Chapter 8
Stormwater and Wastewater Management for Improved Water Quality in Coastal Communities

8.1 Introduction to Stormwater Runoff

Stormwater runoff is rainfall or snowmelt that runs off the ground or impervious surfaces (e.g., buildings, roads, parking lots, etc.). In some cases, it drains directly into streams, rivers, lakes, and oceans. In other cases, particularly in urbanized areas, stormwater drains into streets and man-made drainage systems consisting of inlets and underground pipes, commonly referred to as a storm sewer system. In North Carolina, there is no pre-treatment of stormwater. Storm sewer systems are designed simply to capture the stormwater and convey it to the nearest surface water. These sewers should not be confused with sanitary sewers, which transport human and industrial wastewaters to a treatment plant before discharging into surface waters.

Common stormwater pollutants include sediment, nutrients, organic matter, bacteria, oil and grease, and toxic substances (e.g., metals, pesticides, herbicides, hydrocarbons). Stormwater can also impact the temperature of surface waters, which can affect the water's ability to support certain fish and aquatic communities.

Uncontrolled stormwater runoff has many impacts on both humans and the environment. Cumulative effects include flooding, undercut and eroding streambanks, widened stream channels, threats to public health and safety, impaired recreational use, and increased costs for drinking and wastewater treatment. For more information on stormwater runoff, visit the DWQ Stormwater Permitting Unit at http://h2o.enr.state.nc.us/su/stormwater.html or the NC Stormwater information page at http://www.ncstormwater.org/. Additional fact sheets and information can also be found at http://www.stormwatercenter.net/intro_factsheets.htm and www.bae.ncsu.edu/stormwater/index.html.

8.2 Controlling Stormwater Pollution

Many daily activities have the potential to cause stormwater pollution. Any situation where activities can contribute more pollutants to stormwater runoff is an area that should be considered for efforts to minimize stormwater impacts. A major component in reducing stormwater impacts involves planning up front in the design process. New construction designs should include plans to prevent or minimize the amount of runoff leaving the site. Wide streets, large cul-de-sacs, long driveways, and sidewalks lining both sides of the street are all features of urban development that create excess impervious cover and consume natural areas. In many instances, the presence of intact riparian buffers and/or wetlands in urban areas can reduce the impacts of urban development. Establishment and protection of buffers should be implemented where feasible, and the amount of impervious cover should be limited based on established Low Impact Development (LID) techniques.

Good housekeeping to reduce the volume of stormwater leaving a site and the amount of pollutants used in our own backyards can also minimize the impact of stormwater runoff. DWQ published a pamphlet entitled *Improving Water Quality in Your Own Backyard: Stormwater Management Starts at Home* that provides information on how to reduce the amount of runoff

leaving their property and how to reduce the amount and types of pollutants in that runoff. This document is available on-line at http://h2o.enr.state.nc.us/nps/documents/BackyardPDF.pdf or by calling (919) 733-5083 ext. 558.

Preserving the natural streamside vegetation (riparian buffer) is one of the most economical and efficient BMPs. In particular, forested buffers provide a variety of benefits including filtering runoff and taking up nutrients, moderating water temperature, preventing erosion and loss of land, providing flood control and helping to moderate streamflow, and providing food and habitat for both aquatic and terrestrial wildlife (NCDENR-DWQ, 2004). For more information or to obtain a free copy of DWQ's *Buffers for Clean Water* brochure, call (919) 733-5083, ext. 558.

8.3 Stormwater Programs

The goal of the DWQ stormwater discharge permitting regulations and programs is to prevent pollution from entering the waters of the state via stormwater runoff. These programs try to accomplish this goal by controlling the source(s) of pollutants. These programs include National Pollutant Discharge Elimination System (NPDES) Phase I and II regulations, HQW/ORW stormwater requirements, and requirements associated with the Water Supply Watershed Program. Currently, there is one individual stormwater permit listed for the White Oak River basin (see Appendix II) and Phase I regulations are not applicable; however, there are a few local governments and/or counties that are affected by other water quality protection programs. Those affected are listed in Table 39.

8.3.1 NPDES Phase I

Phase I of the EPA stormwater program started with Amendments to the Clean Water Act (CWA) in 1990. Phase I requires an NPDES permit to address stormwater runoff from medium and large stormwater sewer systems serving populations of 100,000 or more people. There are no municipal NPDES Phase I stormwater permits issued in the White Oak River basin. However, Camp Lejeune Marine Corps Base was issued a stormwater permit equivalent to a Phase I permit in 2004 (Permit NCS000290).

Phase I also has requirements for ten categories of industrial sources to be covered under stormwater permits. Industrial activities which require permitting are defined in categories ranging from sawmills and landfills to manufacturing plants and hazardous waste treatment, storage or disposal facilities. Construction sites disturbing greater than five acres are also required to obtain an NPDES stormwater permit under Phase I of

EPA Stormwater Rules

Phase I – December 1990

- Requires a NPDES permit for municipal storm sewer systems (MS4s) serving populations of 100,000 or more.
- Requires a NPDES stormwater permit for ten categories of industry.
- Requires a NPDES stormwater permit for construction sites that are 5 acres or more.

