Attachment I
Existing North Carolina Nutrient Management Programs

The State of North Carolina has aggressively pursued and endorsed the use of flexible, watershed specific measures for the control of nutrients in its surface waters for over 25 years. Implementation of the various components of North Carolina's nutrient management programs has entailed the expenditure of hundreds of millions of dollars by state, local and federal agencies, industry, agriculture and private interests. A November 2001 EPA Office of Science and Technology (OST) memorandum outlined a number of key elements for States to establish nutrient control criteria. Prior to the 2001 memorandum, North Carolina had already established a functioning nutrient control program that substantially complied with the memorandum requirements.

The remainder of this attachment provides further details regarding the individual elements of North Carolina's existing nutrient control program and accomplishments. Program areas are addressed in Sections I through IX as outlined below:

I. Adopted, and implemented, its **existing nutrient response standards** that includes chlorophyll-a, dissolved oxygen (DO) and pH.

II. Established an innovative, specialized classification of **"Nutrient Sensitive Waters (NSW)"**. The NSW classification, which requires development of a comprehensive control strategy, has been applied to the Neuse, Tar-Pamlico and Chowan river basins and portions of the Cape Fear and White Oak basins. Because of these measures, activities conducted within approximately 30% of the entire land mass of North Carolina are regulated under some form of site-specific nutrient management strategy. Section II, Parts A–E contains detailed information on these strategies for each river basin.

III. Implemented a **statewide sampling and ambient monitoring program** for these nutrient response criteria.

IV. Developed and implemented **use support methodology** to interpret nutrient related ambient water quality data and listed surface waters as "*impaired*" on the North Carolina **303(d) list** for exceedences of the nutrient response criteria, based upon this use support methodology.

V. Created nutrient response models for the development of **Total Maximum Daily Loads (TMDLs)** for chlorophyll-a. Developed and implemented **nitrogen and phosphorus** National Pollutant Discharge Elimination System (NPDES) **permit limits from models** and TMDLs using chlorophyll a targets.

VI. Pursued site oriented **additional management strategies** where issues have been identified through our extensive monitoring efforts.

VII. Adopted **stormwater regulations** that require reductions in nutrient runoff from new development to meet N and P loading targets.

VIII. Required permits for concentrated **animal feeding operations** that include a certified animal waste management plan.

IX. In addition to the NSW classifications, the North Carolina General Assembly adopted: "House Bill 515", the "Clean Water Responsibility and Environmentally Sound Policy Act", in 1997 and "Senate Bill 981", the "Drinking Water Reservoir Protection Act", in 2005/2006. Other **relevant North Carolina legislative actions** have provided additional restrictions on nutrient loads.

I. Existing Nutrient Response Standards

For a number of years, North Carolina has included a suite of nutrient response criteria in its surface water quality standards. These nutrient response criteria include both numeric and narrative standards for chlorophyll-a, dissolved oxygen and pH. These standards are delineated in the North Carolina Administrative Code, specifically 15A NCAC 2B .0211, Fresh Surface Water Quality Standards for Class C Waters and 15A NCAC 2B .0220, Tidal Salt Water Quality Standards for Class SC Waters.

Fresh Waters of the State: The specific nutrient response criteria contained in 2B .0211 that apply to all fresh surface waters of the State are provided below:

- Chlorophyll-a (corrected) [As specified in 15A NCAC 2B .0211(3)(a)]: not greater than 40 ug/L for lakes, reservoirs, and other waters subject to growths of macroscopic or microscopic vegetation not designated as trout waters, and not greater than 15 ug/L for lakes, reservoirs, and other waters subject to growths of macroscopic or microscopic vegetation designated as trout waters (not applicable to lakes and reservoirs less than 10 acres in surface area); the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;

- Dissolved Oxygen (DO) [As specified in 15A NCAC 2B .0211(3)(b)]: not less than 6.0 mg/L for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/L with a minimum instantaneous value of not less than 4.0 mg/L; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions;

- pH [As specified in 15A NCAC 2B .0211(3)(g)]: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions

Tidal Salt Waters: The specific nutrient response criteria contained in 2B .0220 that apply to all tidal salt surface waters of the State are presented below:

- Chlorophyll-a (corrected) [As specified in 15A NCAC 2B .0220(3)(a)]: not greater than 40 ug/L in sounds, estuaries, and other waters subject to growths of macroscopic or microscopic vegetation; the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;

- Dissolved Oxygen [As specified in 15A NCAC 2B .0220(3)(b)]: not less than 5.0 mg/L, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions;

- pH [As specified in 15A NCAC 2B .0220(3)(g)]: shall be normal for the waters in the area, which generally shall range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions

The freshwater and tidal salt water standards were adopted to form a basis for nutrient control throughout the State. The Division uses these nutrient response variables and others for the development of nitrogen and phosphorus limits and nutrient management strategies where the standards are being exceeded. They are also used on a case-by-case basis where these parameters are not exceeded, yet there are indications of decreased water quality (i.e. fish kills and algal blooms).

II. Nutrient Sensitive Waters (NSW) Classification

North Carolina established itself as a leader in innovative approaches to the control of nutrients in surface waters when it adopted its Nutrient Sensitive Waters (NSW) classification for nutrient-polluted water bodies. In response to nuisance algal blooms and fish kills in North Carolina's surface waters, the NC Environmental Management Commission (EMC or Commission) established the NSW supplemental classification (May 1979) as a legal basis for controlling the discharge of nutrients, primarily nitrogen and phosphorus, into surface waters. This designation, which is codified in 15A NCAC 02B .0223, is applied by the EMC "upon a finding that such waters are experiencing or are subject to excessive growths of microscopic or macroscopic vegetation. Excessive growths are growths which the Commission determines impair the use of the water for its best usage as determined by the classification applied to such waters. NSW may include any or all waters within a particular river basin as the Commission deems necessary to effectively control excessive growths of microscopic or macroscopic vegetation." The NSW classification mandates the development of a nutrient management strategy for those waters so designated. These management strategies may be voluntary (incentive based) or mandatory (15A NCAC 02B .0200s) and apply to both point and nonpoint sources of nutrient pollution.

