

***Neuse River Basin:
Model Stormwater Program
for Nitrogen Control***

August 30, 1999

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1. Introduction

1-A. Purpose of the Neuse Stormwater Rule

Water quality has been an issue in the Neuse River Basin for over a century. In 1887, legislation was passed to "prevent the throwing of dead stock into the waters of the Neuse River and its tributaries." Some of the water quality initiatives that have been undertaken in the Neuse River basin between 1950 and 1995 include:

- The State Stream Sanitation Act of 1951 required a statewide survey of all surface waters.
- Since the 1960s, better regulations and technology for wastewater treatment and the development of stream classifications with accompanying water quality standards have been implemented.
- In 1983, the Falls Lake watershed Nutrient Sensitive Waters (NSW) Strategy required more stringent controls for wastewater treatment facilities.
- In 1988, the Environmental Management Commission (EMC) classified the remainder of the Neuse River Basin as NSW, which brought about more stringent nutrient limits for wastewater facilities. Some of the nutrient loading from nonpoint sources (NPS) was controlled through the Agricultural Cost Share Program. In addition, the NC General Assembly adopted a statewide phosphate detergent ban on January 1, 1988.
- In 1993, the Division of Water Quality (DWQ) completed the first Basinwide Management Plan for the Neuse River Basin. The plan recommended an accelerated schedule for reducing nitrogen runoff from nonpoint sources. Since 1993, DWQ has continued to monitor and evaluate conditions in the Neuse River.

Despite these initiatives, the Neuse River basin has continued to have water quality problems. During July, September, and October 1995, extensive fish kills occurred in the Neuse River, primarily from New Bern to Minnesott Beach. Millions of menhaden, as well as numerous flounder, croaker and rock fish, were killed. Unusual meteorological conditions in 1995 were partly responsible for the fish kills. During June, record rainfalls delivered a tremendous load of nonpoint source nutrients into the Neuse River.

Environmental conditions in the Neuse River are driven by complex interactions between rainfall, flows, temperatures, biological factors, and chemistry. Each year will bring its own variations. However, the long history of problems with nutrient pollution and algal blooms provides evidence that immediate control measures are necessary.

On February 8, 1996, the EMC approved a draft comprehensive Neuse River NSW strategy. The goal of the strategy was and still is to achieve a 30 percent nitrogen reduction from each controllable and quantifiable source of nitrogen in the basin. These sources are: Wastewater Treatment, Urban Stormwater, Agriculture and Nutrient Application. The NSW Strategy also includes a rule to protect Riparian Buffers in order to maintain their existing nitrogen removal capabilities.

The NSW Strategy was noticed for public comment several times between its initial development in February 1996 and its final adoption in August 1998. These comment periods included six public workshops in May 1996, four public hearings in November 1996 and two public hearings in October 1997. As a result of the public hearings, each rule, including the Stormwater Rule, was modified to increase flexibility for the regulated community and to improve the mechanisms to insure that the 30% nitrogen reduction goal is met. The full text of the Neuse Stormwater Rule is included in Appendix B.

1-B. Requirements of the Neuse Stormwater Rule

The Neuse stormwater rule applies only to the largest and fastest-growing local governments in the Neuse River basin (shown below). The EMC may also designate additional local governments within the Neuse River basin to comply with the stormwater rule in the future. The rule establishes a broad set of objectives for reducing nitrogen runoff from urban areas. The rule also sets up a process for DWQ to work with the affected local governments to develop a model stormwater program for meeting the objectives.

The affected local governments are:

Cary	Durham County *
Durham	Johnston County *
Garner	Orange County *
Goldsboro	Wake County *
Havelock	Wayne County *
Kinston	
New Bern	
Raleigh	
Smithfield	
Wilson	

* Applicable areas are those under the direct jurisdiction of the respective county.

The timeframes for implementation of the rule are as follows:

August 1, 1998: Effective date of the rule.

- August 1, 1999: Deadline for approval of the Model Stormwater Program by the Environmental Management Commission.
- August 1, 2000: Deadline for submittal of local Stormwater Program (including ordinances) to the Environmental Management Commission.
- February 1, 2001: Deadline for local governments to begin implementing local Stormwater Programs.

Following implementation in February 2001, local governments are required to make annual progress reports to the EMC that will include nitrogen loading reduction estimates.

The general elements that must be included in the local government stormwater management program are:

1. New Development Review/Approval

New development would have to meet the 30% reduction goal by implementing planning considerations and best management practices, such as constructed wetlands. The rule imposes a 3.6 pounds per acre per year (lb/ac/yr) nitrogen loading limit on new development. Nitrogen load from new developments that exceeds this performance standard may be offset by payment of a fee to the Wetlands Restoration Fund provided, however, that no new residential development can exceed 6.0 lb/ac/yr and no new non-residential development can exceed 10.0 lb/ac/yr.

2. Illegal Discharges

Illegal discharges are substances deposited in storm sewers (which lead directly to streams) that really should be handled as wastewater discharges. Depending on the source, illegal discharges may contain nitrogen. Local governments must identify and remove illegal discharges.

3. Retrofit Locations

There are a number of funding sources available for water quality retrofit projects, such as the Clean Water Management Trust Fund and the Wetland Restoration Program that the NC General Assembly has recently established. To assist technical experts, local governments are required to identify sites and opportunities for retrofitting existing development to reduce total nitrogen loads.

4. Public Education

Citizens can reduce the nitrogen pollution coming from their lawns and septic systems if they understand the impacts of their actions and respond with appropriate management measures. The local governments will develop and implement public education programs for the Neuse basin.

2. New Development Review/Approval

2-A. Requirements in the Rule

The Neuse Stormwater Rule (15A NCAC 2B .0235) has the following requirements for new development located within the planning and zoning jurisdictions of the 15 local governments subject to these rules:

- The nutrient load contributed by new development activities is held at 3.6 pounds per acre per year. This is equivalent to 70 percent of the estimated average nitrogen load contributed by the non-urban areas in the Neuse River basin (as defined using 1995 LANDSAT data). The Environmental Management Commission may periodically update the performance standard based on the availability of new scientific information.
- Property owners shall have the option of partially offsetting projected nitrogen loads by funding wetland or riparian area restoration through the North Carolina Wetland Restoration Program. However, the total nitrogen loading rate cannot exceed 6.0 pounds per acre per year for residential development or 10 pounds per acre per year for non-residential development.
- There is no net increase in peak flow leaving the site from the predevelopment conditions for the 1-year, 24-hour storm.
- Local governments must review new development plans to assure compliance with requirements for protecting and maintaining riparian areas as specified in 15A NCAC 2B .0233.

2-B. Protecting Riparian Areas on New Development

The Neuse Stormwater Rule requires local governments to ensure that riparian areas are protected on new developments in accordance with the Riparian Buffer Rule (15A NCAC 2B .0233). The Riparian Buffer Rule requires that 50-foot riparian buffers be maintained on all sides of intermittent and perennial streams, ponds, lakes and estuaries in the Neuse River basin. The rule includes some uses that are allowable within the riparian buffer, such as road and utility crossings.

