Stormwater Pollution Prevention Plan

Moorestown Township

Burlington County

NJPDES # NJG 0150215

August 14, 2019

SPPP Table of Contents

SPPP Form 1 – SPPP Team Members

All records must be available upon request by NJDEP.

Stormwater Program Coordinator (SPC)	
Print/Type Name and Title	Thomas Neff, Township Manager
Office Phone # and eMail	856-235-0912 x 3003
Signature/Date	
Individual(s) Responsible for Major Development Project Stormwater Management Review	
Print/Type Name and Title	Anthony Zappasodi, Director of Community Development
Print/Type Name and Title	Chet Dawson, Environmental Advisory Committee
Print/Type Name and Title	Christopher Noll, Board Engineer
Print/Type Name and Title	
Print/Type Name and Title	
Other SPPP Team Members	
Print/Type Name and Title	Patrica Hunt, RMC - Clerk
Print/Type Name and Title	Karen Davis, Local Education Coordinator
Print/Type Name and Title	Douglas Nims, Director of Public Works
Print/Type Name and Title	

SPPP Form 2 – Revision History

All records must be available upon request by NJDEP.

	Revision Date	SPC Initials	SPPP Form Changed	Reason for Revision
1.	4/20/17		All	
2.	8/14/2019		All	Updated to Comply with new Tier A permit
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SPPP Form 3 – Public Involvement and Participation Including Public Notice

All records must be available upon request by NJDEP.

1. Website URL where the Stormwater Pollution Prevention Plan (SPPP) is posted online:	https://www.moorestown.nj.us/152/Community-Development
2. Date of most current SPPP:	Aug 14, 2019
3. Website URL where the Municipal Stormwater Management Plan (MSWMP) is posted online:	https://www.moorestown.nj.us/152/Community-Development
4. Date of most current MSWMP:	Sep 1, 2007
5. Physical location and/or website URL where associated municipal records of public notices, meeting dates, minutes, etc. are kept:	http://www.moorestown.nj.us/
6. Describe how the permittee complies with applicable state and local public notice requirements when providing for public participation in the development and implementation of a MS4 stormwater program:	
For meetings where public notice is required under the Open Public Meetings Act, N.J.S.A. 10:4-6, et seq., Moorestown Township provides public notice in a manner that complies with the requirements of N.J.S.A. 40:49-1 et seq., Moorestown Township complies with those requirements. In all respects, those statutes require written notice of the activity to be taken by the Township be published in a newspaper of general circulation in the community.	

SPPP Form 4 – Public Education and Outreach

All records must be available upon request by NJDEP.

1. Describe how public education and outreach events are advertised. Include specific websites and/or physical locations where materials are available.
All public education and outreach events are advertised on the Township website at www.moorestown.nj.us. Local ordinances for Illicit connections, pet waste disposal, prohibiting wildlife feeding, litter control, leaves in the street, etc. twice a year on the front page of the website under "recent news" and the Township Facebook page. Events for volunteer storm drain cleaning; STEM (save the environment of moorestown) steps out day; Autumn in Moorestown and Moorestown Day; where publications on stormwater management/control are handed out and displays for protecting the environment are also published on the township website and facebook pages.
2. Describe how businesses and the general public within the municipality are educated about the hazards associated with illicit connections and improper disposal of waste.
The public is educated about the hazards associated with illicit connections and improper disposal of waste via the following items posted on the Township website and Facebook pages. Stormwater Pollution Prevent Plan http://www.moorestown.nj.us/DocumentCenter/View/2066/Stormwater-Pollution-Prevention-Plan---updated-4-20-17?bidId= Environmentally Friendly Tips http://www.moorestown.nj.us/DocumentCenter/View/3164/Environmentally-Friendly-Tips?bidId=
3. Indicate where public education and outreach records are maintained.
All public education and outreach materials are kept with the SPPP and are attached.

Attachment B – Points System for Public Education and Outreach Activities

The Tier A Municipality shall implement a Public Education and Outreach Program that focuses on educational and pollution prevention activities about the impacts of stormwater discharges on surface water and groundwater and to involve the public in reducing pollutants in stormwater runoff and mitigating flow.