These initial NSW regulations were modified in 1997. Most commonly referred to as House Bill 515, Session Law 1997-458 was adopted by the North Carolina General Assembly to provide additional mitigation for North Carolina's waters demonstrating effects of nutrient pollution and eutrophication. This legislation mandated total nitrogen and phosphorus permit limits for specific discharges to those waters that had been designated Nutrient Sensitive Waters. Specifically, House Bill 515 (Session Law 1997-458) established a total nitrogen permit limit of 5.5 mg/L and a total phosphorus limit of 2.0 mg/L capped to existing permitted flows for all facilities existing prior to July 1, 1997 and having a design capacity of greater than 500,000 gallons per day as well as for all new dischargers commencing after July 1, 1997. The effect of this legislation was to mandate stringent limitations on the discharge of nitrogen and phosphorus on a wide range of point sources.

In North Carolina, the implementation of these NSW nutrient management strategies led to the unprecedented use of state-funded agriculture cost-share dollars for the control of agriculturally-related nonpoint sources. To date, the expenditure of agriculture cost-share money in for these purposes has reached approximately $50,000,000 in the Neuse, Tar-Pamlico, White-Oak, Chowan and Catawba basins alone. Nutrient reductions from 2000 – 2008, calculated from the Division of Soil and Water Conservation projects (all Agricultural Cost Share Program 319 projects and Nutrient Sensitive Waters 319 funded projects) are as follows: Nitrogen reductions, approximately 7,200,000 lbs/yr; Phosphorus reductions, approximately 1,960,000 lbs/yr. This level of expenditure and the resulting poundage of nutrients saved clearly demonstrate North Carolina's commitment to the control of nutrient pollution.

The determination to classify a specific waterbody as a Nutrient Sensitive Water is based upon a comprehensive and detailed scientific evaluation of a myriad of parameters including, but not limited to: exceedences of the nutrient response standards, fish kill frequencies, frequency and duration of algal blooms, sediment loading, and a thorough examination of the relative contribution of point and nonpoint sources to the overall nutrient problem. Within North Carolina, the entire Neuse, Tar-Pamlico River and Chowan basins and portions of the Cape Fear and White Oak River basins have received the NSW

designation. In the case of the Neuse and Tar-Pamlico, this designation has resulted in the implementation of a mandatory nutrient management strategy throughout the complete river basins.

The State has designated approximately 15,000 square miles of land area with the Nutrient Sensitive Waters classification. This means that activities conducted within approximately 30% of the entire land mass of North Carolina are already regulated under some form of site-specific nutrient management strategy. Full text of these rules can be located at:http://h2o.enr.state.nc.us/admin/rules/codes_statutes.htm

A brief summary of these rules and their strategies follows:

A. Neuse River Basin Nutrient Reduction Strategy Summary

Nutrient management in the Neuse River basin began with the designation of the portion of the Neuse River basin upstream of the Falls of the Neuse Reservoir dam as NSW in 1983. Due to nuisance algal growths and sporadic blooms of undesirable blue-green algae, the Neuse River basin from below Falls of the Neuse Reservoir Dam to the estuary was also reclassified as NSW in 1988. Separate nutrient management strategies are in place and under development in these two portions of the basin.

- **Falls Lake Nutrient Reduction Strategy Summary (In Progress)**

There are 19 major reservoirs in the Neuse River basin. Most of them are located in the upper portion of the basin. The largest is Falls of the Neuse Reservoir (or Falls Lake) which is managed by the US Army Corps of Engineers for flood control and is the City of Raleigh water supply.

Falls Lake was classified as a Nutrient Sensitive Water in 1983. At that time, special resources were allocated by the State for the implementation of agricultural BMPs to reduce sediment, nitrogen and phosphorus inputs. Local governments adopted zoning ordinances to limit density and the types of development in critical areas of the Falls watershed. Existing dischargers of 0.5 MGD capacity or greater were to have Total Phosphorus limits of 2 mg/L (quarterly average), and all new point source dischargers were to receive limits of 1 mg/L (monthly average).

The 2008 Draft North Carolina Impaired Waters List includes the entire lake for chlorophyll-a standard violations. In anticipation of this listing, DWQ initiated a special study of Falls Lake in February of 2005. The DWQ Falls Lake study has been designed to provide an approximate measure of the reservoir's capacity to assimilate nutrients and to support the development of a TMDL. The study is also designed to provide the information needed to guide management approaches. The ultimate goal is to produce a nutrient management strategy that will protect the waterbody's designated uses.

In addition to the lake's NSW classification and its impaired status, the Drinking Water Supply Reservoir Act of 2005 also applies to Falls Lake. This Act is often referred to as "Senate Bill 981". It is codified as Session Law 2005-190 and Session Law 2006 -259. The Act directs the EMC to evaluate water quality in the state's drinking water reservoirs and to develop and implement a nutrient management strategy for any impaired reservoirs. Additional information with respect to this legislation and a web link to the drinking water reservoir report is located in Section IX, Part B of this document.

To assist the evaluation process, DWQ formed a Falls Lake Technical Advisory Committee (TAC) in July 2005. The role of the TAC was to assist DWQ with the development of mathematical tools for the management of nutrients in Falls Lake. The TAC was tasked with review and modification of the monitoring strategy and the development of acceptable procedures associated with the proposed calibrated nutrient response model. The data collected in the monitoring study and the subsequent modeling analysis will allow the DWQ to determine the extent of the impairments. The field study data

collection process started in 2005 and was completed in the fall of 2007. The watershed model was completed by DWQ staff in November 2008 and is currently being reviewed by the TAC. The lake model is scheduled for completion by February 2009. The results of both models will be presented to the Falls Lake Stakeholder group in April 2009. The calibrated nutrient response model will be used to establish nutrient loading goals.