Each jurisdiction has the following two choices for ensuring that riparian buffers are protected on new developments:

1. Receive a delegated program and implement all applicable provisions of the Riparian Buffer Rule within its jurisdiction, or

2. Disapprove any new development activity that is proposed to take place within the first 50 feet adjacent to a waterbody that is shown on either the USGS topographic map or the NRCS Soil Survey maps unless the owner can show that the activity has been approved by DWQ. DWQ approval may consist of the following:
 - An Authorization Certificate that documents that DWQ has approved an allowable use such as a road crossing or utility line. A detailed list of allowable uses is included in the Riparian Buffer Rule.
 - An opinion from DWQ that vested rights have been established for the proposed development activity.
 - A letter from DWQ documenting that a variance has been approved for the proposed development activity.

2-C. Calculating N Export from New Development

For the purposes of the Neuse Stormwater Program, new development shall be defined as to include the following:

- Any activity that disturbs greater than one acre of land in order to establish, expand or modify a single family or duplex residential development or a recreational facility.
- Any activity that disturbs greater than one-half an acre of land in order to establish, expand or modify a multifamily residential development or a commercial, industrial or institutional facility.

New development shall NOT include agriculture, mining or forestry activities. Land disturbance is defined as grubbing, stump removal and/or grading.

Property owners that can demonstrate that they have vested rights as of the effective date of the Local Stormwater Program for Nitrogen Control (expected February 2001) will not be subject to the requirements for new development. Vested rights may be based on at least one of the following criteria:

- (a) substantial expenditures of resources (time, labor, money) based on a good faith reliance upon having received a valid local government approval to proceed with the project, or
- (b) having an outstanding valid building permit in compliance with G.S. 153A-344.1 or G.S. 160A-385.1, or

- (c) having an approved site specific or phased development plan in compliance with G.S. 153A-344.1 or G.S. 160A-385.1.

Projects that require a state permit, such as landfills, NPDES wastewater discharges, land application of residuals and road construction activities shall be considered to have vested rights if a state permit was issued prior to the effective date of the Local Stormwater Program for Nitrogen Control.

The nitrogen export from each new development must be calculated. This export will be calculated in pounds per acre per year (lbs/ac/yr). Model methodologies that may be used to make this calculation are presented below; however, local governments may propose alternative approaches where it can be demonstrated to be equivalent. There are two different methodologies proposed for calculating nitrogen export from new developments. These are as follows:

- Method 1 is intended for residential developments where lots are shown but the actual footprint of buildings are not shown on site plans. This method does not require calculation of the area of building footprints. Rather, the impervious surface resulting from building footprints is estimated based on typical impervious areas associated with a given lot size. This method is shown in Figure 2a.
- Method 2 is for residential, commercial and industrial developments when the entire footprint of the roads, parking lots, buildings and any other built-upon area is shown on the site plans. This method is simpler and more accurate since it does not require estimating the impervious surface based on lot size like Method 1 does. Method 2 is shown in Figure 2b.

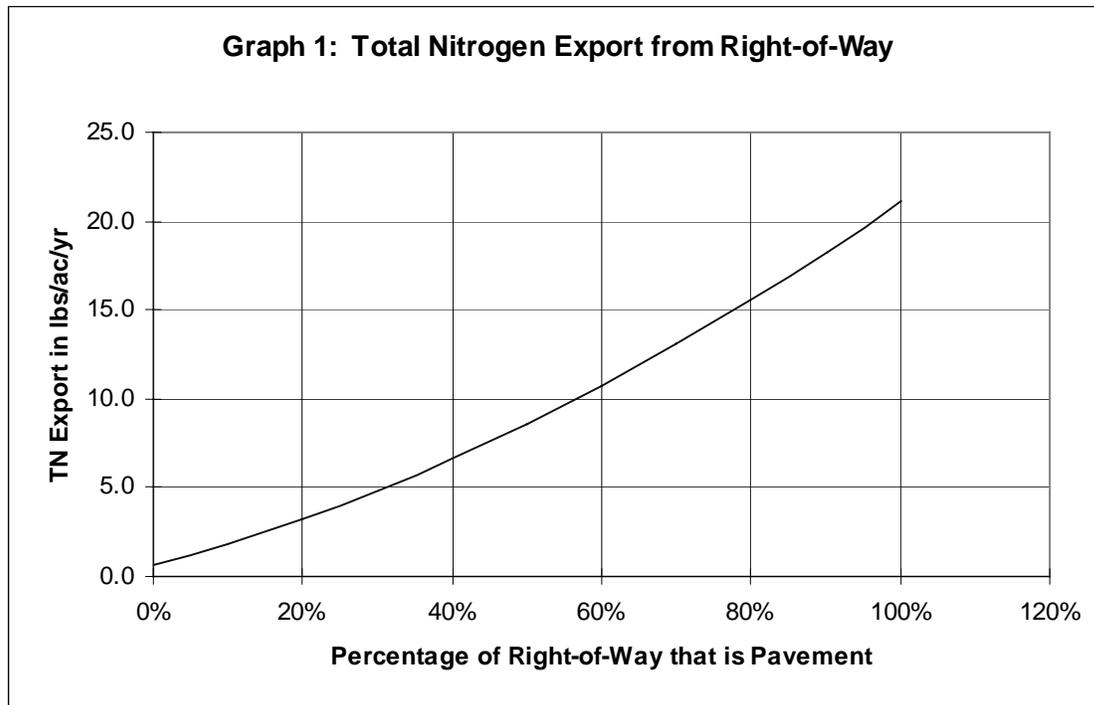
The development of these methods is described in Appendix F. During the one-year process of developing local stormwater programs, the jurisdictions may revisit the development of Methods 1 and 2 and adapt the process to be more applicable to their jurisdictions. Any changes to Methods 1 and 2 should be adequately explained and supported with appropriate technical information.

One situation that is not addressed in either of these methods is a non-residential subdivision where the impervious surfaces are not shown on the plans at the time of submittal. In this case, the local government could require that the property owner specify the areas of impervious surface, undisturbed open space and managed open space on the property in a restrictive covenant or other legal, enforceable mechanism. Then, Method 2 could be applied. An alternative is for the local government to determine a worst-case scenario for the areas of impervious surface and managed open space for the type of development specified and then apply Method 2.

Figure 2a: Method 1 for Quantifying TN Export from Residential Developments when Building and Driveway Footprints are Not Shown

- Step 1: Determine area for each type of land use and enter in Column (2).
- Step 2: Total the areas for each type of land use and enter at the bottom of Column (2).
- Step 3: Determine the TN export coefficient associated with right-of-way using Graph 1.
- Step 4: Determine the TN export coefficient associated with lots using Graph 2.
- Step 5: Multiply the areas in Column (2) by the TN export coefficients in Column (3) and enter in Column (4).
- Step 6: Total the TN exports for each type of land use and enter at the bottom of Column (4).
- Step 7: Determine the export coefficient for site by dividing the total TN export from uses at the bottom of Column (4) by the total area at the bottom of Column (2).

