Amendment to the Monmouth County and Ocean County Water Quality Management Plans

Total Maximum Daily Loads for Phosphorus to Address 3 Stream Segments in the Atlantic Coastal Water Region

WMA 12 and WMA 13
(Shark River Watershed and Metedeconk River North Branch Watershed)

Proposed:	July 5, 2005
Established:	August 31, 2005
Approved:	September 30, 2005
Adopted:	

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1.0 Executive Summary

In accordance with Section 305(b) and 303(d) of the Federal Clean Water Act (CWA), the State of New Jersey, Department of Environmental Protection (Department) developed the *2004 Integrated List of Waterbodies* addressing the overall water quality of the State's waters and, in Sublist 5, identifying the list of impaired waterbodies. On October 4, 2004, the Department adopted the *2004 Integrated List of Waterbodies* as an amendment to the Statewide Water Quality Management Plan, pursuant to the Water Quality Planning Act at N.J.S.A.58:11A-7 and the Statewide Water Quality Management Planning rules at N.J.A.C. 7:15-6.4(a). In the Atlantic Coastal Water Region, the *2004 Integrated List of Waterbodies* Sublist 5 identifies the three impairments identified in Table 1 as being impaired with respect to phosphorus, as indicated by the presence of phosphorus concentrations in excess of standards. A TMDL is required to be developed for each impairment listed on Sublist 5. A TMDL is developed to identify all the contributors of a pollutant of concern and the load reductions necessary to meet the Surface Water Quality Standards (SWQS) relative to that pollutant. TMDLs are being established to address the phosphorus impairment in the waterbodies identified in Table 1.

Table 1 Impaired stream segments identified on the *2004 Integrated List of Waterbodies* to be addressed in this TMDL report.

Impairment Number	WMA	Station Name/Waterbody	Site ID	Sublist	Proposed Action
1	12	Shark River Brook at Shark River Station Rd. in Tinton Falls	30	5	Establish TMDL
2	12	Shark River near Neptune	01407750, EWQ0482	5	Establish TMDL
3	13	Metedeconk River N Br at Jackson Mills in Freehold	6	5	Establish TMDL

This TMDL report includes implementation strategies to achieve SWQS for phosphorus, including an additional measure, which will be included in the municipal stormwater permits for municipalities within the affected watersheds, to adopt a low phosphorus fertilizer ordinance. The TMDLs in this report have been proposed and will be adopted by the Department as amendments to the appropriate area-wide water quality management plans in accordance with N.J.A.C. 7:15-3.4(g). This TMDL report was developed consistent with the United States Environmental Protection Agency's (USEPA's) May 20, 2002 guidance document entitled: "Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992," (Sutfin, 2002) which describes the statutory and regulatory requirements for approvable TMDLs.

2.0 Introduction

In accordance with Section 303(d) of the Federal Clean Water Act (CWA) (33 U.S.C. 1315(B)), the State of New Jersey is required biennially to prepare and submit to the USEPA a report that identifies waters that do not meet or are not expected to meet SWQS after implementation of technology-based effluent limitations or other required controls. This report is commonly referred to as the 303(d) List. In accordance with Section 305(b) of the CWA, the State of New Jersey is also required biennially to prepare and submit to the USEPA a report addressing the overall water quality of the State's waters. This report is commonly referred to as the 305(b) Report or the Water Quality Inventory Report. The *Integrated List of Waterbodies* combines these two assessments and assigns waterbodies to one of five sublists. Sublists 1 through 4 include waterbodies that are generally unimpaired (Sublist 1 and 2), have limited assessment or data availability (Sublist 3), are impaired due to pollution rather than pollutants or have had a TMDL or other enforceable management measure approved by EPA (Sublist 4). Sublist 5 constitutes the traditional 303(d) list for waters impaired or threatened by one or more pollutants, for which a TMDL may be required.

A TMDL represents the assimilative or carrying capacity of a waterbody, taking into consideration point and nonpoint sources of pollutants of concern, natural background and surface water withdrawals. A TMDL quantifies the amount of a pollutant a water body can assimilate without violating a state's water quality standards and allocates that loading capacity to known point and nonpoint sources in the form of Waste Load Allocations (WLAs) for point sources, Load Allocations (LAs) for nonpoint sources, and a margin of safety (MOS).

This report establishes 3 TMDLs that address phosphorus impairment in 20.6 river miles with respect to the waterbodies identified in Table 2. These TMDLs include management approaches to reduce loadings of phosphorus from various sources in order to attain applicable surface water quality standards for phosphorus. With respect to the phosphorus impairment, the waterbodies will be moved to Sublist 4 following approval of the TMDLs by EPA. In addition to the above mentioned phosphorus impairments, Shark River at Shark River Station Rd. in Tinton Falls (AN0481), Shark River at Remsens Mill Rd. (AN0482) and Metedeconk N Br at Jackson Mills (AN0500, AN0499, MB-146, MB-148) are also listed as impaired with respect to benthic macroinvertebrates. The Shark River is also listed as impaired for Dioxin and PCBs. These waterbodies will remain on Sublist 5 with respect to these pollutants and will be addressed in future TMDLs.

Recent EPA guidance (Sutfin, 2002) describes the statutory and regulatory requirements for approvable TMDLs, as well as additional information generally needed for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations. The Department believes that the TMDLs in this report address the following items in the May 20, 2002 guideline document:

1. Identification of waterbody(ies), pollutant of concern, pollutant sources and priority ranking.
2. Description of applicable water quality standards and numeric water quality target(s).
3. Loading capacity – linking water quality and pollutant sources.
4. Load allocations.
5. Waste load allocations.
6. Margin of safety.

7. Seasonal variation.
8. Reasonable assurances.
9. Monitoring plan to track TMDL effectiveness.
10. Implementation (USEPA is not required to and does not approve TMDL implementation plans).
11. Public Participation.

3.0 Pollutant of Concern and Area of Interest

Pollutant of Concern

The pollutant of concern for these TMDLs is phosphorus. For the segments in the Atlantic Coastal Water Region identified in Table 2, phosphorus concentrations were found to exceed New Jersey's SWQS, found at N.J.A.C. 7-9B. The priority ranking for TMDL development for the Shark River in Tinton Falls and the Shark River near Neptune, as well as the Metedeconk River N Br at Jackson Mills is Medium.

Table 2 Waterbodies listed for phosphorus impairment in the Atlantic Coastal Water Region for which TMDLs are being established

TMDL Number	WMA	Station Name/Waterbody	Site ID	County(s)	River Miles
1	12	Shark River Brook at Shark River Station Rd in Tinton Falls	30	Monmouth	4.5
2	12	Shark River near Neptune	01407750, EWQ0482	Monmouth	8.5
3	13	Metedeconk N Br at Jackson Mills Rd in Freehold	6	Monmouth/ Ocean	7.6
Total River Miles:					**20.6**

Applicable Water Quality Standards

All the impaired segments addressed in this document are classified as Fresh Water 2 (FW2). As stated in N.J.A.C. 7:9B-1.14(c) of the SWQS for FW2 waters, the standards for phosphorus are as follows:

Phosphorus, Total (mg/l):

i. Lakes: Phosphorus as total P shall not exceed 0.05 in any lake, pond, reservoir, or in a tributary at the point where it enters such bodies of water, except where site-specific criteria are developed pursuant to N.J.A.C. 7:9B-1.5(g)3.

ii. Streams: Except as necessary to satisfy the more stringent criteria in paragraph i. above or where site-specific criteria are developed pursuant to N.J.A.C. 7:9B1.5(g)3, phosphorus as total P shall not exceed 0.1 in any stream, unless it can be demonstrated that total P is not a limiting nutrient and will not otherwise render the waters unsuitable for the designated uses.

Also as stated in N.J.A.C. 7:9B-1.5(g)2:

> Nutrient policies are as follows:
>
> Except as due to natural conditions, nutrients shall not be allowed in concentrations that cause objectionable algal densities, nuisance aquatic vegetation, abnormal diurnal fluctuations in dissolved oxygen or pH, changes to the composition of aquatic ecosystems, or otherwise render the waters unsuitable for the designated uses.

In all FW2 waters, the designated uses are (NJAC 7:9B-1.12):

1. Maintenance, migration and propagation of the natural and established aquatic biota;
2. Primary and secondary contact recreation;
3 Industrial and agricultural water supply;
4. Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and
5. Any other reasonable uses.

Area of Interest

These TMDLs will address 20.6 impaired river miles within the Atlantic Coastal Water Region. Based on the detailed county hydrography stream coverage, 50.7 overall stream miles are affected by the TMDLs due to the fact that the implementation plans cover entire watersheds, not just impaired waterbody segments. The spatial extent of the impaired segments and the affected drainage area is depicted in Figures 1 and 2.

Figure 1 Spatial extent of impaired segments and affected drainage areas: WMA 12

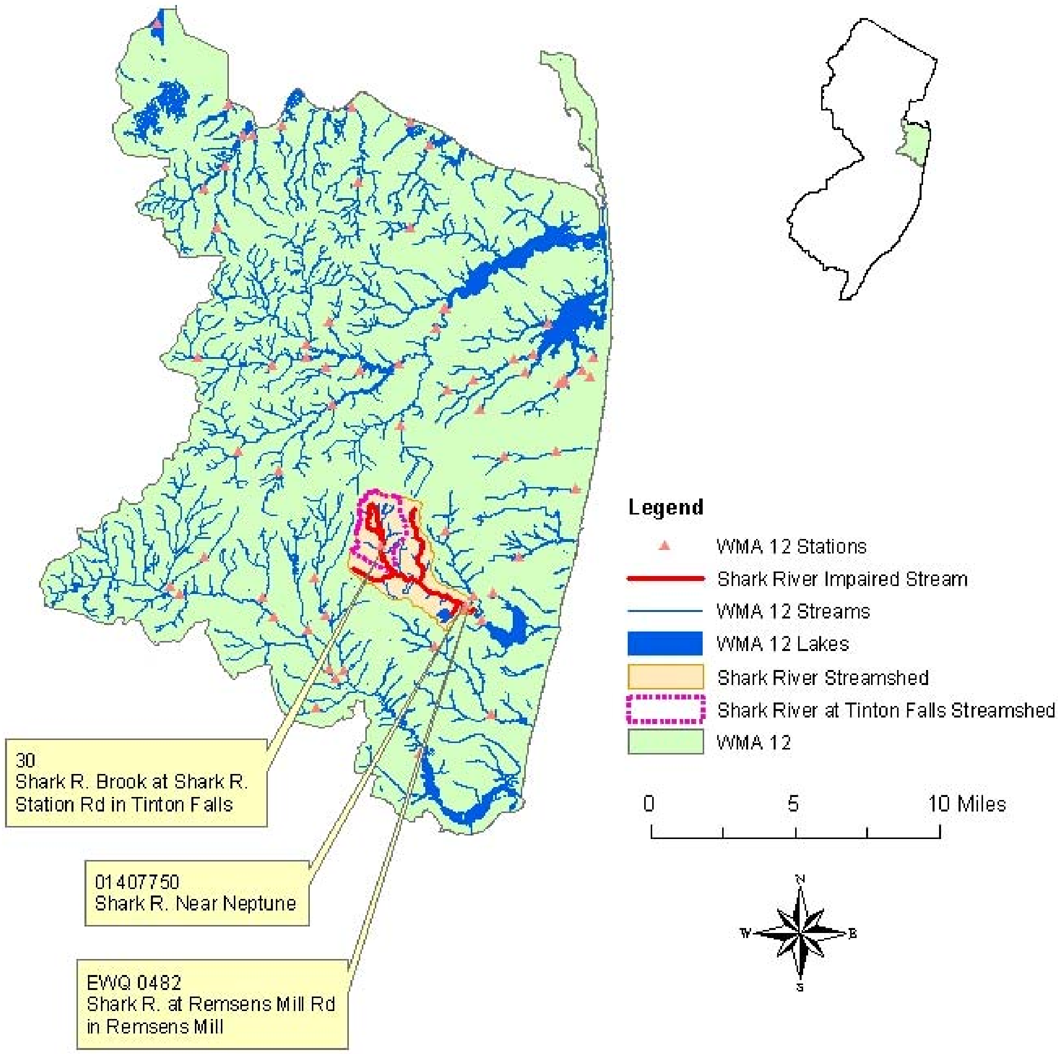
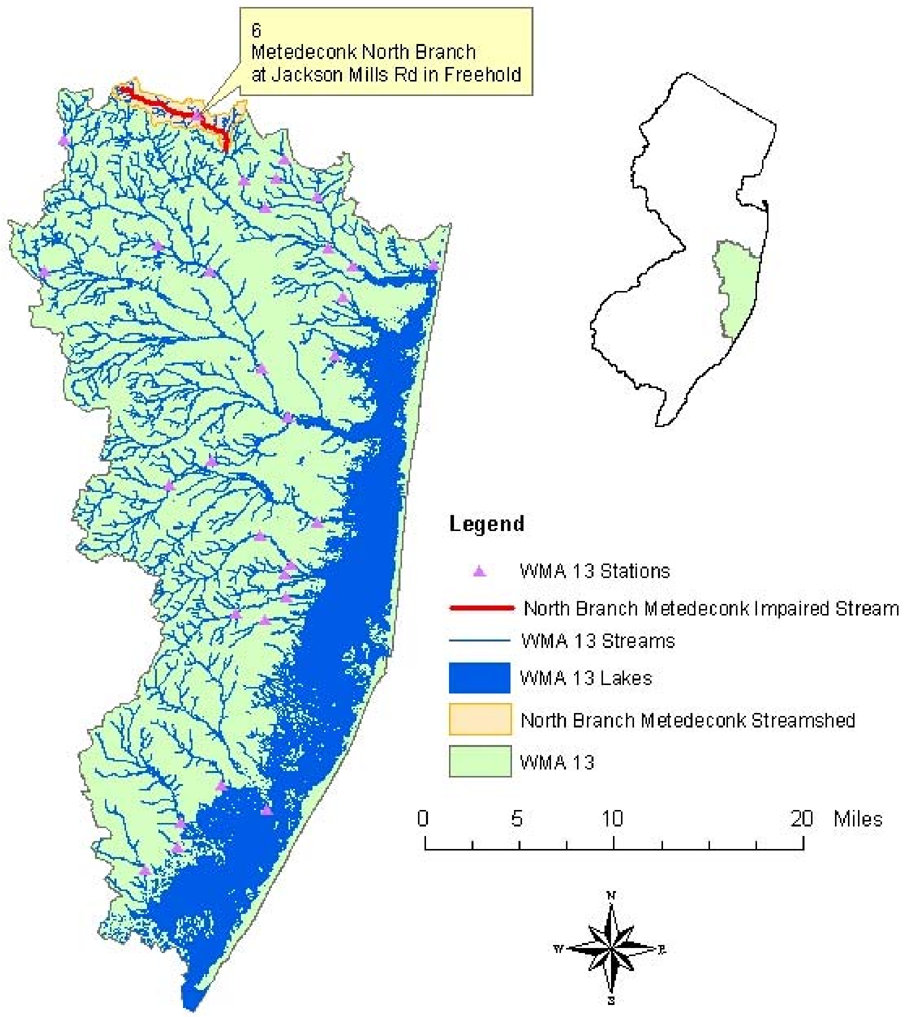