In August 2008 DWQ, along with the Upper Neuse River Basin Association (UNRBA), initiated the Falls Lake Stakeholder process as part of the rule making procedure to begin laying the groundwork for developing the nutrient management strategy for Falls Lake. This process provides a diverse group of stakeholders representing a wide range of interests the opportunity to work with the DWQ in developing the strategy for Falls Lake and its watershed. This collaboration will allow stakeholders and DWQ staff the opportunity to exchange ideas on how to best develop and implement a successful nutrient management strategy to achieve the necessary nutrient reductions for Falls Lake, while addressing specific questions and concerns from individual stakeholders. The Falls Lake Stakeholder process will run through October 2009.

DWQ anticipates having the Falls Lake Nutrient Management Strategy adopted by the NC General Assembly in 2011. Although the specific rules that will eventually be developed for the nutrient reduction strategy are dependent upon the outcomes of the modeling and stakeholder process, the nutrient management strategy will address point and nonpoint sources of nutrients in the Falls Lake watershed.

- **Neuse River Basin Estuary Nutrient Reduction Strategy Summary**

To address mounting water quality problems in the Neuse River estuary, the NC Environmental Management Commission adopted precedent-setting rules that became effective August 1, 1998. The intent of these rules was to reduce nitrogen inputs, from both point and non-point sources, to the Neuse River estuary by 30% from the 1991-1995 baseline. The specific requirements of the Neuse nutrient strategy are delineated in 15A NCAC 2B .0232 through 2B .0242. These rules contain specific nutrient management strategies for agricultural operations, riparian buffer protection, wastewater dischargers, stormwater management, and overall nutrient management.

Under the Neuse nutrient management strategy, the agricultural community is required to achieve and maintain a collective 30% reduction in nitrogen losses by participating in a county nitrogen reduction plan or by implementing standard Best Management Practices. There are *three* rules that address riparian buffers, ensuring that existing 50-foot vegetated riparian areas are protected and maintained on both sides of intermittent and perennial streams, lakes, ponds and estuarine waters to help control nutrient runoff. The wastewater discharge rule assigns nitrogen allocations to NPDES wastewater dischargers and requires nutrient limits for 'large' dischargers, i.e., those with permitted flows of 0.5 MGD or greater (29 facilities at the close of 2008). The Total Nitrogen limits became effective 1/1/2003. Limits for most of the municipalities are equivalent to 3.7 mg/L.

All large dischargers have TP limits of 2 mg/L, as do those in the Falls Lake subbasin with permitted flows from 0.05 to 0.5 MGD. New or expanding dischargers will receive TP limits of 1 mg/L (except members of the Neuse River Compliance Association, which remain at 2 mg/L).

Under the Neuse stormwater rule, five counties and 10 municipalities are required to regulate new development to achieve 30% reduction in nitrogen export and no increase in phosphorus export from basin wide average pre-development conditions. These local governments are also required to identify and eliminate illicit discharges to the stormwater system, conduct education programs, and identify retrofit sites on existing developed lands.

The Neuse nutrient management rule requires applicators that apply fertilizer to 50 acres or more of residential, agricultural, commercial, or industrial land and right-of-way to complete a nutrient management training class or develop a nutrient management plan. Approximately 2,000 applicators were trained in the Neuse Basin under this rule.

B. Tar-Pamlico River Basin Nutrient Reduction Strategy Summary

The Pamlico River estuary witnessed growing numbers of fish kills and diseases, nuisance algal blooms, loss of aquatic vegetation, and other nutrient-related problems during the 1970's and 1980's. In response, the Environmental Management Commission designated the entire Tar-Pamlico River Basin as "Nutrient Sensitive" in December 1989 and called for a strategy to reduce nutrient inputs from around the basin. In the first phase, point sources successfully reduced discharge nutrient loads under an innovative 'trading' program. The second phase, in 1995, established estuary-based goals of a 30% reduction in nitrogen loading and no increase in phosphorus loading relative to a 1991 baseline condition, continued the point source caps and offset program, and called on nonpoint sources to voluntarily meet the loading goals. In 1998, the EMC initiated rulemaking to implement nonpoint source goals. Modeled after rules implemented in the adjacent Neuse River Basin in 1998, a set of rules addressing four areas (agriculture, urban stormwater, riparian buffers, and fertilizer management) went into effect during 2000 and 2001. (15A NCAC 02B .0255 – 0261)

This suite of Tar-Pamlico regulations is summarized as follows:
The rules called for a 30% reduction of nitrogen inputs to the estuary from major sources, including both wastewater and runoff pollution. The rules called for no increase in phosphorus load compared to a baseline year of 1991. As part of the overall strategy, nitrogen and phosphorus loading caps for an association of 15 point source dischargers, the Tar-Pamlico Basin Association, are implemented under a nutrient control agreement. These dischargers comprise approximately 94% of the Basin's point source discharge flows. The Association has steadily reduced N and P annual mass discharge loads below its caps and currently discharges at 60 - 70% of its N and P caps. The agricultural community was required to achieve a collective 30% reduction in nitrogen losses within five years and to ensure no increase in phosphorus losses within four years of the development of a phosphorus accounting method. Agriculture exceeded its goal by 2004, with annual reports currently estimating N loss reductions exceeding 40%. Under the stormwater rule, five counties and six municipalities were required to regulate new development to achieve a 30% reduction in nitrogen export and no increase in phosphorus export from basinwide average pre-development conditions. These local governments were also required to identify and eliminate illicit discharges to the stormwater system, conduct education programs, and identify retrofit sites on existing developed lands. New development permitting programs were implemented in 2004. The riparian buffer rule established protections for existing riparian areas 50 feet in width basinwide and required establishment of such buffers where none exist upon change of land use. The nutrient management rule requires people who apply fertilizer in the basin, except residential landowners who apply fertilizer to their own property, to either take state-sponsored nutrient management training or have a nutrient management plan in place for the lands to which they apply fertilizer. Approximately 1,600 applicators were trained under this rule.

