F. Summary

Based on the modeling results, the New York State DO water quality standards in the western Peconic Estuary would be attained through implementation of the nutrient reduction and mechanical aeration actions outlined in this TMDL. Improvements in the hourly minimum DO from nitrogen management would result in an addition of 2.36 mg/L of DO above the baseline condition at the critical grid cell in tidal Peconic River. Mechanical aeration would improve the hourly minimum DO at the critical grid cell by an additional 2.64 mg/L. The critical grid cell [18,23] is located about 0.23 miles west of the Riverhead STP discharge. The incremental improvement in DO at the critical grid cell for the cumulative impact of each of five management alternatives is shown in Table VI.12. The two largest incremental improvements in DO among the nitrogen management alternatives result from implementation of land use management measures, actions, practices and controls to reduce groundwater nitrogen loads and from practical load reduction controls on the Riverhead STP. Despite significant gains due to applying the PLR controls, mechanical aeration is still required to attain the existing water quality standard for DO of 5.0 mg/L as well as the proposed water quality standards.

Table VI.12: Incremental improvements in DO at critical grid cell [18,23] in tidal Peconic River

Run ID	Cumulative Management Action for Reducing Nitrogen	Lowest Daily Average DO		Lowest Hourly Minimum DO	
		DO (mg/L)	Incremental Improvement In DO (mg/L)	DO (mg/L)	Incremental Improvement In DO (mg/L)
01g	Baseline condition	1.496	-	0.003	-
15h1	Atmospheric deposition reduced by 31.3%	1.649	0.153	0.034	0.031
15h2	Groundwater loads improved to PLR	2.575	0.926	1.156	1.122
15h3	Stormwater and Tributaries improved to PLR	2.787	0.212	1.586	0.043
15h	Riverhead STP improved to PLR	3.423	0.636	2.363	0.777
15i	Mechanical aeration	6.175	2.752	5.005	2.642

VII. Implementation

This section describes programs and actions that are in place that directly or indirectly impact nitrogen loads or the impacts nitrogen has on the Peconic Estuary, including those waters impaired due to low dissolved oxygen. Further, it describes enhancements to those programs and other new or related initiatives that could be put in place to further reduce the nitrogen load or otherwise reduce that impact that excess nitrogen has on the Peconic System. The Peconic Estuary Program seeks to have this TMDL fully implemented within 15 years from approval, based upon current expectations for full build-out and land acquisition programs, development and implementation of education and outreach programs, full participation in the agricultural stewardship/agricultural environmental management program, and other necessary efforts. Full implementation of this TMDL is expected to result in water quality standards for dissolved oxygen being met where they are not currently attained and ensure continued compliance where these standards are presently achieved.

A. Summary of Nutrient Load or Impact Reduction Mechanisms for the Peconic Nitrogen TMDLs

1. Atmospheric Deposition

Atmospheric deposition represents a significant load and through existing Federal Clean Air Act (CAA) authorities, a significant load reduction (31.3%) is scheduled through the implementation of controls over the next decade and beyond. The loads and reductions are important locally and regionally. There are several New York State initiatives, which will probably result in further reductions in nitrogen emissions:

- Adoption of low-emission-vehicle standards for NOx and CO_2
- Adoption of the Regional Greenhouse Gas Initiative
- Initiation of the collaborative Renewable Energy Portfolio

Reductions in air emissions beyond those currently called for in the CAA has not yet been evaluated by the PEP in terms of the cost, impact, or benefit/feasibility. Monitoring reductions is possible through the National Atmospheric Deposition Monitoring (there is a wet deposition monitoring station in the Peconic Watershed).

2. Open Space Preservation/Critical Lands Protection

Open space acquisition is critically important in reducing future loads. There are town (Community Preservation Fund (CPF)), county and state open space acquisition programs, described in detail in the PEP CCMP. Open space acquisition programs with an emphasis on parcels in nitrogen impaired/stressed sub-watersheds could strengthen efforts to protect the overall system and individual waterbody segments that are impaired or threatened. A related effort would be to emphasize the use of transfer of development rights (TDR) credits in a manner that reduces nitrogen loadings, particularly in nitrogen stressed areas. The PEP, with The Nature Conservancy (TNC) has identified priority parcels in nitrogen stressed waters; while this information is known to be used by the towns, county and state in making acquisition decisions and potentially TDR decisions, government agencies could formally adopt nitrogen stress considerations into acquisition program and TDR program considerations. The TNC (through PEP-funded critical lands protection tracking effort) tracks acquisitions at the various levels of government.