Phase II – December 1999

- Requires a NPDES permit for some municipal storm sewer systems serving populations under 100,000, located in urbanized areas.
- Provides a "no stormwater exposure" exemption to industrial facilities covered under Phase I.
- Requires a NPDES stormwater permit for construction sites that are 1-5 acres.

the EPA stormwater program. Excluding construction stormwater general permits, there were no general stormwater or individual stormwater permits issued in this basin under Phase I with the exception of the Camp Lejeune Marine Corps Base permit.

Table 39 Major Post-Construction Stormwater Controls in SL 2006-246

	Shellfish Resource Waters* (SA Waters w/ > 500 ppm chlorides)	**SA Designated Waters – Not Shellfish Resource Waters***	**Coastal County – Not SA Designated Waters**	**Non – Coastal County**
Low Density Threshold	12%	24%	24%	24%
Storm Design for High Density	Difference in pre and post-development for 1-yr, 24-hour storm**	Runoff from first 1.5 inches of rain	Runoff from first 1.5 inches of rain	Runoff from first 1 inch of rain
Setback	30 feet	30 feet	30 feet	30 feet
Other Controls	No new points of s/w discharge No increase in rate, volume, or capacity in existing conveyances Infiltration up to 1-yr, 24-hr storm Diffuse flow in excess of 1-yr, 24-hr storm	No new points of s/w discharge No increase in rate, volume, or capacity in existing conveyances Infiltration up to 1-yr, 24-hr storm Diffuse flow in excess of 1-yr, 24-hr storm		

*These controls apply within ½ mile and draining to these waters.
**Amount of Runoff that would need to be controlled in inches for the difference in pre- and post-development conditions for the 1-year, 24-hour storm.

8.3.2 NPDES Phase II

The EPA delegated Phase II implementation to each state and then in 1999 the Division of Water Quality and the Environmental Management Commission (EMC) initiated a rulemaking process. Phase II of the NPDES Stormwater Program was signed into law in December 1999. The regulation builds upon the existing Phase I stormwater program by requiring smaller communities and public entities that own and operate a municipal storm sewer system (MS4) to apply and obtain an NPDES permit for stormwater discharge. Construction sites greater than one acre are also required to obtain an NPDES stormwater permit under Phase II in addition to establishing erosion and sedimentation controls. The local governments permitted under Phase II are required to develop and implement a comprehensive stormwater management program that includes six minimum measures.

1) Public education and outreach on stormwater impacts.
2) Public involvement/participation.
3) Illicit discharge detection and elimination.
4) Construction site stormwater runoff control.
5) Post-construction stormwater management for new development and redevelopment.
6) Pollution prevention/good housekeeping for municipal operations.

Those municipalities and counties required to obtain a NPDES stormwater permit under the Phase II rules are identified using 1990 US Census Designated Urban Areas and the results of the 2000 US Census. Based on federal census data, EPA identified 123 cities, including

Jacksonville, and 33 counties, including Onslow, in North Carolina that would be required to obtain permits for stormwater management.

Section 2 of the rules define a delineation process that allows for the EMC to delineate regulated coverage areas in accordance with the schedule for review and revision of basinwide water quality management plans as provided in G.S. 143-215.8B(c).

2006 Stormwater Management Rule Update:

The legislature approved Session Law 2006-246, Senate Bill 1566 in 2006. Senate Bill 1566 provides that development projects in Phase II municipalities and counties that cumulatively disturb one acre or more of land must comply with the post-construction stormwater standards set out in the bill. The bill sets out criteria whereby unincorporated areas of counties will be subject to Phase II requirements. Under these criteria 25 counties are fully covered, while 8 counties have portions that are subject to the stormwater requirements. The bill also provides a designation and petition process by which additional local governments and other entities may be required to obtain a stormwater management permit.

8.3.2.1 Stormwater Management in Shellfish Resource Waters

In coastal areas, Senate Bill 2006-246 requires stormwater controls based on a project's level of density and its proximity to Shellfish Resource Waters. Shellfish Resource Waters are waters classified by the EMC as Class SA waters (shellfish growing waters) that contain an average concentration of 500 parts per million of natural chloride ion (saltwater).

In January 2007, the Water Quality Committee (WQC) of the EMC voted to initiate the rulemaking process and proceed with the revised amendments to the State Stormwater Rules. These rules will extend more stringent coastal post-construction stormwater controls in Session Law 2006-246, similar to Phase II, to all 20 Coastal Counties.

Low-Density Projects: Development projects that are located within one-half mile of and draining to Shellfish Resource Waters are considered low density if they contain no more than 12 percent built-upon area. A project that is not located within one-half mile of Shellfish Resource Waters is a low-density project if it contains no more than 24 percent built-upon area or no more than two dwelling units per acre. Low-density projects must use vegetated conveyances to the maximum extent practicable to transport stormwater runoff from the project area.

