

STORET system. Chlorophyll data in STORET are directly accessible by the general public via the internet. In general, chlorophyll *a* data are entered into Modernized STORET at least annually. Some recent chlorophyll data have not been entered into STORET due to recent STORET software changes.

2.4.3.6 Data Analysis/Assessment

Assessment of Chlorophyll *a* data are included in the SCDEHC data analysis and assessment methodology used to make attainment decisions about State waters included in the Integrated Report, which is submitted to EPA on even numbered years for review and approval. The most recent version is published in the most current version of the *State of South Carolina Integrated Report Part I: Listing of Impaired Waters* which can be found on the SCDHEC website at <http://www.scdhec.gov/HomeAndEnvironment/Water/ImpairedWaters/Overview/>.

2.4.3.7 Reporting

Chlorophyll *a* assessment conclusions are forwarded to the Surface Water Monitoring Section for consideration in the preparation of the biennial Integrated Report, which addresses Clean Water Act §303(d), §305(b), and §314 reporting requirements, and the annual Watershed Water Quality Assessments. These reports are available on the SCDHEC website.

2.5 Shellfish Growing Area Water Quality Monitoring

2.5.1 Monitoring Objectives

South Carolina's Shellfish Sanitation Program monitors approximately 580,199 acres of surface water with assigned classifications designated for the harvest of Molluscan shellfish. These coastal waters are divided into 25 shellfish management areas with a total of 462 active monitoring stations. The objectives of the shellfish-monitoring network are to provide data that accurately reflect sanitary and environmental conditions of coastal shellfish and shellfish growing waters in South Carolina in order to:

- Ensure that the health of shellfish consumers is protected;
- Protect and maintain existing shellfish growing area water use; and
- Identify impaired waters suitable for restoration to appropriate use standards.

2.5.2 Monitoring Design

The shellfish-monitoring program provides the database that is used in conducting a comprehensive evaluation of each shellfish growing area. Evaluations of growing areas, which meet NSSP requirements for Triennial Reviews, are conducted annually. Routine bacteriological monitoring and subsequent laboratory analyses of water quality from strategically located sample sites are conducted monthly. Monitoring is based on a systematic random sampling methodology in which coastal shellfish growing area surface waters are sampled in accordance with a pre-established schedule, thereby assuring that a statistically representative cross-section of meteorological, hydrographic, and/or pollution events will be included in the data set. Monitoring sites are established at locations

representative of variable water quality within non-Prohibited classified shellfish areas. Locations are sited with the intent of determining compliance with existing State shellfish regulation water quality standards. Individual monitoring sites are typically representative of a water reach extending in the directions of tidal flow to the closest adjacent monitoring sites. Resulting laboratory analyses detail physical and bacteriological data that are used to classify shellfish growing waters. All standards, monitoring methodology, and laboratory analyses comply with guidance set forth in the National Shellfish Sanitation Program Model Ordinance. Areas closed to the harvesting of shellfish are posted with signs indicting the potential for serious illness from consuming shellfish harvested within these areas and outlining penalties for harvest violations.

The monitoring network also serves to update sanitary-related data from each shellfish area to ensure that conditions that existed during the prior review period still prevail; that the harvest classification is correct; and, ultimately that shellfish are harvested only from growing areas that meet or exceed established standards for shellfish growing waters.

Complete descriptions of station locations are included in Appendix H.

2.5.3 Core and Supplemental Water Quality Indicators

Fecal coliform, used as a human pathogen indicator organism, is the bacteriological parameter used to decide between the *Approved* and *Restricted* classifications (Table 2). Additional monitoring parameters (Salinity, Tide Stage, Wind Direction, etc.) are frequently used in conjunction with the fecal coliform standard and observed meteorological and/or hydrographic conditions in determining the appropriateness of implementing the *Conditionally Approved* classification.

2.5.4 Quality Assurance

Shellfish Sanitation Program monitoring complies with most current revision of SCDHEC's EQC Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, Section 8.10, and all laboratory analyses are conducted by the Bureau of Environmental Health Services according to the most current revision of SCDHEC's Laboratory Procedures Manual for Environmental Microbiology-- Analytical Services.

2.5.5 Data Management

Shellfish data are stored in STORET. Individual data collected subsequent to the mid-1990s are available through FOI request in an electronic (Excel) format. All monitoring sites are represented in a digital coverage located on the Department's GIS server.

2.5.6 Data Analysis/Assessment

S.C Regulation 61-47, Shellfish, has established a fecal coliform standard (geometric mean not to exceed 14 fc mpn/100ml and the estimated 90th percentile value not to exceed 43 mpn/100ml) for waters classified as *Approved*. Sites are monitored on a monthly basis, with monitoring scheduled in advance so as to be random with respect to tide and weather conditions. Data collected over a thirty-six consecutive month period is used in determining compliance. A minimum of thirty samples is required to be collected from each monitoring site for

classification. This standard and methodology fully complies with National Shellfish Sanitation Program Model Ordinance guidance criteria. All shellfish waters receive one of the following harvest classifications.