3. Agricultural Nutrient Management

The Long Island Agricultural Stewardship Program, based on the Agricultural Environmental Management Program, should be fully implemented to reduce nutrient losses to groundwater and runoff. The Long Island Agricultural Stewardship has begun to develop and implement a voluntary management plan that addresses groundwater and surface water protection based on appropriately using nitrogen fertilizers (and pesticides registered for use on Long Island). The Agricultural Stewardship Program developed thirteen environmental risk assessment worksheets for Long Island growers modeled after the New York State Agricultural Environmental Management (AEM) Program. Worksheet topics include nutrients, pesticides, soil, irrigation, water, and well management. These worksheets are part of the AEM five-step program. Other important aspects of the stewardship program include providing information on Best Management

Practices and conducting various pilot projects to evaluate practices to reduce nitrogen (and pesticide) loading into the groundwater. It is also necessary to conduct research and demonstration projects in support of this effort. The Agricultural Stewardship Program tracks local demonstration projects and research, and (confidentially) grower participation. See also Appendix C of this document that includes an implementation highlight discussion and other information (Agricultural Demonstration Projects and Research Summary).

Because the agricultural load of nitrogen is estimated to be an important source of the loads in the Peconic Estuary watershed, achieving the target loads specified in the TMDL depends on significant reductions from agricultural operations. Reductions would be attempted by a voluntary, incentive-based approach to adopting management practices that reduce nitrogen losses. The level of reduction necessary to achieve the targeted loads, particularly in the currently impaired waterbodies, approaches what could be reasonably anticipated from adopting practices. Achieving the target reduction can also be achieved by converting to crops or cropping practices that result in less nitrogen losses. The Suffolk County Soil and Water Conservation Districts is encouraged to implement the AEM program on farms in the watershed that will lead to identification and implementation of management practices to reduce nitrogen loads. These practices would be eligible for state or federal funding and because they address a water quality impairment associated with this TMDL, should score well. Appendix H of the PEP CCMP (see: http://www.peconicestuary.org/CCMP_PDF/AppendixH.pdf) includes the Peconic Estuary Program's detailed Agricultural Environmental Management Strategy. This report goes beyond the traditional approach of describing best management practices to also discuss farm and crop insurance and other innovations that also reduce nitrogen loads. A subsequent report based on that effort is contained in "A Strategy to Develop and Implement the Suffolk County Agricultural Stewardship Program - A Report of the Agricultural Environmental Management Task Force for Nitrogen and Pesticide Load Reduction - Final Report" (May 26, 2004) (see: http://peconicestuary.org/AgForceRpt.pdf)

4. Sewage Treatment Plants/Surface Water Discharges under SPDES

An important milestone in the efforts to manage nitrogen and improve water quality has been the installation of advanced treatment (nutrient removal) at the Riverhead and Sag Harbor STPs. The current advanced treatment at the Riverhead STP has reduced the TN concentration in the effluent. Nutrient limits will be imposed in STP permits (beyond initial "no net increase" based requirements) at the Riverhead, Sag Harbor and Shelter Island Heights STPs, potentially expressed in lbs/day as a monthly average of 24-hr composite samples at a sampling frequency of one sample per week; currently, the Riverhead STP is the only facility with a mass-based nitrogen limit (expressed in lbs/day, as a monthly average). Further reducing the impact from the Riverhead STP will be achieved by using a portion of the Riverhead STP effluent flow to seasonally irrigate the adjacent the County-owned Indian Island Golf Course. New York State Clean Air/Clean Water Bond Act money has been allocated for full scale implementation of this beneficial reuse project.

It might also be worthwhile to investigate additional Riverhead STP land application options, including parkland and agricultural operations (particularly plants grown for ornamental horticultural purposes). The relocation or extension of the Riverhead STP outfall to an area with more flushing might also be considered in the future. While this was previously determined not feasible, at some point, a re-evaluation may be appropriate.

The Atlantis Marine World discharge is a small flow (0.0081 MGD) to the nutrient sensitive tidal Peconic River. The permit for the Atlantis Marine World will be reviewed upon renewal to set discharge limits.

5. Requirements for New Development

The proposed implementation initiatives for new development include: revising zoning to reduce development densities; imposing vegetation preservation requirements (i.e., clearing restrictions) to maintain existing vegetation and reduce potential lawn areas; requiring the establishment of a suitable soil base (perhaps up to 12 inches) where lawn areas are to be established; encouraging cluster development to reduce lawn areas; and evaluating the potential for centralized on-site disposal systems (OSDSs) with nitrogen removal. Sustainable development/redevelopment and other so called "smart growth" techniques, where applicable, can also help do reduce vehicle miles driven and associated air deposition of nitrogen, by encouraging mixed use development.

6. Turf and Landscape Management (for Existing and New Development)

The Peconic Estuary Program implementation initiative for this source includes: developing turf/landscaping recommendations for homeowners to eliminate or minimize fertilizer loses to groundwater or to stormwater. At a development density of one dwelling unit per acre, studies have shown that approximately 50% of the TN loading to groundwater comes from fertilizer applications. The PEP will pursue the implementation of an aggressive education and outreach program regarding residential fertilizer use. Immediate plans include determining residential yard care practices that have beneficial environmental impacts or minimize pollution of ground and surface water resources based on nitrogen loadings, as well as developing incentives, including ones to: eliminate fertilizer application to frozen ground, and establishing labeling or signage requirements at retail establishments to inform consumers of the appropriateness of the range of fertilizer application practices. Some materials have already been prepared and are being distributed. The PEP plans to develop a recommended turf/landscaping protocol for homeowners using commercial landscapers. The PEP also plans to implement targeted programs for commercial and industrial properties; for governmental and quasi-governmental properties (schools, libraries, etc., and for all other properties (places of worship, not-for-profits, etc.). Finally, with local governments, the PEP will investigate creating real property tax incentives for eliminating/reducing turf coverage or eliminating/reducing fertilizer use.