(1) Type of Land Cover	(2) Area (acres)	(3) TN export coeff. (lbs/ac/yr)	(4) TN export from use (lbs/yr)
Permanently protected undisturbed open space (forest, unmown meadow)		0.6	
Permanently protected managed open space (grass, landscaping, etc.)		1.2	
Right-of-way (read TN export from Graph 1)			
Lots (read TN export from Graph 2)			
TOTAL			



Graph 2: Total Nitrogen Export from Lots

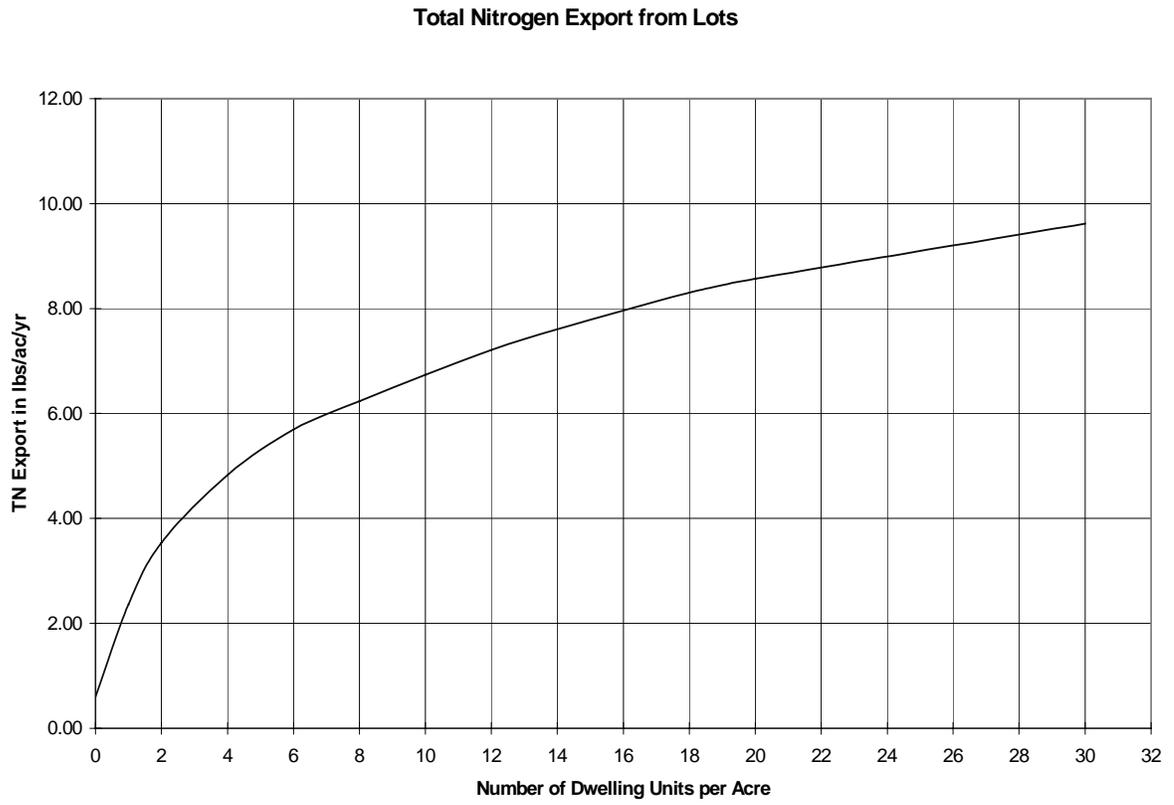


Figure 2b: Method 2 for Quantifying TN Export from Residential / Industrial / Commercial Developments when Footprints of all Impervious Surfaces are Shown

- Step 1: Determine area for each type of land use and enter in Column (2).
- Step 2: Total the areas for each type of land use and enter at the bottom of Column (2).
- Step 3: Multiply the areas in Column (2) by the TN export coefficients in Column (3) and enter in Column (4).
- Step 4: Total the TN exports for each type of land use and enter at the bottom of Column (4).
- Step 5: Determine the export coefficient for site by dividing the total TN export from uses at the bottom of Column (4) by the total area at the bottom of Column (2).

(1) Type of Land Cover	(2) Area (acres)	(3) TN export coeff. (lbs/ac/yr)	(4) TN export from use (lbs/yr)
Permanently protected undisturbed open space (forest, unmown meadow)		0.6	
Permanently protected managed open space (grass, landscaping, etc.)		1.2	
Impervious surfaces (roads, parking lots, driveways, roofs, paved storage areas, etc.)		21.2	
TOTAL		---	

The rule requires that all new developments achieve a nitrogen export of less than or equal to 3.6 pounds per acre per year. If the development contributes greater than 3.6 lbs/ac/yr of nitrogen, then the options shown in Table 2a are available based on whether the development is residential or non-residential.

Table 2a: Nitrogen Export Reduction Options

Residential	Commercial / Industrial
<p>If the computed export is less than 6.0 lbs/ac/yr, then the owner may either:</p> <ol style="list-style-type: none"> 1. Install BMPs to remove enough nitrogen to bring the development down to 3.6 lbs/ac/yr. 2. Pay a one-time offset payment of \$330/lb to bring the nitrogen down to the 3.6 lbs/ac/yr. 3. Do a combination of BMPs and offset payment to achieve a 3.6 lbs/ac/yr export. 	<p>If the computed export is less than 10.0 lbs/ac/yr, then the owner may either:</p> <ol style="list-style-type: none"> 1. Install BMPs to remove enough nitrogen to bring the development down to 3.6 lbs/ac/yr. 2. Pay a one-time offset payment of \$330/lb to bring the nitrogen down to the 3.6 lbs/ac/yr. 3. Do a combination of BMPs and offset payment to achieve a 3.6 lbs/ac/yr export.
<p>If the computed export is greater than 6.0 lbs/ac/yr, then the owner must use on-site BMPs to bring the development's export down to 6.0 lbs/ac/yr. Then, the owner may use one of the three options above to achieve the reduction between 6.0 and 3.6 lbs/ac/yr.</p>	<p>If the computed export is greater than 10.0 lbs/ac/yr, then the owner must use on-site BMPs to bring the development's export down to 10.0 lbs/ac/yr. Then, the owner may use one of the three options above to achieve the reduction between 10.0 and 3.6 lbs/ac/yr.</p>

The table above discusses the option of using offset fees to meet the nitrogen export levels set for new development activities. These offset fees go to the Wetlands Restoration Program (WRP). The WRP will utilize these fees in accordance with the WRPs Basinwide Wetlands and Riparian Restoration plans. It is the policy of the WRP to utilize the funds where they are generated to the maximum extent possible as long as they can obtain the cooperation of the local government.

2-D. Calculating Peak Runoff Volume

The Neuse Stormwater Rule requires there be no net increase in peak flow leaving the site from the predevelopment conditions for the 1-year, 24-hour storm. Each jurisdiction affected by the rule may specify the methodology(ies) that shall used when determining peak flows from new development activities.

Acceptable methodologies for computing the pre- and post-development conditions for the 1-year, 24-hour storm include:

- The Rational Method.
- The Peak Discharge Method as described in USDA Soil Conservation Service’s Technical Release Number 55 (TR-55).
- The Putnam Method.
- Other methods proposed by local governments and approved by the Environmental Management Commission.

