to regulating storm water discharges associated with industrial activities, SCDHEC is charged with regulation storm water discharges originating from construction sites. This is done through the NPDES General Permit for Storm Water Discharges from Large and Small Construction Sites (SCR100000).

The newest version of the General Permit was issued in February of 2006 and is anticipated to

become effective in the spring of 2006. The new permit includes additional inspection and reporting requirements. Storm Water Pollution Prevention Plans (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.

#### *Stormwater Permits- MS4*

SCDHEC also regulates Municipal Separate Storm Sewer Systems (MS4s) in the overall storm water program. There were only two medium-sized MS4s in SC (both counties) that fell under the Phase I Storm Water NPDES program and both of these permits have been issued. With the promulgation of the Phase II Storm Water NPDES Permit regulations, there is an additional MS4 (a city) in South Carolina. SCDHEC has received an application for this MS4 and is presently reviewing the application to determine how to permit the MS4. Either an individual NPDES permit will be issued for this MS4 or the applicant will be made a co-permittee of the applicable county's existing MS4 permit. These permits help insure water quality protection within the boundaries of the affected municipal governments. There are over 70 small MS4s in South Carolina. Most of those have received coverage under the Small MS4 General Permit, however there are a few entities that have appealed their coverage. 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 have 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 diffuse, numerous 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 focuses 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 for the next five years.

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.

South Carolina receives funding in excess of \$3 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 total maximum daily loads (TMDLs). Since FY 2003, 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.

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), ammonia toxicity and total residual chlorine 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 and a TMDL is not required. 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. TMDLs WLAs for phosphorus have been developed for several streams including Eighteen Mile Creek, Reedy River, Bush River and Catawba River. There are also efforts underway for development of nutrient TMDLs for the Reedy River, Catawba River and a tributary of Lake Marion. 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.

## **H. Special State Concerns and Recommendations**

The Bureau of Water continues to implement the operational plan initiated in 2001. These efforts implement portions of the Agency's 2005 – 2010 strategic plan. Elements of the operational plan embrace the Bureau's mission and the Agency's values, and vision.

### **DHEC Values**

Customer service  
Teamwork  
Use of applied scientific knowledge  
Cultural competence  
Excellence in government  
Local solutions to local problems  
Our Employees

### **DHEC Vision**

Healthy people living in healthy communities

### **Bureau of Water Mission**

The Bureau of Water is working to ensure high quality drinkable, fishable and swimmable waters throughout South Carolina.

### **Bureau of Water Goals**

These eight goals of will ensure that our mission is accomplished while embracing the DHEC values and vision. Each goal is supported by indicators, outcomes, outputs and inputs specified in the operational plan.



**Goal 1:** Protect Surface and Ground Water Quality.

**Goal 2:** Adequately Assess Water Quality.

**Goal 3:** Reduce and Eliminate Water Pollution.

**Goal 4:** Protect and Restore Aquatic Habitat.

**Goal 5:** Provide Safe Drinking Water.

**Goal 6:** Protect Public Health and Safety.

**Goal 7:** Expand the Public's Knowledge about Water Issues.

**Goal 8:** Plan Effectively for Growth.

SCDHEC's Bureau of Water continues implementation of a Watershed Water Quality Management Program that is designed to maximize the use of resources, equalize workloads on an annual basis, and develop strategies for water quality maintenance or improvement on a priority basis. Since the implementation of our Watershed Water Quality Management Program, we have reduced the backlog of expired permits and significantly reduced the review time for permit applications. Completion of several complex TMDLs has helped reduce the backlog. The Watershed Water Quality Management Program also has allowed us to better utilize water quality monitoring resources to evaluate water quality in the State as well as wasteload modeling resources for permit limits development.

Our current or future activities will be focused on implementing the following recommendations and strategies. They are presented according to the goal they will help us attain.

*Protect Surface and Ground Water Quality*

- \* The Department completed a triennial review in January 2008. These regulation amendments are presently awaiting legislative approval. Major revisions include adoption of current federal criteria, addition of assessment methodology for enterococci bacteria, removal of language prohibiting mixing zones in source water protection areas, addition of a footnote to allow the use of the biotic ligand model to determine site specific fresh water copper limits, revision of the arsenic standard as allowed by EPA guidance and removal of the non-priority pollutants iron and manganese.
- \* The SCDHEC will continue an assertive process to evaluate and to properly classify SCDHEC waters. In 2006, we completed reclassifying waters within the Congaree National Park to be classified as Outstanding National Resource Waters.
- \* The SCDHEC continues its point source permitting policy of issuing water quality based NPDES permits.

### *Adequately Assess Water Quality*

- \* Water quality monitoring efforts must be continually revised and expanded to address the additional potential impacts of increasing population and development. We have completed our fifth year of monitoring waters at statistically selected stations for lakes and rivers and use these data for our overall statements about water quality in this report. There remains the need for increased analytical capabilities to measure the presence of chemicals at very low concentrations. A greater emphasis on biological integrity is also a recognized need. We participated in the national Wadeable Streams Monitoring effort and are assisting in data evaluation. The SCDHEC must continue to seek resources to develop and implement more extensive biological monitoring and assessment. Recognizing that EPA may be moving away from STORET, we are exploring other ways to house our monitoring data.

### *Reduce and Eliminate Water Pollution*

- \* Improving water quality of impaired waters continues to be a SCDHEC priority. The SCDHEC must develop Total Maximum Daily Loads (TMDLs) for all waters listed on the 303(d) list of impaired waters. The SCDHEC is using State appropriations and some of the Federal Section 319 funds to assist with TMDL development. With the goal to improve as many waters as possible so that water quality standards are consistently met, we are using Section 319 funds to implement controls for water quality improvement in impaired waters (TMDL Implementation for nonpoint source reductions). More than 320 TMDLs have been approved, 20 are currently under development, and 74 TMDLs are currently being implemented through Section 319 funds.
- \* Regulations dealing with Phase II of the National Pollutant Discharge Elimination System (NPDES) storm water permit program have been finalized. The general permit for small MS4s became effective on March 1, 2006. All small MS4s, except for a few, have been granted coverage. The remaining programs have appealed their coverage under the general permit. The general permit for construction activities became effective on September 1, 2006. The general permit for industrial activities expires in August of 2008. SCDHEC is working on the reissuance of this permit. Additional positions have been added to assist with permitting and compliance. These positions will be located in our Regional offices and will work with the MS4s and on issuing coverage under the construction general permit. As always, additional inspectors would make this program more effective.

### *Protect and Restore Aquatic Habitat*

- \* The SCDHEC will more aggressively integrate the Shellfish Sanitation Program into its ongoing efforts to maintain and enhance water quality by focusing corrective actions on impaired shellfish harvesting waters.
- \* The SCDHEC will continue to protect wetlands as waters of the State through its water programs including 401 water quality certification, NPDES permitting, and State stormwater permitting. The SCDHEC is using storm water permitting programs in conjunction with the SC Pollution Control Act to attempt protect isolated wetlands since a Supreme Court decision removed them from regulatory jurisdiction of the Corps of Engineers. We have not been successful in amending water quality certification regulations to provide for protection of isolated wetlands; however, a new statute to protect isolated wetlands was introduced by the Legislature in 2006.

### *Provide Safe Drinking Water*

- \* Source Water Protection and Wellhead Protection Programs continue to receive priority to insure drinking water uses of surface and ground waters are given the highest levels of protection. The SCDHEC has completed all source water protection reports for existing sources. Source water protection reports are developed for new sources as they are permitted.

### *Protect Public Health and Safety*

- \* The Agency continues to maintain a robust fish tissue-monitoring program. The outreach and education programs have been expanded and include public service announcements and health advisory signs at boat landings.
- \* Ocean water quality monitoring with appropriate advisories to the public continues with federal funding under the BEACH Act. In Horry County, the SCDHEC has developed a rainfall model to assist in advisory postings.

### *Expand the Public's Knowledge about Water Issues*

- \* The SCDHEC publishes environmental quality data in its annual report, *Healthy People Living in Healthy Communities*, to inform and educate the general public, State legislature, and State congressional delegation as to the status of our progress to date and important issues. This effort to increase the general awareness of the citizens of the State to the mission, programs, and achievements of the SCDHEC and to help them better understand environmental issues should be expanded through other activities that facilitate interaction between citizens and SCDHEC representatives.
- \* The Bureau of Water has a stable Outreach program to provide education in

connection with nonpoint source pollution and drinking water issues. The mission of the bureau Outreach program is to support the goal of high quality drinkable, fishable, and swimmable waters through the development, implementation and evaluation of quality and timely Outreach programs, resources and services. These programs and services include communication strategies consultation, grant awards for youth environmental projects, resource development and implementation, and targeted outreach activities addressing current water issues.

- \* The Bureau of Water has an excellent Internet web site to facilitate information exchange and to provide public participation in the regulatory process. We continue to provide speakers to address issues of interest to the public and have participated in developing an education curriculum for primary and secondary schools.
- \* In addition to public education on water quality issues, we also recognize the need to provide public forums for participation in water quality management planning and TMDL development.
- \* The SCDHEC continues to expand and upgrade its computer and electronic capabilities, including implementation of the new STORET database system. We are also using a LIMS (Laboratory Information Management System) to input data from the lab into STORET. There are numerous areas where electronic management and processing of data and tracking systems would relieve valuable manpower for other activities and allow a more effective use of available resources. The SCDHEC is anticipating the move to the ICIS data system.

### *Plan Effectively for Growth*

- \* The Governors of South Carolina and Georgia, through Executive Orders, established committees specifically for the purpose of protecting shared water resources. They are currently engaged in discussions on two issues that could significantly affect growth in both states: saltwater intrusion into the upper Floridan aquifer and development and implementation of a Total Maximum Daily Load for the Savannah River.
- \* Legislation in both South Carolina and North Carolina established joint river basin advisory commissions for the Catawba/Wateree River and the Yadkin/Pee Dee River. Members have been named for the Catawba/Wateree Commission and they have met several times. Issues of concern are ensuring adequate quantity for downstream uses and increased pollutant loadings into the Catawba River.
- \* Legislation to allow the SCDHEC to regulate water withdrawals has been introduced. Governor's Water Law Review Committee recommended in its 2004 Report that this legislation is needed for South Carolina to be able to negotiate with neighboring states on water quantity issues.

- \* Waccamaw and Low Country regions of the State have been designated capacity use areas for groundwater for many years. The Trident area was designated in 2002, the Pee Dee area was designated in early 2004 and Hampton County was designated in 2008.

## **SURFACE WATER ASSESSMENT**

### **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, cyclic watershed monitoring, and statewide probability-based 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.net/environment/water/docs/strategy.pdf>.

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

The statewide Probability-Based, or random sampling, 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 probability-based monitoring design is a type of a survey design in that 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 probability-based 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 in association with the U.S. Environmental Protection Agency, National Health and Environmental Effects Research Laboratory (NHEERL), Corvallis, Oregon. Random Sites are sampled once a month for one year, and a new statewide set of probability-based random 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.net/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 probability-based 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) provides laboratory services to the Bureaus of Water and Land and Waste Management. The analytical services offered include bacteriological, chemical, and physical analyses. The types of samples analyzed include water, wastewater, leachate, soil, sediment, chemical waste, fish, and shellfish.