7. Individual On-site Wastewater Disposal Systems (OSDS)

The primary focus here is to ensure existing systems work properly (which may perhaps include regular pumping/removal of solids), that there are no illegal or illicit

interconnections, there is no discharges to surface waters) and that new systems are properly sited and work properly. Potential enhancements include ensuring systems operate properly upon property transfer and to investigate new OSDS nutrient removal technologies. Finally, as an alternative, it may be necessary in the future to investigate needs for traditional sewering, and microsewering. Traditional OSDS achieve roughly a 51% reduction in TN from ~75mg/L to 38.2 mg/L (from LI 208 Study).

8. Stormwater

Municipal separate storm sewer systems (MS4s) regulated under the Phase II Stormwater Program will be required to meet the waste load reductions as described below in the section on Reasonable Assurances. Other stormwater inputs are not currently regulated as point sources and are considered nonpoint sources. There are numerous programs, plans and initiatives in place across the east end town to address and mitigate stormwater flow and impacts on surface waters.

9. Golf Courses

There is a program and plan in place to reduce nutrient losses from golf course operations. There is also the opportunity for further enhancements to that effort, including using "fertigation" and improved compost management, etc. The "fertigation" opportunity associated with the beneficial reuse of a portion of the Riverhead STP effluent at the County owned Indian Island Golf Course needs to be evaluated/pursued to potentially reduce if not eliminate fertilizer applications at the Indian Island Golf Course.

B. Other Implementation Considerations

1. Other STPs

While the former Naval Weapon Industrial Reserve Plant (previously operated by the Grumman Corporation) in Calverton, NY has an STP that discharges to a branch of the freshwater Peconic River, the operators have submitted engineering reports to upgrade and build a new facility discharging to groundwater outside of the Peconic Estuary study area. New York State Clean Air/Clean Water Bond Act funding has been allocated for a portion of this relocation project (which also includes advanced wastewater treatment for the 0.150 MGD flow). Confirmation of the Calverton STP relocation outside of the Peconic Estuary Study Area is needed to implement these TMDLs.

There is advanced treatment for nutrient removal at the Brookhaven National Laboratory Sewage Treatment Plant (BNL STP) that discharges to the freshwater Peconic River. The PEP model accounts for the BNL STP discharge essentially as included within the boundary load in the tributary load attributed to the Peconic River, which is expressed as a loading allocation (LA) within this TMDL. The BNL STP does not discharge to estuarine waters or directly to an impaired segment. The BNL STP discharge is to the free flowing (though previously channelized) freshwater Peconic River on U.S. Department of Energy owned property. Downstream of the BNL STP discharge, the River widens into essentially a wetland ecosystem, before returning once again to a channelized watercourse. At the Laboratory boundary, this branch of the Peconic River is not a perennial watercourse, particularly during periods with little or no precipitation.

The groundwater-fed Peconic River emerges again downstream, joins up with other branches, becoming a perennial watercourse. After intermediary impoundments and four dams, the River is tidal, approximately 11 miles from the BNL STP discharge (and 8 miles from the Laboratory boundary).

Presently, the average flow from the BNL STP is 0.37 MGD and the average total nitrogen concentration is 7 mg/L, which translates to a load of 20 lbs./day of nitrogen. This reflects advanced treatment for nutrient removal that is in place at the facility. It is likely that environmental fate, transport and attenuation mechanisms result is a significantly smaller nitrogen load actually being delivered to what ultimately enters the tidal Peconic River, though this calculation has not been made. This evidenced by the observed good water quality and relatively small nitrogen load associated with the freshwater Peconic River. The permitted flow for the BNL STP discharge is 2.3 MGD with a total nitrogen limit of 10mg/L; if the facility was to discharge at it the maximum flow and nitrogen limit it would discharge 191 1bs./day of nitrogen. Because of the intermittent nature of the steam, the permit also includes an ammonia limit of 2.0 mg/l. At the present time, there are no known plans in place to increase the flow or load from the BNL STP from the current effluent quality conditions. The modeling scenarios, including the baseline scenario, for this TMDL did not include any load greater than that which is currently discharged from the BNL STP (20 lbs./day). When this permit is next renewed, treatment performance and permit limits will be reviewed. Such a review could consider environmental fate, transport and attenuation mechanisms associated with the current or any increased BNL STP load and mechanisms to keep the load from increasing, including additional treatment, beneficial reuse (i.e., irrigation), and discharge to groundwater outside of the groundwater contributing area of the Peconic Estuary.

2. Groundwater Discharges (under SPDES)
Regulatory agencies should continue to evaluate the performance of the Crescent Duck Farm treatment plant that discharges to groundwater in the Meetinghouse Creek watershed. The PEP could investigate needs for nutrient removal technologies for certain (i.e., flow based) other SPDES-permitted groundwater discharges.