The same method must be used for both the pre- and post-development conditions.

Division of Water Quality staff have computed rainfall depths for the 1-year, 24-hour storm for use with hydrologic computation methods. This information is provided in Table 2b below. In addition, the Division will continue to work with local governments in the basin to develop rainfall intensity information and other technical information that may be necessary to assist in the implementation of this requirement.

Table 2b: Rainfall depths for the 1-year, 24-hour storm

Location	1yr - 24 hr depth (inches)	1yr 24 hr intensity* (in/hr)
Raleigh	3.00	To Be Developed
Wilmington	3.70	To Be Developed
Washington	3.40	To Be Developed

* This information is currently under development

The flow control requirement is not required for developments that meet one or all of the following requirements:

- The increase in peak flow between pre- and post-development conditions does not exceed ten percent (note that this exemption makes it easier to conduct redevelopment activities).
- The proposed new development meets all of the following criteria: overall impervious surface is less than fifteen percent, and the remaining pervious portions of the site are utilized to the maximum extent practical to convey and control the stormwater runoff.

It is recognized that in certain parts of drainage basins, stormwater detention can aggravate local flooding problems. Communities may need to tailor requirements or provide exemptions to those specific locations.

2-E. BMPs for Reducing Nitrogen

Designing best management practices that remove nitrogen from stormwater is a developing field. Researchers throughout the country, particularly in the Southeast, are conducting studies to determine effective means of controlling nitrogen. At the present time, current data indicate that most BMPs remove only 20 to 40 percent of total nitrogen on a consistent basis. All BMPs require regular maintenance and some have varying performance depending on soil type and the season. It is crucial to consider the issues of aesthetics, long-term maintenance, safety and reliability in BMP design.

Since it is relatively difficult to design and maintain BMPs that remove nitrogen, the TN accounting method in 2-C was designed to provide credits for site planning practices that reduce nitrogen loadings from new development. These planning measures include reducing impervious surfaces and protecting open spaces. More detail on planning measures that reduce nitrogen loading is given in Appendix G.

The following BMPs may be utilized for reducing nitrogen from new developments:

- Wet detention ponds
- Constructed wetlands
- Open channel practices
- Riparian buffers
- Bioretention
- Proprietary BMPs

The Neuse Stormwater Team estimated total nitrogen removal rates for various BMPs by conducting a literature search of studies performed on BMPs. The total nitrogen BMP removal rates based on current literature studies are provided in Table 2c below. A summary of these literature studies is given in Appendix H.

Table 2c: BMP Types, TN Removal Rates and Design Standards

BMP Type	TN Removal Rate based on Current Literature Studies	Appropriate Design Standards
Wet detention ponds	25%	NC and MD Design Manuals
Constructed wetlands	40%	NC and MD Design Manuals
Open channel practices	30%	NC and MD Design Manuals
Riparian buffers	30%	Neuse Riparian Buffer Rule (15A NCAC 2B .0233)
Vegetated filter strips with level spreader	20%	NC and MD Design Manuals and other literature information
Bioretention	25%	NC and MD Design Manuals
Sand Filters	35%	NC and MD Design Manuals
Proprietary BMPs	Varies	Per manufacturer subject to DWQ approval
Other BMPs	Varies	Subject to DWQ approval

If more than one BMP is installed in series on a development, then the removal rate shall be determined through serial rather than additive calculations. For example, if a wet detention pond discharges through a riparian buffer, then the removal rate shall be estimated to be 47.5 percent. (The pond removes 25 percent of the nitrogen and discharges 75 percent to the buffer. The buffer then removes 30 percent of the nitrogen that discharged from the pond, which is 22.5 percent. The sum of 25 and 22.5 is 47.5. The removal rate is NOT 25 percent plus 30 percent.)

2-F. BMP Maintenance

If BMPs are implemented to achieve the nitrogen loading and flow attenuation requirements for a development, then the local governments must require a maintenance plan for the BMPs. The stormwater management plan must describe the local government’s selected approach for assuring BMP maintenance. Possible options to be considered include, but are not limited to, the following:

- The jurisdiction can charge a stormwater maintenance fee and assume the responsibility of maintaining the stormwater BMP itself, including providing annual inspection.
- The jurisdiction can notify the owner upon finding that maintenance is needed on a BMP. If the owner does not complete the maintenance himself in a timely manner, then the jurisdiction can contract out the maintenance itself and recover costs in the manner it determines most appropriate.
- The jurisdiction can require that escrow accounts be set up to provide sufficient resources to completely replace the BMP in the event of failure.

- The jurisdiction can require a legal maintenance agreement for the BMP with the owner.

An example of a stormwater maintenance program is given in Appendix I.

Regardless of the option selected, the jurisdiction should inspect all BMPs on an annual basis. The resources needed for this may be recovered through an inspection fee or other funding source(s) determined appropriate and necessary by the local government (currently, some of the local governments are charging annual inspection fees for stormwater BMPs that range from \$105 to \$150). Jurisdictions should keep a list (database recommended) of BMPs and their locations to assist in the inspection process.

BMPs should never be included on a separate lot, but should be part of the development site. This prevents the landowner from foreclosing on or abandoning the lot that contains the BMP without repercussions for the entire development.

2-G. Land Use Planning Provisions

This model program is intended to provide the flexibility and incentives to use site design techniques to reduce impervious surfaces on their developments. As discussed previously, reducing impervious surfaces reduces the need for BMPs to control nitrogen and peak stormwater flows and also reduces associated BMP maintenance concerns.

Under the model stormwater program, affected jurisdictions are required to review their local ordinances with regard to the following topics and show that they have provided adequate flexibility for developers to utilize planning measures to reduce impervious surfaces. This review is intended to look for opportunities where these measures could be allowed, or obstacles to their use could be removed.

Each jurisdiction must show that they have reviewed and considered the following planning techniques and the general advantages and disadvantages of incorporating these approaches at the local level.

- Reducing road widths
- Reducing minimum parking requirements
- Minimizing use of curb and gutter
- Cluster or open-space developments
- Traditional neighborhood developments
- Mixed-use developments

Descriptions of these techniques are provided in Appendix G.

2-H. Jurisdiction-Wide and Inter-Local Approaches

Jurisdictions have the option of implementing jurisdiction-wide or inter-local approaches to achieving nitrogen reductions. Such approaches may be incorporated into an individual local government's model program if there is appropriate supporting information to show how they will achieve the nitrogen loading reduction requirements applicable to new development. Some ideas for jurisdiction-wide approaches that a local government may consider include:

- Creating regional stormwater management facilities, such as ponds, to provide some of the nitrogen removal and flow control required from new development. A regional stormwater management facility would have to be implemented in conjunction with on-site controls to locally protect against water quality degradation and flooding. The Neuse buffer requirements may impact the feasibility of using certain regional stormwater approaches.
- "Land banking" within the same watershed where development is occurring. The land to be banked should have significant water quality value, such as being contiguous with an existing floodplain, wetland or riparian area. It should be secured in a permanent conservation easement or equivalent legal mechanism whose provisions prohibit both farming and unapproved logging practices. This conservation land should be tracked on a GIS system and recorded on the plat or deed.