The organizational structure encompasses five sections and seven regional laboratories. The Central Laboratory Sections include Sample Characterization/ Automated Analysis/ Data Management, Metals Analysis, Organic Analysis, and Environmental Microbiology located in the Hayne Building in Columbia. The Radiological Environmental Monitoring Section is located in the Sims/Aycock Building in Columbia. The seven regional laboratories are located in Aiken, Beaufort, North Charleston, Florence, Greenville, Lancaster, and Myrtle Beach.

The Regional Laboratories, except for Beaufort and Myrtle Beach, initiate all stream and wastewater analysis. The Central Laboratories provide support analyses, i.e., metal, nutrient, toxic extraction procedures, and organic analyses. The Beaufort and Myrtle Beach Regional Laboratories analyze microbiological samples only. The Central Laboratory also acts as the Regional Laboratory for the Central Midlands District, performing the same functions as the other Regional Laboratories. Drinking Water Chemical Analysis is essentially a Central Laboratory program with support from the Regional Laboratories. 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 Assurance Management Plan, 2003. 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 Deputy Commissioner for Environmental Quality Control 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 Office (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 Office (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 these goals the Water Quality Monitoring Section, Aquatic Biology Section, and Pollution Source Compliance Section have developed and instituted SQAMO approved field study procedures and documentation, data review, and routine EPA operating overview. These procedures are documented in SCDHEC's Environmental Investigations Standard Operating Procedures and Quality Assurance Manual (SOP) (2006). This document describes in detail the field sampling procedures, meter calibration and maintenance procedures, sample chain-of-custody documentation, sample preservation, holding times and recommended sample containers specifications, data sheet examples, and data submission requirements.

At least once yearly all field personnel are accompanied on sample collection activities by the appropriate program quality assurance officer for evaluation of adherence to standard operating procedures (SOP) for QA/QC. These evaluations each year are for water quality monitoring SOP review and for facility compliance sampling SOP review. Approximately every other year the EPA conducts on-site routine overviews of SCDHEC's QA/QC procedures.

The Division Director and the Quality Assurance Officer for EQC Laboratories coordinate the internal quality assurance program. The laboratory quality assurance program encompasses every aspect of the laboratory analysis from container preparation through the actual data release from the Analytical Services Laboratory to the Environmental Quality Control (EQC) Programs.

Analytical Services has developed two quality control manuals that detail the day-to-day operation of the quality assurance program: (1) Procedures and Quality Control Manual for Chemistry Laboratories--Analytical Services; and (2) Laboratory Procedures Manual for Environmental Microbiology-- Analytical Services. The elements of quality control addressed in the manuals include organization and 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 stated. Performance samples are also analyzed as noted in the manuals. 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 seven 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, whatever is appropriate.

The laboratory analyses are conducted according to the List of Approved Test Procedures in the



Federal Register, Volume 49, No. 209, October 26, 1984; Federal Register, Volume 59, No. 20, January 31, 1994; and Federal Register, Volume 67, No. 205, October 23, 2002. 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 that 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 includes 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 and sediment 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 (see Figure 5). All Ambient Surface Water Physical & Chemical Monitoring data are distributed by the Water Pollution Control Division to the Data Administration Section where the data are reviewed, edited and stored into the LIMS/SIMS Process database. Then the Water Quality Monitoring Section performs a 10 percent review of all data to ensure quality assurance of the data. The data are stored on at least an annual basis in the EPA's STORET distributed water quality database. Data sheets are kept on file in the Water Quality Monitoring Section.

After biological samples are collected, data sheets are kept on file in the Aquatic Biology Section until sample analysis is completed. Macro invertebrate and habitat data are entered into an in-house relational database program. Phytoplankton data are stored in a separate in-house database. Fish tissue results are entered into an Excel database and hard copies are filed and kept on site. Data sheets describing biological data are kept on file in the Aquatic Biology Section.

## **2. Assessment Methodology**

### **A. Probability-Based §305(b) Assessment Approach**

The initial selection of prospective probability-based, or random, monitoring site locations is conducted by 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 grid system and computer selection program is used to randomly select a particular grid to achieve a statewide spatial distribution of sites, and then a specific location within a selected grid is chosen according to the specifics of each waterbody design as described below.

The basic starting dataset 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.

### *Rivers and Streams*

Streams of different sizes may be more or less sensitive to different types of environmental perturbations. Because of this, three stream sizes have been specifically targeted to ensure they are represented in the selected random sites. Approximately 30 total randomly selected stream sites are sampled each year. Each site is sampled monthly for one year.

1. 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.
2. Second 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.
3. Third Order and larger streams, that 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 sizes 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 equal numbers of sites in all three stream sizes. 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.

### *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 public access. 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 random sites. Approximately 30 total randomly selected lake and reservoir sites are sampled each year. Each site is sampled monthly for one year.

1. Major Lakes/Reservoirs greater than 850 acres surface area.
2. Minor Lakes/Reservoirs greater than 40 acres surface area, but less than or equal to 850 acres.

These different sizes 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 equal numbers of sites in both sizes. 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.

### *Estuaries*

The coastal estuarine probability-based 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 dubbed the South Carolina Estuarine and Coastal Assessment Program (SCECAP) and sampling of the probability-based 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.

1. 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.
2. Open Water areas, identified as greater than 100 meters wide on the GIS cover, represent larger estuarine rivers and sounds.

Within these waterbody types there are two distinct types of monitoring sites based on sampling frequency, Core Sites and Supplemental Sites. Core Sites are sampled monthly for one year by SCDHEC for water column physical and chemical parameters and are used for §305(b) reporting purposes.

The Supplemental Sites are sampled one time by SCDNR-MRRI and SCDHEC and are used in conjunction with one time samples collected at the Core Sites in the SCECAP reports and USEPA National Coastal Assessment.

Each year there will be approximately 15 Core Tidal Creek sites and 15 Core Open Water sites. 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**

### *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 defined in S.C. Regulation 61-68, *Water Classifications and Standards*. 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. To determine the appropriate classified uses and water quality criteria for specific waterbodies and locations, refer to S.C. Regulation 61-69, *Classified Waters*, in conjunction with S.C. Regulation 61-68.

Water samples for analysis are collected as surface grab samples once per month, quarter, or year, depending on the parameter. Grab samples collected at a depth of 0.3 meters are considered to be a surface measurement. At most stations sampled by boat, dissolved oxygen and temperature are sampled as a water column profile, with measurements being made at either a depth of 0.3 meters below the water surface and at one-meter intervals to the bottom or at 0.3 meters, bottom and mid-depth. 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 comparisons. 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 standard procedures (SCDHEC 2006).

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 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.

Macroinvertebrate community structure is analyzed routinely at selected stream stations as a means of detecting adverse biological impacts on the aquatic fauna of the state's waters due to water quality conditions that may not be readily detectable in the water column chemistry.

The following statewide assessment information is based on the available quality assured physical,

chemical and biological water quality data collected through the probability-based monitoring design from 2002-2006.

*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. The degree that aquatic life is protected (Aquatic Life Use Support) is assessed by comparing important water quality characteristics and the concentrations of potentially toxic pollutants with numeric criteria.

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

If the appropriate criterion for dissolved oxygen and pH are contravened in 10 percent or less of the samples, the criterion is said to be fully supported. If the percentage of criterion excursions 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 excursions, 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.

If the appropriate acute or chronic aquatic life criterion for any individual toxicant (heavy metals, priority pollutants, ammonia) 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 40CFR131.36(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. If the criterion is exceeded in more than 10 but less than 25 percent, sites are evaluated on a case-by-case basis to determine if local conditions indicate that classified uses are impaired. Among the characteristics considered are: hydrology and morphometry of the waterbody, existing and projected trophic state, characteristics of pollutant loadings and ongoing pollutant control mechanisms. If the criterion is exceeded in less than 10 percent of the samples, then the criterion is fully supported.

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. 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.

***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 pollution 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.

***Recreational Use Support*** - The degree to that the swimmable goal of the Clean Water Act is attained (Recreational Use Support) is based on the frequency of fecal coliform bacteria excursions.

For fecal coliform bacteria, an excursion is an occurrence of a bacteria concentration greater than 400/100 ml for all surface water classes. Comparisons to the bacteria geometric mean standard are not considered appropriate based on sampling frequency and the intent of the standard.

If 10 percent or less of the samples are greater than 400/100 ml 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.

### **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 probability site selection validation, South Carolina has an estimated 21,782 miles of freshwater rivers and streams representing the stream sampling design frame previously described. Because of the inability to reach some selected locations, the 147 probability-based monitoring sites sampled from 2002-2006 represent 12,594 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 probability-based estimates signify that it is 95% certain that the true mileage is between the upper and lower confidence limits.

**Table 6. Rivers and Streams Use Support Summary (Miles)**

<b>Indicator</b>	<b>Category</b>	<b>Probability-Based Estimated Percent of Total Resource</b>	<b>Probability-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	67.2%	8,443	7197	9689
	Partially Supporting	20.7%	2,594	1,600	3,588
	Not Supporting	12.1%	1,517	905	2,128
Recreational Use	Fully Supporting	42.2%	5,295	4,191	6,400
	Partially Supporting	18.7%	2,347	1,488	3,207
	Not Supporting	39.1%	4,911	3,836	5,985

**Table 7. Summary of Fully Supporting and Impaired Rivers and Streams (Not including Fish Consumption Use)**

<b>Category</b>	<b>Probability-Based Estimated Percent of Total Resource</b>	<b>Probability-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	31.7%	3,976	3,012	4,941
Impaired for One or More Use	66.3%	8,577	NA	NA



**Table 8. Total Sizes of Rivers and Streams Impaired by Various Cause Categories (Miles)**

<b>Cause Category</b>	<b>Probability-Based Estimated Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Miles)</b>	<b>Upper 95 Percent Confidence Interval (Miles)</b>
Macroinvertebrate Community	2,822	1,799	3,846
Turbidity	81	0	222
Dissolved Oxygen	917	439	1,395
pH	472	50	894
Chromium	55	0	150
Copper	444	106	781
Nickel	55	0	150
Zinc	565	153	978
Fecal Coliform Bacteria	7,258	6,106	8,411

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

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

Based on the modified USEPA National Hydrography Dataset (NHD) and the results of probability site selection validation, South Carolina has an estimated 318,033 acres of lake and reservoir representing the lake/reservoir sampling design frame previously described. Because of the inability to reach some selected locations, the 144 probability-based monitoring sites sampled from 2002-2006 represent 309,063 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 probability-based estimates signify that it is 95% certain that the true acreage is between the upper and lower confidence limits.

**Table 9. Lake Use Support Summary (Acres)**

<b>Indicator</b>	<b>Category</b>	<b>Probability-Based Estimated Percent of Total Resource</b>	<b>Probability-Based Estimated Acres of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Acres)</b>	<b>Upper 95 Percent Confidence Interval (Acres)</b>
Aquatic Life Use	Fully Supporting	89.1%	275,388	251,007	299,769
	Partially Supporting	4.4%	13,601	2,988	24,214
	Not Supporting	6.5%	20,073	6,810	33,337
Recreational Use	Fully Supporting	99.9%	308,869	286,252	331,485
	Partially Supporting	0.1%	194	0	428

**Table 10. Summary of Fully Supporting and Impaired Lakes (Not including Fish Consumption Use)**

<b>Category</b>	<b>Probability-Based Estimated Percent of Total Resource</b>	<b>Probability-Based Estimated Acres of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Acres)</b>	<b>Upper 95 Percent Confidence Interval (Acres)</b>
Fully Supporting All Assessed Uses	89.0%	275,194	250,806	299,582
Impaired for One or More Use	11%	33,868	NA	NA

**Table 11. Total Sizes of Lakes Impaired by Various Cause Categories (Acres)**

<b>Cause Category</b>	<b>Probability-Based Estimated Acres of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Acres)</b>	<b>Upper 95 Percent Confidence Interval (Acres)</b>
Turbidity	582	230	934
Dissolved Oxygen	291	134	448
pH	22,668	9,151	36,186
Total Phosphorus	19,589	6,327	32,850
Total Nitrogen	194	0	431
Chlorophyll- <i>a</i>	388	72	704
Copper	194	0	428
Zinc	291	134	448
Fecal Coliform Bacteria	194	0	428

**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 that uses 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.

*Background*

Monthly 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, cyclic watershed monitoring, and statewide probability-based monitoring.