Figure 2 Spatial extent of impaired segments and affected drainage area: WMA 13



WMA 12:
Watershed Management Area 12 includes watersheds that primarily drain the eastern portions of Middlesex, Monmouth and Ocean Counties and flow in one of two directions: northeast to Sandy Hook/Raritan Bay or southeast to the Atlantic Ocean. WMA 12 is 503 mi^2 in size and lies within the Coastal Plain physiographic province, which is characterized by a low–lying topography. All of the WMA 12 streams are tidally influenced, usually to the first dam or impoundment above the confluence. Sandy soils and coastal scrub/pine vegetation dominate WMA 12.

WMA 12 includes the following major watersheds: Raritan/Sandy Hook Bay Tributaries, Shark River, Navesink River, Manasquan River, Shrewsbury River, and Wreck Pond Brook. This TMDL deals with impaired segments within the Shark River Watershed.

The **Shark River** drains an area of 26 mi^2. The Shark River Watershed includes not only the Shark River but also a regional collection of nearby streams, most of which are impounded near their mouths to form coastal ponds before draining into the Atlantic Ocean. Surface waters in this watershed include: Hankins Brook, Hannabrand Brook, Hog Swamp Brook, Jumping Brook, Polly Pod Brook, Reevy Branch, Whale Pond Brook, and Wreck Pond Brook. Land use in the affected drainage area is presented in Table 3 and depicted in Figure 3.

WMA 13:
WMA 13 includes watersheds draining the central Atlantic drainage of New Jersey. The area lies mostly in Ocean County and includes the Barnegat Bay as well as the following subwatersheds: Metedeconk River, Toms River, Forked River, Cedar Creek.

ThMetedeconk watershed lies in the Coastal Plain and is about one-half forested, with the remainder in residential developments, a military installation and agriculture. There has been a substantial amount of new residential and commercial development throughout the watershed in the past five years. Land use in the affected drainage area is presented in Table 3 and depicted in Figure 4.

Table 3 River miles, Watershed size, and Area by Anderson Land Use Classification

SITE ID	30	01407750, EWQ0482	6
River miles and drainage area			
Sublist 5 impaired river miles	4.5	8.5	7.6
Total river miles within watershed and included in the implementation plan	10.2	14.9	25.6
Watershed size (acres)	2255	4184	5547

Landuse/Landcover (acres)			
agriculture	107	107	350
medium / high density residential	4.77	220	42.5
low density / rural residential	75	220	509
commercial	121	125	45.0
industrial	18	62.8	11.7
mixed urban / other urban	84	447	227
barren	202	165	35.5
forest	629	1343	1438.5
wetlands	1001	1368	2876
water	13	126	12.2
Total	2255	4184	5547

Figure 3 Land Use in the Shark River Streamshed

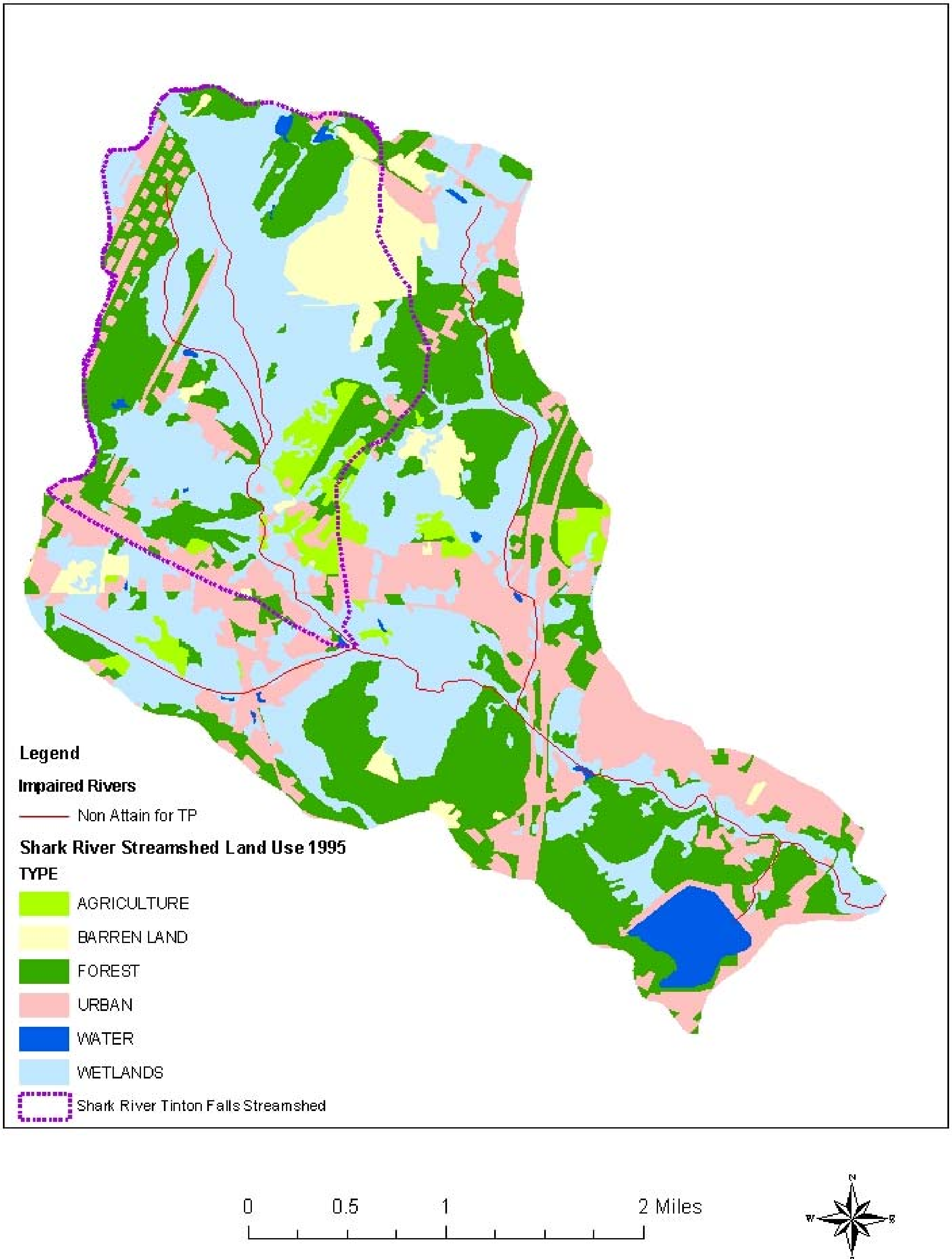
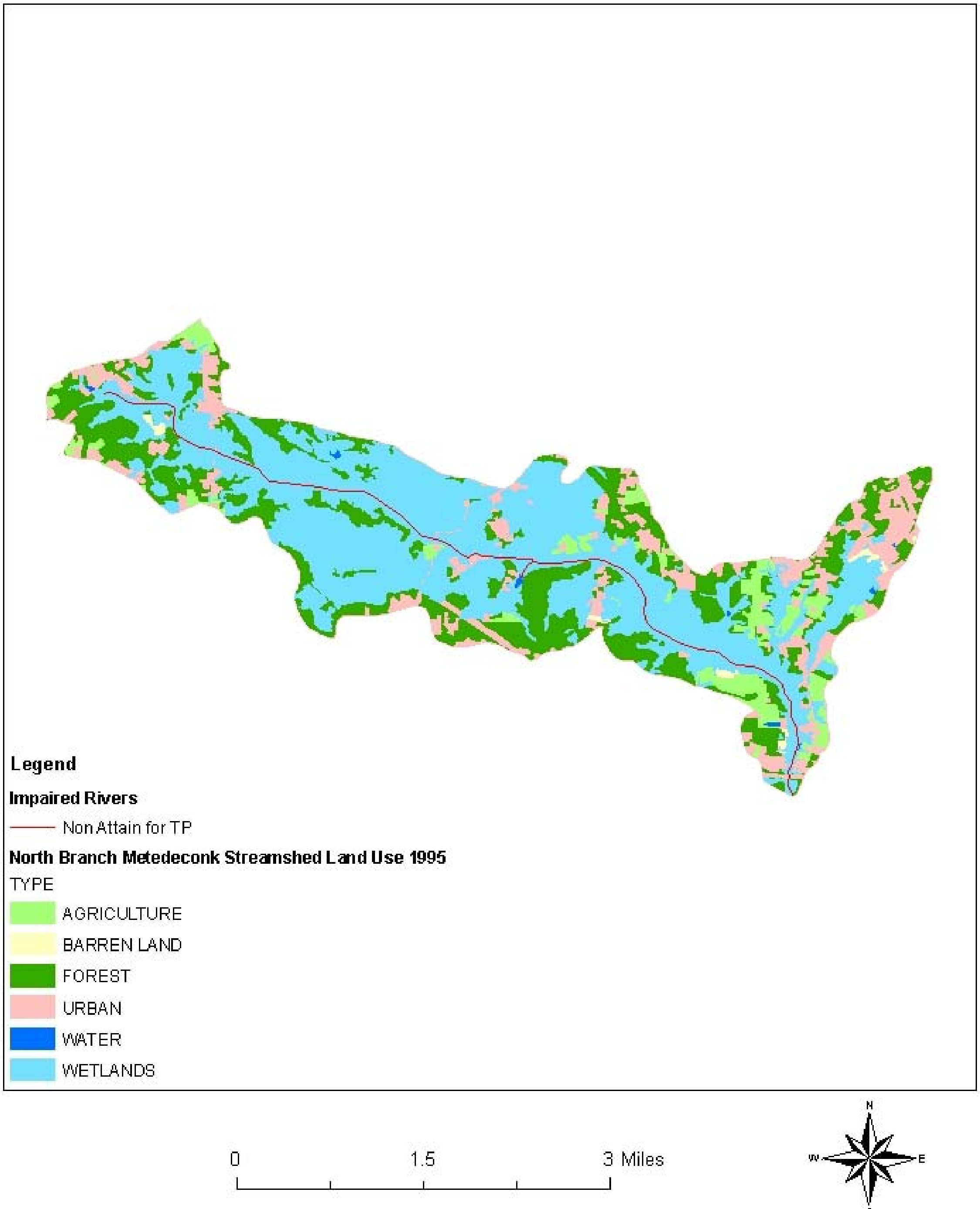


Figure 4 Land Use in the North Branch Metedeconk Streamshed



The Department's Geographic Information System (GIS) was used to describe characteristics of the affected drainage area. The following is general information regarding the data used:

- Land use/Land cover was taken from: "NJDEP 1995/97 Land use/Land cover Update for New Jersey (by WMA)", published 12/01/2000 by the NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA), and delineated by watershed management area.

