THE STATE OF SOUTH CAROLINA'S ADOPTION PLAN FOR NUMERIC NUTRIENT WATER QUALITY CRITERIA

Overview

The South Carolina Department of Health and Environmental Control (SCDHEC or Department) provides this plan in compliance with United States Environmental Protection Agency (EPA) guidelines regarding the adoption of numeric criteria for nutrients for waters of the United States. This is a brief description of our current status with development for numeric values for nutrients and includes a schedule for our State's promulgation of water quality criteria for nutrients. This plan describes methods SCDHEC will use to set and adopt water quality standards for nutrient parameters that protect against measurable impacts to the aquatic environment caused by nutrient over-enrichment.

The standards development process will ultimately lead to adoption of water quality standards for nutrients for all waters identified by the Department to have the potential for eutrophication from nutrient over enrichment. The date of adoption for all criteria is subject to change depending on the outcome of earlier tasks. SCDHEC staff will review this plan annually and the EPA will be notified. The two parties will reestablish mutual agreement on any changes at the time of their submittal.

Prioritization and Coverage of Waters

The Department completed the process of promulgating numeric nutrient criteria for its waters with the adoption of numeric nutrient criteria for lakes of forty acres or more in the 2001 triennial review of the water quality standards regulation, South Carolina Regulation 61-68 *Water Classifications and Standards* (R.61-68). Due to both necessity and a legal urgency, the Department prioritized its lakes for numeric nutrient criteria development. We adopted an ecoregional approach for classification of these waters and modified EPA's Approach to Criteria Development as outlined in the Technical Guidance Documents that are specific to the waterbody types to reflect attributes specific to South Carolina's lakes. At the time of development and promulgation of these numeric criteria, the EPA did not specify that any additional language was necessary for the Department to assess its waters using the criteria that was duly promulgated and adopted. This has since changed and the EPA has requested clarification regarding specific issues such as duration, frequency, and values used for determining compliance with the numeric criteria for 303(d) listing purposes and total maximum daily loads (TMDLs). With this issue in mind, in 2009, the Department extensively reviewed its existing criteria and the process by which they were developed. We applied LOESS regression, SPLINE regression, and logistic regression methods to the data analysis. While not yet ready to propose any adjustment to our existing criteria, we continue with our evaluation on methodology as well as chlorophyll *a* values.

The Department had also been working on gathering additional data and information on our State's estuaries, as well as reviewing data and information on our rivers and streams. Due to significant reductions of our State budget, the Department was unable to do any additional collection of data and in fact, had to reduce our monitoring program and staff during 2008 and 2009. At this time, we are proposing to modify our plan and incorporate a new schedule assuming that our State budget will eventually allow for the necessary additional data and information on our estuaries and rivers and streams. It is still our intent to have our State's waters covered by numeric criteria and to ensure that they reflect a scientifically-defensible and sound approach that will not only provide for the protection and maintenance of our waters from nutrient over-enrichment, but will also improve those waters that are currently impaired due to nutrient loadings. The Department continues to prioritize development of nutrient criteria for estuaries first and then, move onto rivers and streams.

Parameters to be Evaluated

South Carolina has adopted all four of the USEPA nutrient criteria parameters for use with lakes, but will determine through the development process if all four are necessary for each additional type of waters.

a. Total Phosphorus - Phosphorus has largely been implicated as the cause of over-enrichment in freshwater systems and implicated recently as the limiting factor in marine systems as well, thus it is likely that we will develop and adopt phosphorus criteria for all classes of waters. Criteria will be set based on evaluations of relationships between total phosphorus (TP) and various response variables [e.g., chlorophyll *a*, dissolved oxygen (DO), and biological indices].

b. Total Nitrogen - The extent or value of developing nitrogen criteria for all South Carolina waters will be examined further. We will determine whether nitrogen criteria are needed for all waters by evaluating relationships between nitrogen concentrations and in-stream biological parameters (e.g., chlorophyll *a*, and biological indices). The need for nitrogen loading controls to address down stream water quality impacts will also be evaluated.

c. Chlorophyll *a* (can include periphyton and phytoplankton)- We will evaluate the utility of chlorophyll *a* criteria by examining relationships between chlorophyll *a* and nutrients in lotic and lentic waters.

d. Turbidity - South Carolina has adopted turbidity criteria for all of its waters based on waterbody types and also their classified uses.

e. Other information to be evaluated - The Department will evaluate biological indices and macroinvertebrate data to determine its utility for setting nutrient criteria. The Department is also considering the use of dissolved oxygen data and information as it relates to productivity or algal biomass.