*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 13 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 12. Condition of Significant South Carolina Lakes**

Lake Sites Not Attaining Numeric Nutrient Criteria		
PIEDMONT		
STATION ID(S)	Location	Parameters
RL-05403	BOYD MILL POND 0.5 MI NW OF BRIDGE OVER REEDY RIVER ON SC 252	TP
RL-02452	CEDAR CK RES 0.15 MI SE OF S TIP PICKETT ISLAND	TP
RL-02319	CEDAR CK RES FROM W OF BIG ISL 7 MI BELOW ROCKY CK CONFL	TP
CW-033	CEDAR CK RESERVOIR 100 M N OF DAM	TP
CW-174	CEDAR CK RESERVOIR AT UNIMP RD AB JCT WITH ROCKY CK	TN, TP
CW-175	CEDAR CK RESERVOIR/ROCKY CK AT S-12-141 SE OF GREAT FALLS	TP
RL-05391	CEDAR CREEK RESERVOIR 0.42 MI NNW OF S-29-405 ON LANCASTER CHESTER COUNTY LINE	TP
RL-04379	CEDAR CREEK RESERVOIR 1.25 MI ESE OF GREAT FALLS NW OF HILL ISLAND	TP
RL-03353	CEDAR CREEK RESERVOIR 1.9 MI SE OF GREAT FALLS AND E OF BIG ISLAND	TP
RL-04375	CEDAR CREEK RESERVOIR 2.2 MI SE OF GREAT FALLS SE OF BOWDEN ISLAND	TP
RL-05416	CEDAR CREEK RESERVOIR DEBUTARY CREEK BRANCH 0.4 MI E OF DEBUTARY CREEK AND S-20-268	TP
RL-06431	CEDAR CREEK RESEVOIR 1.6 MI SE OF GREAT FALLS E OF BIG ISLAND	TP
RL-06468	CHESTER SATE PARK LAKE 2.5 MI SW OF CHESTER	CHL-A
CW-016F	FISHING CK RES 2 MI BL CANE CREEK	TN, TP
CW-057	FISHING CK RES 75 FT AB DAM NR GREAT FALLS	TP
RL-03351	GREAT FALLS RESERVOIR 0.3 MI NE OF DAM AND W OF BIG ISLAND	TP
RL-03332	GREAT FALLS RESERVOIR 0.9 MI NE OF GREAT FALLS	TN, TP
RL-05414	GREAT FALLS RESERVOIR 1 MI EAST OF JUNCTION OF SC 99 AND US 21	TP
RL-03458	GREAT FALLS RESERVOIR 1 MI NE OF GREAT FALLS	TP
RL-06429	GREAT FALLS RESERVOIR 1.2 MI SE OF GREAT FALLS W OF BIG ISLAND	TP
RL-06438	LAKE AT CHESTER STATE PARK 0.8 MI SE OF ENTRANCE	CHL-A
S-308	LAKE GREENWOOD, REEDY RVR ARM, 150 YDS US RABON CK	TP
SV-268	LAKE HARTWELL - EIGHTEEN MILE CK ARM AT S-04-1098	TP
CL-035	LAKE JOHNSON AT SPILLWAY AT S-42-359	TP, CHL-A
S-309	LAKE MURRAY, BUSH RVR ARM, 4.6 KM US SC 391	TP, CHL-A
S-222	LAKE MURRAY, LITTLE SALUDA ARM AT SC 391	TP
CL-021	LAKE OLIPHANT, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES	CHL-A
RL-02314	LAKE WATEREE 1.0 MI SW FROM MOUTH OF BEAVER CK	TP
RL-03336	LAKE WATEREE NEARSHORE ALONG S-28-802 OPP COLONEL CK CONFL	TP

CW-207	LK WATEREE AT END OF S-20-291	TP
CW-208	LK WATEREE AT S-20-101 11 MI ENE WINNSBORO	TP, CHL-A
CW-209	LK WATEREE AT SMALL ISLAND 2.3 MI N OF DAM	TP
CW-231	LK WATEREE HEADWATERS APPROX 50 YDS DS CONFL CEDAR CK	TP
B-346	PARR RESERVOIR 4.8 KM N OF DAM, UPSTREAM MONTICELLO RESERVOIR	TP
<b>SOUTHEASTERN PLAINS</b>		
<b>STATION ID(S)</b>	<b>Location</b>	<b>Parameters</b>
CL-077	LAKE ASHWOOD, FOREBAY MOVED TO CATWALK NEAR DAM	TN, CHL-A
CL-064	LAKE EDGAR BROWN IN FOREBAY NEAR DAM	TP, CHL-A
RL-04388	LAKE MARION 0.5 MI NE OF CALHOUN LANDING (USE SC-044)	TP
C-058	LK INSPIRATION - ST MATTHEWS (FRONT OF HEALTH DEPT)	TN, TP
RL-02308	LK MARION @ CHANNEL MARKER 69; USE SANTEE COOPER SC-016	TP
ST-025	LK MARION AT OLD US 301/15 BRDG AT SANTEE (SC-015)	TP
SC-040	MID LAKE MARION @ CHANNEL MARKER 79	TP
SC-017	MID LAKE MARION @ TAW CAW CREEK EMBAYMENT	TP
SC-014	UPPER LAKE MARION @ HEADWATERS OF CHAPEL BRANCH CREEK	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-010	UPPER LAKE MARION AT CHANNEL MARKER 150	TP
SC-005	UPPER LAKE MARION NEAR PACK'S LANDING	TP
RL-05412	GOOSE CREEK RESERVOIR 0.55 MI W OF DAM	TP
RL-03340	GOOSE CREEK RESERVOIR 1.0 MI NW OF SPILLWAY NEAR W SHORELINE	TP, CHL-A
RL-06434	GOOSE CREEK RESERVOIR 2 MI N OF SPILLWAY	TP
RL-04390	GOOSE CREEK RESERVOIR 2.8 MI NW OF SPILLWAY NEAR OTRANTO	TP
<b>MIDDLE ATLANTIC COASTAL PLAIN</b>		
<b>STATION ID(S)</b>	<b>Location</b>	<b>Parameters</b>
ST-033	GOOSE CK RESERVOIR AT 2ND POWERLINES US OF BOAT RAMP	TP, CHL-A
ST-032	GOOSE CREEK RESERVOIR 100 M US OF DAM	TP, CHL-A
RL-03331	LAKE WARREN 0.2 MI W OF SPILLWAY NE CORNER OF LAKE CLOSER TO LAKE WARREN ST PARK SHORELINE	TN,TP,CHL-A
<b>Lake Sites Attaining Numeric Nutrient Criteria</b>		
<b>BLUE RIDGE</b>		
<b>STATION ID(S)</b>	<b>Location</b>	
RL-06430	LAKE JOCASSEE 1 MI SSE OF DOUBLE SPRINGS MOUNTAIN	
RL-04380	LAKE KEOWEE, EASTATOE CREEK ARM 0.5 MI N OF KEOWEE/TOXAWAY STATE PARK	
RL-04376	LAKE YONAH 0.65 MI NNE OF SPILLWAY	
SV-358	LAKE YONAH, 50% BETWEEN CENTER OF SPILLWAY AND OPPOSITE SHORE	

SV-336	LK JOCASSEE AT CONFLUENCE OF THOMPSON AND WHITEWATER RVRS
SV-335	LK JOCASSEE AT TOXAWAY, HORSE PASTURE, & LAUREL FORK CONFLUENCE
CL-019	LK JOCASSEE IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
SV-337	LK JOCASSEE OUTSIDE COFFER DAM AT BAD CK PROJECT
SV-334	LK JOCASSEE, MAIN BODY
S-292	NORTH SALUDA RESERVOIR AT WATER INTAKE
S-291	TABLE ROCK RESERVOIR AT WATER INTAKE
SV-359	TUGALOO LAKE, FOREBAY EQUIDISTANT FROM SPILLWAY AND SHORELINES
PIEDMONT	
STATION ID(S)	Location
B-099B	AT DAM LK LANIER IN GREENVILLE CO
S-223	BLACKS BR, LK MURRAY AT SC 391
RL-03355	BROADWAY LAKE 0.5 NW OF SPILLWAY NEARSHORE OPPOSITE END OF S-04-152
RL-06421	BROADWAY LAKE 1 MI SW OF JUNCTION OF US HWY 178 AND US HWY 76
SV-321	BROADWAY LAKE FOREBAY, 50% BETWEEN SPILLWAY AND OPPOSITE LAND
SV-319	BROADWAY LAKE, BROADWAY CK ARM UPSTREAM OF PUBLIC ACCESS
SV-258	BROADWAY LAKE, NEALS CK ARM 50% BETWEEN BANKS AT GOLF COURSE
RL-06443	CEDAR CREEK RESEVOIR 2.3 MI SE OF GREAT FALLS S OF PICKET ISLAND
CL-023	CHESTER STATE PARK LAKE 100 M EAST OF SPILLWAY
RL-05407	CLARKS HILL RESERVOIR 0.3 MI S OF BOAT RAMP AT THE END OF S-33-366
RL-05463	CLARKS HILL RESERVOIR 0.67 MI NW OF US 378
RL-05405	CLARKS HILL RESERVOIR 1.25 MI S OF THE END OF S-33-337
RL-06423	CLARKS HILL RESERVOIR 6.9 MI SSE OF MCCORMICK
SV-291	CLARKS HILL RESERVOIR AT US 378 7 MI SW MCCORMICK
RL-04385	CLARKS HILL RESERVOIR COVE 0.5 MI SW OF HAMILTON BRANCH STATE PARK
CL-040	CLARKS HILL RESERVOIR HEADWATERS (SAVANNAH RVR)
CL-041	CLARKS HILL RESERVOIR IN FOREBAY NEAR DAM
RL-03357	CLARKS HILL RESV NW HICKORY KNOB ST PARK OPP PATTERSON CK
B-735	DUNCAN CREEK RESERVOIR 6B IN FOREBAY NEAR DAM
B-110	ELIZABETH LAKE AT SPILLWAY ON US 21
S-211	HOLLANDS LANDING LK MURRAY OFF S-36-26 AT END OF S-36-3
RL-05413	JOHN D. LONG LAKE 0.2 MI NW OF DAM
RL-03345	LAKE BLALOCK 0.1 MI SE BUCK CREEK CHURCH/S-42-189
RL-04363	LAKE BLALOCK 0.3 MI UPLAKE OF US 221
RL-04389	LAKE BLALOCK 0.6 MI UPLAKE OF US 221