- "NJDEP 2004 Integrated Report Results for Non-Tidal Rivers", published 6/2004 by NJDEP, Watershed Assessment Group (WAT). Online at: http://www.state.nj.us/dep/gis/digidownload/images/ir2004/ir_river_conventionals2004.gif

- "NJDEP Streams of New Jersey (1:24000)", published 11/01/1998 by NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA). Online at: http://www.state.nj.us/dep/gis/strmshp.html

- "NJDEP 14 Digit Hydrologic Unit Code delineations for New Jersey (DEPHUC14)", published 4/5/2000 by NJDEP, New Jersey Geological Survey (NJGS). Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dephuc14.zip

- "NJDEP 11 Digit Hydrologic Unit Code delineations for New Jersey (DEPHUC11)", published 4/5/2000 by NJDEP, New Jersey Geological Survey (NJGS). Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dephuc11.zip

- "NJDEP 2004 Integrated Report Stations on Non-Tidal Rivers (Conventionals and Toxics)", published 6/2004 by NJDEP, Water Assessment Team (WAT). Online at:

  http://www.state.nj.us/dep/gis/digidownload/images/ir2004/ir_stations_river2004.gif

- " NJDEP Digital Elevation Grid for New Jersey (10 meter)", published 10/1/2004 by NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). Online at: http://www.nj.gov/dep/gis/wmalattice.html

- "Dams in New Jersey", created 6/2003 by NJDEP, Division of Watershed Management (DWM). Unpublished.

- "NJDEP County Boundaries for the State of New Jersey", published 01/23/2003 by NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA), Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stco.zip

- "NJDEP Municipality Boundaries for the State of New Jersey", published 01/23/2003 by NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information Systems (BGIS). Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stmun.zip

- "NJDEP Head of Tide Points for Watercourses of New Jersey", published 1986 by NJDEP, Office of Environmental Analysis (OEA), Coast Survey Ltd. (CTD). Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/hot.zip

- New Jersey Environmental Management System (NJEMS)

4.0 Source Assessment

In order to evaluate and characterize phosphorus loadings in the waterbodies of interest in these TMDLs, and thus propose proper management responses, source assessments are critical. Source assessments include identifying the types of sources and their relative contributions to phosphorus loadings, in both time and space variables.

For the purposes of TMDL development, point sources include domestic and industrial wastewater treatment plants that discharge to surface water, as well as stormwater discharges subject to regulation under the National Pollutant Discharge Elimination System (NPDES). This includes facilities with individual or general industrial stormwater permits and Tier A municipalities and state and county facilities regulated under the New Jersey Pollutant Discharge Elimination System (NJPDES) municipal stormwater permitting program. Point sources contributing phosphorus loads within the affected drainage area are limited to stormwater point sources, including the Tier A municipalities listed in Appendix B. Stormwater point sources, like nonpoint sources, derive their pollutant load from runoff from land surfaces and load reduction is accomplished through BMPs. The distinction is that stormwater point sources are regulated under the Clean Water Act.

For the purposes of TMDL development, potential nonpoint sources include stormwater discharges that are not subject to regulation under NPDES, such as Tier B municipalities, which are regulated under the NJPDES municipal stormwater permitting program, and direct stormwater runoff from land surfaces, as well as malfunctioning sewage conveyance systems, failing or inappropriately located septic systems, and direct contributions from wildlife, livestock and pets.

The phosphorus loads in the affected watersheds are contributed by stormwater point sources and nonpoint sources. These loads are effectively estimated using loading coefficients for land uses present in the watersheds. Therefore, watershed loads for total phosphorus were estimated using the Unit Areal Load (UAL) methodology, which applies pollutant export coefficients obtained from literature sources to the land use patterns within the watershed, as described in USEPA's Clean Lakes Program guidance manual (Reckhow, 1979b). Land use was determined using the Department's GIS system from the 1995/1997 land use coverage. The Department reviewed phosphorus export coefficients from an extensive database (Appendix A) and selected the land use categories and values shown in Table 4.

Table 4: Phosphorus export coefficients (Unit Areal Loads)

land use / land cover	LU/LC codes[1]	UAL (kg TP/ha/yr)
Mixed density residential	1100	1.2
medium / high density residential	1110, 1120, 1150	1.6
low density / rural residential	1130, 1140	0.7
Commercial	1200	2.0
Industrial	1300, 1500	1.7
mixed urban / other urban	other urban codes	1.0
Agricultural	2000	1.5
forest, wetland, water	1750, 1850, 2140, 2150, 4000, 6000, 5000, 8000	0.1
barren land	7000	0.5

Units: 1 hectare (ha) = 2.47 acres
1 kilogram (kg) = 2.2 pounds (lbs)
1 kg/ha/yr = 0.89 lbs/acre/yr

5.0 Water Quality Analysis

Table 5 describes the data used for the analysis (for raw data see Appendix C). For the Metedeconk River North Branch station, one data point was determined to be an outlier and was therefore excluded from the analysis. For the Shark River at Neptune segment, data prior to 1987 was not used because it was deemed to be outdated.

[1] LU/LC code is an attribute of the land use coverage that provides the Anderson classification code for the land use. The Anderson classification system is a hierarchical system based on four digits. The four digits represent one to four levels of classification, the first digit being the most general and the fourth digit being the most specific description.

Table 5 Summary of Total Phosphorus sampling data

Water Quality Sample Locations	Site Number	# of samples	Average (mg/L)	% exceeding 0.1 mg/L
Shark River Brook at Shark River Station Rd. in Tinton Falls	30	18	0.116	61%
Shark River near Neptune	01407750, EWQ0482	27 8	0.063 0.058	11% 13%
Metedeconk N Br at Jackson Mills Rd in Freehold	6	17	0.13	47%

**Figure 5	Location of Monitoring Sites on the Shark River**

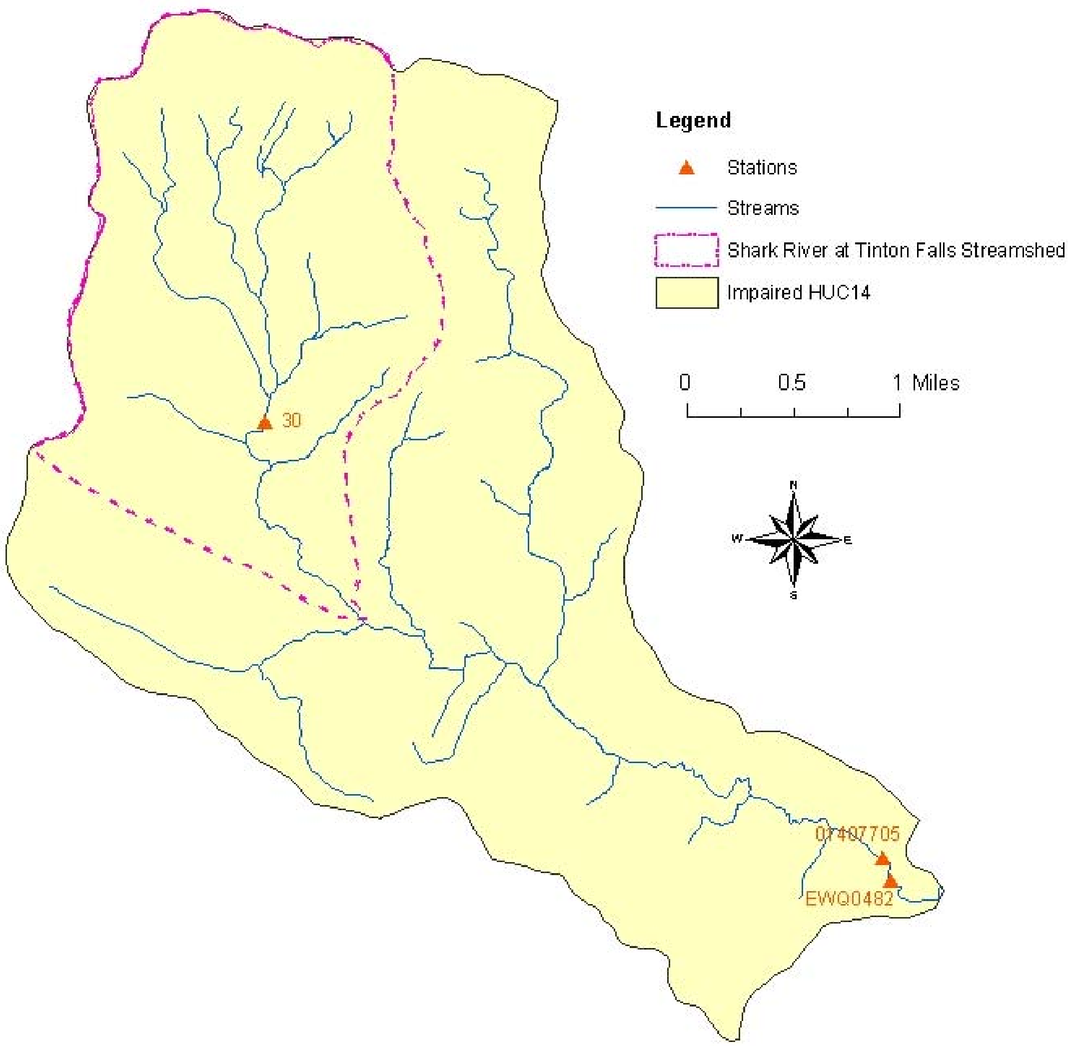
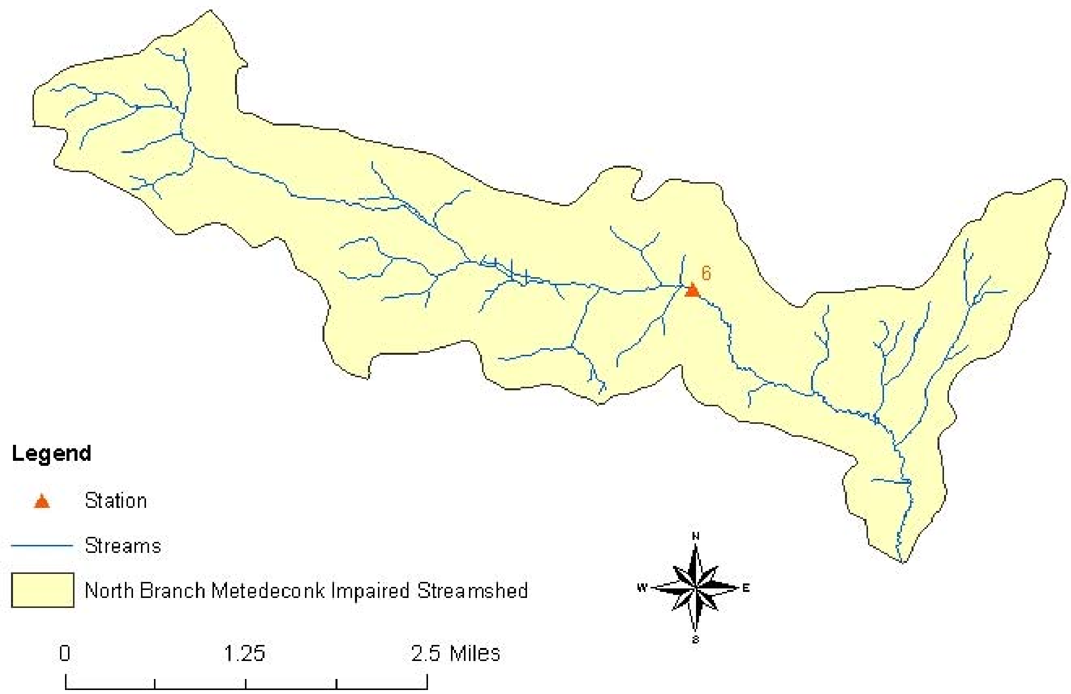


Figure 6 Location of the Monitoring Site on the North Branch Metedeconk River



Seasonal Variation/Critical Conditions

The application of a flow-integrated regression technique for determining loading reductions for impaired segments works well in watersheds that exhibit most of the loading exceedances from nonpoint and stormwater point sources of pollution. The analytical technique used to calculate these TMDLs represents the entire range of flows and all seasons for which the total phosphorus data were collected. Since the technique uses data from annual monitoring programs, seasonal variation and critical conditions are incorporated into the analysis by assessing the loadings over the entire range of flows. Therefore, the method implicitly represents all seasonal meteorological and hydrological conditions. The loading reduction calculated to attain SWQS will do so under all conditions, according to the data available. In this way, the TMDL addresses seasonal variation and critical conditions.