Criteria Development Process

Protection of Classified Uses

South Carolina's nutrient standards will continue to be based on use protection using State-specific data and not just simply a statistical evaluation of the national dataset. We will translate our narrative water quality standards in association with any applicable numeric nutrient criteria adopted as an assurance of coverage for all of the waters of the State and, if necessary, the Department will include a mechanism reference in the water quality standards. Where necessary, the Department will develop numeric nutrient criteria to protect specified uses of the waters of the State.

Approach for Existing Nutrient Criteria

Initially, South Carolina had generated a significant amount of data and information on our lakes of 40 acres or more through our Section 314 program and continue to monitor the trophic status of these waters. In order to better reflect conditions found in our lakes and reservoirs, we decided to use our data and information to develop our existing numeric criteria. Once the review of the data and information was completed, we made a comparison to our trophic indicators previously used by the Department for assessment of trophic conditions and developed nutrient criteria that fully reflected localized conditions, following a modification of the process described in EPA's guidance document for lakes. The Department has determined that lakes that exceed a specified percentage of the assessed values may have eutrophic tendencies. Once a complete review of all pertinent data and information has been accomplished, the

Department makes its decision regarding eutrophic status for the specific waterbody. If determined to be impaired, the waterbody is listed and a TMDL is developed for the specific waterbody. Controls would be implemented for all effected dischargers in the area.

Approach for Developing Remaining Nutrient Criteria and Data Sources and Analysis

South Carolina plans to utilize EPA's technical guidance or modifications thereof to refine and develop criteria for other waters of the State. The actual approaches used will most likely depend on the result of the analysis of available data and future data collections and will use only data specific to South Carolina waters. The approaches will be either effect-based (correlating nutrient levels with measurable water quality or biological effects or impairments utilizing available data and data to be collected, findings in published literature, and historical information) or reference-based (utilizing a percentile of the frequency distribution of all sites for different water body types based on site-specific data and ecoregions).

- Estuaries –

  It is believed that all of South Carolina's estuaries lie within Nutrient Ecoregion XIV. During criteria development, we will determine if it is appropriate to have one set of indicators for all estuarine waters or to include several sets. In 2003, SCDHEC expanded its analysis of estuarine eutrophication indicators, as well as spatial coverage for estuarine sampling to gather additional data and information using a grant provided by the EPA. We collected algal growth potential test (AGPT) data along with nutrients and other specific parameters on ten additional sites we believed would represent our estuaries as a whole, but also included two site locations that represent least impacted or reference sites. While the study did not generate a large data collection, our results indicated that either nitrogen or phosphorus may limit algal biomass even in our least impacted estuarine waters. This is valuable knowledge as we advance our process into water quality criteria for nutrients in South Carolina. Nitrogen, phosphorus, chlorophyll *a*, and turbidity data will be collected from tidal creeks and open waters using both fixed and random sampling designs. The Department included in its original grant request that we may have data and information from additional resources such as the South Carolina Department of Natural Resources and the University of South Carolina as they become available. The Department intends that numeric nutrient criteria for estuaries be adopted during its triennial review of the water quality standards and should be completed by mid 2014. The Department will provide progress reports to the USEPA and will submit for early review and concurrence any numeric criteria (including supporting data and analyses) proposed for water quality standards adoption.

- Rivers and Streams –

  South Carolina's rivers and streams lie within Nutrient Ecoregions IX, XI, and XIV. SCDHEC's river and stream monitoring program has traditionally included phosphorus, nitrogen, turbidity and biological community analyses, with excellent spatial coverage across ecoregions and stream classes. All appropriate data and information will be analyzed and used to develop numeric nutrient criteria for South Carolina rivers and streams according to EPA guidance. The dynamic relationships between nutrients, water chemistry, substrate, lentic and lotic conditions within the waterbody and designated uses of these waterbodies will be evaluated. The Department proposes that numeric nutrient criteria for rivers and streams be adopted on a site-specific basis with the Department first establishing a methodology that will provide a measure for the presence of eutrophic conditions instream. This methodology will incorporate a process for identification of

nutrient over-enrichment and the severity of the pollution. It is our intent to have this methodology available by the next triennial review of the water quality standards and should be completed by mid 2014. The individual site-specific numeric water quality standards will be conducted at the time of their development. The Department will provide progress reports to the USEPA and will submit for early review and concurrence any numeric criteria (including supporting data and analyses) proposed for water quality standards adoption.