C. Chowan Nutrient Reduction Strategy Summary

In the 70's the Chowan River suffered from frequent and spatially severe blue-green algal blooms. These thick blooms prevented contact recreation throughout the river and were accompanied by massive fish kills involving recreationally important species of fish. The Division and academic scientists agreed that aggressive actions from both point and nonpoint sources were needed to reduce the elevated nitrogen and phosphorus loads feeding these blooms. The EMC adopted the Chowan River Basin Nutrient Sensitive Waters Management Strategy Plan in 1982. The NSW plan was subsequently updated in 1990 to reduce

nitrogen loading by 20% and phosphorus loading by 35-40%. Since the application of the NSW management strategy, reductions in nutrient loads have been achieved and algal blooms have been less frequent and last for shorter periods of time effectively restoring appropriate uses to the waters. Much of this success can be attributed to actions involving agricultural best management practices and establishment of the Agricultural Cost Share Program. The State of North Carolina additionally implemented stringent point source limits on N and P (3 mg/L for TN and 1 mg/L for TP). Because of the imposed limitations, point source discharges in the basin have converted their facilities to land application operations, further reducing nutrient loads to the surface waters. These efforts were also complimented with the Commonwealth of Virginia's implementation of a program to control point and non-point sources of nutrients to its portion of the Chowan Basin. Continued monitoring has demonstrated very few, if any surface blooms and an actual measurable reduction of phosphorous in the Chowan. Overall, the goals and strategies associated with the management of the Chowan basin have been deemed successful. As early as 1990, the nitrogen reduction goal of 20% had been accomplished and total phosphorus had been reduced by 29%.

D. Upper Cape Fear (Jordan Lake/Haw River sub-basin)

- **Jordan Lake Proposed Nutrient Reduction Strategy Summary**

DWQ has developed a nutrient management strategy for the Jordan Lake based on nutrient response modeling. The strategy is designed around separate nitrogen and phosphorus percentage reduction goals for each of the three arms of Jordan Lake relative to a common starting point of 2001. The proposed strategy was reviewed and approved by the North Carolina Environmental Management Commission and the Rules Review Commission. The proposed rules will go to the 2009 General Assembly for adoption, with strategy implementation in the summer of 2009.

The proposed set of rules would involve a comprehensive effort to address nutrient sources to Jordan Lake in order to meet the reduction goals established by the modeling. It would entail reductions by point source discharges, nutrient runoff from agriculture, existing development, and new development. Riparian buffer protection rules would largely stem loading increases that would otherwise result from loss of those landscape features. Requirements to establish buffers during a change in land use would achieve some additional loading reduction. A fertilizer management rule would result in training of fertilizer applicators in the watershed, potentially reducing nutrient inputs through education. Changes from previous nutrient strategies implemented in the Neuse and Tar Pamlico River Basins include stormwater requirements for *all* local governments in the watershed, *local* implementation of buffer rules, a rule requiring local governments to achieve loading reductions from existing developed lands, a separate stormwater rule for State and Federal entities, and a separate rule outlining a trading framework to maximize options for cost-effective reductions. Outside of these rules, staff is also evaluating possible improvements to Division of Water Quality rules for land application of wastes and the potential for improved onsite wastewater management through the Division of Environmental Health.

Under the proposed Jordan Lake nutrient management strategy, the agricultural community would collectively meet the percent reduction goals either within five years through voluntary enlistment of additional practice implementation or within eight years through additional measures imposed by the Commission. Annual reporting would aggregate county scale accounting for each subwatershed.
The buffer protection rule will require local governments to ensure protection of existing vegetated riparian areas 50 feet wide adjacent to intermittent and perennial streams and impoundments. They would permit mitigation where no practical alternatives exist. Under the stormwater rule, all local governments would develop and implement programs requiring stormwater controls on new development projects to meet subwatershed loading rate targets based on the percent reduction goals. North Carolina Department of Transportation (NCDOT), universities, and other state and federal entities will be required to meet the

same new and existing development requirements as imposed on local governments under the rules. The existing development stormwater rule requires all local governments to incrementally implement sustainable loading reducing measures on existing developed lands toward the percent reduction goals. Local governments would also conduct feasibility studies from which they would propose the pace and nature of implementation. The nutrient management rule requires applicators that apply fertilizer to 50 acres or more of residential, agricultural, commercial, or industrial land and right-of-way be subject to complete a nutrient management training class or develop a nutrient management plan.

The wastewater discharge section of the proposed Jordan rules requires point sources of 0.1 MGD and larger to meet annual mass loading limits consistent with the approved nutrient TMDLs within one year for phosphorus and five years for nitrogen. This rule includes effluent trading and group compliance options similar to those established under the Neuse River strategy. In the Haw River arm of the Jordan reservoir, the 10 WWTP's with greater than 0.1 MGD will receive limits equivalent to 5.3 mg/L nitrogen and 0.66 mg/L phosphorus. In the Upper New Hope arm, the 4 WWTP's with permitted flows of 0.1 MGD or greater will receive limits equivalent to 3.0 mg/L of nitrogen and 0.23 mg/L of phosphorus. The Lower New Hope arm has one discharger with limits equivalent to 5.35 mg/L of nitrogen and 0.37 mg/L of phosphorus.

E. White Oak River Basin

Nutrient Sensitive Waters discharge strategies are applicable in a portion of the White Oak river basin. As nutrient enrichment has historically been a significant problem in the estuarine portions of the New River, the New River was classified as NSW in 1991. In 1998, the City of Jacksonville removed its discharge from the upper New River estuary and Camp Lejeune consolidated its seven discharges into one tertiary treatment facility. These discharges were considered a major source of nutrients into the upper estuarine portions of the New River. Since the removal of these nutrient sources, documented reduction of nitrogen and phosphorus, 57 percent and 71 percent decrease respectively, has occurred. As reported by the 2001 White Oak River Basin Plan, algal blooms have decreased in frequency, extent and severity. DWQ recommended that Jacksonville develop a stormwater program as part of Phase II requirements. The City of Jacksonville was issued an NPDES Permit for their storm sewer system, effective March 1, 2007, which required the city to develop a stormwater management plan. The permit required all stormwater programs to be in place by March 1, 2008, except the post-construction ordinance which has to be in place by March 1, 2009.