RL-06447	LAKE BLALOCK 0.8 MI SE OF BRIDGE US 221 OVER LAKE
RL-04367	LAKE BLALOCK 0.9 MI UPLAKE OF US 221
RL-02323	LAKE BLALOCK AT S-42-43
RL-04461	LAKE BLALOCK AT US 221
B-347	LAKE BLALOCK IN FOREBAY NEAR DAM
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-02455	LAKE BROADWAY 0.2 MI NW OF ALLEN PARK
B-343	LAKE CHEROKEE IN FOREBAY NEAR DAM
RL-05399	LAKE COOLEY 2.5 MI N OF WELLFORD
B-348	LAKE COOLEY IN FOREBAY NEAR DAM
CL-033	LAKE CRAIG 45 M NORTHWEST OF DAM
B-341	LAKE CUNNINGHAM IN FOREBAY NEAR DAM
S-097	LAKE GREENWOOD - CANE CK ARM AT SC 72 3.1 MI SW CROSS HILL
RL-02311	LAKE GREENWOOD 1.0 MI NW OF SEABOARD RR CROSSING
RL-04387	LAKE GREENWOOD 2.2 MI NW OF LAKE GREENWOOD STATE PARK
S-303	LAKE GREENWOOD 200 FT US OF DAM
S-024	LAKE GREENWOOD, HEADWATERS, JUST US S-30-33
S-307	LAKE GREENWOOD, RABON CK ARM, .8 KM N RD S-30-307
RL-05417	LAKE HARTWELL 0.3 MI SOUTH OF SC 24 BRIDGE OVER SENECA RIVER ARM
RL-03333	LAKE HARTWELL 3.9 MI NW OF SADLERS CREEK ST PARK
RL-05392	LAKE HARTWELL 5.96 MI SSW OF PENDELTON
RL-06444	LAKE HARTWELL 8.9 MI WSW OF WESTMINISTER
SV-236	LAKE HARTWELL AT S-37-184 6.5 MI SSE OF SENECA
RL-04371	LAKE HARTWELL COVE 0.75 MI SE OF SADLERS CREEK STATE PARK
SV-249	LAKE HARTWELL HEADWATERS, SENECA RVR ARM AT SC 183 3.8 MI WSW SIX MILE
SV-363	LAKE HARTWELL OFF GLENN FORD LANDING US BEAVERDAM CK COVE
RL-04378	LAKE HARTWELL, SENECA RVR ARM 0.8 MI WNW OF CLEMSON LOOKOUT TOWER
RL-06432	LAKE ISSAQUEENA 0.1 MI N OF SPILLWAY
SV-360	LAKE ISSAQUEENA, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-02327	LAKE J. ROBINSON 0.4 MI S OF S-23-113
RL-02453	LAKE J. ROBINSON 0.7 MI S OF S-23-113
RL-05395	LAKE J. ROBINSON 0.77 MI NNW OF BRIDGE OVER BEAVERDAM CREEK ON S-23-92
RL-06445	LAKE J. ROBINSON 0.92 MI S BRIDGE S-23-113 OVER LAKE
RL-04365	LAKE J. ROBINSON 1 MI NNW OF DAM
RL-06449	LAKE J. ROBINSON 1.7 MI NNE BRIDGE S-23-113 OVER LAKE
RL-04361	LAKE J. ROBINSON 2.3 MI NNW OF DAM
RL-02321	LAKE J. ROBINSON 6.3 MI NNW OF GREER
RL-03343	LAKE J. ROBINSON IN COVE 0.5 MI SW OF S-23-113 CROSSING

CL-100	LAKE J. ROBINSON, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
B-344	LAKE JOHN D. LONG IN FOREBAY NEAR DAM
RL-05466	LAKE KEOWEE 0.25 MI NWN OF S-37-340 AND S-37-588
RL-03354	LAKE KEOWEE 1.6 MI NW OF SC 188 & 0.7 MI SE OF S-37-175
RL-05394	LAKE KEOWEE 5.06 MI NNW OF SECEA
RL-02304	LAKE KEOWEE 7.0 MI E OF WALHALLA
RL-05418	LAKE MURRAY 0.38 MI SSE OF S-32-1322
RL-06442	LAKE MURRAY 0.65 MI NW JUNCTION OF S-32-109 AN S-32-38
RL-05420	LAKE MURRAY 0.7 MI NNW OF LAKE MURRAY SHORES
RL-03338	LAKE MURRAY 0.8 MI S OF COUNTS ISLAND & 0.75 MI NW OF LUNCH ISLAND
RL-06440	LAKE MURRAY 0.95 MI NE OF END S-32-1239
RL-05410	LAKE MURRAY AT END OF SHULL ISLAND AT THE END OF S-32-115
S-213	LAKE MURRAY AT S-36-15
RL-03334	LAKE MURRAY COVE 1.3 MI W OF BALLENTINE
RL-04372	LAKE MURRAY HOLLOW/HORSE CREEKS ARM 1.75 MI NNE OF US 378 CROSSING
RL-02316	LAKE MURRAY SW OF JAKES MARINA
S-310	LAKE MURRAY, SALUDA RVR ARM, US BUSH RVR, 3.8 KM US SC 391
S-798	LAKE OOLENOY AT DRAIN NEAR SPILLWAY AT SC 11
RL-02307	LAKE OOLENOY SAMPLED FROM S SIDE OF SC 11 BRIDGE
RL-03359	LAKE RABON 0.6 MI SE S-30-312
S-296	LAKE RABON 300 FT US OF DAM
RL-02305	LAKE RABON NEAR BOAT LANDING ON UNN CNTY RD OFF S-30-54
RL-02303	LAKE RABON NEAR NE SHORE AND BELOW US 76
S-313	LAKE RABON, N RABON CK ARM, 2.5 MI US DAM
RL-05411	LAKE RABON, N RABON CK ARM, 2.8 MI UPSTREAM FROM DAM
S-312	LAKE RABON, S RABON CK ARM, AT S-30-312
SV-100	LAKE RUSSELL AT SC 181 6.5 MI SW STARR
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-02309	LAKE STROM THURMOND NEAR HAMILTON BRANCH ST PK
B-342	LAKE THICKETTY IN FOREBAY NEAR DAM
RL-02301	LAKE THICKETTY NEAR SE SHORE APPROX 1.0 MI FROM MACEDONIA
RL-03341	LAKE WHELCHER 2.7 MI NE OF GAFFNEY LAUNCH FROM GAFFNEY PUBLIC WORKS BOAT LANDING
RL-06435	LAKE WHELCHER 3 MI NE OF GAFFNEY
RL-03339	LAKE WYLIE 0.1 MI W OF TEGA CAY SAMPLE CLOSER TO TEGA CAY SIDE
RL-06433	LAKE WYLIE 0.5 MI W OF TEGA CAY SAMPLE CLOSER TO TEGA CAY SIDE
CW-197	LAKE WYLIE AB MILL CK ARM AT END OF S-46-557
CW-230	LAKE WYLIE AT DAM, UNDER POWERLINES



CW-198	LAKE WYLIE OUTSIDE MOUTH OF CROWDERS CK ARM
CW-245	LAKE WYLIE, CROWDERS CK ARM AT FIRST POWERLINES US OF MAIN POOL
B-737	LAKE YORK IN KINGS MOUNTAIN STATE PARK
CL-039	LITTLE RIVER ARM OF CLARKS HILL RESERVOIR
S-131	LK GREENWOOD AT US 221 7.6 MI NNW 96
RL-02330	LK HARTWELL 0.4 MI SE OF OCONEE/ANDERSON CO LINE 5.0 M W OF SANDY SPRINGS
RL-03352	LK HARTWELL 0.9 MI NE ANDERSON/OCONEE/HART CO, GA JUNCTION
RL-02315	LK HARTWELL 12.0 NW OF ANDERSON 2.0 MI N OF SADLERS CK ST PK
RL-03459	LK HARTWELL TUGALOO RVR ARM APPROXIMATELY 1.2 MI S OF JCT S-04-890 & S-04-23
SV-340	LK HARTWELL, MAIN BODY AT USACE WQ BUOY BTWN MRKRS 11 & 12
SV-288	LK HARTWELL, SENECA RVR ARM AT USACE BUOY BTWN MRKRS S-28A & S-29
SV-339	LK HARTWELL, SENECA RVR ARM AT USACE BUOY BTWN S-14 AND S-15
SV-338	LK KEOWEE ABOVE SC ROUTE 130 AND DAM
SV-311	LK KEOWEE AT SC 188 - CANE CK ARM 3.5 MI NW SENECA
SV-312	LK KEOWEE AT SC 188 - CROOKED CK ARM 4.5 MI N SENECA
SV-361	LK KEOWEE IN FOREBAY OF LITTLE RIVER DAM
S-204	LK MURRAY AT DAM AT SPILLWAY (MARKER 1)
S-280	LK MURRAY AT MARKER 102
S-274	LK MURRAY AT MARKER 143
S-273	LK MURRAY AT MARKER 166
S-279	LK MURRAY AT MARKER 63
CL-083	LK MURRAY IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
SV-332	LK SECESSION APPROX 400 YDS ABOVE DAM
SV-331	LK SECESSION, 1 1/4 MI BELOW SC ROUTE 28
CL-089	LK WATEREE IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
CW-200	LK WYLIE AT SC 274 9 MI NE OF YORK
CW-201	LK WYLIE N LAKEWOODS S/D AT EBENEZER ACCESS
S-212	MACEDONIA LANDING LK MURRAY AT END OF S-36-26 MACEDONIA
SV-106	MARTIN CK ARM OF LAKE HARTWELL AT S-37-65 N OF CLEMSON
RL-04370	MONTICELLO LAKE 1.7 MI NW OF MONTICELLO
RL-04374	MONTICELLO LAKE 3.5 MI N OF JENKINSVILLE
B-327	MONTICELLO LK-LOWER IMPOUNDMENT BETWEEN LARGE ISLANDS
B-328	MONTICELLO LK-UPPER IMPOUNDMENT AT BUOY IN MIDDLE OF LAKE
B-099A	ON # 1 INLET LK LANIER IN GREENVILLE CO
B-345	PARR RESERVOIR IN FOREBAY NEAR DAM
S-022	REEDY FORK OF LK GREENWOOD AT S-30-29