High-Density Projects: Projects that are located within one-half mile of and draining to Shellfish Resource Waters are considered high density if they contain more than 12 percent built-upon area. A project that is not located within one-half mile of Shellfish Resource Waters is a high-density project if it contains more than 24 percent built-upon area or more than two dwelling units per acre. High-density projects must use structural stormwater management systems that will control and treat runoff from the first 1.5 inches of rain. In addition, projects that are located within one-half mile and draining to Shellfish Resource Waters must control and treat the difference in the stormwater runoff from the pre-development and post-development conditions for the one-year twenty-four hour storm as well as meet certain design standards.

Implementation

Senate Law 2006-246 provides an implementation schedule that requires regulated entities to apply for an NPDES stormwater management permit within 18 months of being notified that it is a regulated entity subject to the requirements of this act. The rules define a delineation process that allows for the EMC to delineate regulated coverage areas in accordance with the schedule for review and revision of basinwide water quality management plans as provided in G.S. 143-215.8B(c). A regulated entity must implement its post-construction program no later than 24 months from the date the permit is issued and fully implement its permitted program within five years of permit issuance. The City of Jacksonville and Onslow County have both submitted applications for Phase II. Camp Lejeune Marine Corps Base has also submitted a Phase II permit application.

Jacksonville has been issued an NPDES permit pursuant to Session Law 2006-246. Jacksonville has 18 months to develop and implement an ordinance under the conditions of their permit. Until then, effective July 1, 2007, the state will implement post-construction requirements in accordance with Section 9 of SL 2006-246. DWQ is in the process of evaluating the Onslow County application for a similar permit.

The bill authorizes the EMC to adopt Phase II stormwater management rules. If the EMC does adopt rules, the rules must be substantially identical to the provisions of this act and will be automatically subject to review by the General Assembly and not subject to review by the RRC. The bill became effective retroactively to July 1, 2006. The 2006 Stormwater Requirements are listed in Table 40 below. For additional information on stormwater programs please go to the DWQ Stormwater Unit Web site http://h2o.enr.state.nc.us/su/ and the EPA Web site http://cfpub.epa.gov/npdes/stormwater/swphases.cfm. The DWQ Web site includes a detailed history of the rulemaking process and lists those municipalities and counties that may be subject to Phase II stormwater permits.

2007 Recommendations

Communities in the White Oak River basin are experiencing significant and rapid population growth. Chapter 9 presents figures for population projections that estimate Jacksonville experienced a 54 percent population increase between 1990 and 2000, Morehead City experienced a 21 percent increase, and Emerald Isle a 30 percent increase. In addition, Onslow County is expected to experience a 16 percent population increase between 2000 and 2020, while Carteret County is expected to see an increase of 14 percent. These estimates do not take into account the significant population influxes during the tourist season.

In the White Oak River basin, the City of Jacksonville, Onslow County, and the Camp Lejeune Marine Corps Base are identified as meeting the criteria for developing stormwater management programs as required under the Phase II Session Law.

In addition, Morehead City, Atlantic Beach and Emerald Isle are being assessed by DWQ to determine if these communities meet the criteria for inclusion in the Phase II stormwater program. These communities are being assessed at this time due to the direction of the EMC. As noted above, the EMC was given authority by rule to delineate regulated coverage areas in accordance with the schedule for review and revision of basinwide water quality plans.

DWQ recommends that other local governments in the basin develop stormwater management programs voluntarily to begin the process of restoring and improving water quality in the region.

DWQ and other NCDENR agencies will continue to provide information on funding sources and technical assistance to support local government and county stormwater program development.

8.4 State Stormwater Programs

The State Stormwater Management Program was established in the late 1980s under the authority of the North Carolina Environmental Management Commission (EMC) and North Carolina General Statute 143-214.7. This program codified in 15A NCAC 2H .1000, affects development activities that require either an Erosion and Sediment Control Plan (for disturbances of one or more acres) or a CAMA major permit within one of the 20 coastal counties and/or development draining to Outstanding Resource Waters (ORW) or High Quality Waters (HQW).

8.4.1 Stormwater Management Near Sensitive Waters (HQW/ORW)

The State Stormwater Management Program requires developments to protect Outstanding Resource Waters (ORW) or High Quality Waters (HQW) by maintaining a low density of impervious surfaces, maintaining vegetative buffers and transporting runoff through vegetative conveyances. The program, codified in 15A NCAC 2H .1000, affects development activities that require an Erosion and Sediment Control Plan for disturbances of one or more acres. It also pertains to the 20 coastal counties that are required to obtain major permits under CAMA.

Under the state's stormwater program, low-density development thresholds vary from 12 to 30 percent built-upon area (impervious surface) depending on the classification of the receiving stream. If low-density design criteria cannot be met, then high-density development requires the installation of structural best management practices (BMPs) to collect and treat stormwater runoff from the project. High-density BMPs must control runoff from the 1- or 1.5-inch rain event (depending on the receiving stream classification) and remove 85 percent of the total suspended solids. More information about the State Stormwater Management Program can be found on the DWQ Stormwater Unit Web site (http://h2o.enr.state.nc.us/su/state_sw.htm).

Table 40 shows the counties in the White Oak River basin where permits may be required under the state stormwater management program under ORW stormwater rules.