6.0 TMDL Calculations

A regression technique, derived from a load duration method (Stiles 2002), was developed by the Department for data-limited TMDLs where nonpoint and stormwater point sources are predominant. For this technique, linear regression is used to develop a flow-integrated relationship between measured pollutant concentrations and the associated flows at a single monitoring site. The method, known as the Flow-Integrated Reduction of Exceedances (FIRE), provides an accurate estimation of the load that will not cause an exceedance of the water quality standard. The FIRE method is applied over the entire range of flows, eliminating the need to establish a single target flow to estimate an average annual loading reduction. For this approach, calculated phosphorus loads based on actual data are plotted against corresponding flows. The regression relationship between the load and flow for exceedances of the SWQS is established and the regression line drawn. The target load line corresponding with the TP concentration of 0.1 mg/L is plotted on the same graph with the linear exceedance regression line. For this technique, a zero-intercept for the regression line is assumed. The zero intercept is within the 95 percent confidence interval, so the zero intercept cannot be rejected as the point of origin. In addition, given the predominance of nonpoint sources, at zero flow there would be zero load. Given lines with a common intercept, the difference between the slopes of the two lines provides the percent load reduction needed to attain SWQS. The resultant percent reduction is the same whether the y-axis is expressed as pounds per day, pounds per year, or as metric units of kilograms per day or per year.

A Margin of Safety (MOS) must be provided to account for "lack of knowledge concerning the relationship between effluent limitations and water quality" (40 CFR 130.7(c)). A MOS accounts for uncertainty in the loading estimates, physical parameters and the model itself. The MOS, as described in USEPA guidance (Sutfin, 2002), can be either explicit or implicit (i.e., addressed through conservative assumptions used in establishing the TMDL). For this TMDL calculation, an explicit MOS has been incorporated as described below.

A percent loading reduction that includes a margin of safety is estimated by taking the difference between the upper 95 percent confidence limit of the slope of the exceedance regression line and the slope of the target loading. The margin of safety component is the difference between the exceedance regression line and the 95 percent confidence limit for the regression.

The regression results for the impaired segments are presented in Tables 6, 7 and 8 and Figures 7, 8, 9 and 10. The final TMDL for the Metedeconk River N Br at Jackson Mills Rd. in Freehold after excluding the outlier is depicted in Figure 10.

Figure 7 Estimated Percent Reduction for the Shark River Brook at Shark River Station Rd. in Tinton Falls using a Regression Method

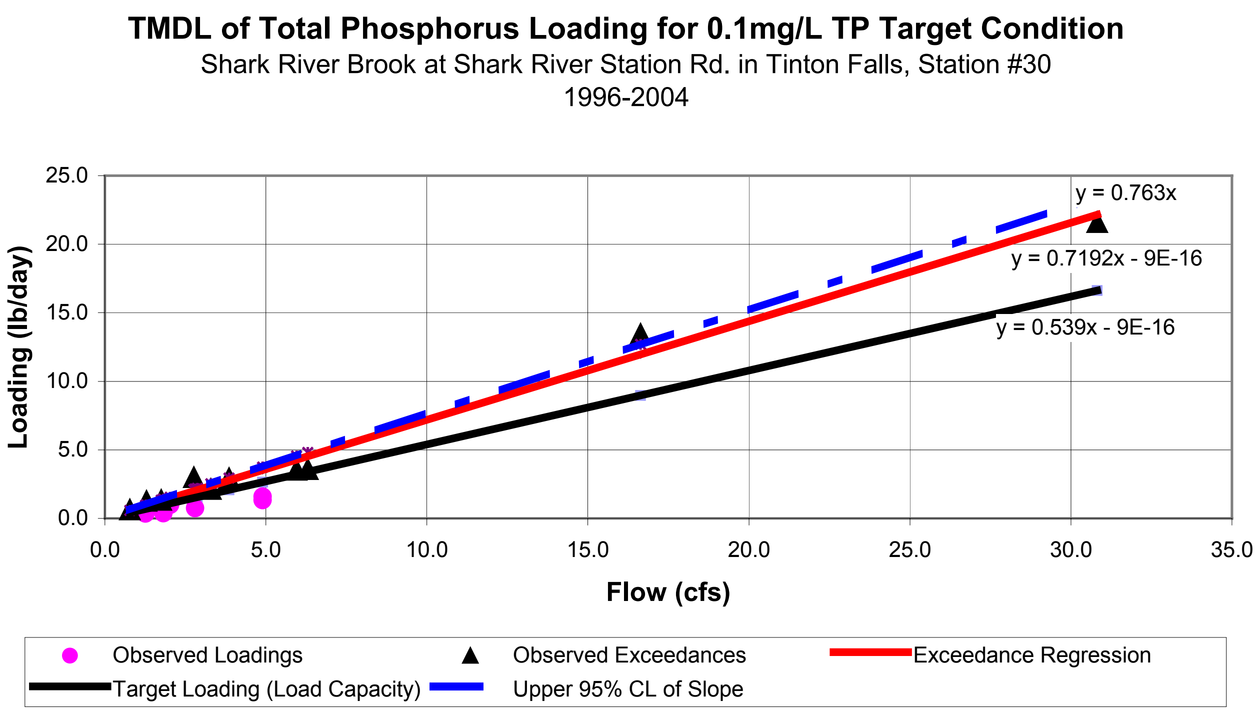


Table 6 Shark River Brook at Shark River Station Rd. in Tinton Falls (30)

Results from Regression Analysis		
Target Loading Slope	=	0.5390
Exceedance Regression Slope	=	0.7192
Upper 95% Confidence Limit of Slope	=	0.7630

To achieve SWQSs within the impaired Shark River at Tinton Falls segment, the required reductions are as follows:

Target Load (lb/day) for the given TP SWQS:

$$\text{Target Load (lb/day)} = \text{flow (cfs)} * 0.539$$

Required TP Load Reduction based on the regression line:

$$(1-\frac{0.539}{0.7192})x100\% = 0.2506x100\% = 25.06\%$$

The portion of the reduction attributed to MOS is calculated as follows:

$$\text{MOS} = (1-\frac{0.7192}{0.763})x100\% = 0.0574x100\% = 5.74\%$$

Figure 8 Estimated Percent Reduction for the Shark River near Neptune using a Regression Method

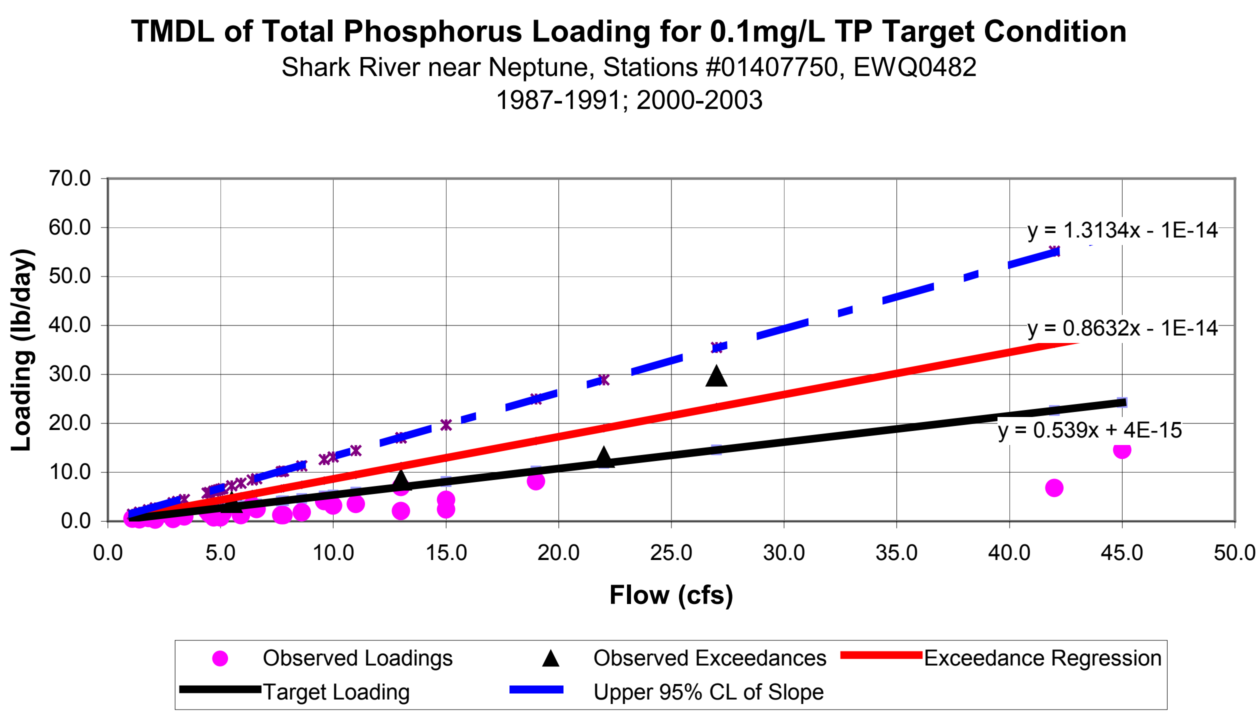


Table 7 Shark River at Neptune (01407750, EWQ0482)

Results from Regression Analysis		
Target Loading Slope	=	0.5390
Exceedance Regression Slope	=	0.8632
Upper 95% Confidence Limit of Slope	=	1.3134

To achieve SWQSs within the impaired Shark River near Neptune segment, the required reductions are as follows:

Target Load (lb/day) for the given TP SWQS:

Target Load (lb/day) = flow (cfs) * 0.539

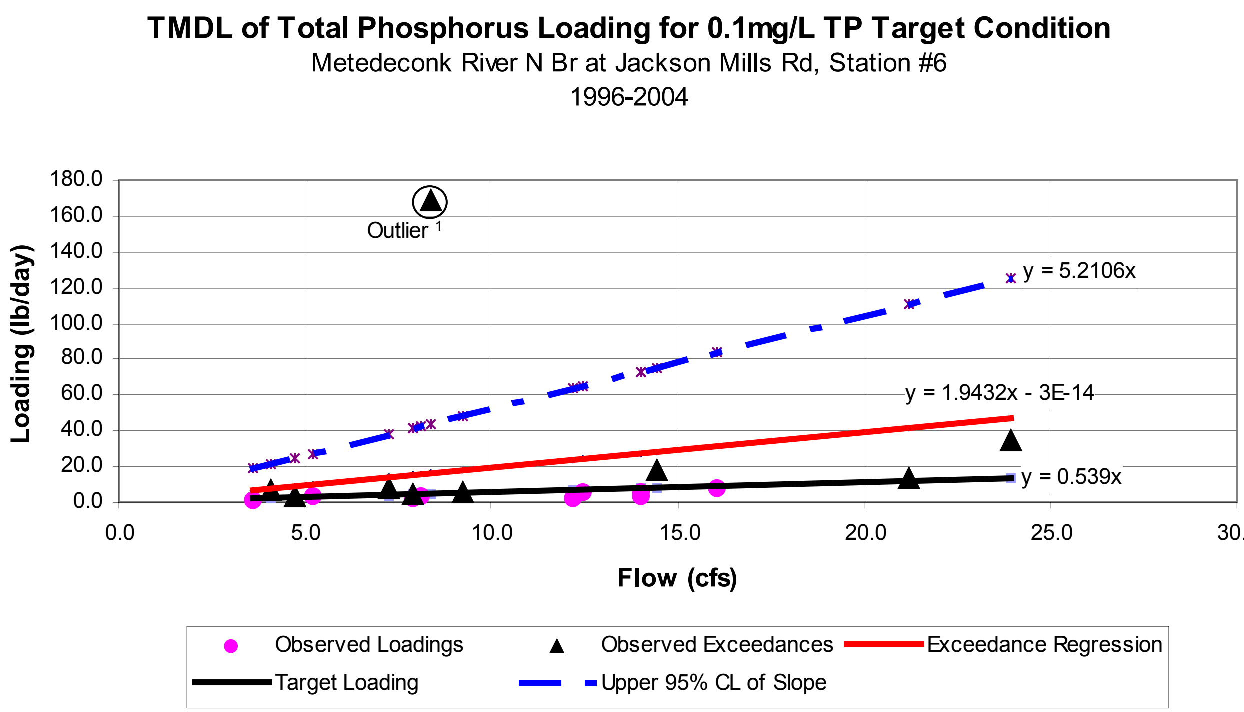
Required TP Load Reduction based on the regression line:

$$(1 - \frac{0.539}{0.8632})x100\% = 0.3756x100\% = 37.56\%$$

The portion of the reduction attributed to MOS is calculated as follows:

$$\text{MOS} = (1 - \frac{0.8632}{1.3134})x100\% = 0.3428x100\% = 34.28\%$$

Figure 9 Estimated Percent Reduction for the Metedeconk River N Br at Jackson Mills Rd. in Freehold using a Regression Method (before removing the outlier)