Any jurisdiction that wishes to implement a jurisdiction-wide approach will be responsible for demonstrating and quantifying the associated nitrogen removals. This information can be submitted to the Environmental Management Commission as part of the jurisdiction's stormwater program.

2-I. References

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Land of Sky Regional Council. 1995. Stormwater Fact Sheet Number 8: Plan Early for Stormwater in Your New Development. Asheville, NC. 4 pp.

Schueler, T. S. Dec. 1995. Site Planning for Urban Stream Protection. Metropolitan Washington Council of Governments. Silver Spring, MD 231 pp.

Stimmel Associates. 1993. Traditional Neighborhood Development Design Guidelines. Chapel Hill, NC.

3. *Illegal Discharges*

3-A. *Requirements in the Rule*

The Neuse Stormwater Rule requires that all municipalities establish a program to prevent, identify and remove illegal discharges. Illegal discharges are flows in the stormwater collection system that are not associated with stormwater runoff or an allowable discharge.

3-B. *What is an Illegal Discharge?*

Stormwater collection systems are vulnerable to receiving illegal discharges (even though the person responsible for the discharge may be unaware that it is illegal). Depending on their source, illegal discharges may convey pollutants such as nutrients, phenols, and metals to receiving waters. Table 3a identifies some potential flows to the stormwater collection system that may be allowable. Table 3b identifies some discharges that are not allowed.

Table 3a: Discharges that may be allowable to the stormwater collection system

Waterline Flushing	Landscape Irrigation	Diverted Stream Flows
Uncontaminated Rising Ground Water	Uncontaminated Ground Water Infiltration to stormwater collection system	Uncontaminated Pumped Ground Water
Discharges from potable water sources	Foundation Drains	Uncontaminated Air Conditioning Condensation
Irrigation Water	Springs	Water from Crawl Space Pumps
Footing Drains	Lawn Watering	Non-commercial Car Washing
Flows from Riparian Habitats and Wetlands	NPDES permitted discharges	Street wash water
Fire Fighting Emergency Activities	Wash Water from the Cleaning of Buildings	Dechlorinated backwash and draining associated with swimming pools

Table 3b: Types of Discharges that are not allowed to stormwater collection system

Dumping of oil, anti-freeze, paint, cleaning fluids	Commercial Car Wash	Industrial Discharges
Contaminated Foundation Drains	Cooling water unless no chemicals added and has NPDES permit	Washwaters from commercial / industrial activities
Sanitary Sewer Discharges	Septic Tank Discharges	Washing Machine Discharges
Chlorinated backwash and draining associated with swimming pools		

3-C. Establishing Legal Authority

One of the first steps that each local government is required to take is establishing the legal authority to control illegal discharges. According to the policies of each individual local government, this legal authority may be carried out through ordinances, policies, city codes or charters.

By February 2001, each local government is required to show that it has established the legal authority to do the following:

- Control the contribution of pollutants to the stormwater collection system associated with industrial activity.
- Prohibit illegal discharges to the stormwater collection system.
- Prohibit discharge of spills and disposal of materials other than stormwater to the stormwater collection system.
- Determine compliance and non-compliance.
- Require compliance and undertake enforcement measures in cases of non-compliance.

Raleigh and Durham have established legal authority in the above areas. Examples of these ordinances are provided in Appendix J. Examples from other communities may be compiled by the Triangle J Council of Governments.

3-D. Collecting Jurisdiction-Wide Information

Under the Model Program for Illegal Discharges, each jurisdiction is required to collect geographic information at three increasing levels of detail:

- The first, most cursory level is information that shall be collected for the entire jurisdiction. The associated requirements are discussed in this section.
- The second level is a more detailed screening for high priority areas within the jurisdiction. The associated requirements are discussed in Section 3-E.

- The third level is a very detailed investigation that shall be done upon the discovery of an illegal discharge. The associated requirements are discussed in Section 3-F.

The purpose of collecting jurisdiction-wide information are to assist with identifying potential illegal discharge sources and characterizing illegal discharges after they are discovered.

Each local government shall compile maps that show the following information. It is not necessary that all of this information be shown on a single map. The maps shall be at a scale that is most useful to the jurisdiction; however, no scale may be greater than 1:24,000.

- Location of sanitary sewers in areas of the major stormwater collection systems and the location of areas that are not served by sanitary sewers.
- Waters that appear on the USDA – Natural Resources Conservation Service Soil Survey Maps and the U.S. Geological Survey 1:24,000 scale topographic maps.
- Land uses. Categories, at a minimum, should include undeveloped, residential, commercial, agriculture, industrial, institutional, publicly owned open space and others.
- Currently operating and known closed municipal landfills and other treatment, storage, and disposal facilities, including for hazardous materials.
- Major stormwater structural controls.
- Known NPDES permitted discharges to the stormwater collection system (this list can be obtained from the Division of Water Quality).

Written descriptions should be provided for the map components as follows:

- A summary table of municipal waste facilities that includes the names of the facilities, the status (open/closed), the types, and addresses.
- A summary table of the NPDES permitted dischargers that includes the name of the permit holder, the address of the facility and permit number.
- A summary table of the major structural stormwater control structures that shows the type of structure, area served, party responsible for maintaining, and age of structure.
- A summary table of publicly owned open space that identifies size, location, and primary function of each open area.

The local governments shall complete this collection of jurisdiction-wide information by the time the second annual report is due (October 2002).

3-E. Mapping and Field Screening in High Priority Areas

Beginning in the third year after implementation of the local stormwater program, each jurisdiction shall identify a high priority area of its jurisdiction for more detailed mapping and field screening. This high priority area shall comprise at least ten percent of the jurisdiction's area. This requirement will begin in the third year after implementation. Each subsequent year, the jurisdiction is responsible for selecting and screening another high priority area that comprises at least ten percent of its jurisdiction.

The method for determining the high priority area will vary from jurisdiction to jurisdiction. "High priority" means the areas within a jurisdiction where it is most likely to locate illegal discharges. Based on the experiences of Raleigh and Durham, the most likely locations for identifying illegal discharges are areas with older development. Each year, the local governments should explain their basis for selection of the high priority areas.

The first part of the screening process for the selected high priority area is mapping the stormwater system. At a minimum, the map that is produced shall include the following:

- Locations of the outfalls of any pipes from non-industrial areas that are greater than or equal to 36 inches.
- Locations of the outfalls of any pipes from industrial areas that are greater than or equal to 12 inches.
- Locations of drainage ditches that drain more than 50 acres of non-industrial lands.
- Locations of drainage ditches that drain more than 2 acres of industrial land.
- An accompanying summary table listing the outfalls that meet the above criteria that includes outfall ID numbers, location, primary and supplemental classification of receiving water, and use-support of receiving water.