2007 Recommendations

DWQ will continue implementing the state stormwater program with the other NCDENR agencies and local governments. Local governments should develop local land use plans that minimize impervious surfaces in sensitive areas. Communities should integrate state stormwater program requirements, to the extent possible, with other stormwater programs in order to be more efficient and gain the most water quality benefits for protection of public health and aquatic life.

Table 40 Communities in the White Oak River Basin Subject to Stormwater and/or Water Supply Watershed Stormwater Requirements.

	NPDES		State Stormwater Program	Water Supply Watershed Stormwater Requirements
Local Government	**Phase I**	**Phase II**		
Municipalities		+++		
Atlantic Beach		**EMC review July 07**		
Beaufort				
Bogue				
Cape Carteret				
Cedar Point				
Emerald Isle		**EMC review July 07**		
Indian Beach				
Morehead City		**EMC review July 07**		
Newport				
Peletier				
Pine Knoll Shores				
Jacksonville		**X**		
North Topsail Beach				
Richlands				
Swansboro				
Maysville				
Counties		+++		
Carteret			**X**	
Craven			**X**	
Jones				
Onslow		**X**	**X**	
Camp Lejeune Marine Corps Base	**X**	**Under DWQ review**		

8.4.2 Universal Stormwater Management Program

The Universal Stormwater Management Program (USMP) is an optional, voluntary stormwater management program developed by DWQ that will allow local governments to adopt and implement a single, simplified set of stormwater rules within their jurisdiction. The USMP is available to local governments that adopt an ordinance that complies with the rule and receives approval from the EMC. For those entities that adopt the program, the rule outlines requirements that apply to development and redevelopment activities that meet defined thresholds. For more information see http://h2o.enr.state.nc.us/su/usmp.htm.

Design standards for the 20 coastal counties include runoff controls from the 1.5 inch rainfall event for all development activities that disturb 10,000 square feet or more of land, including projects that disturb less than 10,000 square feet of land that are part of a larger common plan of development or sale. As required for the non-coastal counties, these stormwater control and treatment measures must be capable of removing 85 percent of the Total Suspended Solids and must have a volume drawdown of at least 48 hours, but not more than 120 hours. In addition, the storage volume of the stormwater control device must be discharged at a rate equal or less than the pre-development discharge rate for the 1-year, 24-hour storm. In addition, all impervious surfaces, except for roads, paths, and water dependent structures, shall be located at least 30 feet landward of all perennial and intermittent surface waters. Also, all development activities that are located within 575 feet of waters designated by the Environmental Management Commission

as shellfishing waters shall be limited to a maximum impervious surface density of 36 percent. Redevelopment activities that meet the provisions of 15A NCAC 02H .1002(14) shall not be required to comply with these requirements.

In addition to the other measures required in this Rule, all development activities located in one of the 20 coastal counties that disturb 10,000 square feet or more of land within ½ mile and draining to SA waters shall:

1) Use stormwater control measures that result in fecal coliform die off and that control, to the maximum extent practicable, sources of fecal coliform.
2) Prohibit new points of stormwater discharge to SA waters or expansion (increase in the volume of stormwater flow through conveyances or increase in capacity of conveyances) of existing stormwater conveyance systems that drain to SA waters. Any modification or redesign of a stormwater conveyance system within the contributing drainage basin must not increase the net amount or rate of stormwater discharge through existing outfalls to SA waters. Diffuse flow of stormwater at a non-erosive velocity to a vegetated buffer or other natural area capable of providing effective infiltration of the runoff from the 1-year, 24-hour storm shall not be considered a direct point of stormwater discharge. Consideration shall be given to soil type, slope, vegetation, and existing hydrology when evaluating infiltration effectiveness.

8.4.3 Stormwater Regulation Challenges

One challenge in meeting the goal of enhancing and protecting water quality is the state's inaccurate or lack of location data to identify permitted stormwater discharges. This permit data is important to DWQ for both tracking and renewing permits, assessing the program, and determining potential cumulative impacts. Discharge outfall locations are also important to compliment protection and restoration efforts by other organizations. In particular, the Division of Environmental Health needs to include the data in their extensive surveys of pollution sources for shellfish growing areas.

To correct this problem, updating discharge locations began in 2005 to include GPS coordinates of outfalls and digital photographs. A temporary administrative staff position has been requested to begin updating or correcting coastal stormwater permit data in DWQ's Basinwide Information Management System (BIMS) database. DWQ is working with regional offices to ensure data entry is consistent and a protocol exists for collecting GPS coordinates in a consistent manner at permitted sites. As a result of the 2005-2006 municipal outfalls update, the number of untreated stormwater outfalls are listed in Table 41 below:

Table 41 Stormwater Outfalls (2005-06)

Municipality	Number of Outfalls Identified
Beaufort	20
Emerald Isle	23
Jacksonville	>100 (incomplete dataset)
Morehead City	80
Newport	4
Swansboro	10
Topsail Beach	5

In addition to these outfalls, Camp Lejeune Marine Corps Base reports that there are currently 69 stormwater industrial outfalls and 249 residential stormwater outfalls at the base.