[1] Based on a statistical 95 and 99 percent confidence intervals about the data set, this point is represented as an outlier and excluded from further calculations

Figure 10 Final Estimated Percent Reduction for the Metedeconk River N Br at Jackson Mills Rd. in Freehold using a Regression Method

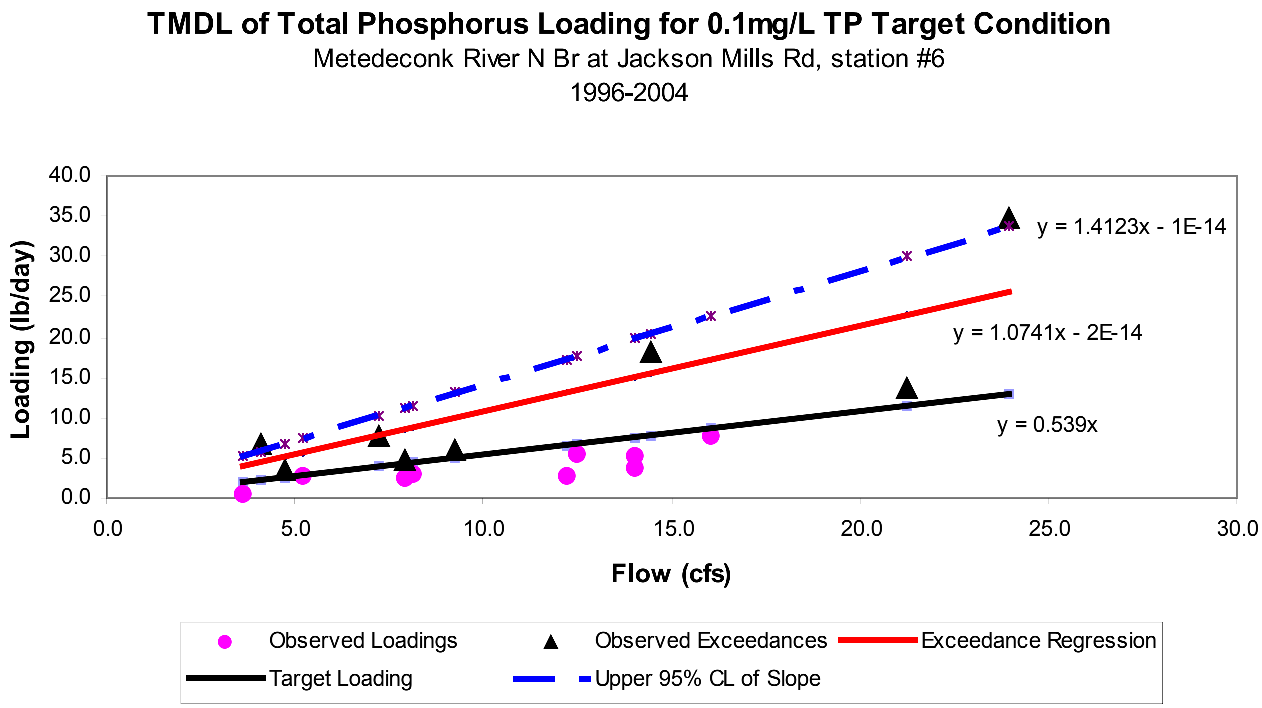


Table 8 Metedeconk River N Br at Jackson Mills Rd. in Freehold (6)

Results from Regression Analysis		
Target Loading Slope	=	0.5390
Exceedance Regression Slope	=	1.0741
Upper 95% Confidence Limit of Slope	=	1.4123

To achieve SWQSs within the impaired Metedeconk River N Br at Jackson Mills Rd. in Freehold segment, the required reductions are as follows:

Target Load (lb/day) for the given TP SWQS:

Target Load (lb/day) = flow (cfs) * 0.539

Required TP Load Reduction based on the regression line:

$$(1-\frac{0.539}{1.074})x100\% = 0.4981x100\% = 49.81\%$$

The portion of the reduction attributed to MOS is calculated as follows:

$$\text{MOS} = (1-\frac{1.0741}{1.4123})x100\% = 0.2395x100\% = 23.95\%$$

To determine the TMDL for each stream segment, the target load is calculated as shown above. The load that corresponds to the MOS is calculated and then subtracted from the target load. The result is the allocable load. Loads from some land uses, specifically forest, wetland, water and barren land, are not adjustable. There are no measures that can reasonably be applied to runoff from these sources to reduce the loads generated. As a result, existing loads from these sources are equal to the future loads. Therefore, in order to achieve the TMDL, the load reduction from land uses for which reduction measures can reasonably be applied must be increased proportionally, as presented below. Additional detail on the method used to derive load reductions that are assigned to each land use from the FIRE outputs is provided in Appendix E.

Wasteload Allocations and Load Allocations

WLAs are established for all point sources, while LAs are established for nonpoint sources, as these terms are defined in "Source Assessment." There are no point sources, other than stormwater point sources in the affected streamsheds. Both WLAs and LAs are expressed as percent reductions for particular stream segments, and are differentiated as discussed below.

Stormwater discharges can be a point source or a nonpoint source, depending on NJPDES regulatory jurisdiction, yet the suite of measures to achieve reduction of loads from stormwater discharges is the same, regardless of this distinction. Stormwater point sources receiving a WLA are distinguished from stormwater generating areas receiving a LA on the basis of land use. This distribution of loading capacity between WLAs and LAs is consistent with recent EPA guidance that clarifies existing regulatory requirements for establishing WLAs for stormwater discharges (Wayland, November 2002). Stormwater discharges are captured within the runoff sources quantified according to land use, as described previously. Distinguishing between regulated and unregulated stormwater is necessary in order to express WLAs and LAs numerically; however, "EPA recognizes that these allocations might be fairly rudimentary because of data limitations and variability within the system" (Wayland, November 2002, p.1). Therefore allocations are established according to source categories as shown in Table 9. This demarcation between WLAs and LAs based on land use source categories is not perfect, but it represents the best estimate defined as narrowly as data allow. The Department acknowledges that there may be stormwater sources in the residential, commercial, industrial and mixed urban runoff source categories that are not NJPDES-regulated. Nothing in these TMDLs shall be construed to require the Department to regulate a stormwater source under NJPDES that would not already be regulated as such, nor shall anything in these TMDLs be construed to prevent the Department from regulating a stormwater source under NJPDES.

Table 9 Distribution of WLAs and LAs among source categories

Source category	TMDL allocation
Nonpoint and Stormwater Sources	
medium / high density residential	WLA
low density / rural residential	WLA
commercial	WLA
industrial	WLA
Mixed urban / other urban	WLA
agricultural	LA
forest, wetland, water	LA
barren land	LA

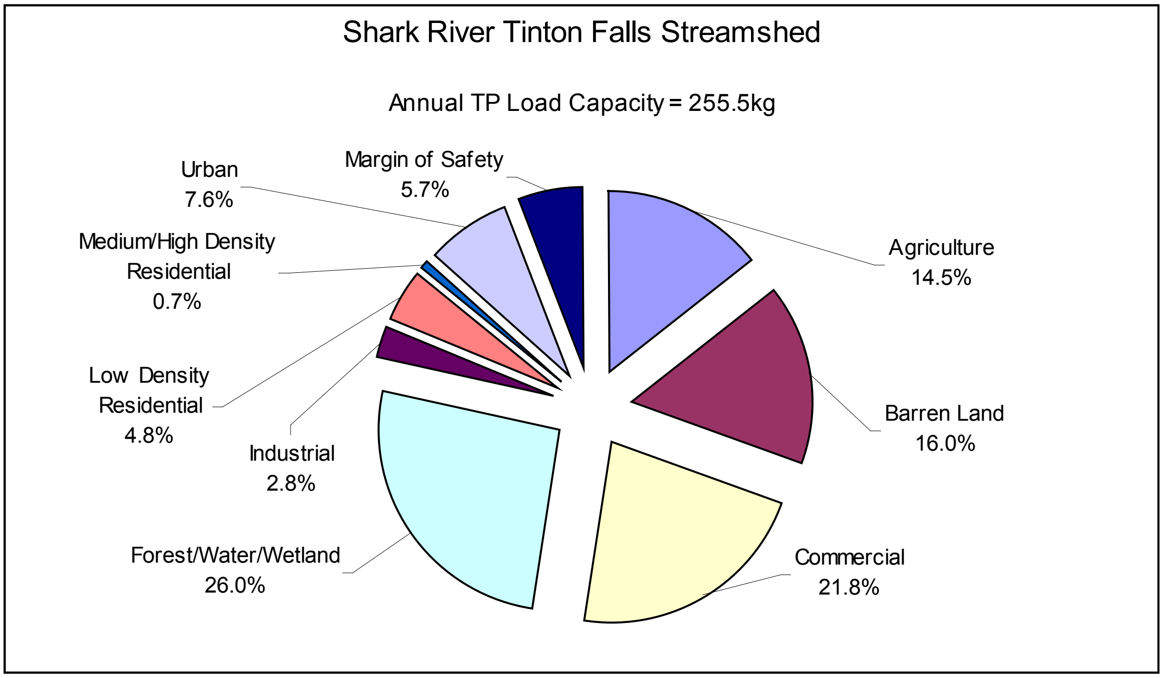
Wasteload allocations and load allocations for sources within the drainage area of the impaired Shark River at Tinton Falls segment are presented in Table 10 and Figure 11.

Table 10 TMDL calculations for the Shark River Brook at Shark River Station Rd. in Tinton Falls

	Shark River at Tinton Falls		% reduction	Existing Load
	kg TP/yr (lb/yr)	% of LC		kg TP/yr (lb/yr)
Loading capacity (LC)	255.5 (562.1)	100%	n/a	340.9 (750.0)
LOAD ALLOCATION				
Point Sources other than Stormwater	n/a			
Nonpoint and Stormwater Sources				
medium / high density residential	1.77 (3.89)	0.69	42.8%	3.09 (6.80)
low density / rural residential	12.20 (26.84)	4.78	42.8%	21.3 (46.9)
commercial	55.75 (122.65)	21.82	42.8%	97.6 (214.7)
industrial	7.24 (15.93)	2.83	42.8%	12.7 (27.9)
mixed urban / other urban	19.51 (42.92)	7.63	42.8%	34.1 (75.0)
agricultural	36.98 (81.36)	14.48	42.8%	64.7 (142.3)
forest, wetland, water	66.50 (146.3)	26.03	0%	66.5 (146.3)
barren land	40.87 (89.91)	16.0	0%	40.9 (90.0)
Margin of Safety	14.66 (32.25)	5.74	n/a	n/a
TOTAL	255.5 (562.1)	100	25.06%	340.9 (750.0)

*Percent reductions shown for individual sources are necessary to achieve overall reductions

Figure 11 Phosphorus Allocations for the Shark River Brook at Shark River Station Rd. in Tinton Falls



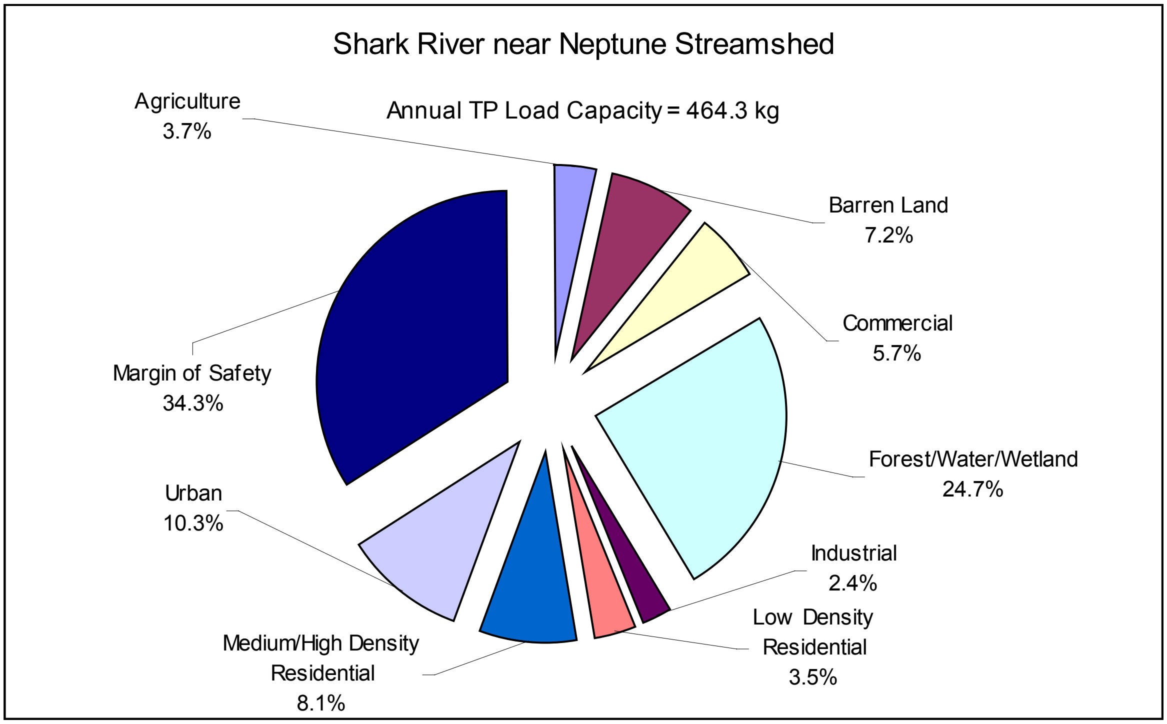
Wasteload allocations and load allocations for sources within the drainage area of the impaired Shark River near Neptune segment are presented in Table 11 and Figure 12.