3. In-place Highly Enriched Bay Bottom Sediments
Through the PEP there is a plan to investigate the accelerated remediation, through removal or other means, of nutrient enriched bay bottom sediments. Meetinghouse Creek is a priority remediation area for consideration.

4. Shellfish & Habitat Restoration
Efforts under this heading include the proposed evaluation of shellfish restoration efforts, the restoration of eelgrass beds, and macroalgae harvesting as a means of sequestering or removing nitrogen. The state of science for these measures is unknown for applicability to TMDLs.

5. Boundary Conditions
This includes at least maintaining and ultimately improving water quality at the Long Island Sound interface. Similarly, the manipulation of the Shinnecock Locks to introduce

additional flushing was previously determined not feasible, but a re-evaluation in the future may be appropriate.

6. Other Sources/Mechanisms
Other initiatives that address nitrogen load reductions include the established Vessel Waste No Discharge Area, and existing programs preserving and protecting wetlands and buffers to mitigate direct stormwater runoff. There is also the potential for improving domestic and wild animal and livestock waste management, and local or larger scale groundwater remediation efforts.

VIII. Reasonable Assurances
This section describes and explains the reasonable assurances for achieving wasteload allocations for point sources and load allocations for nonpoint sources, with an expanded discussion of Phase II stormwater regulations and current and continuing nonpoint source management programs/efforts.

A. Overview/Discussion
When a TMDL is developed for waters impaired by point sources only, the issuance of a National Pollutant Discharge Elimination System (NPDES) permit(s) provides the reasonable assurance that the wasteload allocations contained in the TMDL will be achieved. This is because 40 C.F.R. 122.44(d)(1)(vii)(B) requires that effluent limits in permits be consistent with "the assumptions and requirements of any available wasteload allocation" in an approved TMDL.

When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source load reductions will occur, EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures will achieve expected load reductions in order for the TMDL to be approvable. This information is necessary for EPA to determine that the TMDL, including the load and wasteload allocations, has been established at a level necessary to implement water quality standards.

EPA's August 1997 TMDL Guidance also directs EPA Regional Offices to work with States to achieve TMDL load allocations in waters impaired only by nonpoint sources. However, EPA cannot disapprove a TMDL for nonpoint source-only impaired waters, which do not have a demonstration of reasonable assurance that load allocations (LAs) will be achieved, because such a showing is not required by current regulations.

B. Point Sources
Point source loads will be addressed consistent with the WLAs and TMDL contained in this report and the accompanying text, including the discussion in the implementation section.

Table VIII.1: Surface Water Discharges to Fresh and Estuarine Waters of the Peconic Estuary System

Facility Name	State Pollutant Discharge Elimination System (SPDES) Permit Number
Riverhead Sewer District Sewage Treatment Plant	NY0020061
Village of Sag Harbor Wastewater Treatment Plant	NY0028908
Shelter Island Heights Property Owners Corp. Sewage Treatment Plant	NY0021814
Atlantis Marine World & Riverhead Foundation for Marine Research	NY0226459
Brookhaven National Laboratory	NY0005835
Plum Island Animal Disease Center Sewage Treatment Plant	NY0008117
Calverton Enterprise Park (Former Naval Weapons Industrial Reserve Plant)	NY0025453

Additional information regarding the implementation of Phase II Stormwater Regulations is contained in the section below.

C. Implementation of Phase II Stormwater Regulations

NYSDEC has expanded its permitting program to include a new federally mandated program to control stormwater runoff and protect waterways.

According to the federal law, commonly known as Stormwater Phase II, permits will be required for stormwater discharges from Municipal Separate Storm Sewer Systems (MS4s) in urbanized areas and for construction activities disturbing one or more acres. To implement the law, the NYSDEC has developed two general SPDES permits, one for MS4s in urbanized areas and one for construction activities. Operators of regulated small MS4s seeking authorization to discharge stormwater in compliance with the federal Clean Water Act are required to apply for and secure coverage under the SPDES General Permit for Municipal Separate Storm Sewer Systems. Operators of regulated MS4s and construction activities must have obtained either a SPDES or a general permit no later than March 10, 2003 or prior to the commencement of construction.

Regulated MS4 municipalities are required to develop, implement and enforce a stormwater management program (SWMP). The SWMP must describe the Best Management Practices (BMPs) for each of the minimum control measures:

1. Public education and outreach program to inform the public about the impacts of the stormwater on the receiving water quality.
2. Public involvement and participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control program for sites disturbing one or more acres.
5. Post-construction runoff control program for new development and redevelopment sites disturbing one or more acres.
6. Pollution prevention and good housekeeping operation and maintenance program.

Operators must have developed the initial SWMP prior to March 10, 2003 and have provided adequate resources to fully implement the SWMP no later than five years from the issuance date of the MS4 permit. Each of the regulated MS4s in this TMDL (see table below) has developed an initial SWMP and has coverage under the general permit (GP-02-02). An MS4 may modify its SWMP at any time, although any changes to a SWMP shall be reported to the NYSDEC in the MS4's annual report. MS4s are required to make steady progress toward full implementation.