8.4.4 Local Government Stormwater Initiatives

The Town of Emerald Isle

The Town of Emerald Isle has enforced a stringent stormwater ordinance since 2001. The Town's ordinance requires that all development, including single-family homes, prepare a stormwater plan to infiltrate stormwater generated by the first two inches of rainfall. The Town does not allow a "low-density" option as the State allows, and requires all development, regardless of impervious coverage, to meet the Town's stormwater requirements. The Town's requirements are more stringent than current State regulations and the proposed Universal Stormwater Management Program.

The Town of Emerald Isle is more than 95 percent platted (i.e, subdivided into building lots, with related infrastructure already in place) with more than 85 percent of lots of record already built upon. Only one large undeveloped 29-acre ± parcel near the center of Town remains. Any new subdivisions or commercial centers will result in redevelopment, and this redevelopment will likely provide for better stormwater controls than exist with the current development. In addition, more than 90 percent of the town is zoned for single-family and duplex residential development only. The remaining areas are zoned for commercial uses and multi-family housing. The areas zoned for multi-family housing are limited to 8 units per acre, a relatively low density for a coastal community. The Town's minimum residential lot size is 12,500 sq. ft., more than double the size of typical residential lots in other North Carolina coastal communities.

A 2000 study funded by the town noted that the existing impervious percentage in the Coast Guard Road corridor (an area equal to approximately 1.6 square miles) is less than 20 percent. The majority of this area is developed and the total projected impervious surface in the area upon full build-out remains in the 20 percent range. Although the study focused on the Coast Guard Road corridor, development patterns in the remainder of Emerald Isle are similar to the Coast Guard Road corridor. The town has inferred from the study results that the total impervious coverage of the entire Town is in the 25 percent range or less.

The Town has enforced a stringent "Dunes and Vegetation" ordinance for decades. This ordinance requires that approximately 35 percent of a residential lot be retained in a natural, undisturbed state. This ordinance contributes to the relatively low impervious coverage in the Town, and also provides natural areas for infiltration for development that occurred prior to the enforcement of the Town's stormwater ordinance.

The Town continues to pursue the removal of its five existing ocean stormwater outfalls in the vicinity of Bogue Inlet Pier. The Town anticipates redevelopment in this area, and the Town will be working to remove these outfalls at the time of redevelopment.

The Town has completed improvements at several street-ends to eliminate direct sheet flow from streets into Bogue Sound through the construction of a new bulkhead and installation of infiltration systems/areas between the street-end and the bulkhead wall. The Town has plans to continue this approach at other locations in future years.

8.5 Wastewater Programs

8.5.1 NPDES Wastewater Discharge Permit Summary

Discharges that enter surface waters through a pipe, ditch or other well-defined point of discharge are broadly referred to as 'point sources'. Wastewater point source discharges include municipal (city and county) and industrial wastewater treatment plants and small domestic wastewater treatment systems serving schools, commercial offices, residential subdivisions and individual homes. Stormwater point source discharges include stormwater collection systems for municipalities and stormwater discharges associated with certain industrial activities. Point source dischargers in North Carolina must apply for and obtain a NPDES permit. Discharge permits are issued under the NPDES program, which is delegated to DWQ by the Environmental Protection Agency (EPA).

The primary pollutants associated with point source discharges are:

- oxygen-consuming wastes,
- nutrients,
- sediments,
- color, and
- toxic substances including chlorine, ammonia and metals.

Currently, there are 44 permitted wastewater dischargers in the White Oak River basin. Table 42 provides summary information (by type and subbasin) about the discharges. The types of dischargers listed in the table are described in the inset box. Facilities are mapped in each subbasin chapter, and a complete listing of permitted facilities is included in Appendix II.

Types of Wastewater Discharges

Major Facilities: Wastewater treatment plants with flows ≥1 MGD (million gallons per day); and some industrial facilities (depending on flow and potential impacts to public health and water quality).

Minor Facilities: Facilities not defined as Major.

100% Domestic Waste: Facilities that only treat domestic-type waste (from toilets, sinks, washers).

Municipal Facilities: Public facilities that serve a municipality. Can treat waste from homes and industries.

Nonmunicipal Facilities: Non-public facilities that provide treatment for domestic, industrial or commercial wastewater. This category includes wastewater from industrial processes such as textiles, mining, seafood processing, glass-making and power generation, and other facilities such as schools, subdivisions, nursing homes, groundwater remediation projects, water treatment plants and non-process industrial wastewater.

The majority of NPDES permitted wastewater flow into the waters of the White Oak River basin is from three municipal wastewater treatment plants (WWTP). Facilities, large or small, where recent data show problems with a discharge are discussed in each subbasin chapter (Chapters 1-5).

Table 42 Summary of NPDES Dischargers and Permitted Flows for the White Oak River Basin (November 2006).