To reduce point source contributions of nutrients to the upper New River estuary, dischargers have the following requirements:
1) Existing facilities with permitted capacity of 0.05 MGD or greater receive total phosphorus (TP) limits of 2.0 mg/L.
2) New and expanding facilities receive TP limits of 0.5 mg/L.
3) New and expanding facilities greater than 1 MGD receive total nitrogen limits
(TN) similar to Camp Lejeune of 5.0 mg/L (summer) and 10.0 mg/L (winter).
4) All wastewater facilities without limits are required to monitor TN and TP. (Water treatment plants and groundwater remediation facilities are generally excused from nutrient monitoring.)

III. Statewide Sampling and Ambient Monitoring Program

Through the Ambient Lake Monitoring Program (ALMP), DWQ monitors approximately 160 lakes statewide. In addition to chlorophyll-a, dissolved oxygen and pH, the ALMP includes nutrient monitoring at selected stations and Secchi depth readings at all reservoir stations. Most lakes are sampled at least three times during May through September (growing season) of a single year for each five year river basin planning cycle. ALMP has 486 stations throughout the State resulting in over 6500 samples collected in a five year period. These sample totals reflect all lake sampling, including special studies (examples: Falls and Jordan Lakes).

Additionally, North Carolina has an extensive ambient monitoring program. This program includes monitoring performed by Division staff and an innovative coalition monitoring program. Additional information can be obtained through the following website: http://www.esb.enr.state.nc.us/ams.html .

IV. Use Support Methodology/ 303(d) Listings

Waters where greater than 10% of chlorophyll a samples exceed 40 ug/L are assigned a use support rating of *Impaired* and placed in Category 5 of the Integrated Report (303d list). DWQ has been using this method to identify waters as *Impaired* for excessive algal growth due to nutrient overloading since 1994. DWQ has developed TMDLs for nutrients in these waters and management strategies to address these impairments. Currently, there are 29 assessment units (305b segments) in Category 5 for chlorophyll a impairments. There are 20 assessment units (305b segments) with approved nutrient TMDLs to address chlorophyll a impairments identified in earlier use support assessments. There are seven waters where management strategies were developed to address nutrient related problems so that TMDLs would not be necessary. Fifteen waters are currently identified for further evaluation to determine if there are nutrient related problems. DWQ will continue to refine assessment methods to best identify real and potential nutrient related water quality problems.

V. Total Maximum Daily Load Development, Nitrogen & Phosphorus Permit Limits

When a water is listed in Category 5 of the Integrated Report (303d list), the Division initiates the development of a Total Maximum Daily Load (TMDL) in order to meet the exceeded standard in the *Impaired* waters. An integral part of the nutrient TMDL process is the creation of a comprehensive nutrient response model. This model includes nitrogen and phosphorus load allocations for both point and nonpoint sources in the affected watershed. Load allocations developed in this process are then utilized to establish total nitrogen and phosphorus NPDES limitations for dischargers to these affected water bodies.

NC currently has 124 permits with nutrient limits. Of the NPDES permits, 53 NPDES permits have nitrogen limits (10 with concentration limits, 43 with mass load limitations). Phosphorus limitations are applicable to 118 permits (102 contain concentration limits for phosphorus, and 16 facilities have mass limits for phosphorus). *Both* nitrogen *and* phosphorus limits are currently applied to 47 permits. Upon approval of the Jordan Lake rules, 12 additional permits will receive mass limits for both nitrogen and phosphorus.

VI. Additional Nutrient Management Strategies

North Carolina has additional management options for the control of nutrients through a variety of programs. The following is a brief synopsis of those controls listed by river basin.

A. High Rock Lake Nutrient Reduction Strategy Summary (In Progress)

High Rock Lake is on the North Carolina 303(d) list of impaired waters for chlorophyll-a and turbidity violations. As a result, DWQ has initiated a field study and modeling plan to aid in the development of a nutrient management strategy for the lake. A High Rock Lake Technical Advisory Committee (High Rock TAC) was formed in July 2005. The role of the High Rock TAC was to assist DWQ with the development of mathematical tools for the management of nutrients in High Rock Lake including review and modification of the monitoring strategy and developing levels of confidence for decision making associated with the monitoring and modeling activities conducted to develop a calibrated nutrient response model. The sample collection process began in March 2008 and will be completed in 2010. Model development is slated to be completed in 2011 with a stakeholder and rule making process to follow. Although the specific rules that will eventually be developed for the nutrient reduction strategy are dependent upon the outcomes of the modeling and stakeholder process, the nutrient management strategy will address point and nonpoint sources of nutrients into the High Rock Lake watershed.

B. West Buffalo Creek Arm of Santeetlah Lake

The West Buffalo Creek arm of Santeetlah Lake is on the 303(d) list (289 acres) for impairment due to nutrient enrichment (chlorophyll *a*) based on special studies conducted by the Division of Water Quality in 1993 and 1999. Nutrient concentrations were especially high immediately downstream of trout farms on West Buffalo Creek. The Clean Water Management Trust Fund awarded $1.25 million dollars to support the buyout of the four trout farms on the West Buffalo Creek arm responsible for the largest contributions of nutrients to the creek. The four farms were fully decommissioned by the end of March 2004.

During the spring, summer, and fall of 2005, the Division of Water Quality conducted a special study of West Buffalo Creek and the West Buffalo Creek arm of Santeetlah Lake. This study was conducted to document changes or improvements to the water quality of Buffalo Creek following the de-population and dismantling of the trout farms. This study examined physical, chemical and biological water quality parameters on West Buffalo Creek and Santeetlah Lake to determine the degree of nutrient reduction obtained from the trout farm removal.