The Tier A Municipality shall **annually** conduct educational activities that total at least **12 points** and include activities from at least three of the five categories found below. At a minimum, at least one of the activities shall involve educating businesses and the general public of hazards associated with illicit connections and improper disposal of waste. Each approved activity is listed below with an assigned point value. Additional information on how to conduct these Public Education and Outreach activities can be found under Notes and Definitions Part IV.A.3 and 4 of this Tier A MS4 NJPDES permit. Records shall be kept necessary to demonstrate compliance with this requirement, including date of activities and any other relevant documentation.

Category 1: General Public Outreach		
Activity	**Description**	**Points**
Website and Social Media	Maintain a stormwater related page on the municipal website or on a municipal social media site. The web page may include links to other stormwater related resources, including the NJDEP stormwater website (www.njstormwater.org).	1
Newspaper Ad	Use Department created and approved stormwater education materials available on www.cleanwaternj.org to publish an ad in a newspaper or newsletter that serves the municipality.	1
Radio/Television	Broadcast a radio or television public service announcement from www.cleanwaternj.org on a local radio or municipal public service channel.	1
Green Infrastructure Signage	Post signs at municipally-owned green infrastructure sites that describe the function and importance of the infrastructure, contact phone number, municipal identification number, and/or website for more information. *New signs receive 0.5 credits per sign. Existing signs that are maintained or upgraded receive 0.25 credits per sign. A maximum of 5 credits are allowed.	5*
Billboard/Sign	Produce and maintain (for credit in subsequent years) a billboard or sign which can be displayed on a bus, bus stop shelter, recreation field (outfield sign), or other similar public venue.	2
Mural	Produce and maintain (for credit in subsequent years) the planning and painting of a stormwater pollution themed mural, storm drain art or other artwork at a local downtown/commercial area or other similar public venue.	2
Stormwater Facility Signage	Post signs at municipally-owned stormwater management basins or other structural stormwater related facilities that describe the function and importance of the facility, contact phone number, municipal identification number, and/or website for more information. *New signs receive 0.5 credits per sign. Existing signs that are maintained or upgraded receive 0.25 credits per sign. A maximum of 5 credits are allowed.	5*

Category 2: Targeted Audiences Outreach		
Activity	**Description**	**Points**
Stormwater Display	Present a stormwater related display or materials at any municipal event (e.g., Earth Day, town picnic), at the municipal building or other similar public venue.	1
Promotional Item	Distribute an item or items with a stormwater related message (e.g., refrigerator magnets, temporary tattoos, key chains, bookmarks, pet waste bag dispensers, coloring books, and pens or pencils). Municipality must initially have available a minimum number of the items equal to 10% of the municipal population.	2
Mailing or e-Mailing Campaign	Provide information to all known owners of stormwater facilities not owned or operated by the municipality (i.e., privately owned) highlighting the importance of proper maintenance of stormwater measures. For assistance, see information at www.nj.gov/dep/stormwater/maintenance_guidance.htm.	3
Mailing or e-Mailing Campaign	Distribute any of the Department's educational brochures, tip cards, or a municipally produced equivalent (e.g., community calendar, newsletter, or recycling schedule) via a mailing to every resident and business in the municipality.	2
Ordinance Education	Distribute a letter or e-mail from the mayor or municipal official to every resident and business in the municipality highlighting the requirements and environmental benefits of the Pet Waste, Wildlife Feeding, Litter Control, Improper Disposal of Waste, Containerized Waste/Yard Waste Collection, Private Storm Drain Inlet Retrofitting and Illicit Connection ordinances. Provide a link to the municipal website where subject ordinances are posted.	3