RL-06439	RICHARD B. RUSSELL LAKE 0.2 MI S OF BRIDGE SC HWY 71
RL-05409	RICHARD B. RUSSELL LAKE 3.85 MI WSW OF END OF S-1-169
RL-06441	RICHARD B. RUSSELL LAKE 5.8 MI WSW OF IVA
RL-05401	SALUDA LAKE 0.13 MI NE OF DAM
RL-06427	SALUDA LAKE 0.7 MI N OF DAM
RL-03349	SALUDA LAKE 0.9 MI SE SC 183 IN SMALL ARM
S-250	SALUDA LAKE AT FARRS BRDG ON SC 183 7 MI NE EASLEY
S-314	SALUDA LAKE, .5 MI US OF LANDING
B-113	SPARTANBURG RESERVOIR #1 ON S-42-213 NE OF INMAN
SV-294	STEVENS CK RESERVOIR HEADWATERS AT CLARKS HILL DAM BOAT RAMP
SV-200	TUGALOO RVR ARM OF LAKE HARTWELL AT US 123
<b>SOUTHEASTERN PLAINS</b>	
<b>STATION ID(S)</b>	<b>Location</b>
CL-078	ADAMS MILLPOND, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-06448	EUREKA LAKE 4.2 MI SW OF CHERAW
RL-06436	EUREKA LAKE 5 MI SW OF CHERAW
RL-03346	EUREKA LAKE IN CHERAW STATE PARK APPROX MID-LAKE
SV-686	FLAT ROCK POND IN FOREBAY NEAR DAM
C-068	FOREST LAKE AT DAM
SV-722	GRANITEVILLE POND #2 IN FOREBAY NEAR DAM
CL-088	JUNIPER LAKE, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-06437	LAKE BROWN 0.3 MI NNE OF BRIDGE S-6-488
RL-03360	LAKE MARION 0.4 MI W OF DAM
RL-04382	LAKE MARION 1 MI DOWNLAKE OF I-95 BRIDGE IN OLD RIVER CHANNEL
RL-01011	LAKE MARION 1.10 M SSE OF SANTEE NAT. WILDLIFE REFUGE AND 1MI S OF EAGLE POINT (SC-035)
RL-05406	LAKE MARION 3.25 MI S OF LOG JAM LANDING
RL-05402	LAKE MARION 3.5 MI NNW OF BRIDGE OVER DIVERSION CANAL ON SC 45
RL-04384	LAKE MARION 3.8 MI W OF EADYTOWN
RL-03358	LAKE MARION 4.0 MI SE OF I-95
RL-05464	LAKE MARION 4.97 MI SE OF I-95 BRIDGE OVER LAKE
RL-04386	LAKE MARION EUTAW CREEK ARM NEAR CATHEAD BOAT RAMP
CL-042	LAKE MARION FOREBAY, SPILLWAY MARKER 44 (SC-022)
RL-02310	LAKE MARION NEAR SANTEE NATL WILDLIFE REFUGE
RL-04368	LAKE WALLACE 0.4 MI NNE OF FISHING PIER
RL-05398	LAKE WALLACE EAST SHORE NEAR PICNIC AREA
RL-02324	LAKE WALLACE S OF S-35-47
CL-086	LAKE WALLACE, FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-03335	LANGLEY POND 0.05 MI OFF NW END OF DAM AND SHORELINE
RL-04373	LANGLEY POND 0.85 MI UPLAKE (NE) OF SPILLWAY
CL-069	LANGLEY POND IN FOREBAY NEAR DAM
RL-02317	LANGLEY POND NEAR NW SHORE AND 0.6 MI NE OF SPWY

RL-02306	LK MARION @ JACK'S CK EMBAYMENT; USE SANTEE COOPER SC-012
ST-036	LK MARION, WYBOO CREEK ARM DS OF CLUBHOUSE BR (SC-023A)
PD-327	LK ROBINSON AT S-13-346 5 MI E MCBEE BY BOAT
CL-094	LK ROBINSON IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES FROM PRIVATE ACCESS
SC-019	LOWER LAKE MARION @ POTATO CREEK FLOODED EMBAYMENT
SC-021	LOWER LAKE MARION, 1.5 KM NE OF ROCK'S POND CAMPGROUND
SC-042	MID LAKE MARION @ NORTH END OF I-95 / U.S. 301 BRIDGES
SC-036	MID LAKE MARION @ THE MOUTH OF TAW CAW CREEK
SC-041	MID LAKE MARION 3.2 KM NORTH OF CHANNEL MARKER 79
CL-067	VAUCLUSE POND IN FOREBAY NEAR DAM
C-048	WINDSOR LK SPILLWAY ON WINDSOR LK BLVD
MIDDLE ATLANTIC COASTAL PLAIN	
STATION ID(S)	Location
CSTL-124	BACK RIVER RES IN FOREBAY EQUIDISTANT FROM DAM AND SHORELINES
RL-04362	LAKE MOULTRIE 2.2 MI SE OF CROSS
RL-04364	LAKE MOULTRIE 3.3 MI NW OF BONNEAU BEACH
RL-05400	LAKE MOULTRIE 3.7 MI WNW OF BONNEAU
RL-04462	LAKE MOULTRIE 4.2 MI SW OF RUSSELLVILLE
RL-03348	LAKE MOULTRIE 5.25 MI NNW OF PINOPOLIS
RL-05396	LAKE MOULTRIE 6.25 MI WNW OF BONNEAU
ST-037	LAKE MOULTRIE AT CHANNEL MARKER 17 (SC-030)
RL-02322	LAKE MOULTRIE NE 3.0 MI FM BONNEAU BEACH
RL-02454	LAKE MOULTRIE SW IN OPEN WATER
RL-02328	LAKE MOULTRIE SW NEAR DUCK PD AND APPROX 2.0 E OF CROSS
CL-062	LAKE WARREN IN FOREBAY NEAR DAM
CSTL-075	LAKE WARREN, BLACK CK ARM, AT S-25-41 5 MI SW OF HAMPTON
SC-031	NORTH QUADRANT OF LAKE MOULTRIE @ MOUTH OF REDIVERSION CANAL
SC-028	NW QUADRANT OF LAKE MOULTRIE NEAR ANGEL'S LANDING COVE
SC-032	SE QUADRANT OF LAKE MOULTRIE @ CHANNEL MARKER 2
SC-046	SE QUADRANT OF LAKE MOULTRIE AT PINOPOLIS EMBAYMENT
SC-027	SW QUADRANT OF LAKE MOULTRIE 1.2 KM EAST OF SHORELINE

### *Control Methods*

NPDES permits and nonpoint source control programs, that were previously described in the Municipal and Industrial permitting sections, are designed to protect lake water quality. South Carolina's water classifications and criteria are applicable to lakes.

### *Restoration Efforts*

Plans to restore and/or protect lake quality are integrated with the watershed water quality management approach and other watershed pollution control plans.

#### *Acid Effects on Lakes*

SCDHEC measures pH as part of its routine monitoring program at all lake sites and includes any lakes with a pH less than the appropriate State standard in more than 10% of samples in the current §303(d) assessment reported in *Part I: Listing of Impaired Waters* of this Integrated Report.

State water quality criteria specify, with few exceptions, a pH of at least 6.0 SU to protect classified and existing uses. EPA's Eastern Lake Survey reported high acid neutralizing capacity in Southern Blue Ridge region lakes, including those in northwestern South Carolina.

#### *Toxic Effects on Lakes*

As part of the State's probability-based monitoring all lake sites are monitored for metals and/or ammonia. In the Summary Statistics for this section, Table 10 lists causes for partial or non-support of lake classified uses, and Table 18 lists the total size affected by toxicants. The section on Public Health: Aquatic Life Impacts contains a discussion of fish consumption advisories issued in South Carolina.

## **5. Estuary and Coastal Assessment**

### **A. Summary Statistics**

Based on a hydrographic GIS cover developed jointly by SCDHEC and the South Carolina Department of Natural Resources and the results of probability site selection validation, South Carolina has an estimated 267 combined square miles of tide creek and open water habitat representing the estuarine sampling design frame previously described. Because of the inability to reach some selected locations, the 150 probability-based monitoring sites sampled from 2002-2006 represent 260 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 probability-based estimates signify that it is 95% certain that the true mileage is between the upper and lower confidence limits.

**Table 13. Estuaries Use Support Summary (Square Miles)**

<b>Indicator</b>	<b>Category</b>	<b>Probability-Based Estimated Percent of Total Resource</b>	<b>Probability-Based Estimated Square Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Square Miles)</b>	<b>Upper 95 Percent Confidence Interval (Square Miles)</b>
Aquatic Life Use	Fully Supporting	84.7%	220	204	236
	Partially Supporting	3.5%	9	0	18
	Not Supporting	11.8%	31	17	44
Recreational Use	Fully Supporting	99.4%	258	257	259
	Partially Supporting	0.5%	1	0	2
	Not Supporting	0.2%	0	0	1

**Table 14. Summary of Fully Supporting and Impaired Estuaries (Not including Fish/Shellfish Consumption Use)**

<b>Category</b>	<b>Probability-Based Estimated Percent of Total Resource</b>	<b>Probability-Based Estimated Square Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Square Miles)</b>	<b>Upper 95 Percent Confidence Interval (Square Miles)</b>
Fully Supporting All Assessed Uses	84.4%	219	203	235
Impaired for One or More Use	15.6%	41	NA	NA

**Table 15. Total Sizes of Estuaries Impaired by Various Cause Categories (Square Miles)**

<b>Cause Category</b>	<b>Probability-Based Estimated Square Miles of Total Resource</b>	<b>Lower 95 Percent Confidence Interval (Square Miles)</b>	<b>Upper 95 Percent Confidence Interval (Square Miles)</b>
Turbidity	15.1	5.8	24.3
Dissolved Oxygen	13.8	3.5	24.1
Nickel	3.1	0.0	8.1
Copper	13.8	3.5	24.2
Zinc	0.4	0.0	1.1
Fecal Coliform Bacteria	1.6	0.3	2.9

**6. Wetlands Assessment**

**A. Summary Statistics**

**Table 16. Extent of Wetlands, by Type**

<b>Wetland Type</b>	<b>Historical Extent in Acreage</b>	<b>1980's Reported Acreage</b>	<b>1994 Reported Acreage</b>	<b>Most Recent Acreage</b>
Saturated Bottomland Forest	6,414,000	4,659,000	1,804,884	1,804,884
Nonforested Wetlands/Marsh			485,314	485,314

SCDHEC maintains a number of GIS land use coverages that include wetland acreages. SCDHEC and S.C. Department of Natural Resources (SCDNR) have derived land use/land cover data from SPOT satellite imagery from December 1988 to March 1990.

The National Land Cover Dataset or NLCD (SCDHEC GIS coverage last edited March 16, 2003) includes 15 classes (2 wetland classes) and was compiled from Landsat 5 Thematic Mapper satellite imagery with a spatial resolution of 30 meters and supplemented by a host of ancillary data. The NLCD was produced as a cooperative effort between the U.S. Geological Survey (USGS) and the U.S. Environmental Protection Agency (US EPA) to produce a consistent, land cover data layer for the coterminous U.S. using early 1990s (1991-1993) Landsat Thematic Mapper data purchased by the Multi-Resolution Land Characteristics (MRLC Consortium. The MRLC Consortium is a partnership of federal agencies that produce or use land cover data. Partners include the USGS (National Mapping, Biological Resources, and Water Resources Divisions), U.S. EPA, the U.S. Forest Service, and the National Oceanic and Atmospheric Administration.

Multi-Resolution Land Characteristics (MRLC) Consortium Home:  
<http://www.mrlc.gov/index.asp>

National Land Cover Dataset Home:  
<http://landcover.usgs.gov/natl/landcover.asp>

The SC-GAP project mapped the State's natural and man-made vegetation to two classifications, a general 27-class (8 wetland classes) habitat map that was used in modeling vertebrate distributions, and a more detailed 54-class map (at least 21 wetland classes) in accordance with the National GAP guidelines of mapping to the alliance level where possible. The initial data used in developing the map was remotely sensed satellite data from the Multi-Resolution Land Characteristics (MRLC) Consortium. Ancillary data included detailed soil surveys, National Wetlands Inventory surveys, and elevation maps to improve this classification and develop the 54-class land cover. This was aggregated into the habitat map for use in producing vertebrate distributions. From: "A Gap Analysis of South Carolina, 2001 Final Report"

A detailed National Wetlands Inventory mapping is current, but not yet complete for the State.

## **B. Extent of Wetlands Resources**

A tracking system called Environmental Facilities Information System or EFIS has been adopted agency-wide. The Water Quality Certification, Standards, and Wetlands Programs 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. We are 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.

## **C. 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.

*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 (ACE) 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 (CZM) 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 EPA to support assumption.

*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.