Results from that study indicate that the nutrient reduction strategy was effective. Nutrient loading into the West Buffalo Creek arm of the lake was reduced up to 92 percent and algal blooms were diminished. Phytoplankton species shifts also occurred. *Anabaena spiroides*, a filamentous blue-green alga responsible for blooms and complaints in 1993 and 1999, was not present in samples analyzed in 2005. While problematic species were still present, densities were more than 50 percent lower in 2005 than in previous years. Additionally, feedback from local citizens was very positive regarding the appearance of the West Buffalo Creek arm of Santeetlah Lake. Citizens commented that 2005 was the first year in recent memory that they did not see the “pea soup” appearance they had witnessed in years past.

It is clear that management efforts and nutrient reductions have restored this body of water to fully supporting its designated uses. DWQ has recommended the West Buffalo Creek arm of Santeetlah Lake be removed from the Impaired Waters List. The Graham County Soil and Water Conservation District has current plans with other agricultural produces along this stream to fence out cattle from West Buffalo

Creek to further enhance the conservation efforts on this creek. DWQ supports Graham County SWCD in this effort.

C. Deep River, from Randleman Reservoir to Carbonton Dam

The Deep River behind Carbonton Dam is considered impaired for chlorophyll *a* standards violations. Due to the this 303(d) listing, no new or additional TP or TN mass loading will be permitted for any discharges upstream of Carbonton Dam and below Randleman Dam. Further reductions in nutrients from permitted facilities upstream of the dam, as well as from non-point sources may be required.

D. Randleman Lake Nutrient Management

In November 1998, waters in the proposed Randleman Reservoir watershed were reclassified to WS-IV, Critical Area (CA). Rules have been adopted (15A NCAC 2B .0248 through .0251) to help prevent potential water quality problems in the proposed reservoir. The rules address point source discharges by not allowing new or expanding discharges into the watershed with the exception of High Point Eastside WWTP. Any revisions to the High Point Eastside permit must have both concentration and mass limits for TN and TP as predicted to protect water quality. The rules address nonpoint source pollution in the Randleman Reservoir watershed with management strategies that maintain and protect riparian areas and require urban stormwater programs to be developed by local governments having land use authority in the watershed.

Local governments were required to develop ordinances or modify existing water supply ordinances to protect riparian areas and implement stormwater management plans by January 1, 2000. All of the affected local governments have submitted their revised ordinances to meet the specifications set forth in the Randleman Lake Water Supply Watershed Nutrient Management Strategy for approval by the EMC's Water Quality Committee.

E. Catawba Basin

- **Riparian Buffer Rules**

In May 2001, the North Carolina Environmental Management Commission adopted a pair of rules to protect existing shoreline, or riparian, buffers in certain parts of the Catawba River Basin. The rules apply to the Catawba River main stem and main stem lakes from, and including, Lake James to the North Carolina/South Carolina line in Lake Wylie.

The rules were adopted as temporary rules effective June 30, 2001 and became effective as permanent rules August 1, 2004. The buffer protection rule (15A NCAC 2B .0243) requires maintaining and protecting existing 50-foot wide vegetated riparian (shoreline) areas along the Catawba River below Lake James and along the main stem lake shorelines from, and including, Lake James to the North Carolina portion of Lake Wylie. This rule does not require establishment of new buffers unless the existing use in the buffer area changes. The footprints of existing uses such as agriculture, buildings, commercial and other facilities, maintained lawns, and utility lines are exempt. Within this 50 feet of buffer, the first 30 feet closest to the water, referred to as Zone 1, is to remain undisturbed with the exception of certain activities. The outer 20 feet, referred to as Zone 2, must be vegetated, but certain additional uses are allowed. Specific activities are identified in the rule as "exempt", "allowable", "allowable with mitigation" or "prohibited". Any proposed activities not included in the table of uses are considered "prohibited". The buffer mitigation rule 15A NCAC 2B .0244 provides details for activities that are "allowable with mitigation".

- **Lake Wylie TMDL and NPDES Nutrient Limits**

In addition to the buffer rules, a TMDL was approved for Lake Wylie in 1996. As a result of this TMDL, nutrient permit limits were established for the six major point source dischargers in the region. For example, the City of Gastonia's Long Creek Wastewater Treatment Plant received permit limits for both total nitrogen and phosphorus. These limits are 1 mg/L for total phosphorus – year round and 6 mg/L for total nitrogen during the summer season. Following the imposition of these nutrient limits, the Long Creek plant expended approximately $30,000,000 in order to be able to comply with these requirements.

F. Cape Fear River

- **From Jordan Dam to Buckhorn Dam**

The Cape Fear River upstream of Buckhorn Dam is considered impaired because of chlorophyll a standards violations. A TMDL will be developed to address the chlorophyll a impairment that may require further reductions in nutrients from permitted facilities upstream of the dam as well as from nonpoint sources. No additional TP or TN mass loading is permitted for any discharges upstream of Buckhorn Dam and below Carbonton Dam on the Deep River and Jordan Dam on the Haw River.

- **from Buckhorn Dam to Lock and Dam # 3**

The Cape Fear River from Grays Creek to Lock and Dam 3 is considered impaired because of chlorophyll a standards violations. Because of this impairment, the following interim permitting policy will be used for discharges from Buckhorn Dam to L&D #3.
1) New discharges will not be allowed until completion and approval of the TMDL
2) Expanding discharges: Seasonal summer (April-October) mass nutrient loads based on the greater of either:
   a) freezing current nutrient mass loading using actual flows and actual nutrient concentrations; or
   b) mass nutrient loadings based on permitted expansion flow and concentrations of TN = 6 mg/L and TP = 2 mg/L.

VII. Stormwater Regulations

North Carolina's Division of Water Quality and the Environmental Management Commission began to push in the late 1980's for statewide legislation adopting and implementing stormwater rules and regulations. In the decade that followed, DWQ and the EMC were extremely proactive, initiating numerous stormwater programs to address nonpoint source pollution. These programs include the Water Supply Watershed Protection Program, Coastal Stormwater Rule, High Quality Water (HQW) and Outstanding Resource Water (ORW) Management Zones, Neuse River Nutrient Sensitive Waters (NSW) Management Strategy, Tar-Pamlico River NSW Management Strategy and Phase II Stormwater Management Program. Other aspects of these programs have been covered in previous sections of this document.