Category 3: School / Youth Education and Activities		
Activity	**Description**	**Points**
School Presentations	Provide water-related educational presentation(s) and/or activities to local preschool, elementary, middle, and/or high school classes using municipal staff or local partner organizations. Topics could include stormwater, nonpoint source pollution, watersheds, water conservation and water quality. For ideas, see information at www.nj.gov/dep/seeds. *Presentations receive 1 credit per presentation, with a maximum of 5 credits allowed.	5*
Water Education Workshops	Provide water-related professional development workshops for local teachers from a registered NJ Department of Education Professional Development Provider.	2
Storm Drain Labeling	Organize a project to label and/or maintain storm drain labels (that are not already precast with a message) with a scout troop, local school district, or faith based group, or other community youth group for a minimum of 40 labels. This project could also include stenciling over precast labels to improve legibility.	3
Educational Contest for Schools	Organize an educational contest with a local school district or a local community organization serving youth to design a poster, magnet, rain stick, rain barrel or other craft/art object. Contest themes shall have an appropriate stormwater message. Winning entries are to be displayed at publicly accessible locations within the municipality such as at the town hall, library, post office, or school. The winning design should be shown on the municipality's website or social media site, if practical.	3
AmeriCorps Event	Coordinate an event (e.g. volunteer stream monitoring, educational presentations, or stormwater awareness project) through AmeriCorps NJ Watershed Ambassador Program	4
Clean-up	Sponsor or organize a litter clean up for a scout troop, local school district, faith based group or other community youth group along a local waterway, public park, stormwater facility, or in an area with storm drains that discharge to a local lake or waterway.	3

Category 4: Watershed/Regional Collaboration		
Activity	**Description**	**Points**
Regional Stormwater Collaboration	Participate in a regional stormwater, community collaborative or other watershed-based group on a regular basis to discuss impaired waterbodies, TMDLs, regional stormwater related issues, or watershed restoration plans that address those waterbodies. Evaluate, develop and implement remedies that resolve stormwater-related issues within the affected waterbody or watershed.	3
Green Infrastructure Workshop	Organize or participate in a rain barrel, rain garden or other green infrastructure workshop on a regional or watershed basis. This could be a partnership exercise with a local watershed organization, utility, university, school, youth/faith based group, and/or other organization.	3
Community Activity	Organize or participate in the organization of a regional or watershed based event to carry out stormwater activities such as stormwater facility maintenance or litter clean-up. The municipality may identify and enter into a partnership agreement with a local group such as a watershed organization, utility, university, school, youth/faith based group, and/or other organization to carry out these activities.	3

Category 5: Community Involvement Activities		
Activity	**Description**	**Points**
Volunteer Stormwater Assessment or Stream Monitoring	Establish a volunteer stormwater facility assessment (inspection, inventory and/or mapping) or stream monitoring program for a waterbody within the municipality in order to gauge the health of the waterway through chemical, biological or visual monitoring protocols. Contact NJDEP's AmeriCorps NJ Watershed Ambassador Program or review USEPA National Directory of Volunteer Monitoring Programs.	3
Rain Barrel Workshop	Organize or participate in a rain barrel workshop. This could be a partnership exercise with a local watershed organization, university, school, youth/faith based group, and/or other nonprofit.	3
Rain Garden Workshop	Organize or participate in a rain garden training or installation workshop. This could be a partnership exercise with a local watershed organization, university, school, youth/faith based group, and/or other nonprofit.	3
Community Event	Organize or participate in the organization of a community event to carry out stormwater activities such as stormwater measure maintenance or a stream buffer restoration. The municipality may identify and enter into a partnership agreement with a local group such as a watershed organization, university, utility, school, youth/faith based group, and/or other nonprofit to carry out these activities.	3
Community Involvement	Organize a project with a local organization to create and post signs at either green and/or gray stormwater infrastructure sites or facilities that describe the function and importance of the facility, contact phone number, municipal identification number, and/or website for more information. *Signs receive 0.5 credits per sign. A maximum of 5 credits are allowed.	5*

Angelique Tucker

From: Kenneth Shine
Sent: Wednesday, April 24, 2019 3:16 PM
To: Angelique Tucker
Subject: FW: NJDEP Annual Report and Certification (due May 1)

Follow Up Flag: Follow up
Flag Status: Flagged

See below.
How's it look?
Let me know what you think.