Table 11 TMDL calculations for the Shark River near Neptune

	Shark River near Neptune		% reduction	Existing load
	kg TP/yr (lb/yr)	% of LC		kg TP/yr (lb/yr)
Loading capacity (LC)	464.28 (1021.4)	100%	n/a	743.5 (1635.7)
LOAD ALLOCATION				
Point Sources other than Stormwater	n/a			
Nonpoint and Stormwater Sources				
medium / high density residential	37.62 (82.76)	8.10	73.7%	142.8 (314.16)
low density / rural residential	16.36 (36.00)	3.52	73.7%	62.1 (136.6)
commercial	26.69 (58.72)	5.75	73.7%	101.3 (222.86)
industrial	11.3 (24.86)	2.43	73.7%	42.9 (94.38)
mixed urban / other urban	47.68 (104.90)	10.27	73.7%	180.9 (398.0)
agricultural	17.19 (37.82)	3.70	73.7%	65.2 (143.4)
forest, wetland, water	114.81 (252.58)	24.73	0%	114.8 (252.56)
barren land	33.47 (73.63)	7.21	0%	33.5 (73.7)
Margin of Safety	159.15 (350.13)	34.28	n/a	n/a
TOTAL	464.28 (1021.4)	100	37.56%	743.5 (1635.7)

*Percent reductions shown for individual sources are necessary to achieve overall reductions

Figure 12 Phosphorus Allocations for the Shark River near Neptune



Wasteload allocations and load allocations for sources within the drainage area of the impaired Metedeconk River N Br at Jackson Mills Rd. segment are presented in Table 12 and Figure 13.

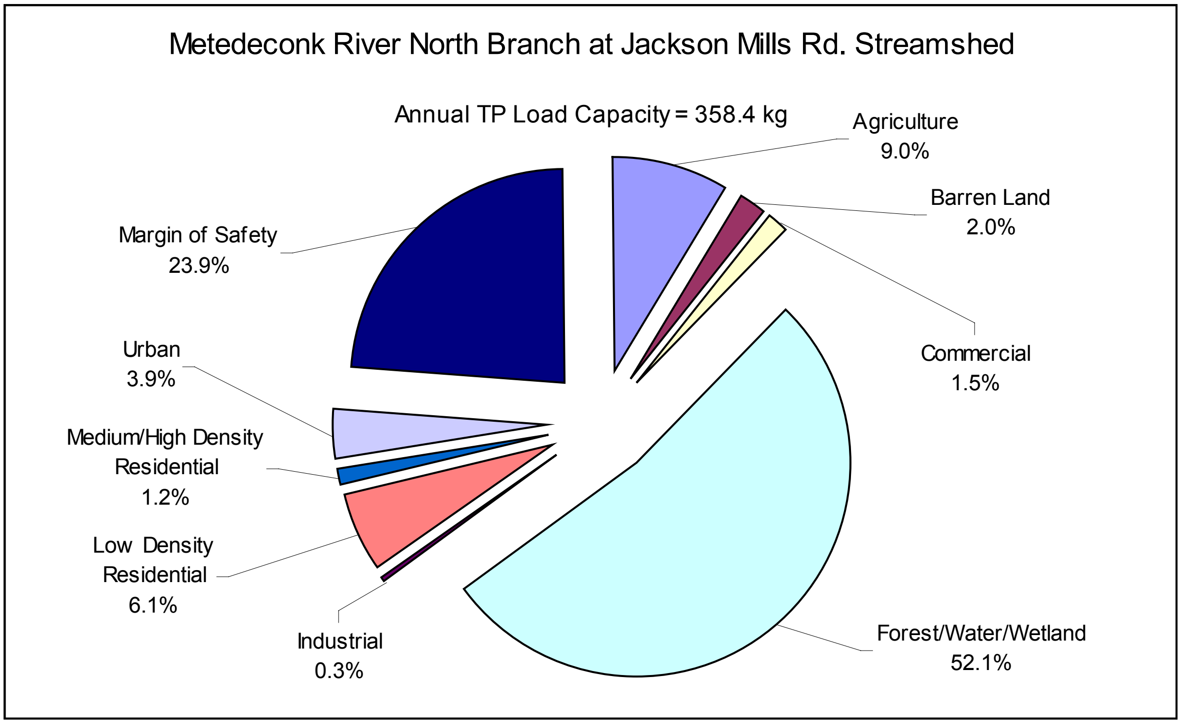
Table 12 TMDL calculations for the Metedeconk River N Br at Jackson Mills Rd.

	Metedeconk R N Br at Jackson Mills Rd.		% reduction	Existing Load
	kg TP/yr (lb/yr)	% of LC		kg TP/yr (lb/yr)
Loading capacity (LC)	358.4 (788.48)	100%	n/a	714.3 (1571.5)
LOAD ALLOCATION				
Point Sources other than Stormwater	n/a			
Nonpoint and Stormwater Sources				
medium / high density residential	4.2 (9.24)	1.2	84.9%	27.5 (60.5)
low density / rural residential	21.8 (47.96)	6.1	84.9%	144.3 (317.5)
commercial	5.5 (12.10)	1.5	84.9%	36.4 (80.1)
industrial	1.2 (2.64)	0.3	84.9%	8.04 (17.7)
mixed urban / other urban	13.9 (30.58)	3.9	84.9%	91.7 (201.7)
agricultural	32.1 (70.62)	9.0	84.9%	212.5 (467.5)
forest, wetland, water	186.7 (410.74)	52.1	0%	186.7 (410.7)
barren land	7.2 (15.84)	2.0	0%	7.2 (15.8)
Margin of Safety	85.8 (188.76)	23.9	n/a	n/a
TOTAL	358.4 (788.48)	100	49.81%	714.3 (1571.5)

	Metedeconk R N Br at Jackson Mills Rd.		% reduction	Existing Load
	kg TP/yr (lb/yr)	% of LC		kg TP/yr (lb/yr)

*Percent reductions shown for individual sources are necessary to achieve overall reductions

Figure 13 Phosphorus allocations for the Metedeconk River N Br at Jackson Mills Rd.



Reserve Capacity

Reserve capacity is an optional means of reserving a portion of the loading capacity to allow for future growth. Reserve capacities are not included at this time. The loading capacity of each stream is expressed as a function of the current load, and both WLAs and LAs are expressed as percentage reductions for particular stream segments. Therefore, the percent reductions from current levels must be attained in consideration of any new sources that may accompany future development.

7.0 Follow-up Monitoring

The Water Resources Division of the U.S. Geological Survey and the Department have cooperatively operated the Ambient Stream Monitoring Network (ASMN) in New Jersey since the 1970s. The ASMN currently includes approximately 115 stations that are routinely monitored on a quarterly basis. A second ambient monitoring network, DEP's Supplemental Ambient Surface Water Network (100 stations), has improved spatial coverage for water quality monitoring in New Jersey. The data from this these networks have been used to assess the quality of freshwater streams and percent load reductions. The ambient networks, as well as targeted studies, will be the means to determine the effectiveness of TMDL implementation and the need for additional management strategies.

8.0 Implementation Plan

Management measures are "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint and stormwater sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint and stormwater source pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives" (USEPA, 1993).

The Department recognizes that TMDLs alone are not sufficient to restore impaired stream segments. The TMDL establishes the required pollutant reduction targets while the implementation plan identifies some of the regulatory and non-regulatory tools to achieve the reductions, matches management measures with sources, and suggests responsible entities for non-regulatory tools. This provides a basis for aligning available resources to assist with implementation activities. Projects proposed by the State, local government units and other stakeholders that would implement the measures identified within the impaired watershed are a priority for available State (for example, CBT) and federal (for example, 319(h)) funds. In addition, the Department's ongoing watershed management initiative will develop detailed watershed restoration plans for impaired stream segments in a priority order that will identify more specific measures to achieve the identified load reductions.

In these impaired watersheds wetlands and forest represent a significant portion of the land use. As discussed under source assessment, loads from these land uses are not adjustable. Urban and agricultural land use sources must be the focus for implementation. Urban land use will be addressed primarily by stormwater regulation. Agricultural land uses will be addressed by implementation of conservation management practices tailored to each farm. Other measures are discussed further below.

Stormwater measures

The stormwater facilities subject to regulation under NPDES in this watershed must be assigned WLAs. The WLAs for these point sources are expressed in terms of the required percent reduction for nonpoint sources and are applied to the land use categories that correspond to the areas regulated under industrial and municipal stormwater programs. The BMPs required through stormwater permits, including the additional measure discussed below, are generally expected to achieve the required load reductions. The success of these measures will be assessed through follow up monitoring. As needed through adaptive management, other additional measures may need to be identified and included in stormwater permits. Follow up monitoring or watershed restoration plans may determine that other additional measures are required, which would then be incorporated into Phase II permits. Additional measures that may be considered include, for example, more frequent street sweeping and inlet cleaning, or retrofit of stormwater management facilities to include nutrient removal. A more detailed discussion of stormwater source control measures follows.

On February 2, 2004 the Department promulgated two sets of stormwater rules: The Phase II New Jersey Pollutant Discharge Elimination System (NJPDES) Stormwater Rules, N.J.A.C. 7:14A and the Stormwater Management Rules, N.J.A.C. 7:8

The Phase II NJPDES rules for the Municipal Stormwater Regulation Program require municipalities, highway agencies, and regulated "public complexes" to develop stormwater management programs consistent with the NJPDES permit requirements. The stormwater discharged through "municipal separate storm sewer systems" (MS4s) is regulated under the Department's Phase II NJPDES stormwater rules. Under these rules and associated general permits, Tier A municipalities are required to implement various control measures that should substantially reduce phosphorus loadings in the impaired watersheds. These control measures include adoption and enforcement of a pet waste disposal ordinance, prohibiting the feeding of unconfined wildlife on public property, cleaning catch basins, performing good housekeeping at maintenance yards, and providing related public education and employee training. These basic requirements will provide for a measure of load reduction from existing development.

Each impaired watershed was assessed for the applicability of a mandatory low phosphorous fertilizer ordinance to aid in the reduction of phosphorus loading from nonpoint sources. If the watershed contained a high percentage of agricultural land uses, it was determined that the greatest nonpoint source reductions would be achieved through the implementation of agricultural BMPs, and therefore the low phosphorus fertilizer ordinance for urban land uses was not required as an additional measure. However, in those subwatersheds which contained a small percentage of agricultural land uses, and a high percentage of urban land uses, it was determined that the low phosphorus fertilizer ordinance was necessary in order to effectively reduce the phosphorus load originating from the urban land uses.

In the Shark River and Metedeconk River North Branch watersheds, it was determined that the low phosphorus fertilizer ordinance was required based on the guidelines provided above.

Therefore, all municipalities with contributory drainage area into the impaired stream segments will be required to adopt an ordinance as an additional measure that prohibits the outdoor application of fertilizer other than low phosphorus fertilizer, consistent with a model ordinance provided by the Department. Fertilizer does not include animal or vegetable manure or compost. This model ordinance has been posted on www.njstormwater.org. The additional measure is as follows:

Low Phosphorus Fertilizer Ordinance

Minimum Standard – Municipalities listed in Appendix B shall adopt and enforce an ordinance, consistent with a model ordinance provided by the Department, to prohibit the outdoor application of fertilizer other than low phosphorus fertilizer, except:

Any application of fertilizer at a commercial farm that is exempted by the Right to Farm Act, N.J.S.A. 4:1C-1 et seq.

Any application of fertilizer needed for establishing new vegetation after land disturbance in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.

Measurable Goal - Municipalities listed in Appendix B shall certify annually that they have met the Low Phosphorus Fertilizer Ordinance minimum standard.