Facility Categories	03-05-01	03-05-02	03-05-03	03-05-04	03-05-05	TOTAL
Total Facilities	5	27	9	5	0	46
Total Permitted Flow (MGD)	0.51	17.45	3.95	0.03	0.00	21.94
Facilities Grouped by Size						
Major Discharges	0	1	2	0	0	3
Permitted Flow (MGD)	0.00	15.00	3.2	0.00	0.00	18.2
Minor Discharges	5	26	7	5	0	43
Permitted Flow (MGD)	0.51	2.45	0.75	0.03	0.00	3.74
Facilities Grouped by Type						
100% Domestic Waste	2	20	0	1	0	23
Permitted Flow (MGD)	0.03	1.67	0.00	0.02	0.00	1.72
Municipal Facilities	3	2	5	2	0	12
Permitted Flow (MGD)	0.48	0.25	3.95	0.00	0.00	4.68
Nonmunicipal Facilities	0	5	4	2	0	11
Permitted Flow (MGD)	0.00	15.52	0.00	0.01	0.00	15.53

8.5.2 Nutrient Sensitive Waters Discharge Strategies

Waters classified as Nutrient Sensitive Waters (NSW) are subject to wastewater discharge limitations (refer to 15A NCAC 2B .0223 for specifics on NSW rules). The New River was classified as NSW in 1991. Previous White Oak Basin plans (1997 & 2001) recommended the following as part of the New River NSW strategy to reduce point source contributions of nutrients to the upper New River estuary:

- Existing facilities with permitted capacity of 0.05 MGD or greater should continue to receive total phosphorus (TP) limits of 2.0 mg/l.
- New and expanding facilities should continue to receive TP limits of 0.5 mg/l.
- New and expanding facilities greater than 1 MGD should receive total nitrogen limits (TN) similar to Camp Lejeune of 5.0 mg/l (summer) and 10.0 mg/l (winter).
- All facilities without limits will be required to monitor TN and TP.

It is also recommended that no new discharges be permitted and expansions of existing facilities only be allowed if there is no increase in permitted loading of oxygen-consuming waste.

Refer to Chapter 2 for discussion on the success of this NSW strategy for the New River.

8.5.3 Permitted Non-Discharge Waste Management Strategies

New development activities in coastal areas frequently rely on non-discharge systems for wastewater treatment and disposal. These treatment systems are designed to satisfy at least the minimum permitting requirements for protection of the surface and ground waters that they could potentially impact. Permitted non-discharge facilities can be a good alternative to

permitted surface water discharges when appropriately permitted based on site conditions for disposal and treatment. The new rules for waste not discharged to surface waters can be found at: http://h2o.enr.state.nc.us/admin/rules/documents/2Tbook.pdf as 15A NCAC 02T. Numerous non-discharge systems and necessary treatment requirements are described at this website. These rules replaced the earlier 15A NCAC 02H .0200 rule version and are used in concert with 15A NCAC 02H .0400 rules (Coastal Waste Treatment Disposal Rules).

Reuse quality treatment may use infiltration ponds, but many systems use a sprayfield area with known soil types and crop designations along with hydraulic limits for disposal. Older, smaller package plants often have rotary distributor disposal systems, although these are becoming outdated and are being replaced by drip irrigation or small spray systems within the rotary field. There are drip irrigation fields at large sites as well.

Setbacks are required for surface waters, drainage ditches and waterways for all irrigation sites. The land surface provides a final "treatment" phase in the disposal process, allowing for uptake and often vegetative removal of nutrients and/or fecal coliform bacteria that may be present in plant effluent depending on the level of treatment permitted for a given facility. However, the effectiveness of this treatment depends upon the ability of the cover crops to take up the nutrients. In additional, the coarse grain sands do not always provide adequate adsorption, and the retention time before it enters groundwater is minimal so soil bacteria do not provide much treatment. With the promulgation of the Subchapter 02T rules, high-rate systems must meet more stringent effluent limitations and/or increased setbacks.

If the water table is high in a disposal area, water level meters are installed to prevent irrigation until there is a certain vertical separation between the land surface and the water table. Runoff is a real concern at any irrigation site, but it can be prevented with proper hydraulic loading (water balance), buffering, and storage.

In the White Oak River basin there is documentation of some problems associated with these non-discharge systems. These problems are typically traced back to operator and operational system management issues or poor design.

Another issue that can be associated with non-discharge systems is the installation of high rate infiltration systems in very densely developed areas. The high rate systems, combined with low-pressure systems and individual septic tank systems, can overload the upper groundwater aquifer in coastal areas, such as Atlantic Beach and the Emerald Isle Barrier Islands. These conditions make it very difficult to conduct meaningful groundwater compliance monitoring because of the large number of neighboring influences from septic systems. Some solutions include effluent monitoring limits combined with more effective bacteriological treatment, increased denitrification, centralized waste treatment or limiting growth.

Non-discharge systems work well when the site is conducive to infiltration. However, problems can arise when the site is a low-lying area with a high groundwater table (thereby inhibiting infiltration), or with nearby wetlands or ditches that can act as a ready conduit for runoff. Most non-discharge spray irrigation sites have storage ponds that would allow the wastewater to be held until appropriate to spray.

Many non-discharge systems are constructed by the developer and turned over to a homeowners association (HOA) after completion. If there is a major problem, the HOA is responsible for the

repair bill and funding the repair can be an issue. For systems that will be or are owned by a HOA, the statutes and rules require special accounts be set up by the HOA for the operation of the treatment system. In addition, the HOA must set up a reserve fund for major repairs.