The second part of the screening process for the selected high priority area is conducting a dry weather field screening of all outfalls that meet the above criteria to detect illegal discharges. The dry weather field screening shall not be conducted during or within 72 hours following a rain event of 0.1 inches or greater. In residential areas, it is recommended to conduct the field screening either before 9:00 am or after 5:00 pm, since these are the hours that citizens are most likely to be home and thus any illegal discharges are more likely to be evident.

Figure 3a illustrates a suggested process for conducting field screening sampling activities and following up with any findings of dry weather flow. As shown in the figure, if the field screening shows that an outfall is dry, then the outfall should be checked for intermittent flow at a later date.

If the field screening shows that an outfall has a dry weather flow, then the local government is required to complete a screening report for the outfall. The information that should be contained in the screening report is outlined in Table 3c. Screening reports shall be kept on file for a minimum of five years. Example screening report forms are provided in Appendix K.

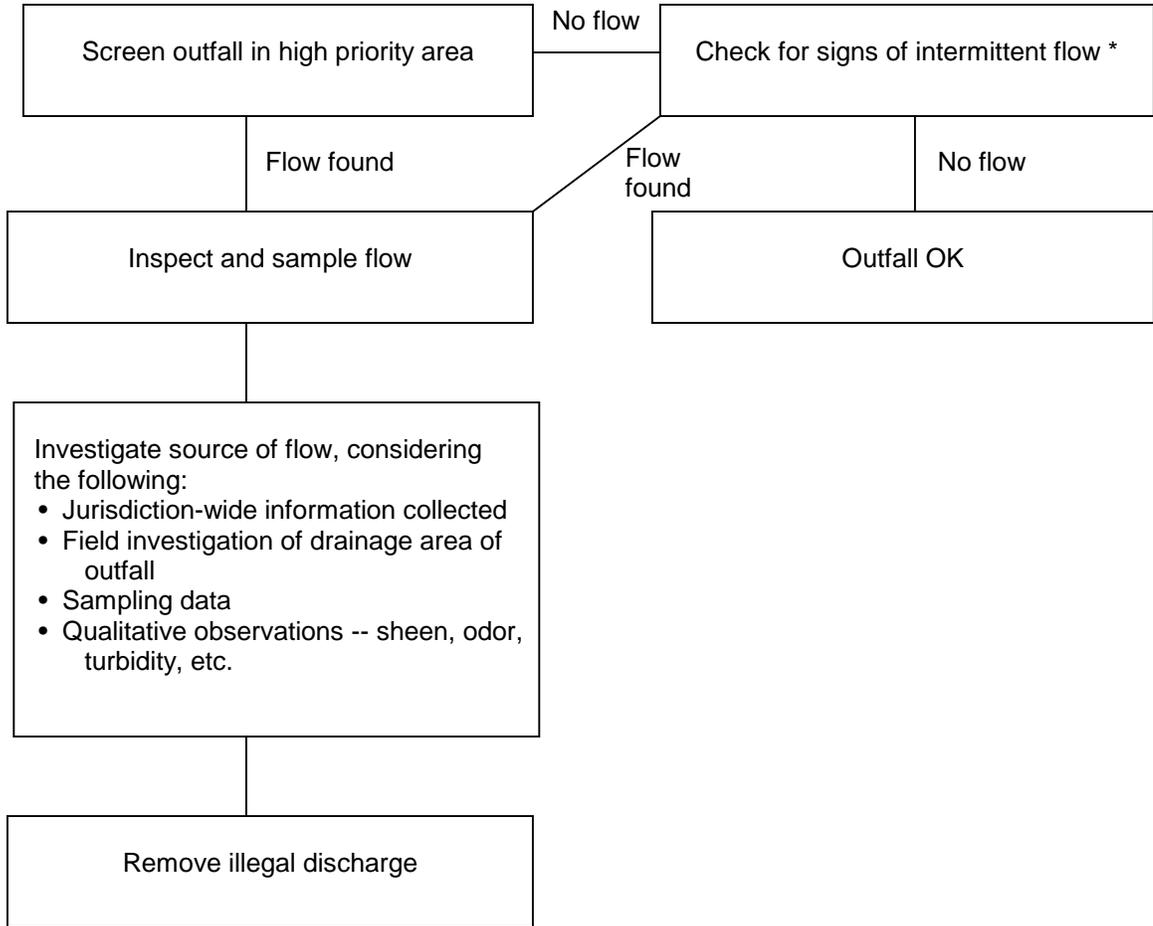
Table 3c: Field Screening Report Information

General Information	Sheet Number Outfall ID Number Date Time Date, Time and Quantity of Last Rainfall Event	
Field Site Description	Location Type of Outfall Dominant Watershed Land Use(s)	
Visual Observations	Photograph Odor Color Clarity Floatables	Deposits/Stains Vegetation Condition Structural Condition Biological Flow Estimation
Sampling Analysis *	Temperature pH Nitrogen-Ammonia	Nitrogen-Nitrate/Nitrite Fluoride or Chlorine

* Analytical monitoring is required only if an obvious source of the dry weather flow cannot be determined through an investigation of the upstream stormwater collection system.

Outfalls with flow will be screened again within 24 hours for the above parameters. The tests for ammonia and nitrate/nitrite that are purchased should be sensitive for 0.1 to 10 mg/L. The cities of Raleigh and Durham can be contacted for guidance on test kit information.

Figure 3a: Field Screening Process



* Checking for intermittent flow includes rechecking outfall at a later date as well as visual observations for evidence of intermittent flow.

Note: Analytical monitoring is required only if an obvious source of the dry weather flow cannot be determined through an investigation of the upstream stormwater collection system.

The purpose of the field screening is to provide clues as to the source of the illegal discharge. The characterization should be used in conjunction with the jurisdiction-wide information and a field investigation to identify the source of the illegal discharge. The process of identifying and removing illegal discharges is discussed in the next section.

As part of the review process for field screening activities, the Team recognized that there were some training needs associated with performing these activities. The Education Program (outlined in Section 5) should look at the development of training materials and opportunities to assist local governments in preparing to implement these measures.

3-F. Identifying and Removing Illegal Discharges

After the field screening is complete, local governments are required to take measures to identify and remove illegal discharges. Identifying illegal discharges may require a combination of office and field work. After the field screening, local government staff should consult the jurisdiction-wide information they have compiled (see Section 3-D) to obtain information about the land uses, infrastructure, industries, potential sources and types of pollution that exist in the drainage area of the outfall.

After potential sources have been identified in the office, a systematic field investigation should be planned that minimizes the amount of resources required to identify the source. Several field methods may be used to identify illegal discharges. It is recommended that local governments use a simple approach if that will suffice. Listed below are several approaches that are recommended by Raleigh and Durham, starting with simple approaches and moving to more complex ones

- Site Investigation
- Additional Chemical Analysis (recommend testing for fecal coliform if the ammonia concentration was found to exceed 1.0 mg/L)
- Flow Monitoring (recommended to use multiple site visits rather than a depth indicator)
- Dye Testing (fluorescent dye is recommended)
- Smoke Testing
- Television Inspection

One tip on identifying illegal discharges is that outfalls that do not have flow during wet weather are likely to originate from floor drains.