The Division of Water Quality evaluated 691 projects that required a §401 Water Quality Certification in FYs 2006 through 2007. SCDHEC routinely requires compensation for wetland impacts at greater than a one to one basis. This compensation may be in the form of preservation, lineation, enhancement, or restoration and may not strictly meet the State and Federal "no net loss" goals.

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 includes protection of existing uses, will not be violated. The federal permit cannot be issued if certification is denied.

*Water Quality Certification, Nationwide Permits (NWP)* - SCDHEC sent a Notice of Proposed Decision for the 2007 NWPs on April 25, 2007 to the ACOE. SCDHEC proposed to deny NWPs: 16, 17, 21, 34, 46, 49, and 50. In regard to NWP 17, SCDHEC currently reviews all applications for FERC licenses. The following NWPs were proposed for issuance with conditions: 3-7, 12-15, 18, 19, 20, 22, 23, 25, 27, 29, 30, 31, 32, 33, and 36-45, 47, and 48. The most shared condition states that proposed impacts will not exceed 0.10 ac or 300 linear feet. The ACOE proposed to replace NWP 26 with several “activity specific” NWPs and NWP 26 was placed on reserve. To take advantage of a NWP permit, the applicant must submit a wetlands delineation and, in some cases, a pre-construction notification to the ACOE.

Wetlands losses can cause significant adverse, but avoidable, cumulative environmental impacts. Wetlands losses may lead to increased costs to the public for flood control and drinking water treatment. Moreover, wetlands are especially important in providing storm water filtration to maintain surface and ground water quality. Protection of wetlands is imperative if South Carolina is to achieve the goals of the Clean Water Act to restore and maintain the chemical, physical, and biological integrity of its waters.

## **D. 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 that 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.

With funding from the EPA, SCDHEC developed classifications and standards for wetlands. The intent was that the system would augment the State's existing water quality classifications and standards to ensure greater protection of the State's wetlands through Clean Water Act programs.

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. In 1993, SCDHEC received additional funding from EPA to further determine wetlands protection mechanisms and encourage consensus-building through education.

## **E. 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 - Aquatic Life Concerns

### A. Sizes of Water Affected by Toxicants

Toxic pollutants in South Carolina's surface waters were assessed for this report through the evaluation of data collected through the statewide probability-based ambient monitoring program.

**Table 17. Total Size Affected by Toxicants**

Waterbody Type	Size Monitored for Toxicants	Probability-Based Estimate of Total Resource	Lower 95 Percent Confidence Interval	Upper 95 Percent Confidence Interval
Rivers (miles)	12,594	1,119	NA	NA
Lakes (acres)	309,063	485	NA	NA
Estuaries (square miles)	260	17.3	NA	NA

### B. Public Health: Aquatic Life Impacts

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

During 2006 there were a total of 77 fish kill investigations conducted by SCDHEC and 71 investigations in 2007. Dissolved oxygen depletion, weather conditions, and other natural causes accounted for approximately 57 % of all fish kills in 2006 and 63% in 2007. In 2007 nearly 65% of the kills occurred in privately owned ponds or lagoons, 13% the kills could not be determined and approximately 24% of the fish kills investigated in 2007 were from unnatural causes. Unnatural causes ranged from fish being cough and dumped back into lakes and streams to the runoff of pesticides and pollution.

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.

The *Pfiesteria* program continues to be an important program in South Carolina with the coastal regional offices maintaining trained personnel to investigate *Pfiesteria* related incidents. For the 2006 and 2007 FY's, no fish kills could be linked directly to *Pfiesteria*. *Pfiesteria piscicida*, the only known form to kill fish, has not been detected in South Carolina waters.

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. 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. SC DHEC's

Computer system, EFIS (Environmental Facility Information System) acts as the official fish kill report.

### *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.

### *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 (February 1, 2008) has approximately 571,717 estuarine/riverine surface acres classified for the harvest of molluscan shellfish. Of this total, Approved accounts for 68.1% of total acreage, Conditionally Approved - 1.8%, Restricted - 17.8%, and Prohibited - 12.3%.

**Table 18. Summary of Shellfish Harvesting Status in South Carolina Shellfish Waters**

Harvesting Status	Acreage	Percent
Approved	393,335	68.1%
Conditionally Approved	10,427	1.8%
Restricted	102,815	17.8%
Prohibited	71,139	12.3%
Total Assessed	577,717	100.0%

*Restrictions on Bathing Areas*

There are currently fifty-eight (58) Natural Public Swimming Areas permitted for operation by SCDHEC. These areas are tested for Fecal Coliform (FC) bacteria prior to obtaining a yearly operating permit and are tested twice per month during the swimming season. The following swimming areas exceeded acceptable fecal coliform levels as specified in S.C. Regulation 61-50, *Natural Public Swimming Area*. Areas exceeding the specified parameters are closed until satisfactory sample results are collected. These are all fresh waters. Saltwater areas are addressed in the Ocean Water Quality Monitoring section.

**Table 19. Areas of Bathing Restrictions**

<b>Natural Area</b>	<b>Frequency</b>
Lanølev Pond Park	one time 07/09/07
The Outing Club	one time 06/04/07
Pleasant Ridge County Park	recurrent 07/05/06, 08/04/07
Bethel Christian Camp	one time 07/16/07

*Ocean Water Quality Monitoring*

Ocean water quality is currently monitored at a total of 129 sample sites along the South Carolina coast. Sampling frequency is based on beach Tier level. Tier 1 beaches are high use, high risk beaches. Tier 2 beaches are lower use and/or lower risk beaches. Tier 1 beaches are sampled weekly May 15 through October 15. Tier 2 beaches are sampled twice per month May 15 through October 15. Advisories are issued based on EPA guidelines of 104 Enterococci per 100 ml or greater from two consecutive samples taken within 24 hours. Advisories are issued following a single sampling event if the Enterococcus level exceeds 500 colonies per 100 ml. Precautionary advisories are issued without sampling data based on historical knowledge of the effects of rainfall on specific areas. Advisories are retracted when Enterococcus counts return to below 104 colonies per 100 ml.

The following is a summary of the advisory data for years 2006 and 2007. Data is listed by station number. The stations begin in North Myrtle with WAC-001 and end at Hilton Head with LC-111. Not all stations had an advisory. When an advisory is issued it covers 400 total feet of beach – two hundred feet on either side of the sampling site. For ease of reading the advisory summary, here is a table of SC beaches with their station numbers.

City of North Myrtle Beach	WAC-001-008
Horry County – White Point Swash	WAC-009
Town of Briarcliffe Acres	WAC-009A-010
Horry County – Arcadia	WAC-011-015
City of Myrtle Beach	WAC-016-025
Horry County – Springmaid Beach	WAC-026
Horry County – State Park and Campgrounds	WAC-027-029
Town of Surfside Beach	WAC-030-035
Horry County – Garden City Beach	WAC-036-037
Georgetown County – Garden City Beach	WAC-038
Georgetown County – Huntington Beach State Park	WAC-039-040
Georgetown County – Litchfield Beach	WAC-041-043A
Town of Pawley’s Island	WAC-044A-046
Georgetown County – Debordieu Beach	WAC-047-048
Isle of Palms	TRI-050-056

Sullivans Island	TRI-057-059
Folly Beach	TRI-060-067
Kiawah Island	TRI-068-072
Seabrook Island	TRI-073-074
Edisto Island	LC-075-082
Harbor Island	LC-083-085A
Hunting Island State Park	LC-086-091
Fripp Island	LC-092-096
Hilton Head Island	LC-098-111

**Table 20. Areas Affected by Beach Advisories**

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
City of North Myrtle Beach	WAC-009	5	May 2006
City of North Myrtle Beach	WAC-004	4	June 2006
City of North Myrtle Beach	WAC-005	4	June 2006
City of North Myrtle Beach	WAC-005	2	July 2006
City of North Myrtle Beach	WAC-004	1	August 2006
City of North Myrtle Beach	WAC-005	1	August 2006
City of North Myrtle Beach	WAC-001	1	September 2006
City of North Myrtle Beach	WAC-002	1	September 2006
City of North Myrtle Beach	WAC-003	1	September 2006
City of North Myrtle Beach	WAC-004	1	September 2006
City of North Myrtle Beach	WAC-005	1	September 2006
City of North Myrtle Beach	WAC-005A	1	September 2006
City of North Myrtle Beach	WAC-006	3	September 2006
City of North Myrtle Beach	WAC-007	1	September 2006
City of North Myrtle Beach	WAC-008	1	September 2006
City of North Myrtle Beach	WAC-008	1	June 2007
City of North Myrtle Beach	WAC-005	1	June 2007
City of North Myrtle Beach	WAC-004	1	August 2007
White Point Swash	WAC-009	1	September 2006



<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
White Point Swash	WAC-009	1	June 2007
Town of Briarcliffe Acres	WAC-009A	5	May 2006
Town of Briarcliffe Acres	WAC-009A	13	June 2006
Town of Briarcliffe Acres	WAC-009A	7	July 2006
Town of Briarcliffe Acres	WAC-009A	9	August 2006
Town of Briarcliffe Acres	WAC-009A	12	September 2006
Town of Briarcliffe Acres	WAC-010	10	June 2006
Town of Briarcliffe Acres	WAC-010	6	July 2006
Town of Briarcliffe Acres	WAC-010	7	August 2006
Town of Briarcliffe Acres	WAC-010	9	September 2006
Town of Briarcliffe Acres	WAC-010	6	October 2006
Town of Briarcliffe Acres	WAC-009A	1	May 2007
Town of Briarcliffe Acres	WAC-009A	10	June 2007
Town of Briarcliffe Acres	WAC-009A	9	July 2007
Town of Briarcliffe Acres	WAC-009A	6	August 2007
Town of Briarcliffe Acres	WAC-009A	3	August/Sept 2007
Town of Briarcliffe Acres	WAC-009A	2	September 2007
Town of Briarcliffe Acres	WAC-009A	1	October 2007
Arcadia Beach	WAC-015	8	May 2006
Arcadia Beach	WAC-011	11	June 2006
Arcadia Beach	WAC-015	5	July 2006
Arcadia Beach	WAC-015	4	August 2006
Arcadia Beach	WAC-012	1	September 2006
Arcadia Beach	WAC-014	3	September 2006
Arcadia Beach	WAC-015	9	September 2006

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
Arcadia Beach	WAC-015	2	October 2006
Arcadia Beach	WAC-015	1	May 2007
Arcadia Beach	WAC-011	1	June 2007
Arcadia Beach	WAC-012	1	June 2007
Arcadia Beach	WAC-013	1	June 2007
Arcadia Beach	WAC-014	1	June 2007
Arcadia Beach	WAC-015	5	June 2007
Arcadia Beach	WAC-015	6	July 2007
Arcadia Beach	WAC-014	1	August 2007
Arcadia Beach	WAC-015	4	August 2007
Arcadia Beach	WAC-015	3	Aug / Sept 2007
Arcadia Beach	WAC-015	4	September 2007
Arcadia Beach	WAC-015	1	October 2007
City of Myrtle Beach	WAC-015A	2	June 2007
City of Myrtle Beach	WAC-016	2	May 2006
City of Myrtle Beach	WAC-016	1	July 2006
City of Myrtle Beach	WAC-016	2	September 2006
City of Myrtle Beach	WAC-016A	2	May 2006
City of Myrtle Beach	WAC-016A	9	June 2006
City of Myrtle Beach	WAC-016A	7	July 2006
City of Myrtle Beach	WAC-016A	4	August 2006
City of Myrtle Beach	WAC-016A	7	September 2006
City of Myrtle Beach	WAC-016A	4	October 2006
City of Myrtle Beach	WAC-017	1	July 2006
City of Myrtle Beach	WAC-017	1	August 2006