Implementation - Within 6 months from adoption of the TMDL, municipalities listed in Appendix B shall have fully implemented the Low Phosphorus Fertilizer Ordinance minimum standard.

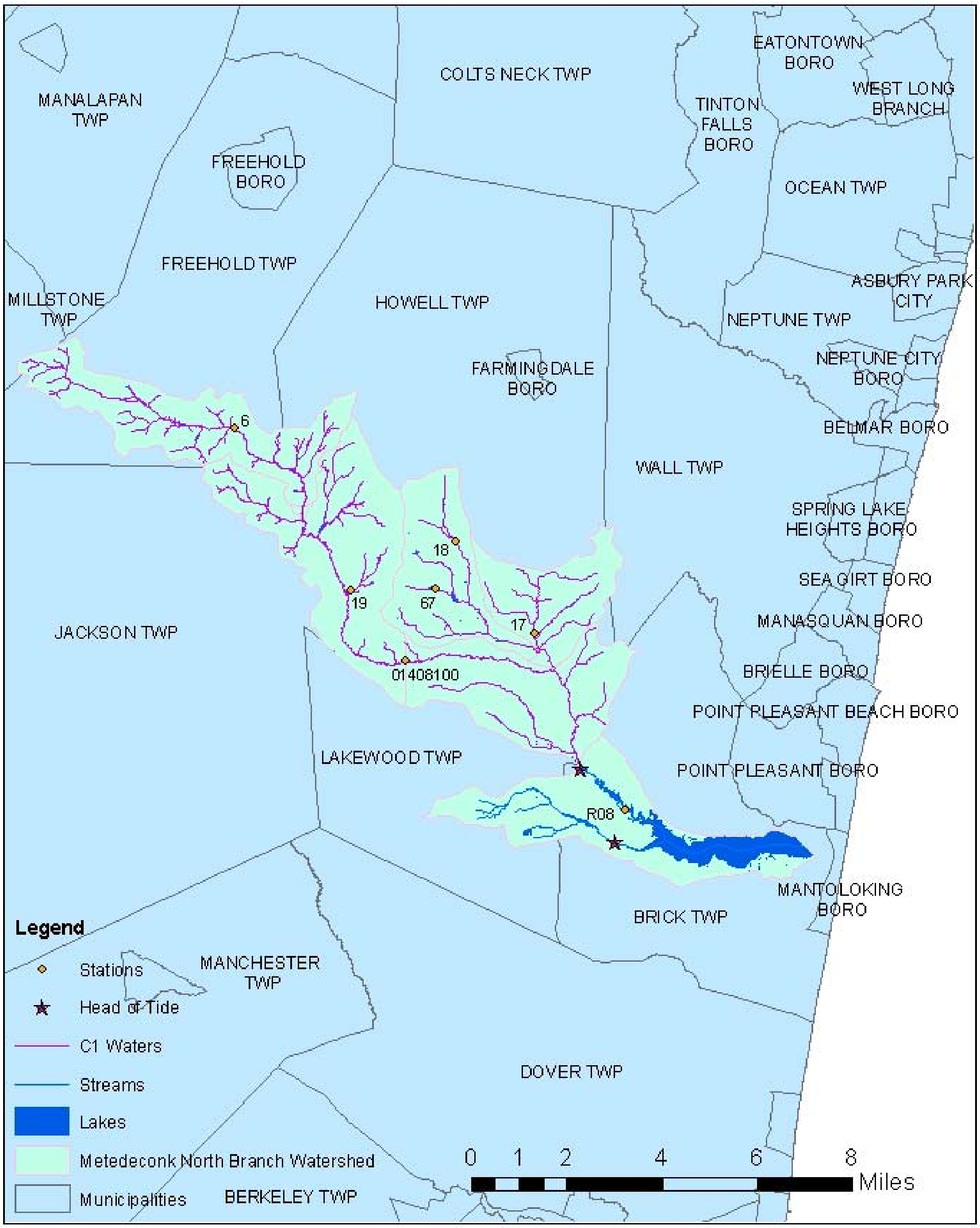
The Stormwater Management Rules have been updated for the first time since their original adoption in 1983. These rules establish statewide minimum standards for stormwater management in new development, and the ability to analyze and establish region-specific performance standards targeted to the impairments and other stormwater runoff related issues within a particular drainage basin through regional stormwater management plans. The Stormwater Management Rules are currently implemented through the Residential Site Improvement Standards (RSIS) and the Department's Land Use Regulation Program (LURP) in the review of permits such as freshwater wetlands, stream encroachment, CAFRA, and Waterfront Development.

The Stormwater Management Rules focus on the prevention and minimization of stormwater runoff and pollutants in the management of stormwater. The rules require every project to evaluate methods to prevent pollutants from becoming available to stormwater runoff and to design the project to minimize runoff impacts from new development through better site design, also known as low impact development. Some of the issues that are required to be assessed for the site are the maintenance of existing vegetation, minimizing and disconnecting impervious surfaces, and pollution prevention techniques. In addition, performance standards are established to address existing groundwater that contributes to baseflow and aquifers, to prevent increases to flooding and erosion, and to provide water quality treatment through stormwater management measures for TSS and nutrients.

As part of the requirements under the municipal stormwater permitting program, municipalities are required to adopt and implement municipal stormwater management plans and stormwater control ordinances consistent with the requirements of the stormwater management rules. As such, in addition to changes in the design of projects regulated through the RSIS and LURP, municipalities will also be updating their regulatory requirements to provide the additional protections in the Stormwater Management Rules within approximately two years of the issuance of the NJPDES General Permit Authorization.

Furthermore, the New Jersey Stormwater Management Rules establish a 300-foot special water resource protection area (SWRPA) around Category One (C1) waterbodies and their intermittent and perennial tributaries, within the HUC 14 subwatershed. In the SWRPA, new development is typically limited to existing disturbed areas to maintain the integrity of the C1 waterbody. C1 waters receive the highest form of water quality protection in the state, which prohibits any measurable deterioration in the existing water quality. Figure 14 shows the category one (C1) waterways in the MetedeconkWatershed. Definitions for surface water classifications, detailed segment description, and designated uses may be found in various amendments to the Surface Water Quality Standards at www.state.nj.us/dep/wmm/sgwqt/sgwqt.html.

Figure 14 Category One Waterways in the North Branch Metedeconk River Watershed



Agricultural and other measures

Generic management strategies for nonpoint source categories, beyond those that will be implemented under the Phase II stormwater management program, and responses are summarized below.

Table 13 Nonpoint source management measures

Source Category	Responses	Potential Responsible Entity	Possible Funding options
Human Sources	Septic system management programs	Municipalities, residents, watershed stewards, property owner	319(h), State sources
Non-Human Sources	Goose management programs, riparian buffer restoration	Municipalities, residents, watershed stewards, property owner	319(h), State sources
Agricultural practices	Develop and implement conservation plans or resource management plans	Property owner	EQIP, CRP, CREP

Human and Non-Human measures

Where septic system service areas are located in close proximity to impaired waterbodies, septic surveys should be undertaken to determine if there are improper effluent disposal practices that need to be corrected. Septic system management programs should be implemented in municipalities with septic system service areas to ensure proper design, installation and maintenance of septic systems. Where resident goose populations are excessive, community based goose management programs should be supported. Through stewardship programs, areas such as commercial/corporate lawns should be converted to alternative landscaping that minimizes goose habitat and areas requiring intensive landscape maintenance. Where existing developed areas have encroached on riparian buffers, riparian buffer restoration projects should be undertaken where feasible.

Agricultural measures

Several programs are available to assist farmers in the development and implementation of conservation management plans and resource management plans. The Natural Resource Conservation Service is the primary source of assistance for landowners in the development of resource management pertaining to soil conservation, water quality improvement, wildlife habitat enhancement, and irrigation water management. The USDA Farm Services Agency performs most of the funding assistance. All agricultural technical assistance is coordinated through the locally led Soil Conservation Districts. The funding programs include:

The Environmental Quality Incentive Program (EQIP) is designed to provide technical, financial, and educational assistance to farmers/producers for conservation practices that address natural resource concerns, such as water quality. Practices under this program include integrated crop management, grazing land management, well sealing, erosion control systems, agri-chemical handling facilities, vegetative filter strips/riparian buffers, animal waste management facilities and irrigation systems.

The Conservation Reserve Program (CRP) is designed to provide technical and financial assistance to farmers/producers to address the agricultural impacts on water quality and to maintain and improve wildlife habitat. CRP practices include the establishment of filter strips, riparian buffers and permanent wildlife habitats. This program provides the basis for the Conservation Reserve Enhancement Program (CREP).

Conservation Reserve Enhancement Program (CREP) The New Jersey Departments of Environmental Protection and Agriculture, in partnership with the Farm Service Agency and Natural Resources Conservation Service, signed a $100 million CREP agreement earlier this year. This program matches $23 million of State money with $77 million from the Commodity Credit Corp. within USDA. Through CREP, financial incentives are offered for agricultural landowners to voluntarily implement conservation practices on agricultural lands. NJ CREP will be part of the USDA's Conservation Reserve Program (CRP). There will be a ten-year enrollment period, with CREP leases ranging between 10-15 years. The State intends to augment this program to make these leases permanent easements. The enrollment of farmland into CREP in New Jersey is expected to improve stream health through the installation of water quality conservation practices on New Jersey farmland.

Current Implementation Projects

Implementation projects include those recently completed, underway and planned. Pertinent measures in the impaired watersheds are as follows:

Implementation of Stormwater Best Management Practices at Lake Alberta
The Township of Neptune received a 319(h) grant in the amount of $195,400 in SFY 03 to implement multiple lake and stormwater best management practices designed to improve water quality conditions in Lake Alberta by reducing the nonpoint source pollution load entering the lake. Through the installation of a stormwater intercept, a sub-surface aerator system, a line skimmer, and waterfowl deterrent measures this project will reduce the amount of total suspended solids, phosphorus, petroleum hydrocarbons, and fecal coliform entering the lake system.

Shark River Clean-Up Coalition Strategic Plan
The mission of the Shark River Cleanup Coalition Inc. is to significantly enhance the water quality of the Shark River Estuary and its fresh water tributaries, to improve and protect habitats important to the conservation and abundance of the wildlife, to protect the

recreational and commercial uses from degradation and pollution, thereby ensuring the ecological and economical stability of this important watershed. In order to accomplish its mission the coalition plans to implement programs in 7 areas including: Education and Outreach, Water Monitoring, Clean-Ups, Advocacy, and Open Space Preservation.

Sylvan Lake Commission
Sylvan Lake Commission received a 319(h) grant in the amount of $40,000 in SFY 01 to construct a concrete containment area to capture sediment and debris from the stormwater trunk line serving portions of Neptune City and Neptune Township.

Priority Stream Segment Restoration Plans

In addition to the generic and specific, current and future implementation measures identifed above, the Department, through its watershed management program, is undertaking the development of watershed restoration plans for priory stream segment. These restoration plans will identify specific measures ands the means to accomplish them, beyond those identifed in this TMDL report, that will assist in the attainment of the required load reductions. Due to the number of TMDLs recently generated, the Department must prioritize which stream segments will be the focus of initial consideration. The Department's nutrient policy identifies that, "Except as due to natural conditions, nutrients shall not be allowed in concentrations that cause objectionable algal densities, nuisance aquatic vegetation, abnormal diurnal fluctuations in dissolved oxygen or pH, changes to the composition of aquatic ecosystems, or otherwise render the water unsuitable for the designated uses (N.J.A.C. 7:9B-1.5(g)3) ."
With respect to nutrient TMDLs, the initial priority will be given to those streams where the impairments exist in the impaired stream or downstream lakes, beyond simple exceedance of the water quality criterion. Other priority considerations include:

- Headwater area;
- Proximity to drinking water supply;
- Proximity to recreation area;
- Possibility of adverse human health conditions;
- Proximity to a lake intake;
- Existence of eutrophication;
- Phosphorus is identified as the limiting nutrient;
- Existence of use impairments;
- Ability to create a measurable change;
- Probability of human source;
- Stream Classifications;
- High success level.

9.0 Reasonable Assurance

Commitment to carry out the activities described in the implementation plan to reduce phosphorus loads provides reasonable assurance that the SWQS will be attained for phosphorus in the (name of watershed/WMA or Water region). Reasonable Assurance for the implementation of these TMDLs has been considered for point and nonpoint sources for which phosphorus load reductions are necessary. Moreover, stormwater sources for which WLAs have been established will be regulated as NJPDES point sources. Follow-up monitoring will identify if the strategies implemented are completely, or only partially successful. It will then be determined if other management measures can be implemented to fully attain the SWQS or if it will be necessary to consider other approaches, such as use attainability.