Table VIII.2: Stormwater Permits in the Peconic Estuary

Permittee	SPDES #	Date Notice of Intent (NOI) Submitted
Town of Riverhead	NYR20A020	03/04/2003
Town of Southampton	NYR20A454	03/04/2003
Village of Sag Harbor	NYR20A095	02/27/2003
Village of North Haven	NYR20A500	12/15/2003
Suffolk County	NYR20A180	03/25/2003
NYSDOT	NYR20A288	03/10/2003
Town of Brookhaven	NYR20A411	05/08/03

A SWMP is designed to reduce the discharge of pollutants to the maximum extent practicable (MEP) to protect water quality and to satisfy the appropriate water quality requirements of the Environmental Conservation Law and the Clean Water Act. MEP is a technology-based standard established by Congress in the Clean Water Act. Since no precise definition of MEP exists, it allows for maximum flexibility on the part of MS4 operators as they develop their programs. If stormwater is being discharged to a 303(d)-listed segment of a water body, the SWMP must ensure there is no resulting increase in the pollutant of concern to the receiving waters. Where required to meet water quality standards, NYSDEC enforces additional requirements based on WLAs determined through a TMDL. The MS4 must review applicable TMDLs to see if they include requirements for control of stormwater discharges. If an MS4 is not meeting the TMDL stormwater allocations, it must, within six (6) months of the TMDL approval, modify its SWMP to ensure that reduction of the pollutant of concern specified in the TMDL is achieved. Modifications must be considered for each of the six minimum measures. The revised management program must include an updated schedule for implementation.

The MS4s that discharge to the Peconic Estuary System are owned and operated by the municipalities located around the system. Accordingly, all municipalities identified in the TMDL have submitted an application to gain coverage under New York's SPDES General Permit for Municipal Separate Storm Sewer Systems.

NYSDEC will continue to work with these municipalities to identify funding sources and to evaluate locations and designs for stormwater control BMPs throughout the watershed. Under the State's Environmental Protection Fund (EPF), $10.8 million were made available in 2005 (update) through an application process to assist communities in

implementing the Stormwater Phase II regulations and for non-agricultural nonpoint source abatement and control projects.

Currently, the Towns of East Hampton, Southold and Shelter Island are not part of an MS4 area. In order to implement pathogen TMDLs, the Towns of the East Hampton and Southold would be designated as regulated MS4s after approval of TMDLs by EPA.

This TMDL does not invoke additional requirements set forth in the SPDES General Permit for Stormwater Discharges from Construction Activity, Permit No. GP-02-01, applicable to facilities satisfying Condition A of Part III.A.1.b.(1) for construction sites discharging to these waterbodies.

D. Information Regarding Nonpoint Source Management Programs/Efforts

As discussed in the Implementation section this document, the east end towns, Suffolk County, and New York State along with the Peconic Estuary Program and its many stakeholders have made and continue to make significant strides in developing and implementing programs and projects to reduce point and nonpoint source loads of nitrogen. These include:

- Supporting open space acquisition programs at all levels of government, and recommending that parcels of land in nitrogen stressed sub watersheds be priorities for acquisition.
- Supporting existing and proposed local government initiatives to preserving existing vegetation of parcels being developed, subdivided or re-developed, which among other ecological benefits can serve to limit the size of intensively managed landscapes now and in the future.
- Supporting using the effluent from the Riverhead Sewage Treatment Plan to irrigate and "fertigate" the adjoining County owned Indian Island Golf Course and supporting the allocation of funding to pilot test and fully implement this project.
- Working cooperatively with the 34 golf courses east of the William Floyd Parkway to reduce the amount of nitrogen that makes its way into groundwater and surface waters through improved management practices, and providing funding to develop plans for individual courses.
- Supporting the construction of a groundwater discharging treatment plant at the Corwin Duck Farm on Meetinghouse Creek to treat processing waters from that operation.
- Implementing the requirements of the Vessel Waste No Discharge Zone for the entire Peconic Estuary to eliminate this pollution source, and working with marine engine retailers to encourage boaters to purchase low emission/clean marine engines that are now on the market.
- Working with the agricultural community to reduce the nitrogen load from agriculture, including funding a county agricultural stewardship coordinator and staff to work to secure funding to develop and implement the necessary farm plans to achieve that goal.
- Developing recommendations and regulatory elements for reducing impacts associated with landscaping practices on residential, commercial, and public properties (i.e., eliminating or reducing fertilizer inputs); securing funding to develop and carry out

education and outreach program aimed at working with property owners/managers and commercial landscapers.
- Working with governments at all levels to implement projects to reduce direct and indirect stormwater inputs from road and highway drainage systems.
- Investigating opportunities to reduce nutrient loadings from on-site wastewater disposal systems ("septic systems" or "cesspools"), such as advanced treatment and micro-sewering, and pursuing feasible innovations and alternatives.
- Providing funding to investigate the feasibility for removing in-place and highly nutrient enriched bottom sediments.
- Supporting and funding efforts to reestablish eelgrass beds and the reverse trends responsible for the decline of existing beds.
- The allocation of significant funding for projects aimed at restoring commercially important shellfish (scallops and hard clams) through seeding and the establishment of spawner sanctuaries.
- Plans to further investigate other opportunities to reduce, manage or otherwise understand other nutrient inputs (i.e., wet and dry atmospheric deposition).