A. Water Supply Watershed Protection Program

One of the boldest and earliest initiatives began in 1986, when the Commission and the Division initiated a Water Supply Protection Program. Initially, the program was administered voluntarily by counties and municipalities pursuing protective measures for their water supply watersheds. The measures included limitations on the number and type of wastewater discharges which were allowed in the water supply watersheds. These limits were enforced by DWQ; and, in turn, local governments adopted and enforced

land use control ordinances to protect surface waters from nonpoint sources pollution, thereby reducing nutrient loading to waterways.

This program later became mandatory. Division staff worked with local governments in determining the location of all surface water intakes and existing land use within the water supply watersheds. This information, in conjunction with information on the types and location of wastewater discharges, was used to determine the appropriate classification for the 208 surface water supplies in the state. Twelve public hearings were held on the reclassifications during August of 1991 to receive comments. The Commission also decided to bring the adopted Water Supply Watershed Protection Rules, with proposed modifications, back to public hearing. The final version of the rules became effective on Feb. 13, 1992. The Commission reclassified all of the surface water supplies on May 14, 1992 and the classifications became effective in August 1992. Additional clarification can be found in North Carolina General Statutes: GS 143-214.5.

B. Coastal Stormwater Rule

First adopted in January 1988, the program mandated nonpoint controls in North Carolina's 20 coastal counties: Beaufort, Bertie, Brunswick, Camden, Carteret, Chowan, Craven, Currituck, Dare, Gates, Hertford, Hyde, New Hanover, Onslow, Pamlico, Pasquotank, Pender, Perquimans, Tyrrell and Washington. The requirements for low density development, or treating stormwater as an alternative, were implemented after lengthy discussion and negotiation with representatives from the development community. In an effort to increase protection from nonpoint sources of pollution on the coast, the Commission revised the rules in 2006 to strengthen runoff controls. Although adopted by the Commission, opposition to provisions in the rules led to modifications in the 2007 state legislature. Known as Session Law 2008-211, the more stringent requirements applicable to new commercial and residential development in the 20 coastal counties became effective Oct. 1, 2008. (See 15A NCAC 02H .1001 for complete rule text)

C. High Quality Water and Outstanding Resource Water Management Zones

In 1988, the Commission adopted regulations which required that certain bodies of water should be considered High Quality Waters (HQW) or Outstanding Resource Waters (ORW) because of their high natural resource values. High Quality Waters are those rated as excellent based on biological and physical/chemical characteristics. Outstanding Resource Waters, a special subset of HQW, are unique and special waters of exceptional state or national recreational or ecological significance. (See 15A NCAC 2B .0101 and 15A NCAC 02B .0224; 15A NCAC 02B .0101 and 15A NCAC 2B .0225)

After the reclassification of hundreds of streams, the Division took on the responsibility for providing added protection for these special waters through stormwater management strategies. These rules require low-density development, stream buffers and vegetated conveyance requirements for transporting stormwater. In some areas, high density is allowed if appropriate adequate stormwater treatment is provided.

Although the HQW/ORW stormwater rules were not adopted specifically for nutrient controls, nutrient limitations were a *major* focus for many of the affected water bodies. Limiting nutrient contributions to our streams has been a driving force for initiating and adopting a wide range of nonpoint source control requirements.

D. Neuse River Estuary Nutrient Sensitive Waters Management Strategy

Stormwater management is a component of the overall Neuse Estuary NSW Strategy mentioned earlier in this report (See Section II Part A), which calls for each major source to reduce its nitrogen pollution by 30 percent. The Neuse Estuary NSW stormwater management program applies to the 15 largest local governments in the Neuse River Basin. These local governments must implement nitrogen reduction programs that include:

- Review and approval of stormwater management plans for new development
- Education of the public and development community
- Identification and elimination of illegal discharges
- Identification of retrofit opportunities in existing developed areas

To assist these local governments in meeting the requirements of the Neuse rules, the Division, representatives of the local governments and other interest groups developed a model stormwater management plan. The model was approved Aug. 30, 1999. (15A NCAC 2B .0235)

E. Tar-Pamlico River Nutrient Sensitive Waters Management Strategy

The Tar-Pamlico Rule is a component of the overall Nutrient Sensitive Waters designation that requires 11 local governments in the basin to develop and implement programs to control nutrient inputs from their stormwater systems to the river (See Section III for additional information). The rule requires local programs to include:

- Regulation of new development to achieve and maintain a 30 percent reduction in nitrogen export and no increase in phosphorus export from pre-development levels
- Identification and elimination of illicit discharges
- Education of the public and development community
- Identification of retrofit opportunities in existing developed areas

The communities regulated by this rule developed their individual programs and submitted them for approval by the Commission on Sept. 8, 2004. Programs were approved by local boards during August, September and October 2004 and were implemented during September and October 2004, depending on local adoption dates. (15A NCAC 02B .0258).

F. Phase II Stormwater Management Program

In 1972, the National Pollutant Discharge Elimination System program was established under the authority of the Clean Water Act. Phase I of the NPDES stormwater program was established in 1990. It required NPDES permit coverage for large or medium municipalities that had populations of 100,000 or more. In North Carolina, there are six Phase I communities. The Phase II program extends permit coverage to smaller (population < 100,000) communities and public entities that own or operate a municipal separate storm sewer system (MS4). (See NC General Assembly Session Law 2006-246)

Phase II of the NPDES Stormwater program (December 1999) builds upon the existing Phase I program by requiring smaller communities and public entities that own and operate a MS4 to apply and obtain an NPDES permit for stormwater discharges. Session Law 2004-163 (July 2004) provided the Commission the authority and guidelines for implementing the Phase II program in North Carolina. The North Carolina General Assembly enacted Session Law 2006-246, replacing Session Law 2004-163, continuing to provide legislation for implementation of Phase II Stormwater Management Requirements. This act establishes procedures for implementing the federal NPDES Stormwater Permitting program for small communities in census designated urbanized areas. In addition to permitting requirements for Municipal

Separate Storm Sewer Systems (MS4s), the act established post-construction stormwater management requirements, in both unincorporated and incorporated areas, for development activities in areas outside of the permitted MS4s. The act requires that new development and redevelopment in these areas meet the post-construction requirements effective July 1, 2007.