Kenneth Shine, Assoc. DBIA, CFM

Pennoni
515 Grove Street, Suite 1B | Haddon Heights, NJ 08035
Direct: +1 (856) 656-2890 | **Mobile:** +1 (609) 820-5803
www.pennoni.com | KShine@Pennoni.com

From: Karen Daily <kdaily@moorestown.nj.us>
Sent: Wednesday, April 24, 2019 9:17 AM
To: Kenneth Shine <KShine@Pennoni.com>
Cc: Thomas Neff <tneff@moorestown.nj.us>; Douglas Nims <dnims@moorestown.nj.us>; Anthony J. Zappasodi <azappasodi@moorestown.nj.us>
Subject: RE: NJDEP Annual Report and Certification (due May 1)

See my responses below.

Karen Daily, Admin. Asst.
Township Manager's Office
Township of Moorestown
856-914-3001

From: Kenneth Shine [mailto:KShine@Pennoni.com]
Sent: Tuesday, April 23, 2019 12:15 PM
To: Karen Daily <kdaily@moorestown.nj.us>
Cc: Thomas Neff <tneff@moorestown.nj.us>; Douglas Nims <dnims@moorestown.nj.us>
Subject: NJDEP Annual Report and Certification (due May 1)

Hi Karen
I know you can answer some of the questions posed by NJDEP for the report. Hopefully you can answer all of them. If not, please let me know who you think I'd be best to contact. Thanks!

<u>Public Involvement and Participation (I also posed this one to Tony)</u>

- Can the MSWMP be accessed online? Where? – Stormwater Pollution Prevention Plan is found on the Department of Community Development's home page. Link attached for your convenience. http://www.moorestown.nj.us/DocumentCenter/View/2066/Stormwater-Pollution-Prevention-Plan---updated-4-20-17?bidId=

Local Public Education and Outreach

- Report number of points obtained in each public education and outreach category in 2018:
  - General Public Outreach – **Website & Social Media 1 pt.**
    Stormwater Display 1 pt. (Moorestown Day, STEM steps Out Day)
    Mailing or emailing 2 pts. (Community Calendar, Recycling Schedules sent out with tax bills annually)
    Ordinance/Education 3 pts. (Pet Waste, Wildlife Feeding, Litter Control, Improper Disposal of Waste, Containerized Waste/Yard Waste, posted on Website 2 times/year)
  - Targeted Audiences Outreach – Residents / Students / Visitors
  - School/Youth Education and Activities – Sustainable Moorestown Green Team visits each school at least 1 time/year to educated students on protecting our environment; litter control; pollution control; water conservation and quality water. Six schools visited **5 pts**.
  - Watershed/Regional Collaboration – **Americorps (Volunteer Events) 4 pts.**
    Clean-ups 3 pts. STEM and the Environmental Advisory Committee host clean ups 2 x per year at all of our Open Space areas and Streams leading to creeks. They work with local volunteer groups to pick up litter, walk the creeks to make sure nothing is blocking the flow and help DPW inspect storm drains to streams for flow.
    Regional Stormwater Collaboration 3 pts. Our Environmental Advisory Committee reviews all plans for Stormwater related issues. They offer remedies that resolve Stormwater related issues prior to building application approvals are given.
  - Community Involvement Activities – **Community Activity 3 pts.** Save the Environment of Moorestown (STEM) work with many volunteer organizations (Scout troops, AEGIS, Republic Bank, TD Bank, Lockheed Martin) to clean up streams and remove litter and debris from open space areas which may obstruct drains to streams.
    Community Events (category 5) 3 pts. Strawbridge Lake Beautification Committee has many clean ups through the year to protect the stream buffers and restore vegetation that may need attention.
- Has the municipality advertised public education and outreach activities on the website? STEM has a newsletter that is published 4 x / year that is sent to all residents, advertising their clean ups and who to contact if interested. We also have a pool of volunteers that we reach out to when an urgent clean up need has been received.