E. Monitoring and Reporting

The SCDHS also will continue its monitoring effort in the Peconic Estuary to continue to document water quality conditions and trends.

The Peconic Estuary Program seeks to have this TMDL fully implemented within 15 years from approval, based upon current expectations for full build-out and land acquisition programs, development and implementation of education and outreach programs, full participation in the agricultural stewardship/agricultural environmental management program, and other necessary efforts. The Peconic Estuary Program plans to track and report on progress in implementing and achieving this TMDL at five-year intervals. Full implementation of this TMDL is expected to result in water quality standards for dissolved oxygen being met where they are not currently attained and ensure continued compliance where these standards are presently achieved.

IX. Public Participation

EPA, DEC and SCDHS have worked together to prepare this TMDL to meet the requirements of Section 303(d) of the Clean Water Act. A notice was published in the Environmental Notice Bulletin (ENB) on July 18, 2007. The ENB publication announced the availability of the DRAFT TMDL document for comment and provided contact information for accessing the DRAFT TMDL Document and information on the scheduled public meeting. The public was given 30 days to submit comments to the DEC. The deadline for submitting comments to DEC for consideration was August 17, 2007. During the public comment period DEC received 7 sets of comments. Responses were provided in a Reponses to Public Comments Document and comments were considered in finalizing the TMDL.

DEC worked with the Peconic Estuary Program to make this document available to the public, local agencies, and stakeholders for their review and feedback through various

email and letter correspondences. These correspondences announced the July 18, 2007 ENB publication and provided the file transfer protocol (ftp) website where the DRAFT TMDL document could be obtained and information on the scheduled public meeting. Several hard copies of the DRAFT TMDL document were also mailed. The stakeholders notified included, but were not limited to, the Towns of Riverhead, Southampton, East Hampton, Southold, Shelter Island and Brookhaven; the Villages of Sag Harbor, North Haven, Dering Harbor, and Greenport; the Brookhaven National Laboratory, Riverhead, Sag Harbor, and Shelter Island Heights STPs; other stakeholders involved in the Peconic Estuary Program and its committees and members.

DEC held one (1) public meeting to discuss and answer questions on the proposed TMDL on August 2, 2007 at the Cornell Cooperative Extension Education Center, First Floor Conference Room, 432 Griffing Avenue, Suite 100 Riverhead, NY 11901-3071, at 1pm. Staff from the DEC, EPA, SCDHS and PEP were present at this meeting; 25 stakeholders attended. DEC and EPA personnel discussed issues related to water quality standards, nitrogen as the pollutant which contributes to the causes of low DO levels, and development of the TMDL as a vehicle address water quality impairments and preserve water quality in the remaining waters of the Peconic Estuary.

X. References

References for Section V

Cerco, C.F. and T. Cole. 1993. Three-dimensional eutrophication model of Chesapeake Bay. *J. Environ. Engnr.* 119:1006-1025.

Cerco, C.F. and T.M. Cole. 1994. Three-dimensional eutrophication model of Chesapeake Bay, Volume 1: Main Report. Technical Report EL-94-4. U.S. Army Corps of Engineers, Waterways Experiment Station. May 1994.

Cochran, J.K, D.J. Hirschberg, and D. Amiel. 2000. Particle mixing and sediment accretion rates of Peconic Estuary sediments: A sediment accretion study in support of the Peconic Estuary Program. Marine Sciences Research Center, State University of New York, Stony Brook, NY. June 26, 2000.

DiToro, D.M. 2001. *Sediment Flux Modeling*. John Wiley & Sons, New York. 624 pp.

Hamrick, J.M., 1992. A Three-dimensional Environmental and Fluid Dynamics Computer Code: Theoretical and Computational Aspects. The College of William and Mary, Virginia Institute of Marine Science. Special Report 317. 63 pp.

Park, K., A.Y. Kuo, J. Shen, and J.M. Hamrick. 1995. A three-dimensional hydrodynamic-eutrophication model (HEM3D): description of water quality and sediment processes submodels. Special Report 327. The College of William and Mary, Virginia Institute of Marine Science. 113 pp.

Schubert, C.E. 1998. Areas Contributing Ground Water to the Peconic Estuary, and Groundwater Budgets for the North and South Forks, Shelter Island, and Eastern Suffolk County, New York. Water Resources Investigation Report 97-4136. U.S. Geological Survey, Coram, NY.

Tetra Tech. 2000. Three-dimensional Hydrodynamic and Water Quality Model of Peconic Estuary, Draft Final Report. Prepared for Peconic Estuary Program, County of Suffolk, Department of Health Services, Office of Ecology, Riverhead, NY. Prepared by Tetra Tech, Inc., Fairfax, VA. June 2000.

