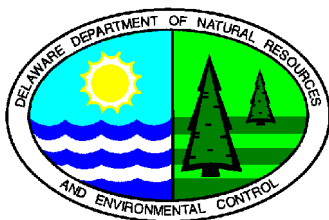


TOTAL MAXIMUM DAILY LOAD (TMDL) ANALYSIS
FOR
NANTICOKE RIVER AND BROAD CREEK
DELAWARE

Prepared by:

Watershed Assessment Section
Division of Water Resources
Delaware Department of Natural Resources and Environmental Control
29 S. State Street
Dover, DE 19901



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Preface

The Clean Water Act requires States to list all waters that do not meet water quality standards even after pollution controls required by law are in place. For these waters, the State must establish Total Maximum Daily Loads (TMDLs) for the pollutants of concern. A TMDL sets a limit on the amount of a pollutant that can be put in the water without violating the standard, and then distribute that amount to all sources. Delaware Department of Natural Resources and Environmental Control (DNREC) has listed the Nanticoke River and Broad Creek as waters that do not meet water quality standard for designated uses even though all the pollution controls required by law are already in place. Nutrients of phosphorus and nitrogen and Carbonaceous Biochemical Oxygen Demand (BOD, a primary factor for in-stream dissolved oxygen content) were identified as pollutants for these listed waters and therefore, TMDLs for these pollutants must be developed.

DNREC, in cooperation with other parties, has led the development of the TMDLs for the Nanticoke River and Broad Creek. This document provides background information for the TMDL development, and serves as a technical basis for the TMDLs regulation.

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EXECUTIVE SUMMARY

Section 303(d) of the Clean Water Act (CWA) as amended by the Water Quality Act of 1987, requires States to identify those waters within their boundaries which are water quality limited, to prioritize them, and to develop Total Maximum Daily Loads (TMDLs) for pollutants of concern. A water quality limited water is a waterbody in which water quality does not meet applicable water quality standards, and/or is not expected to meet applicable standards, even after application of technology-based effluent limitations for Publicly Owned Treatment Works (POTW) and other point sources.

The Nanticoke River and Broad Creek in Delaware have been identified as water quality limited waters, are included in the State's 1996 and 1998 303(d) list, and are targeted for development of TMDLs. The major environmental problems in the sub-basin are nutrient overenrichment and low dissolved oxygen levels caused by point source discharges and nonpoint sources. Therefore, TMDLs developed in this report focuses on chemical constituents of total nitrogen, total phosphorus, and dissolved oxygen. The targeted concentrations for these three constituents are 3.0 mg/l, 0.1 mg/l and 5.5 mg/l, respectively.

To develop the total maximum daily loads for Nanticoke River and Broad Creek, an intensive water quality monitoring was conducted from 1991 through 1994. During this period, water quality and quantity data were collected for the Nanticoke River and its major tributaries. The result of this monitoring activity was used to develop and calibrate a hydrodynamic and water quality model of the Nanticoke River and Broad Creek. The U.S. EPA's Water Analysis Simulation Program (WASP) modeling framework was used for this purpose. The Nanticoke River Model was calibrated to water quality and hydrodynamic conditions of the year 1992 (as a base-line).

Using the calibrated model of the Nanticoke River, several point and nonpoint source loading scenarios were considered for the sub-basin. The results of these analyses showed that to

improve water quality condition of the Nanticoke River, pollutants loads to the river should be reduced significantly. Based on the results of these scenario runs, Delaware DNREC has established total maximum daily loads for the mainstem of Nanticoke River and Broad Creek which call for implementation of the following action plans:

1. Biological Nutrient Removal (BNR), or equivalent, processes shall be employed in three large municipal wastewater treatment plants in the Nanticoke River and Broad Creek Sub-basin. These three facilities include Seaford Sewage Treatment Plant, Bridgeville Sewage Treatment Plant, and Laurel Sewage Treatment Plant. This shall result in reducing nitrogen load from these three facilities from the current permitted load of 199 kilograms per day (439 pounds per day) to 100 kilograms per day (221 pounds per day). Reduction of phosphorous loads from these three facilities will be from the current permitted load of 33 kilograms per day (73 pounds per day) to 25 kilograms per day (55 pounds per day).
2. For the remaining wastewater treatment plants in the watershed, discharge of nitrogen and phosphorous loads shall be capped at their current permitted loads. These loads are 568 kilograms per day (1252 pounds per day) of nitrogen and 1.0 kilograms per day (2.2 pounds per day) of phosphorous.
3. The nonpoint source nitrogen load to the Nanticoke River and Broad Creek shall be reduced by 30 percent (from year 1992 base-line). This shall result in reduction of all nitrogen loads during a normal rainfall year from 2274 kilograms per day (5013 pounds per day) to 1723 kilograms per day (3799 pounds per day).
4. The nonpoint source phosphorus load to the Nanticoke River and Broad Creek shall be reduced by 50 percent (from year 1992 base-line). This shall result in reduction of all phosphorous loads during a normal rainfall year from 54 kilograms per day (119 pounds per day) to 36 kilograms per day (79 pounds per day).

Based upon hydrodynamic and water quality model runs and assuming implementation of reductions identified by actions 1 through 4, DNREC has determined that, with an adequate margin of safety, water quality standards will be met in the Nanticoke River and Broad Creek.

Implementation of this TMDL Regulation shall be achieved through development and implementation of a Pollution Control Strategy. The Strategy will be developed by DNREC in concert with the Department's ongoing Whole Basin Management Program and the affected public.