Section VIII: Animal Feeding Operation Regulations

The Division of Water Quality regulates animal feeding operations under G.S. § 143-215.10A-I, which was initially passed in 1997 and required the first permits for facilities. Previous rules had required facility registration, but lagoon failures in 1995 led to the development of more stringent regulations. As a result, animal operations of 250 or more swine, 100 or more confined cattle, or 30,000 or more poultry with a liquid waste system must apply for non-discharge permit coverage under the State General Permit, the NPDES General Permit, or an Individual Permit.

These permits require that each facility have a certified animal waste management plan (CAWMP) developed by a certified Technical Specialist. Each CAWMP includes a waste utilization plan that establishes maximum application rates for fields based on the realistic yield expectation (RYE), which is a function of soil type and the receiving crop. By statute, nitrogen is the rate-determining element and if a phosphorus assessment demonstrates the need to limit the application of phosphorus, then it too shall be a rate-determining element. Other components of a CAWMP include checklists for odor and insect control, mortality disposal plan, BMPs for riparian buffers, and emergency action plans. Statute further requires annual soil tests to evaluate copper and zinc levels as well as soil pH to maintain optimum conditions for crop production.

The Swine Farm Siting Act (G.S. § 106-800) established restrictions on the location of swine houses and lagoons with respect to residences, schools and other public facilities, property boundaries, and wells. This statute prohibits construction of an animal waste management system in the 100-year flood plain and also established buffer requirements for land areas receiving waste.

The Division has recently passed rules requiring new or expanding swine farms to meet a series of performance standards to better protect water and air quality. The performance standards require that earthen structures be designed and constructed with synthetic liners to eliminate seepage, that the structures that automatically convey swine waste have audible and visible high water alarms with an auto dialing device to contact the farm owner or manager, or have an appropriately sized containment structure. In addition, there are strict limits on the ammonia emissions from storage structures, land application sites and the farm as a whole. Odor controls are required to meet strict air quality standards. Any land application that takes place must be done in accordance with a Comprehensive Nutrient Management Plan (CNMP), which is similar to the current CAWMP already used in North Carolina. Newly permitted systems have quarterly monitoring requirements for at least two years to assure that the performance standards are being met.

The Division is in the process of drafting rules to require surface water monitoring by animal operations. The proposed rules would require some level of water quality monitoring for permitted animal operations, typically three times per year at one upstream and two downstream sites. The proposed rules would be implemented on a watershed basis starting with more sensitive watersheds and those with a high number of operations in a watershed. The purpose of these rules is to help discover and eliminate any unpermitted discharges, and to evaluate the effectiveness of the Waste Management Plans related to application rates and timing of application.

IX. Additional Relevant North Carolina Legislation

A. House Bill 515 Summary (Session Law 1997-458)

In 1997, the North Carolina General Assembly adopted legislation (Session Law 1997-458) intended to provide additional protection to North Carolina's waters from the effects of nutrient pollution and eutrophication. These protective measures were contained in Part VI, Nitrogen and Phosphorus Limits for Surface Waters, of "House Bill 515". This legislation mandated total nitrogen and phosphorus permit limits for specific discharges to those waters that had been designated as Nutrient Sensitive Waters, as described above. Specifically, Session Law 1997-458 established a total nitrogen permit limit of 5.5 mg/L and phosphorus limit of 2.0 mg/L for all new dischargers commencing after July 1, 1997, and those dischargers existing before this date and with a discharge greater than 500,000 gallons per day. The effect of this legislation was to mandate stringent limitations on the discharge of nitrogen and phosphorus on a wide range of point sources.

B. Senate Bill 981 Summary (Session Law 2005-190 and Session Law 2006 -259)

Recognizing the importance of North Carolina's waters, the Legislature adopted the 2005 Drinking Water Reservoir Protection Act (Senate Bill 981; Session Law 2005-190 /Session Law 2006-259). This act tasks the Environmental Management Commission to study drinking water supply reservoirs in NC and to develop and implement a nutrient management strategy based on a calibrated nutrient response model for certain drinking water supplies that are impaired or may become impaired within five years of adoption of the act. The act requires no new or increased nutrient loading allocation to any impaired drinking water supply until rules to implement a nutrient management strategy for that reservoir become effective. Under Section 2(a) of this Act, the EMC was charged with studying the state's drinking water reservoirs, determining which reservoirs are not meeting surface water quality standards using available data, and reporting their findings and recommendations to the Environmental Review Commission (ERC) by May 1, 2006. That report is available on the Division's webpage at: http://h2o.enr.state.nc.us/esb/documents/ERCWQWSLakes2006.pdf.

Per Section 2 (b) of the Drinking Water Reservoir Protection Act, the Environmental Management Commission is required to identify nutrient control criteria necessary to prevent excess nutrient loading in each applicable drinking water supply reservoir by January 1 2009 and to adopt final nutrient control criteria by May 1 2010. As written, the Act is applicable specifically to the Falls of the Neuse Reservoir (Falls Lake) and requires development of a nutrient management strategy for the reservoir. Monitoring data collected from 2005–2007 in Falls Lake and the Falls Lake Watershed are being used to calibrate and validate the lake nutrient response model as well as the watershed loading model. While the session law calls for the strategy to be adopted by 2009, the Division of Water Quality has been working with the original sponsors of the Senate Bill and has submitted a request to the NC General Assembly to extend the adoption timeline to 2010. This extension will allow sufficient time for the modeling process and State required regulatory process, including stakeholder involvement. DWQ is currently awaiting appropriate legislative responses to these inquiries which may ultimately affect proposed timelines and modifications to the water quality standards. See the discussion of the Falls of the Neuse management strategy in Section II, Part A of this report for more information on current activities.

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