Tetra Tech. 2005. Refinements to the Three-dimensional Hydrodynamic and Water Quality Model of Peconic Estuary, Draft Report. Prepared for Peconic Estuary Program, County of Suffolk, Department of Health Services, Office of Ecology, Riverhead, NY. Prepared by Tetra Tech, Inc., Fairfax, VA. March 2005.

Other References

Suffolk County Department of Health Services, December 2002. Impacts of Agriculture on Shallow Groundwater in Suffolk County NY.

XI. Glossary

Algae: Any organisms of a group of chiefly aquatic microscopic nonvascular plants; most algae have chlorophyll as the primary pigment for carbon fixation. As primary producers, algae serve as the base of the aquatic food web, providing food for zooplankton and fish resources. An overabundance of algae in natural waters is known as eutrophication.

Anoxic: Aquatic environmental conditions containing zero or little dissolved oxygen. See also anaerobic.

Assimilative capacity: The amount of contaminant load (expressed as mass per unit time) that can be discharged to a specific stream or river without exceeding water quality standards or criteria. Assimilative capacity is used to define the ability of a water body to naturally absorb and use waste matter and organic materials without impairing water quality or harming aquatic life.

Bacterial decomposition: Breakdown by oxidation, or decay, of organic matter by heterotrophic bacteria. Bacteria use the organic carbon in organic matter as the energy source for cell synthesis.

Best management practices (BMPs): Methods, measures, or practices that are determined to be reasonable and cost-effective means to meet certain generally nonpoint source, pollution control needs. BMPs include structural and nonstructural controls and operation and maintenance procedures.

Biochemical oxygen demand (BOD): The amount of oxygen per unit volume of water required to bacterially or chemically oxidize (stabilize) the oxidizable matter in water. Biochemical oxygen demand measurements are usually conducted over specific time intervals (5, 10, 20, 30 days). The term BOD generally refers to the standard 5-day BOD test.

Brown Tide: A harmful algal bloom of the microscopic alga Aureococcus anophagefferens. In 1985, severe brown tides were first reported in the Peconic Estuary of eastern Long Island, New York, in Narragansett Bay, Rhode Island and possibly in Barnegat Bay, New Jersey. Since then, brown tide has intermittently occurred with variable intensity in Barnegat Bay and in the bays of Long Island.

Calibration: Testing and tuning of a model to a set of field data not used in the development of the model; also includes minimization of deviations between measured field conditions and output of a model by selecting appropriate model coefficients.

Designated use: Uses specified in water quality standards for each waterbody of segment regardless of actual attainment

Discharge permit (NPDES): A permit by the U.S. EPA or a state regulatory agency that sets specific limits on the type and amount of pollutants that a municipality or industry can discharge to a receiving water; it also includes a compliance schedule for achieving those limits. The permit process was established under the National Pollutant Discharge Elimination System (NPDES), under provisions of the Federal Clean Water Act

Dissolved oxygen (DO): The amount of oxygen that is dissolved in water. It also refers to a measure of the amount of oxygen available for biochemical activity in a waterbody and as indicator of the quality of that water.

Drainage basin: A part of the land area enclosed by a topographic divides from which direct surface runoff from precipitation normally drains by gravity into a receiving water. Also referred to as watershed, river basin, or hydrologic unit.

Effluent: Municipal sewage or industrial liquid waste (untreated, partially treated, or completely treated) that flows out of a treatment plant, septic system, pipe or other conduit.

Estuary: Brackish-water area influenced by the tides where the mouth of the river meets the sea.

Eutrophication: Enrichment of an aquatic ecosystem with nutrients (nitrates, phosphates) that accelerate biological productivity (growth of algae and weeds) and an undesirable accumulation of algal biomass.

Eutrophication model: Mathematical formulation that describes the advection, dispersion, and biological, chemical and geo-chemical reactions that influence the growth

and accumulation of algae in aquatic ecosystems. Models of eutrophication typically include one or more species groups of algae, inorganic and organic nutrients (N, P), organic carbon, and dissolved oxygen.

Hydrodynamic model: Mathematical formulation used in describing circulation, transport, and deposition processes in receiving water.

Hypoxia: The aquatic environmental conditions of reduced oxygen concentration in a water body that may lead to stressful or fatal conditions for aquatic organisms.

Loading, load, loading rate: The total amount of material (pollutants) entering the system from one source or multiple sources; measured as a rate in weight per unit time.

Load allocation (LA): The portion of receiving water's total maximum daily load that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources.

Margin of safety (MOS): A required component of the TMDL that accounts for the uncertainty about the relationship between the pollutant load and the quality of the receiving waterbody. This uncertainty can be caused by insufficient or poor-quality data or a lack of knowledge about the water resource and pollution effects.

Mathematical model: A system of mathematical expressions that describes the spatial and temporal distribution of water quality constituents resulting from fluid transport and the one, or more, individual processes and interactions within some prototype\aquatic ecosystem. A mathematical water quality model is used as the basis for TMDL evaluations.