There are also "space" issues to consider. Although a designated green space area (in essence a repair area) is required for a coastal project, the repair solution can still be difficult to implement due to limited space to work in.

Non-discharge systems create some challenges for the DWQ regional offices in terms of inspections and assuring permit and compliance conditions are met. DWQ may seek additional staffing resources to meet these challenges. One of DWQs goals is to better review covenants and bylaws upon permit review to make sure that HOAs are adhering to the financial assuredness requirements under the permit.

8.6 Waste Management in Coastal Communities

North Carolina has enacted laws and adopted rules that mandate significant requirements for inspection and review of On-site Waste System (OSWS) performance. In addition to the three tiers of permits including Improvement Permits (site approval for OSWS), Construction Authorizations (system approval for installation or construction), and Operation Permits (approval of the OSWS to be covered, placed into use, and permanent electrical power to the facility), numerous activities require inspection after the system receives an initial Operation Permit.

Comprehensive site/soil evaluation, system design review and layout, and installation inspection is required (including appropriate permits) for:

- All new construction,
- All expansion /additions to dwelling units or other facilities with existing OSWS,
- All proposed increases in the design wastewater flow with existing OSWS, and
- All proposed increases in wastewater strength with existing OSWS.

Post installation inspections and evaluations of OSWS (including appropriate permits) by professional Environmental Health Specialists are required for:

- All complaints reported to the State or Local Health Department,
- All OSWS requiring repairs and includes a comprehensive failure analysis,
- All relocations of a manufactured home in a mobile home park and requires all systems serving the park to be inspected prior to issuing a written authorization,
- All reconnections to existing on-site wastewater systems,
- All OSWS required to be operated and maintained by a certified subsurface system operator,
- All systems located adjacent or near shellfishing waters (SA).

Sitting, sizing, inspections, approvals, and permitting are the responsibilities of County Health Departments through their local authorized agents, but the engineers and regional soil specialists are called upon for training, authorization, informal appeals, and consultation with the Environmental Health Specialists. Enforcement of on-site wastewater rules and laws is the responsibility of the local Environmental Health Specialists. OSWS activities for FY 2003-2004

in Onslow and Carteret Counties are noted below in Table 43. Data for Craven and Jones counties are not included in the table since only a very small portion of land area of these two counties are within the White Oak River basin. For more information on state rules pertaining to site evaluations and soil suitability for septic systems see http://www.deh.enr.state.nc.us/osww_new/images/Rules/1900RulesJune2006.pdf.

Table 43 Onslow and Carteret Counties On-site Waste System activities (2003-04)

	Carteret	Onslow
Site Visits	3197	7758
Applications Received	1604	1798
Improvement Permit's Issued: New, non expiring	3	0
Improvement Permit's Issued: New, valid for 5 years	579	1334
Improvement Permit's Issued: Expansion of existing system	14	1
Improvement Permit's Issued: Repairs	73	19
Improvement Permit's Denied	109	122
Construction Authorization's Issued - New	556	911
Construction Authorization's Issued - Expansion	11	79
Construction Authorization's Issued - Repair	155	175
Construction Authorization's Denied	11	1
Authorizations - MHP's	91	27
Authorizations - Existing system reuse/relocation	215	22
Notices of Violation Issued	19	39
Legal Remedies (Rule .1967 or .1968)	3	3
Permits Revoked (notice)	40	1
Permits Suspended (notice)	2	2
NEW OPERATION PERMITS (total)	395	766
EXPANSION OPERATION PERMITS (total)	1	61
REPAIR OPERATION PERMITS (total)	61	60
TOTAL OPERATION PERMITS	457	887

*Permits are totaled by county and may not all be in White Oak River Basin

DENR On-Site Wastewater System Management

DENR has several initiatives related to on-site wastewater education, including current literature and scientific evaluation of potential pollutants from On-site Wastewater Systems. The DEH On-Site Wastewater Section has an active grant-seeking program. Current successful grants include those to the WaDE program for eliminating straight pipes and failing systems, NPS coordinator grants for fate and transport of microbes in the shellfish areas, endocrine disrupting chemicals and pharmaceuticals, and an on-site management grant. The DEH Shellfish Sanitation and Recreational Water Quality Section also have significant involvement with on-site wastewater inspections and protection of water quality in the CAMA counties. Sanitary Surveys are conducted for the shellfishing harvesting areas, which include inspecting on-site wastewater discharges. On-site wastewater systems are inspected once every year as a drive-by or shoreline observation, and every three years door-to-door inspections. The Division of Waste Management oversees the septage management firms and septage disposal in NC. The septage capacity is set yearly, and in the CAMA counties there is inadequate capacity to dispose of septic system waste if they are pumped every three years.

8.6.1 Septic Systems and Straight Piping

With the increase in development there is an increase in demand for individual wastewater treatment systems requiring higher flows on smaller tracks of land. Wastewater from many households is not treated at wastewater treatment plants associated with NPDES discharge permits. Instead, it is treated on-site through the use of permitted septic systems. Poorly planned and/or maintained systems can fail and contribute to nonpoint source pollution. Wastewater from some of these homes illegally discharges directly to streams through what is known as a "straight pipe". In other cases, wastewater from failing septic systems makes its way to streams or contaminates groundwater. Straight piping and failing septic systems are illegal discharges of wastewater into waters of the State.