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
City of Myrtle Beach	WAC-017	1	September 2006
City of Myrtle Beach	WAC-017A	1	May 2006
City of Myrtle Beach	WAC-017A	1	August 2006
City of Myrtle Beach	WAC-018	1	May 2006
City of Myrtle Beach	WAC-018	1	August 2006
City of Myrtle Beach	WAC-019	1	May 2006
City of Myrtle Beach	WAC-019	1	September 2006
City of Myrtle Beach	WAC-020	1	May 2006
City of Myrtle Beach	WAC-020	14	June 2006
City of Myrtle Beach	WAC-020	7	July 2006
City of Myrtle Beach	WAC-020	8	August 2006
City of Myrtle Beach	WAC-020	3	September 2006
City of Myrtle Beach	WAC-020	3	October 2006
City of Myrtle Beach	WAC-021	1	May 2006
City of Myrtle Beach	WAC-021	4	June 2006
City of Myrtle Beach	WAC-021	7	July 2006
City of Myrtle Beach	WAC-021	2	August 2006
City of Myrtle Beach	WAC-021	3	September 2006
City of Myrtle Beach	WAC-022A	9	May 2006
City of Myrtle Beach	WAC-022A	17	June 2006
City of Myrtle Beach	WAC-022A	9	July 2006
City of Myrtle Beach	WAC-022A	7	August 2006
City of Myrtle Beach	WAC-022A	7	September 2006
City of Myrtle Beach	WAC-022A	3	October 2006
City of Myrtle Beach	WAC-024	1	August 2006
City of Myrtle Beach	WAC-025A	7	May 2006

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
City of Myrtle Beach	WAC-025A	14	June 2006
City of Myrtle Beach	WAC-025A	7	July 2006
City of Myrtle Beach	WAC-025A	9	August 2006
City of Myrtle Beach	WAC-025A	7	September 2006
City of Myrtle Beach	WAC-025A	3	October 2006
Springmaid Beach	WAC-026	1	October 2006
Springmaid Beach	WAC-026	1	September 2007
Horry County State Park	WAC-027	1	September 2006
Horry County State Park	WAC-027	1	July 2007
Pirateland Beaver Dam Cr	WAC-028	7	July 2006
Pirateland Beaver Dam Cr	WAC-028	10	August 2006
Pirateland Beaver Dam Cr	WAC-028	10	September 2006
Pirateland Beaver Dam Cr	WAC-028	4	October 2006
Pirateland Beaver Dam Cr	WAC-028	5	June 2007
Pirateland Beaver Dam Cr	WAC-028	7	July 2007
Ocean Lakes CG	WAC-029	8	May 2006
Ocean Lakes CG	WAC-029	11	June 2006
Ocean Lakes CG	WAC-029	9	July 2006
Ocean Lakes CG	WAC-029	8	August 2006
Ocean Lakes CG	WAC-029	8	September 2006
Ocean Lakes CG	WAC-029	2	June 2007
Ocean Lakes CG	WAC-029	2	July 2007
Ocean Lakes CG	WAC-029A	8	May 2006
Ocean Lakes CG	WAC-029A	13	June 2006
Ocean Lakes CG	WAC-029A	7	July 2006
Ocean Lakes CG	WAC-029A	4	August 2006

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
Ocean Lakes CG	WAC-029A	6	September 2006
Ocean Lakes CG	WAC-029A	3	October 2006
Ocean Lakes CG	WAC-029A	4	June 2007
Town of Surfside Beach	WAC-030	3	May 2006
Town of Surfside Beach	WAC-030	12	June 2006
Town of Surfside Beach	WAC-030	7	July 2006
Town of Surfside Beach	WAC-030	5	August 2006
Town of Surfside Beach	WAC-030	8	September 2006
Town of Surfside Beach	WAC-030	3	October 2006
Town of Surfside Beach	WAC-030	1	May 2007
Town of Surfside Beach	WAC-030	3	June 2007
Town of Surfside Beach	WAC-031	7	May 2006
Town of Surfside Beach	WAC-031	11	June 2006
Town of Surfside Beach	WAC-031	7	July 2006
Town of Surfside Beach	WAC-031	4	August 2006
Town of Surfside Beach	WAC-031	7	September 2006
Town of Surfside Beach	WAC-031	3	October 2006
Town of Surfside Beach	WAC-031	1	May 2007
Town of Surfside Beach	WAC-031	3	June 2007
Town of Surfside Beach	WAC-031A	8	May 2006
Town of Surfside Beach	WAC-031A	12	June 2006
Town of Surfside Beach	WAC-031A	7	July 2006
Town of Surfside Beach	WAC-031A	5	August 2006
Town of Surfside Beach	WAC-031A	8	September 2006
Town of Surfside Beach	WAC-031A	3	October 2006
Town of Surfside Beach	WAC-031A	1	May 2007

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
Town of Surfside Beach	WAC-031A	3	June 2007
Town of Surfside Beach	WAC-031A	5	July 2007
Town of Surfside Beach	WAC-031A	1	August 2007
Town of Surfside Beach	WAC-031A	3	September 2007
Town of Surfside Beach	WAC-032	6	June 2006
Town of Surfside Beach	WAC-032	2	August 2006
Town of Surfside Beach	WAC-032	2	September 2006
Town of Surfside Beach	WAC-032	1	October 2006
Town of Surfside Beach	WAC-032	1	June 2007
Town of Surfside Beach	WAC-032	1	July 2007
Town of Surfside Beach	WAC-033	5	May 2006
Town of Surfside Beach	WAC-033	5	June 2006
Town of Surfside Beach	WAC-033	5	July 2006
Town of Surfside Beach	WAC-033	4	August 2006
Town of Surfside Beach	WAC-033	7	September 2006
Town of Surfside Beach	WAC-033	3	October 2006
Town of Surfside Beach	WAC-033	1	May 2007
Town of Surfside Beach	WAC-033	2	June 2007
Town of Surfside Beach	WAC-033	2	August 2007
Town of Surfside Beach	WAC-034	1	October 2006
Town of Surfside Beach	WAC-034	1	August 2007
Town of Surfside Beach	WAC-035	7	May 2006
Town of Surfside Beach	WAC-035	10	June 2006
Town of Surfside Beach	WAC-035	3	July 2006
Town of Surfside Beach	WAC-035	1	August 2006
Town of Surfside Beach	WAC-035	5	September 2006

<b>Area Affected</b>	<b>Station</b>	<b>Days Posted</b>	<b>Month/Year</b>
Town of Surfside Beach	WAC-035	3	October 2006
Town of Surfside Beach	WAC-035	1	May 2007
Town of Surfside Beach	WAC-035	3	June 2007
Town of Surfside Beach	WAC-035	3	August 2007
Sullivans Island	TRI-057	2	June 2007
Folly Beach	TRI-063a	1	July 2007
Fripp Island	LC-093	1	September/2006
Harbor Island	LC-085A	3	Sept/Oct 2007
Hilton Head Island	LC-099	1	September 2006
Hilton Head Island	LC-106	2	October 2006
Hilton Head Island	LC-108	1	September 2006
Hilton Head Island	LC-108	2	October 2006
Hilton Head Island	LC-109	1	September 2006
Hilton Head Island	LC-109	2	August 2007

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

#### *Restrictions in Surface Drinking Water Supplies and Incidents of Waterborne Diseases*

There were ten (10) Notices of Violation (NOV) issued to four (4) systems during the period of July 2005 - June 2006 for Treatment Technique and Monitoring and Reporting violations under the Stage 1 Disinfectants/Disinfection Byproducts and Surface Water Treatment Rules. The State reported four (4) exceedances of the Maximum Contaminant Level (MCL) for one (1) system for Trihalomethanes (THMs) and no exceedances of the MCL for Haloacetic Acids (HAAs). The state reported no incidences of waterborne disease during the same period.

### **GROUNDWATER ASSESSMENT**

Groundwater is the source of drinking water for more than 40 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 data are to be presented in a series of tables and it is recognized that all states do not have all the information requested at this time. Therefore this year's report serves as a template by that future monitoring and reporting can be designed. The data presented were assembled from existing reports: the state wide ambient groundwater quality monitoring network, the groundwater contamination inventory that is updated annually, the volatile organic compound (VOC) monitoring program for public supply wells, and reports from domestic well owners.

### 1. Overview of Groundwater Contamination Sources

The major sources of contamination impacting groundwater are presented in Table 21. Underground storage tank (UST) releases account for 3728 of the 4459 total instances. 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 21 indicates the contaminants associated with the highest priority sources. Petroleum compounds, halogenated solvents, metals and nitrates are the contaminants most frequently detected.

**Table 21. Major Sources of Groundwater Contamination**

Contaminant Source	Ten Highest-Priority Sources (T)	Factors Considered in Selecting a Contaminant Source	Contaminants
<i>Agricultural Activities</i>			
Agricultural chemical facilities			
Animal feedlots			



<b>Contaminant Source</b>	<b>Ten Highest-Priority Sources (T)</b>	<b>Factors Considered in Selecting a Contaminant Source</b>	<b>Contaminants</b>
Drainage wells			
Fertilizer applications			
Irrigation practices			
Pesticide applications			
<b><i>Storage and Treatment Activities</i></b>			
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			
<b><i>Disposal Activities</i></b>			
Deep injection wells			
Landfills	T	D	C,D,H
Septic systems			
Shallow injection wells			
<b><i>Other</i></b>			
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,M Acid mine

Contaminant Source	Ten Highest-Priority Sources (T)	Factors Considered in Selecting a Contaminant Source	Contaminants
			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 (☐) 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 M).
 

A. Inorganic pesticides	H. Metals
B. Organic pesticides	I. Radionuclides
C. Halogenated solvents	J. Bacteria
D. Petroleum compounds	K. Protozoa

E. Nitrate  
F. Fluoride  
G. Salinity/brine

L. Viruses  
M. Other (please add or describe in the narrative)

Tables 22, 23, 24 and 25 were designed to report the stress that contaminated sites place on individual aquifers or hydrogeologic settings. The report on each identified aquifer is further subdivided by type of source based on program area, contaminants present, and degree of remediation accomplished thus far. South Carolina's major drinking water aquifers are in the subsurface of the Coastal Plain. The sources and contaminants indicated in Table 21 are generally present in the near surface, shallowest aquifers. At this point, contamination data is gathered on a site by site basis, rather than by aquifer. Thus, portions of these tables can be completed for the Piedmont saprolite/bedrock and the Coastal Plain water table aquifers only. The number of confirmed groundwater contamination cases that have been identified in the Coastal Plain are 2891 and 1568 has been confirmed in the Piedmont. This number was obtained by counting the sites county by county.