Documentation of the results of the office and field investigations should be kept on file for five years with the screening report.

After a local government identifies the source of an illegal discharge, it is required to take enforcement action to have the source removed. The legal authority that was established for the illegal discharge program shall provide the means to accomplish this requirement. Enforcement should include requiring the person responsible for the discharge to remove or redirect it to the sanitary sewer. There should also be remedies to deal with cases of non-compliance. Records of all compliance actions shall be kept for five years with the screening report.

In addition to keeping all screening reports on file, each jurisdiction shall maintain a map that includes the following:

- Points of identified illegal discharges.
- Watershed boundaries of the outfalls where illegal discharges have been identified.
- An accompanying table that summarizes the illegal discharges that have been identified that includes location, a description of pollutant(s) identified, and removal status.

3-G. Preventing Discharges and Establishing a Hotline

Local governments are required to contact persons who are responsible for establishments that are likely sources of illegal discharges. Some of these sources include automotive sales, rental, repair and detailing establishments, lawn care companies, cleaners and certain types of contractors. Previous experience has shown that many illegal discharges are actually unintentional. A sample letter to inform owners and operators about the requirements of the illegal discharge program is included in Appendix L.

The experiences of Raleigh and Durham have shown that an illegal discharge hotline is a cost-effective way to identify illegal discharges. Part of the public education program (discussed in Chapter 5) will be to educate citizens about what types of discharges should not go to the stormwater collection system and make them aware of the hotline.

Local governments are responsible for establishing a hotline. The hotline will require them to either designate a new phone number or use an existing service. The hotline should include a recording advising citizens what to do if they call during non-business hours. There should be another number given in cases where the illegal discharge is perceived to be an emergency.

3-H. Implementation Schedule

In keeping with their goal of having an efficient and cost-effective program, the Neuse Stormwater Team has created a phased implementation schedule for illegal discharges (Table 3d). The schedule allows for collecting jurisdiction-wide information during the first year of implementation and then screening the high priority areas during future years. This phased schedule is also intended to allow communities to evaluate and make improvements to their programs as they progress through high priority areas.

Table 3d: Implementation Schedule and Annual Reporting Requirements

Year	Implementation Requirements	Annual Report Requirements
By February 2001	<ul style="list-style-type: none"> Establish legal authority to address illegal discharges 	<ul style="list-style-type: none"> Submit report identifying established legal authority to meet requirements.
By October 2002	<ul style="list-style-type: none"> Collect jurisdiction-wide information. Select high priority area for additional screening. Initiate illegal discharge hotline. 	<ul style="list-style-type: none"> Report on completion of jurisdiction-wide information collection. Submit map of high priority areas and reason for selection. Report on initiation of illegal discharge hotline.
Each subsequent year after 2002	<ul style="list-style-type: none"> Complete mapping and field screening for high priority area. Select next high priority area. Identify and remove illegal discharges as encountered. Continue operating illegal discharge hotline. 	<ul style="list-style-type: none"> Submit map of stormwater collection system in high priority area upon request by DWQ. Document illegal discharges found and resulting action. Report on hotline usage and actions taken. Submit map of next high priority area and reason for selection.

3-J. References

Debo, Thomas N. and Reese, Andrew J., Municipal Stormwater Management, CRC Press, Inc. 1995

U.S. Environmental Protection Agency (EPA). 1992. Manual of Practice – Identification of Illicit Connections. EPA 833/R-90-100

U.S. Environmental Protection Agency (EPA). 1993. Investigation of Inappropriate Pollutant Entries into Storm Drainage Systems – A User’s Guide. EPA 600/R-92-238.

U.S. Environmental Protection Agency (EPA). 1991. Guidance Manual for the Preparation of Part 1 of the NPDES Permit Applications for Discharges from Municipal Separate Storm Sewer Systems. EPA 505/8-91-003A.

4. Retrofit Locations

4-A. Requirements in the Rule

The rule requires that all affected local governments establish a program to identify places within existing developed areas that are suitable for retrofits.

4-B. Approach for Meeting the Requirements

Retrofit opportunities will be considered acceptable if all of the following conditions have been investigated:

- The retrofit, if implemented, clearly has the potential to reduce nitrogen loading to the receiving water.
- The watershed is clearly contributing nitrogen loading above background levels.
- The landowner where the retrofit is proposed is willing to have the retrofit installed on his property. Securing the landowner's cooperation is one of the most important tasks for the local government, as this is often the most difficult aspect of implementing a retrofit.
- There is adequate space and access for the retrofit.
- It is technically practical to install a retrofit at that location.

The minimum number of retrofit opportunities that each local government is required to identify is based on a sliding scale according to the population of the government. For those communities that are not completely located within the Neuse River Basin, the number of retrofits can be based on the estimated population within the Neuse River Basin. The local government will have to provide the data to support this population. Table 4a shows the minimum requirements for identifying retrofit opportunities for each affected jurisdiction. Sites may be carried over to meet the minimum requirements for up to two subsequent years provided that BMPs/retrofits have not been implemented and the site continues to meet the criteria above on an annual basis.

Table 4a: Minimum Number of Retrofit Opportunities that Each Local Government Must Identify on an Annual Basis

Population Category	Local Government	1997 Population	Minimum Number of Retrofit Sites to be Identified
Less than 30,000	Smithfield	11,194	2
	Garner	17,821	
	Havelock	21,374	
	New Bern	22,032	
	Kinston	25,398	
Between 30,000 and 60,000	Durham County	37,292	3
	Wilson	41,103	
	Orange County	43,913	
	Goldsboro	48,356	
	Wayne County	56,117	
Between 60,000 and 100,000	Johnston County	67,526	4
	Cary	80,751	
Between 100,000 and 250,000	Wake County	144,374	5
	Raleigh	266,530	
	Durham	159,030	

4-C. Data Collection and Notification

Each retrofit opportunity that is identified shall be accompanied by information to describe the location of the retrofit, the type of retrofit being proposed, the property owner, as well as basic information about the watershed and the receiving water. Table 4b shows a suggested format for presenting this information for each retrofit opportunity.

The tables shall be submitted to the Division of Water Quality on October 30 of each year beginning in the year 2001 as part of the annual report.

The Division will take the responsibility for posting these retrofit opportunities on its Web Page and also for notifying, at a minimum, the following organizations of the opportunities for retrofitting within existing developed areas:

- Clean Water Management Trust Fund
- N.C. State University Cooperative Extension Service
- Triangle J Council of Governments
- Kerr-Tar Council of Governments
- Eastern Carolina Council of Governments
- Environmental programs at N.C. State University, Duke University, University of N.C., East Carolina University and others
- N.C. Sea Grant

- USDA – Natural Resources Conservation Service
- Upper Neuse Basin Association
- Lower Neuse Basin Association
- N.C. Wetlands Restoration Program

4-D. Mapping Requirements

Affected local governments are required to provide maps that show the locations of retrofit opportunities. Mapping may be accomplished by using computers or with existing hard copy maps. The scale of the map should be large enough to adequately identify the following required parameters:

- Drainage area to retrofit opportunity site.
- Land uses within the drainage area.
- Location of retrofit opportunity.
- Property boundaries in the vicinity of the retrofit opportunity.
- Significant hydrography (as depicted on U.S.G.S. topographic maps and USDA-NRCS Soil Survey maps).
- Roads.
- Environmentally sensitive areas (steep slopes, wetlands, riparian buffers, endangered/threatened species habitat – where available).
- Publicly owned parks, recreational areas, and other open lands.