With on-site septic systems, the septic tank unit treats some wastes and the drainfield provides further treatment and filtration of the pollutants and pathogens found in wastewater. A septic system that is operating properly does not discharge untreated wastewater to streams and lakes or to the ground's surface where it can run into nearby surface waters. Septic systems are a safe and effective long-term method for treating wastewater if they are sited, sized and maintained properly. If the tank or drainfield are improperly located or constructed, or the systems are not maintained, nearby wells and surface waters may become contaminated, causing potential risks to human health. Septic tanks must be properly installed and maintained to ensure they function properly over the life of the system. Information about the proper installation and maintenance of septic tanks can be obtained by calling the environmental health sections of the local county health departments. See Appendix III for contact information.

The discharge of untreated or partially treated sewage can be extremely harmful to humans and the aquatic environment. Pollutants from illegally discharged household wastewater contain chemicals, nutrients, disease pathogens and endocrine disrupting chemicals. Although DWQ ambient monitoring of the waters in the White Oak River basin show a relatively small percentage of fecal coliform bacteria samples exceeding state standards for primary recreation, smaller streams may contain a higher concentration of bacteria and other pollutants. The economies of the counties in this basin are highly dependent upon river recreation, especially for tourists and seasonal residents.

2007 Recommendations

In order to protect human health and maintain water quality, straight pipes must be eliminated, failing septic systems must be repaired, and older systems must be updated. Additional monitoring of fecal coliform throughout tributary watersheds will aid in identifying where straight pipes and failing septic systems are problems. Precautions should be taken by local health departments to ensure that new systems are sited and constructed properly and an adequate repair area is available. County, town and city planners need to understand the economic and human health ramifications caused by unsatisfactory septic systems and plan for long-term septic system sustainability. In areas where soils prevent individual septic systems a collective community septic system in appropriate soils may allow for sustainable development where a centralized sewer system is not available. Educational information should also be provided to new septic system owners regarding the maintenance of these systems over time.

Education and Outreach

DENR promotes the adoption of On-Site/Decentralized Wastewater Management Plans by local governments. On-site or decentralized plans emphasize the need for a life-cycle management of

the entire range of decentralized wastewater systems. A decentralized plan includes proper on-site inspection and maintenance. A manual is being developed to assist local governments in establishing a decentralized wastewater management plan. DWQ has developed a booklet that discusses actions individuals can take to reduce stormwater runoff and improve stormwater quality entitled *Improving Water Quality In Your Own Backyard*. The publication includes a discussion about septic system maintenance and offers other sources of information. To obtain a free copy, call 919- 733-5083.

For more information on septic systems, contact the DEH On-Site Wastewater Section, toll free at 1-866-223-5718 or visit their website at http://www.deh.enr.state.nc.us/osww_new//. Additional information regarding environmental stewardship for coastal homeowners is available at http://www.soil.ncsu.edu/assist/coastindex.html. North Carolina National Estuarine Research Reserve program also provides on-site waste management outreach materials and workshops for realtors; see http://www.ncnerr.org/.

Initiative Examples

The increase in development, need for individual wastewater systems, and failing older systems in Carteret County contribute to declining water quality conditions and threats to human health. In 2004 Carteret County Environmental Health Division received Section 319 funding to support inspection, tracking and management of on-site waste. Through this grant, the County established a wastewater system database to monitor and track installed systems and follow up on failing systems. This database is linked to DEH Shellfish Sanitation surveys, which allows the data to identify problem areas or potential areas of wastewater system failure. The combination of these data sets provides a valuable tool for protecting surface waters and shellfish waters. To compliment this effort, the County will provide education and regulatory information to the public through workshops, pamphlets, handouts, website and newspaper articles. The County and the Carteret County Association of Realtors formed a Septic Task Force to address the septic permit violations because of over occupancy of rental property. Property evaluation and wastewater system upgrades are currently being processed for occupancy compliance.

The Town of Nags Head in the Pasquotank River basin implemented the Septic Health Initiative to improve management of septic systems and to reduce a potential source of microbes. This initiative includes four major programs including public education, septic tank inspection and pumping, water quality monitoring and the development of a long-term decentralized wastewater management plan. This voluntary program is designed to encourage homeowners to have their septic systems inspected and pumped on a regular basis by providing refunds for inspection costs and utility credits for septic pumping. A homeowner low interest loan program also promotes the replacement of failing systems. The development of a decentralized wastewater management plan is Nags Head's long-term strategy in protecting water quality while allowing the continued use of on-site wastewater systems. (source: http://www.townofnagshead.net)

In 2005, UNC's Institute for Marine Sciences received a grant to trace microbial pollutants from conventional on-site septic systems in the Newport and North rivers. Data can be used both to assess impacts of on-site wastewater treatment systems on coastal water quality and correlate repair of failing systems to restoration of shellfish harvesting areas. DEH Shellfish Sanitation and Carteret County Health Department are project cooperators.