Nonpoint source pollution: Pollution that is typically not released through pipes but rather originates from multiple sources over a relatively large area. Nonpoint sources can be attributed to activities or land or water uses including: onsite disposal systems (septic systems), agricultural and forestry operations, lawn care, boating, and wet and dry atmospheric deposition. Nonpoint source pollution may reach surface waters via ground water.

Nutrient: A primary element necessary for the growth of living organisms. Nitrogen, and phosphorus, for example, are nutrients required for phytoplankton growth.

Nutrient limitation: Deficit of nutrient (e.g., nitrogen and phosphorus) required by microorganisms in order to metabolize organic substrates.

Point source: Pollutant loads discharged at a specific location from pipes, outfalls, and conveyance channels from either municipal wastewater treatment plants or industrial waste treatment facilities.

Three-dimensional (3-D) model: Mathematical model defined along three spatial coordinates (length, width, and depth) where the water quality constituents are considered to vary over all three spatial coordinates.

Waste load allocation (WLA): The portion of a receiving water's total maximum daily load that is allocated to one of its existing or future point sources of pollution.

Water quality: The biological, chemical, and physical conditions of a waterbody; a measure of the ability of a waterbody to support beneficial uses.

Water quality criteria (WQC): Water quality criteria are composed of numeric and narrative criteria. Numeric criteria are scientifically derived ambient concentrations developed by EPA or states for various pollutants of concern to protect human health and aquatic life. Narrative criteria are statements that describe the desired water quality goal.

Water quality standard (WQS): A law or regulation that consists of the beneficial designated use or uses of a waterbody, the numeric and narrative water quality criteria that are necessary to protect the use or uses of that particular waterbody, and an antidegradation statement.

Watershed: The area of land from which rainfall (and/or snowmelt) drains into a stream or other waterbody. Watersheds are also sometimes referred to as drainage basins. Ridges of higher ground generally form the boundaries between watersheds.

XII. Acronyms

ac-ft-days – acre-feet-days
BMP – best management practice
BNL – Brookhaven National Laboratory
CCMP - Comprehensive Conservation and Management Plan
CFR – Code of Federal Regulations
CPF – Community Preservation Fund
CWA - Federal Clean Water Act
DEC - New York State Department of Environmental Conservation
DO - dissolved oxygen
EFDC - Environmental Fluid Dynamics Code
ENB – Environmental Notice Bulletin
EPA - U.S. Environmental Protection Agency
EPF – Environmental Protection Fund
ft - feet
ftp - file transfer protocol
GIS - geographic information system
lb (or lbs.) - pounds
LA - load allocation
L-O-T or LOT – limit of technology
m - meters

MC – Meetinghouse Creek [groundwater management zone]
MEP – maximum extent practicable
mg/L - milligrams per liter
MGD or mgd – million gallons per day
MOS - margin of safety
MS4 – Municipal Separate Storm Sewer System
N - nitrogen
NOI – Notice of Intent
NEP - National Estuary Program
NPDES - National Pollutant Discharge Elimination System
NYSCRR New York State Codes, Rules and Regulations
NYSDOT – New York State Department of Transportation
P - phosphorus
PEP - Peconic Estuary Program
PLR – practical load reduction
PR-E – Peconic River – East [groundwater management zone]
psu - practical salinity units
PWL - Priority Waterbodies List
SAV - submerged aquatic vegetation
SCDHS - Suffolk County Department of Health Services
SPDES - State Pollutant Discharge Elimination System
STP - sewage treatment plant
SWMP – stormwater management plan
TMDL – total maximum daily load
TN – total nitrogen
TOC - total organic carbon
USGS – U.S. Geological Survey
WLA – wasteload allocation
WQBELs - water quality-based effluent limits
YSI - Yellowbird Springs Instruments

XIII. Links to Relevant Documents and Web Sites

A Strategy to Develop and Implement the Suffolk County Agricultural Stewardship Program - A Report of the Agricultural Environmental Management Task Force for Nitrogen and Pesticide Load Reduction - Final Report (May 26, 2004)
http://peconicestuary.org/AgForceRpt.pdf

Peconic Estuary Program Comprehensive Conservation and Management Plan (November 2001)
http://www.peconicestuary.org/CCMP.html

Appendix H (Agricultural Environmental Management Strategy) of the Peconic Estuary Program Comprehensive Conservation and Management Plan (November 2001)
http://www.peconicestuary.org/CCMP_PDF/AppendixH.pdf

FINAL REPORT for Peconic Bay Pathogens TMDL (September 2006)
http://www.epa.gov/waters/tmdldocs/NY-2006-Pathogens-Peconic_Bay-TMDLDoc.pdf

San Joaquin River Dissolved Oxygen Aeration Project Draft Engineering Feasibility Study, Prepared for: The California Bay-Delta Authority; Prepared by: HDR Engineering, Inc., Folsom, CA, July 2004.
http://www.sjrdotmdl.org/library_folder/apdxa.pdf