10.0 Public Participation

The Water Quality Management Planning Rules at NJAC 7:15-7.2 require the Department to initiate a public process prior to the development of each TMDL and to allow public input to the Department on policy issues affecting the development of the TMDL. Further, the Department shall propose each TMDL as an amendment to the appropriate area-wide water quality management plan in accordance with procedures at N.J.A.C. 7:15-3.4(g). Electronic maps showing the spatial extent of the impaired segments and a PowerPoint presentation describing the TMDL process and method used were posted online at http://www.state.nj.us/dep/watershedmgt/tmdl_segments.htm on June 1st, 2005 and public comment was solicited.

In accordance with N.J.A.C. 7:15–7.2(g), these TMDLs have been proposed by the Department as an amendment to the Monmouth County WQMP and Ocean County WQMP.

The notice proposing the TMDLs was published on July 5, 2005 in the New Jersey Register and in the Asbury Park Press. The TMDL documents were made available at the Department, upon request by mail, and on the Department's website. The Department conducted a non-adversarial public hearing on August 8, 2005 at the Rutgers Cooperative Research Extension Agriculture Building in Freehold, New Jersey. An informal presentation describing the development of the TMDL and a question and answer session preceeded the formal hearing. The public comment period ended on August 23, 2005.

Department initiated changes include the following:

1. The New Jersey Environmental Management System (NJEMS), which contains NJPDES permitted facility information evaluated during TMDL development, has been listed under "Data Sources".
2. Addition of the priority designation for the subject TMDLs on Sublist 5 of the Integrated List.
3. Addition of an addendum demonstrating the methodology to convert the percent reductions obtained from applying FIRE to percent reductions per land use category.
4. Addition of an explanation regarding selection of municipalities that will be required to adopt a low phosphorus fertilizer ordinance.
5. Addition of an existing loads column to the tables identifying the allocation of the TMDL for each segment.

Two comment letters (1. Robert Bowden, Township Administrator, Township of Colts Neck and 2. Bruce Davis, Township Clerk, Howell Township) were received on the proposed TMDLs. One person attended the public hearing (Rob Karl); no one testified.

Two comments were received, which are summarized below along with the Department's responses. The number in parentheses following each comment refers to the commenter number above.

Comment 1. Please advise if Colts Neck is within the "contributory drainage" area of the proposed TMDL, which if adopted, would require the Township to adopt a low phosphorus fertilizer ordinance. (1)

Response 1. As stated in Appendix B of the TMDL document, Colts Neck is within the contributory drainage area and will be required to adopt a low phosphorus fertilizer ordinance as an additional measure component of the township's municipal stormwater permit. A letter from the Department was sent to the Township of Colts Neck in response to this comment.

Comment 2. The the low phosphorus ordinance was introduced at the August 16, 2005 meeting of the Township Council and is anticipated to be adopted at the September 20, 2005 meeting. (2)

Response 2. The Department appreciates the prompt response of the township in advancing water quality improvement. A letter thanking the Township of Howell was sent in response to this comment.

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Appendices

Appendix A: Database of Phosphorus Export Coefficients

In December 2001, the Department concluded a contract with the USEPA, Region 2, and a contracting entity, TetraTech, Inc., the purpose of which was to identify export coefficients applicable to New Jersey. As part of that contract, a database of literature values was assembled that includes approximately four-thousand values accompanied by site-specific characteristics such as location, soil type, mean annual rainfall, and site percent-impervious. In conjunction with the database, the contractor reported on recommendations for selecting values for use in New Jersey. Analysis of mean annual rainfall data revealed noticeable trends, and, of the categories analyzed, was shown to have the most influence on the reported export coefficients. Incorporating this and other contractor recommendations, the Department took steps to identify appropriate export values for these TMDLs by first filtering the database to include only those studies whose reported mean annual rainfall was between 40 and 51 inches per year. From the remaining studies, total phosphorus values were selected based on best professional judgement for eight land uses categories.

The sources incorporated in the database include a variety of governmental and non-governmental documents. All values used to develop the database and the total phosphorus values in this document are included in the below reference list.

Export Coefficient Database Reference List

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Appendix B: Tier A Municipalities

NJPDES Permit Number	Municipality	Discharge Type	Stream Segment	Additional Measures
NJG0150070	Tinton Falls Boro	Tier A	Shark River	Low phosphorus ordinance
NJG0153214	Wall Twp	Tier A	Shark River	Low phosphorus ordinance
NJG0150631	Neptune Twp	Tier A	Shark River	Low phosphorus ordinance
NJG0151564	Colts Neck Twp	Tier A	Shark River	Low phosphorus ordinance
NJG0153940	Howell Twp	Tier A	Shark River/Metedeconk River North Branch	Low phosphorus ordinance
NJG0150797	Freehold Twp	Tier A	Metedeconk River North Branch	Low phosphorus ordinance
NJG0150665	Jackson Twp	Tier A	Metedeconk River North Branch	Low phosphorus ordinance
NJG0153532	Millstone Twp	Tier A	Metedeconk River North Branch	Low phosphorus ordinance

Appendix C: Total Phosphorus Sampling Data

Water Quality Sample Locations	Site ID	Date	Result (mg/L)
Shark River Brook at Shark River Station Rd. in Tinton Falls	30	10/22/1996	0.13
		3/25/1997	0.2
		10/29/1997	0.11
		2/23/1998	0.05
		5/27/1998	0.06
		10/27/1998	0.14
		3/9/1999	0.08
		10/19/1999	0.105
		3/14/2000	0.05
		10/24/2000	0.152
		3/27/2001	0.05
		10/23/2001	0.14
		3/26/2002	0.12
		10/17/2002	0.04
		3/26/2003	0.09
		9/17/2003	0.14
		6/23/2004	0.18
		12/8/2004	0.15
Shark River at Neptune	01407750, EWQ0482	2/25/1987	0.04
		3/24/1987	0.02
		6/24/1987	0.053
		7/30/1987	0.04

		8/19/1987	0.06
		10/29/1987	0.09
		1/26/1988	0.02
		5/10/1988	0.054
		6/21/1988	0.066
		7/14/1988	0.085
		8/17/1988	0.051
		10/12/1988	0.02
		2/14/1989	0.13
		3/2/1989	0.08
		6/14/1989	0.12
		7/19/1989	0.06
		8/31/1989	0.11
		10/4/1989	0.08
		2/7/1990	0.1
		4/24/1990	0.04
		5/25/1990	0.07
		7/17/1990	0.06
		8/20/1990	0.06
		10/29/1990	0.02
		2/11/1991	0.02
		4/9/1991	0.06
		6/12/1991	0.09
		11/08/2000	0.015
		01/18/2001	0.06

		04/04/2001	0.015
		10/24/2001	0.015
		01/08/2002	0.015
		06/06/2002	0.204
		08/19/2002	0.085
		10/6/2003	0.065
Metedeconk R N Br at Jackson Mills Rd in Freehold	6	10/1/1996	0.12
		3/3/1997	0.07
		10/7/1997	0.14
		2/3/1998	0.04
		5/5/1998	0.12
		10/13/1998	0.10
		3/2/1999	0.09
		10/5/1999	0.233
		3/7/2000	0.06
		10/3/2000	0.11
		3/14/2001	0.27
		10/30/2001	0.31
		3/5/2002	3.76
		10/1/2002	0.03
		3/18/2003	0.05

		9/9/2003	0.07
		6/10/2004	0.20
		12/16/2004	0.08

Appendix D : Summary Outputs from the Regression Analysis

Shark River Brook at Shark River Station Rd. in Tinton Falls (30)

SUMMARY OUTPUT FOR EXCEEDANCES AT SHARK RIVER IN TINTON FALLS

Regression Statistics	
Multiple R	0.993804819
R Square	0.987648017
Adjusted R Square	0.887648017
Standard Error	0.722239093
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	417.0878207	417.0878207	799.586632	4.20812E-10
Residual	10	5.21629307	0.521629307		
Total	11	422.3041137			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.719155582	0.019667678	36.56535253	5.5663E-12	0.675333257	0.762977907

Shark River near Neptune (01407750,EWQ0482)

SUMMARY OUTPUT FOR EXCEEDANCES AT SHARK RIVER NEAR NEPTUNE

Regression Statistics	
Multiple R	0.88171307
R Square	0.777417938
Adjusted R Square	0.444084604
Standard Error	5.316680825
Observations	4

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	296.1875695	296.1875695	10.47817505	0.083637543
Residual	3	84.801285	28.267095		
Total	4	380.9888545			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	0.863195762	0.14147666	6.101329815	0.008845356	0.412953467	1.313438057

Metedeconk River N Br at Jackson Mills Rd in Freehold (6)

SUMMARY OUTPUT FOR EXCEEDANCES AT METEDECONK RIVER N BR AT JACKSON MILLS RD

Regression Statistics	
Multiple R	0.851755278
R Square	0.725487054
Adjusted R Square	0.582629911
Standard Error	5.483832976
Observations	8

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	556.3310688	556.3310688	18.49970813	0.00508651
Residual	7	210.5069687	30.0724241		
Total	8	766.8380375			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A
X Variable 1	1.07412655	0.14301511	7.510580868	0.000136088	0.735949794	1.412303306

Appendix E Methodology for Applying Percentage reductions to Land Use Loadings

The outputs of the FIRE method establish a percent reduction needed to meet the target load (that which will attain the applicable SWQS) and a margin of safety. These values are then applied to the existing land use loadings within the impaired streamshed to determine the load allocations for various land uses.

Existing loads are determined as follows. GIS is used to determine the area in acres of each of the land uses in the impaired watershed. The loading coefficients identified in the TMDL report are applied to the acres of land use to calculate an existing load for each land use in the impaired streamshed. Existing loads for point sources, other than stormwater point sources (essentially, wastewater treatment plants), if any, in the impaired streamshed are calculated using the average flow and concentration data from the discharge monitoring reports for the facilities. This load is added to the existing TP load calculated from land use.

To calculate the overall target load the percent reduction (the difference between the target load and the exceedance regression) as determined through FIRE is applied to the total existing load. The load associated with the margin of safety as determined through FIRE (the difference between the 95% confidence interval and the exceedance regression) is then removed from the overall target load (target loading line), leaving a reduced amount of loading now available to allocate. The load from any discharges is determined by taking the full permitted flow and assigning an effluent concentration. This load is also removed from the potential allocable load leaving a further reduced amount of allocable load for land uses.

There are a number of land uses from which a reduction in current load cannot be taken. These land uses include Forest, Water, Wetlands, and Barren land. The current loads for these land uses as calculated for existing load are carried over entirely as a component of the future load allocations. Therefore, for these land uses, the existing load and future load are equal. The sum of the non-reduceable land use loads is then removed from the reduced allocable land use load leaving the final allocable land use load to be allocated among the land uses that are amenable to load reduction (urban and agricultural). This final allocable land use load is then applied to each land use category in proportion to the amount of each land use in the watershed.

The final percent reduction is calculated by comparing the final WLA or LA for each land use to the existing loads of those land uses. Because of the adjustments made in removing the loads associated with the MOS, the non-reduceable land uses, and discharges, the percent reduction associated with the final allocable land use load is higher than that which appears as an output to FIRE.

Example:

Land- Use	**Existing Load**	**Percent Reduction**	**Allocation**
Agriculture	100	88.85%	11.15

Barren	15	0%	15.00
Commercial	300	88.85%	33.45
Forest	125	0%	125.00
Low Density	40	88.85%	4.46
High Density	250	88.85%	27.88
Other Urban	15	88.85%	1.67
Water	100	0%	100.00
Wetlands	30	0%	30.00
Discharger A	25	0%	25.00
MOS			95.87
TOTAL	**1000**		**469.5**

Output from FIRE

Margin of Safety		**= 20.42%**
Target Loading		**= 46.95%**

Target Load

Target Load = 0.4695 * Existing Load
= 0.4695 * 1000
Target Load = 469.5 lb/yr

Margin of Safety

MOS = 0.2042* Target Load
= 0.2042* 469.5 lb/yr
= 95.87 lb/yr

Allocable Load

AL = Target Load – MOS
= 469.5 –95.87
= 373.63 lb/yr

Allocable Land Use Load

ALUL = AL- Future Discharge Load
= 373.6 – 25
= 348.63 lb/yr

SUM of Non Reducable Land Use Loads

Non Reduceable Land use Load = Existing Forest + Water & Wetlands Load + Barren Land Load
= 125 + 100 + 30 + 15
= 270 kg/yr

Final Allocable Land use Load

Final Allocable Land use Load = Allocable Land use Load – Non Reduceable Land use Load
= 348.6 – 270
= 78.6 lb/yr

Final Percent Reduction

Final Percent Reduction = 1 – (Final allocable Land use load / Sum of existing load of reducable land uses)
= 1 – (78.6/ 15+250+40+300+100)
= 1 – (78.6/705)
= 0.8885
= 88.85 %