Sources of Data

As noted earlier, the reduction in our overall budget will limit the amount and type of data that will be collected and will also impact the essential staff to do the review and development of any new numeric water quality criteria for nutrients. It is essential to the State that these criteria represent the best scientifically-defensible water quality standards when they are proposed. The Department will continue to use what data and information is has from state sources and some state data may be used that is currently not in the National Nutrient Database. Other data will be reviewed as provided by external sources (USGS, studies, etc) and also from continued data collection by the Department and/or other state or federal agencies.

Data collection will be conducted by Department staff according to SCDHEC Standard Operating Procedures. Statistical analyses will be performed by staff using Excel, SAS or other appropriate software.

Department staff have gathered information from various sources regarding historical and current studies of nutrients in South Carolina estuaries, rivers and streams. This information may be used for background or baseline determinations.

Additional data needs

Although several sampling initiatives are mentioned above, not all represent extensive data collection for the expressed purpose of developing nutrient criteria. Currently, resources to collect these types of information are not available from state funds. South Carolina will seek to utilize any additional available funds, EPA nutrient criteria development and/or training funds, information available from studies in other states, etc. to provide resources or information to help fill in these data gaps. Additional data and resource needs include, but are not limited to:

a. Further assessments of relationships between nutrient (TP and TN) concentrations and impairment of designated uses in more waters throughout the state.
b. Seasonal effects of nutrients.
c. The importance of flow, turbidity, substrate, and light in moderating the effects of nutrients.
d. Additional resources to collect, compile, and analyze data from future collection efforts.

Other Concerns to be Addressed

The Department has other issues that we believe will need to be addressed as we develop criteria for other waters of the State regarding nutrient criteria implementation. We expect to address these issues throughout the development process as we gather additional information and review that data and information. These issues include, but are not limited to, the following:

- Criteria protective of designated uses
- Continued application of narrative criteria
- System for evaluating exceedences of nutrient criteria for assessment
- Modeling and assessing effluents
- Consideration of downstream effects

Schedule

The Department intends that numeric nutrient criteria for estuaries and rivers and streams be developed and adopted as soon as resources allow the Department to begin to collect additional data and information necessary to develop scientifically defensible water quality criteria. For now we are adjusting our promulgation schedule by one triennial review period. This means that we should have new numeric water quality criteria by mid 2014.

Adoption Process

The Department must promulgate these criteria through its regulation process as new water quality standards. Our state process is a lengthy one and provides for ample opportunity for public involvement and participation. The first step by the Department is to develop the criteria based upon the process we have described. The next step is to begin the public process of adoption of these values. This process will require multiple public comment periods and opportunities for the public to provide additional data, information, and comment to the actual development of the water quality standards that are derived from the criteria development process. This often includes application and implementation decisions as well as the criteria themselves. Our process for regulation development is briefly described as follows:

- Notice of Drafting – *State Register* notification. Includes a thirty (30) day comment period.
- Meetings with stakeholders – Usually multiple meetings are convened to provide for interaction between the many different stakeholders and the Department. Other Federal and State agencies are involved as well as environmental groups and members of the regulated community along with local governmental groups representing cities and towns.
- First Board meeting – The Department requests permission from our Agency Board members for a Notice of Proposed Regulation, a Staff-conducted Informational Forum to be convened, and a Public Hearing to be held.
- Notice of Proposed Regulation – *State Register* notification. Another thirty (30) day comment period. Department prepares final language of the regulation and a responsiveness summary to all comments received during the process.
- Staff Informational Forum – The Department provides an additional opportunity for the public to provide comments regarding the proposed regulation.
- Public Hearing – Conducted before the Agency Board and if the proposed regulation is approved, then the Department may go forward with sending the promulgated regulation to the South Carolina Legislature for approval.
- Submittal to S.C. Legislature – If after 120 days, it is approved or no action taken, the regulation is then published in the next *State Register.*
  The regulation becomes effective for purposes of state activities.
- Submittal by the Attorney General to the EPA – EPA is now given sixty (60) days to approve the regulation revision or ninety (90) days to disapprove.

- If approved by the EPA – State may use the numeric criteria as South Carolina water quality standards for purposes of the Clean Water Act.

Summary

South Carolina was the first state in Region 4 to promulgate and adopt numeric nutrient criteria for lakes based upon a modification of the EPA guidelines. We believe that this indicates the seriousness with which this Department views the problems of nutrient over-enrichment. As necessary, the Department plans to continue to develop nutrient criteria and believes that these criteria are essential for our water quality standards program and for our water programs in general. We are committed to their continued development. With the full knowledge that we have addressed the most egregious nutrient eutrophication problems in our State by the adoption and implementation of nutrient controls for our lakes and reservoirs, the Department will begin to address those other waters impacted by nutrient over-enrichment as soon as resources become available.