Table 4b: Retrofit Opportunity Table

Location description, including directions from a major highway	
Type and description of retrofit opportunity	
Current property owner	
Is the property owner willing to cooperate?	
Land area available for retrofit (sq. ft)	
Accessibility to retrofit site	
Drainage area size (acres)	
Land use in drainage area (percent of each type of land use)	
Average slope in drainage area (%)	
Environmentally sensitive areas in drainage area (steep slopes, wetlands, riparian buffers, endangered/ threatened species habitat)	
Approximate annual nitrogen loading from drainage area (lbs/acre/year) *	
Potential nitrogen reduction (lbs/ac/yr)	
Estimated cost of retrofit	
Receiving water	
DWQ classification of receiving water	
Use support rating for receiving water	
Other important information	

* Suggested methodology: Use Figure 2b from Chapter 2 to compute nitrogen export from the drainage area based on the amount of impervious surface, landscaped area and forested area in the watershed.

5. Public Education

5-A. Requirements in the Rule

The Neuse Stormwater Rule requires each of the affected jurisdictions in the Neuse River Basin to develop a locally administered environmental education program to address nitrogen loading issues.

5-B. Public Education Action Plan

Each targeted community is required to develop a Public Education Action Plan. The purpose of the Action Plan is to provide local governments a platform to design their own locally unique public education effort. The Action Plan will outline the proposed education activities for the upcoming year, identifying target audiences and anticipated costs of the program. Each targeted community shall submit an annual Action Plan to DWQ for approval prior to October 1 of each year. An example Action Plan format can be found in Appendix M.

The Action Plan shall consist of activities from each of the two categories listed below in Table 5a. Innovative public education activities not included in this list may be considered for approval on a case-by-case basis. All activities must be designed to raise awareness and educate the audience about water quality, nonpoint source pollution, and the effects of everyday activities on water quality and nutrient loading. In addition to the Category One and Two activities, all Action Plans must include two technical workshops (see below) in the first year and a toll free hotline for reporting illegal discharges.

The ultimate goal of the public education program is to utilize major media advertising (television, radio, and newspaper) to reach a broad audience. However, the model recognizes that these venues are cost prohibitive for many small local governments. If a local government chooses to use effective major media advertising, either independently or through a cooperative effort, that local government is exempted from minimum Category One and Two requirements.

Table 5a: Public Education Action Plan Categories

Category 1	Category 2
Demonstration Sites (for Best Management Practices)	Fact Sheets
“Adopt-a-Program”	Environmental Freebies
Quarterly local newspaper articles	Fertilizer Tags
Storm drain marking	Flyers
Recognition Program (recognize environment friendly participants)	Postmarks
Web page	Utility bills inserts

Local Cable TV program	Close-out Packages (new homeowners)
Toll free hotline for reporting environmental problems	Speak to civic organizations quarterly
Environmental field day	
Technical Workshop (only applicable after 1 st year)	
Environmental Contest	

The number of annual activities required is dependent upon the total population of the subject local government. The number of different required activities from each category is indicated in Table 5b below. The combination of selected activities must provide a general awareness of nitrogen loading issues and address a diverse audience.

Table 5b: Minimum Number of Annual Activities

Population	Category 1 Activities	Category 2 Activities
< 60,000	2	2
> 60,000	3	4

During the first year of program implementation, targeted communities are required to conduct two (2) technical workshops. One shall be designed to educate local government officials and staff and the other for the development community, including: engineers, developers, architects, contractors, surveyors, planners, and realtors. During subsequent years, technical workshops are considered an option under Category 2 activities. Communities are encouraged to work jointly to develop and conduct the workshops, if feasible. A Sample workshop agenda, including recommended resources, is located in Appendix N.

5-C. Flexibility of Implementation/Alternative Programs

Communities may develop a locally unique program designed to meet their needs as long as the activities meet or exceed the minimum requirements set forth above. While it is not a requirement, targeted communities are encouraged to work with each other to make use of existing resources and stormwater education efforts in their areas to meet the requirements. Working together will provide a more consistent education effort for communities of all sizes, will be an efficient use of resources and will reduce duplication of efforts.

5-D. Recommended Alternative Approaches

To reduce the burden to targeted communities to meet the requirements, the creation of two (2) positions is suggested as an alternative approach that the local governments can utilize to help implement the required Action Plan. See Appendix O for a summary of this recommended approach.

6. Reporting Requirements

Annual Neuse River Basin Stormwater Program reports must be submitted to the Division of Water Quality by October 30 of each year beginning in 2001. All reports shall contain the following information.

6-A. New Development Review/Approval

Under the model program for new development review/approval, local governments are responsible for submitting the following information as part of the annual reporting requirement:

- Acres of new development and impervious surface based on plan approvals.
- Acres of new development and impervious surface based on certificates of occupancy.
- Summary of BMPs implemented and use of offset fees.
- Computed baseline and net change in nitrogen export from new development that year.
- Summary of maintenance activities conducted on BMPs.
- Summary of any BMP failures and how they were handled.
- Summary of results from jurisdictional review of planning issues.

6-B. Illegal Discharges

Table 6a outlines the annual reporting requirements for illegal discharges.

Table 6a: Implementation Schedule and Annual Reporting Requirements

Year	Implementation Requirements	Annual Report Requirements
By February 2001	<ul style="list-style-type: none"> • Establish legal authority to address illegal discharges 	<ul style="list-style-type: none"> • Submit report identifying established legal authority to meet requirements.
By October 2002	<ul style="list-style-type: none"> • Collect jurisdiction-wide information. • Select high priority area for additional screening. • Initiate illegal discharge hotline. 	<ul style="list-style-type: none"> • Report on completion of jurisdiction-wide information collection. • Submit map of high priority areas and reason for selection. • Report on initiation of illegal discharge hotline.
Each subsequent year after 2002	<ul style="list-style-type: none"> • Complete mapping and field screening for high priority area. • Select next high priority area. • Identify and remove illegal discharges as encountered. • Continue operating illegal discharge hotline. 	<ul style="list-style-type: none"> • Submit map of stormwater collection system in high priority area upon request by DWQ. • Document illegal discharges found and resulting action. • Report on hotline usage and actions taken. • Submit map of next high priority area and reason for selection.

6-C. Retrofit Locations

- Data on each retrofit opportunity (Table 4b or other equivalent format),
- Maps of potential retrofit sites as specified in Section 4-D, and
- The status of any retrofit efforts that have been undertaken within the jurisdiction.

6-D. Public Education

The Report will summarize the next years Action Plan and evaluate the implementation of the previous years Action Plan (if applicable). The report should include goals, activities completed, realized education program costs, explanation of experienced shortfalls and a plan as to how the locality will address shortfalls.