**Table 22. Groundwater Contamination Summary**

Aquifer Description: Above Fall Line  
 Aquifer Setting: Saprolite/Bedrock Aquifer  
 Data Reporting Period: Ending July 2003

Source Type	Present in reporting area	Number of sites in area	Number of sites that are listed and/or have confirmed releases	Number with confirmed ground water contamination	Contaminants
NPL	YES		14	14	A,B,C,H,M(P CBs)
CERCLIS (non-NPL)	YES		34	34	A,B,C,D,E,H, M(PCBs)
DOD/DOE	YES		3	3	D
LUST	YES		1167	1167	A,B,C,D
RCRA Corrective Action	YES		30	30	C,D,H
Underground Injection	NO	0	0	0	
State Sites	YES		38	38	A,B,C,D,E H,
Nonpoint Sources	YES		2	2	E
Other (specify)	YES		110	110	C,D,E,H
Totals			1398	1398	

NPL - National Priority List  
 CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System  
 DOE - Department of Energy  
 DOD - Department of Defense  
 LUST - Leaking Underground Storage Tanks  
 RCRA - Resource Conservation and Recovery Act

List of Contaminants:

- A. Inorganic pesticides
- B. Organic pesticides
- C. Halogenated solvents
- D. Petroleum compounds
- E. Nitrate
- F. Flouride
- G. Salinity/brine
- H. Metals
- I. Radionuclides
- J. Bacteria
- K. Protozoa
- L. Viruses
- M. Other (please add or describe in the narrative)

**Table 23. Groundwater Contamination Summary (above fall line)**

Source Type	Number of Site Investigations (optional)	Number of sites that have been stabilized or have had the source removed (optional)	Number of sites with corrective action plans (optional)	Number of sites with active remediation (optional)	Number of sites with cleanup completed (optional)
NPL					
CERCLIS (non-NPL)					
DOD/DOE					
LUST					
RCRA Corrective Action					
Underground Injection					
State Sites					
Nonpoint Sources					
Other (specify)					

NPL - National Priority List

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

DOE - Department of Energy

DOD - Department of Defense

LUST - Leaking Underground Storage Tanks

RCRA - Resource Conservation and Recovery Act

**Table 24. Groundwater Contamination Summary (2)**

Aquifer Description: Below Fall Line  
 Aquifer Setting: Coastal Plain  
 Data Reporting Period: Ending July 2001

Source Type	Present in reporting area	Number of sites in area	Number of sites that are listed and/or have confirmed releases	Number with confirmed ground water contamination	Contaminants
NPL	<b>YES</b>		<b>22</b>	<b>22</b>	<b>A,B,C,D,H</b>
CERCLIS (non-NPL)	<b>YES</b>		<b>61</b>	<b>61</b>	<b>A,B,C,D,H</b>
DOD/DOE	<b>YES</b>		<b>16</b>	<b>16</b>	<b>A,B,C,D,H,I</b>
LUST	<b>YES</b>		<b>2238</b>	<b>2238</b>	<b>A,B,C,D</b>
RCRA Corrective Action	<b>YES</b>		<b>23</b>	<b>23</b>	<b>A,B,C,D,E,H</b>
Underground Injection	<b>NO</b>	<b>0</b>	<b>0</b>	<b>0</b>	
State Sites	<b>YES</b>		<b>24</b>	<b>24</b>	<b>C,D,A,B,D,E</b>
Nonpoint Sources	<b>YES</b>		<b>16</b>	<b>16</b>	<b>E</b>
Other (specify)	<b>YES</b>		<b>138</b>	<b>138</b>	<b>C,D,E,H</b>
Totals			<b>2538</b>	<b>2538</b>	

NPL - National Priority List  
 CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System  
 DOE - Department of Energy  
 DOD - Department of Defense  
 LUST - Leaking Underground Storage Tanks  
 RCRA - Resource Conservation and Recovery Act

List of Contaminants:

- A. Inorganic pesticides
- B. Organic pesticides
- C. Halogenated solvents
- D. Petroleum compounds
- E. Nitrate
- F. Flouride
- G. Salinity/brine
- H. Metals
- I. Radionuclides
- J. Bacteria
- K. Protozoa
- L. Viruses
- M. Other (please add or describe in the narrative)



**Table 25. Groundwater Contamination Summary (below fall line)**

<b>Source Type</b>	<b>Number of Site Investigations (optional)</b>	<b>Number of sites that have been stabilized or have had the source removed (optional)</b>	<b>Number of sites with corrective action plans (optional)</b>	<b>Number of sites with active remediation (optional)</b>	<b>Number of sites with cleanup completed (optional)</b>
NPL					
CERCLIS (non-NPL)					
DOD/DOE					
LUST					
RCRA Corrective Action					
Underground Injection					
State Sites					
Nonpoint Sources					
Other (specify)					

NPL - National Priority List

CERCLIS (non-NPL) - Comprehensive Environmental Response, Compensation, and Liability Information System

DOE - Department of Energy

DOD - Department of Defense

LUST - Leaking Underground Storage Tanks

RCRA - Resource Conservation and Recovery Act

Each source type is listed in each area with the exception of underground injection as waste or contaminant injection, that is not permitted in this state. The "state" sites are state Superfund sites. The "Nonpoint Source" category contains spray irrigation sites only at this time. Pesticide and nitrate monitoring data is gathered by Clemson University, Department of Fertilizer and Pesticide

Control. The "other" category includes spills and leaks; pits, ponds and lagoons; landfills; unpermitted disposal; aboveground storage tanks; and septic tanks/tile fields. The "number of sites in the area" is left blank because any number of facilities can be potential sources and that data is not tracked at this time. The number of sites that have confirmed groundwater contamination are listed along with the contaminants (using the contaminant classes from Table 21). The remediation status represented by Tables 23 and 25 is not fully completed because that information is not recorded in that format in all program areas.

## 2. Overview of Groundwater Protection Programs

The state's groundwater protection programs are summarized and characterized in Table 26. The Groundwater Working Group, that is comprised of SCDHEC's groundwater program managers, was formed to provide consistency across the programs.

**Table 26. 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	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM/Emergency Response</b>
Ambient groundwater monitoring system	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW/GWM</b>
Aquifer vulnerability assessment	<b>Y</b>	<b>Under Development</b>	<b>SCDHEC/BOW/GWM</b>
Aquifer mapping	<b>Y</b>	<b>Continuing Efforts</b>	<b>DNR-SCDHEC/BOW/GWM</b>
Aquifer characterization	<b>Y</b>	<b>Continuing Efforts</b>	<b>DNR-SCDHEC/BOW/GWM</b>
Comprehensive data management system	<b>Y</b>	<b>Under Development</b>	<b>DNR-SCDHEC</b>
EPA-endorsed Core Comprehensive State Groundwater Protection Program (CSGWPP)	<b>Y</b>	<b>Under Development</b>	<b>SCDHEC/BOW/GWM</b>
Groundwater discharge permits	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW</b>
Groundwater Best Management Practices	<b>Y</b>	<b>Under Development</b>	<b>SCDHEC/BOW/IAWD</b>
Groundwater legislation	<b>Y</b>	<b>Continuing Efforts</b>	<b>SCDHEC-DNR</b>

<b>Programs or Activities</b>	<b>Check (Y)</b>	<b>Implementation Status</b>	<b>Responsible State Agency</b>
Groundwater classification	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW</b>
Groundwater quality standards	<b>Y</b>	<b>Under Revision</b>	<b>SCDHEC</b>
Interagency coordination for groundwater protection initiatives	<b>Y</b>	<b>Under Development</b>	<b>SCDHEC-DNR-Clemson Univ.</b>
Nonpoint source controls	<b>Y</b>	<b>Under Development</b>	<b>SCDHEC/BOW</b>
Pesticide State Management Plan	<b>Y</b>	<b>Under Development</b>	<b>SCDHEC/BOW/GWM-Clemson Univ.</b>
Pollution Prevention Program	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM</b>
Resource Conservation and Recovery Act (RCRA) Primacy	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM</b>
State Superfund	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM/CE RCLA</b>
State RCRA Program incorporating more stringent requirements than RCRA primacy		<b>Not Applicable</b>	
State septic system requirements	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/ENV. HEALTH</b>
Underground storage tank installation requirements	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM/US T Program</b>
Underground Storage Tank Remediation Fund	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM/US T Program</b>
Underground Storage Tank Permit Program	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BL&amp;WM/US T Program</b>
Underground Injection Control Program	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW/GWM</b>
Vulnerability assessment for drinking water/wellhead protection	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW/GWM</b>
Well abandonment regulations	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW</b>

<b>Programs or Activities</b>	<b>Check (Y)</b>	<b>Implementation Status</b>	<b>Responsible State Agency</b>
Wellhead Protection Program (EPA-approved)	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW/GWM</b>
Well installation regulations	<b>Y</b>	<b>Fully Established</b>	<b>SCDHEC/BOW</b>

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. The Groundwater Contamination Inventory and the Ambient Groundwater Quality Monitoring Report were also completed last quarter.

### **3. Summary of Groundwater Quality**

Aquifer Monitoring Data are presented in Tables 27 and 28. The state's ambient quality monitoring network is designed to develop a baseline for groundwater quality for each of the aquifers within the state. The wells were selected in areas to avoid known or potential contamination in order to test the assumption that variability in water chemistry reflects differences in geologic framework and/or spatial setting. In addition, neither VOCs nor SOCs are included in the analytical parameters. Accordingly, no data from the ambient monitoring network is included in Tables 27 and 28.

**Table 27. Aquifer Monitoring Data**

Aquifer Description \_\_\_\_\_  
 Aquifer Setting \_\_\_\_\_

County(ies) (optional)  
 Longitude/Latitude (optional)  
 Data Reporting Period

Monitoring Data Type	Total No. of Wells Used in the Assessment	Parameter Groups	Number of Wells			
			No detections of Parameters above MDLs of background levels	No detections of parameters above MDLs or background levels and nitrate concentrations range from background levels to less than or equal to 5 mg/l.	ND	Number of Wells in Sensitive or Vulnerable Areas (optional)
Ambient Monitoring Network (optional)		VOC				
		SOC				
		NO3				
		Other				
Raw Water Quality Data from Public Water Supply Wells		VOC				
		SOC				
		NO3				
		Other				
Finished Water Quality Data from Public Water Supply Wells		VOC	149		2	
		SOC	11		4	
		NO3	38		8	
		Other				

**Table 28. Aquifer Monitoring Data (2)**

Aquifer Description \_\_\_\_\_  
 Aquifer Setting \_\_\_\_\_

County(ies) (optional)  
 Longitude/Latitude (optional)  
 Data Reporting Period

Number of Wells				
Parameters are detected at concentrations exceeding the MDL but are less than or equal to the MCLs and/or nitrate ranges from greater than 5 to less than or equal to 10 mg/l	Parameters are detected at concentrations exceeding the MCLs	Removed from Service	Special Treatment	Background parameters exceed MCLs
Finished Water Quality Data from Public Water Supply Wells	VOC			
	SOC			
	NO3			
	Other			

**4. 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.

## References

- South Carolina Department of Health and Environmental Control. 1998. Laboratory Procedures Manual for Environmental Microbiology. Bureau of Environmental Services, Columbia, S.C.
- South Carolina Department of Health and Environmental Control. 2005. Procedures and Quality Control Manual for Chemistry Laboratories. Bureau of Environmental Services, Columbia, S.C.
- South Carolina Department of Health and Environmental Control. 2006. Environmental Investigations Standard Operating Procedures and Quality Assurance Manual. Office of Environmental Quality Control. Columbia, SC.
- South Carolina Department of Health and Environmental Control. 2004. Water Classifications and Standards (Regulation 61-68) and Classified Waters (Regulation 61-69) for the State of South Carolina. Office of Environmental Quality Control, Columbia, S.C.
- South Carolina Department of Health and Environmental Control. 2005. State of South Carolina Monitoring Strategy for Calendar Year 2005. Technical Report 003-05. Bureau of Water Pollution Control, Columbia, S.C.
- United States Environmental Protection Agency. 1992. National Toxics Rule, December 22, 1992. Federal Register Reference 57FR60848.