Table 2. Fixed-Station Shellfish Monitoring Program Physical and Bacteriological Parameter Coverage and Sampling Frequency

Parameter Group	Parameter	Water	Shellstock
Physical	Tide Stage	*	NA
	Water Temperature	*	NA
	Air Temperature	*	NA
	Wind Direction	*	NA
	Salinity	*	NA
Bacteriological	Fecal Coliform	*	**
	Total Plate Count	NA	**
	E. coli	**	**
	Sample Temperature	*	**
	Sample Type	NA	**
	Species	NA	**

*Sampled monthly (minimum frequency).

**Sampled as appropriate.

2.5.6.1 *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 which would render shellfish unsafe for human consumption. *Approved* area classification shall be determined upon a sanitary survey, which 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, and not more than ten percent of the samples shall 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, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

2.5.6.2 *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 which 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.

Shellfish shall not be directly marketed from a *Conditionally Approved* area until conditions for an *Approved* classification have been met for a time that should insure the shellfish are safe for consumption. Shellstock from *Conditionally Approved* areas that have been subjected to temporary conditions of actual or potential pollution may be relayed to *Approved* areas for purification or depuration through controlled purification operations only by special permit issued by the Department.

2.5.6.3 *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 which 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.

The suitability of *Restricted* areas for harvesting of shellstock for Relay or Depuration purposes may be determined through the use of comparison studies of background tissue samples with post-process tissue samples, as well as other process verification techniques deemed appropriate by the Department.

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 and not more than ten percent of the samples shall 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 and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using the formula outlined in the NSSP manual.

2.5.6.4 *Conditionally Restricted*: Growing areas may be classified *Conditionally Restricted* 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 or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as *Conditionally Restricted*. Where appropriate, the management plan for each *Conditionally Restricted* area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems and an evaluation of each source of pollution, and

description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Shellfish may be harvested from areas classified as *Conditionally Restricted* only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision.

For *Conditionally Restricted* areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of *Conditionally Restricted* waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall 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 and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using ISSP guidelines.

2.5.6.5 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 which could render shellfish unfit or unsafe for human consumption. Waters classified as *Prohibited* are administrative closures.

Harvesting of shellfish for human consumption from *Prohibited* areas shall not be allowed by the Department. Shellfish may be depleted for non-food use from *Prohibited* areas upon approval of the Department and under specified conditions.

Growing waters adjacent to sewage treatment plant outfalls and other waste discharges shall be classified *Prohibited*. A variety of assumptions and criteria will be considered in determining the area that could be potentially impacted.

Growing waters within marinas shall be classified as *Prohibited*. Classification of waters adjacent to marinas will be determined using a dilution analysis that incorporates various assumptions.

2.5.6.6 Waters meeting the standard are typically classified as *Approved* and waters exceeding the standard are classified as *Restricted*. *Approved* waters approaching the standard's limit (14/43) or *Restricted* waters slightly exceeding the standard are candidates for management under the *Conditionally Approved* classification. Use of this classification requires that pollution events be predictable and manageable. Management of *Conditionally Approved* areas is manpower intensive and, although its use is encouraged; field managers are allowed some discretion in its implementation.

2.5.7 Reporting

The Shellfish Sanitation Program produces annual reports for each of the twenty-five shellfish management areas. These reports are routinely distributed to the United States Food and Drug Administration, the South Carolina Department of Natural Resources, the Department's Office of Coastal Resource Management, and the Department's Bureau of Water – Division of Water Quality. All reports are updated annually and are available for viewing on the Department's Shellfish Sanitation Program webpage.

2.6 Groundwater Monitoring

Ambient groundwater monitoring is currently suspended. This section is reserved for future use as needed.

2.7 Quality Assurance/Quality Control Procedures

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

The Director of Environmental Affairs has the overall responsibility for the development, implementation, and continued operation of EA's Quality Assurance (QA) Program. To ensure that EA's QA Program is uniformly applied to the generating and processing of all environmental data, a Quality Assurance Manager (QAM) has been appointed.

The QAM is responsible for the Quality Assurance Program. Environmentally-related measurement activities conducted by or for EA shall be done only with the approval of the QAM and/or QAM designee after ensuring 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.

2.7.1 Quality Assurance Project Plans and Standard Operating Procedures

Two basic tools for QA management are QA Project Plans (QAPPs) and Standard Operating Procedures (SOPs). Routine studies (program monitoring activities) are implemented under a generic project plan, primarily SOPs. Special studies require a written QAPP specific to that study. Special studies involving an immediate public health threat or a criminal investigation may not have an approved QAPP due to the limited time frame for obtaining samples. These studies will be handled like routine work requiring adherence to applicable SOPs. To accomplish the above, each environmental monitoring organization shall develop and implement SOPs, approved by the QAM and/or designee, for all monitoring activities.