Community Wide Ordinances

- Does the municipality maintain a database to track all instances of community wide ordinance violations? – Community Development has a program "govpilot" that may have that capability. I do not use it, so I am not familiar with that program.
- Number of warnings and violations for all ordinances listed in SP3 – Community Development may have this information
- Method of enforcement (Annual Report) – DPW or CD may have this information. ☺

Thanks,
Ken

Kenneth Shine, Assoc. DBIA, CFM

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Direct: +1 (856) 656-2890 | **Mobile:** +1 (609) 820-5803
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PARTNERS FOR WHAT'S POSSIBLE

South Central Park

Public Education Records (Website)

Public Education Records (Newspaper)

Public Education Records (Billboard/Sign)

Public Education Records
(Stormwater Display)

Public Education Records (Promotional Item)

Public Education Records
(Mailing Campaign)

Public Education Records
(Clean-up)

NJDEP Brochures for Annual Distribution

SPPP Form 5 – Post-Construction Stormwater Management in New Development and Redevelopment Program

All records must be available upon request by NJDEP.

1. How does the municipality define 'major development'?
Major development is defined in the Stormwater Management Ordinance (attached) as "any develoment that provides for ultimately disturbing one or more acres of land or increasing an impervious surface by one-quarter acre or more."
2. Does the municipality approach residential projects differently than it does for non-residential projects? If so, how?
Our Planning and Zoning Boards presently assure that all new residential development and redevelopment projects that are subject to the RSIS for stormwater management, including the NJDEP Stormwater Management rules, N.J.A.C 7:8, referenced in those standards) are in compliance with those standards before issuing preliminary and final subdivision or site plan approvals under the Municipal Land Use Law. Stormwater from non-residential and redevelopment projects is controlled by our Planning and Zoning Boards and code enforcement officer, through administration of our ordinances. Where it is necessary to implement the municipal stormwater management plan, the approve ordinance also controls aspects of residential development and redevelopment projects that are not subject to the RSIS.
3. What process is in place to ensure that municipal projects meet the Stormwater Control Ordinance?
Moorestown assures adequate long-term operation and maintenance of BMP's for any new development or redevelopment projects constructed on municipal property by requiring a project maintenance plan similar to the maintenance plan described in our ordinance, and by requiring and funding the implementation of that plan. Moorestown will assure adequate long-term operation as well as preventative and corrective maintenance (including replacement) of BMP's. We require any storm drain inlets that we install to comply with the design standards in Attachment C of our permit.

4. Describe the process for reviewing major development project applications for compliance with the Stormwater Control Ordinance (SCO) and Residential Site Improvement Standards (RSIS). Attach a flow chart if available.
1) Applicant submits project to Township Board who in turn gives it to the Board Engineer. 2) Board Engineer reviews it and provides comments to the designer. 3) Designer makes revisions and resubmits and repeats as necessary. 4) After final revisions are made, then the project will be approved. 5) After approval, Township Engineer inspects installation of improvements to ensure they conform with the approved plan.

5. Does the Municipal Stormwater Management Plan include a mitigation plan?	Yes
6. What is the physical location of approved applications for major development projects, Major Development Summary Sheets (permit att. D), and mitigation plans?	Moorestown Town Hall 111 West Second Street Moorestown, NJ 08057

Major Development Stormwater Summary (Attachment D)

Attachment D – Major Development Stormwater Summary

General Information

1. Project Name:
2. Municipality: County: Block(s): Lot(s):
3. Site Location (State Plane Coordinates – NAD83): E: N:
4. Date of Final Approval for Construction by Municipality:
   Date of Certificate of Occupancy:
5. Project Type (circle all that apply):
   Residential Commercial Industrial Other (please specify) ____________________
6. Soil Conservation District Project Number:
7. Did project require NJDEP Land Use Permit? Yes No Land Use Permit #:
8. Did project require the use of any mitigation measures? Yes No
   If yes, which standard was mitigated?

Site Design Specifications

1. Area of Disturbance (acres): Area of Proposed Impervious (acres):
2. List all Hydrologic Soil Groups:
3. Please Identify the Amount of Each Best Management Practices (BMPs) Utilized in Design Below:
   Bioretention Systems ___ Constructed Wetlands ___ Dry Wells ___ Extended Detention Basins ___
   Infiltration Basins ___ Combination Infiltration/Detention Basins ___ Manufactured Treatment Devices___
   Pervious Paving Systems ___ Sand Filters ___ Vegetative Filter Strips ___ Wet Ponds ___
   Grass Swales ___ Subsurface Gravel Wetlands ___ Other ____________________

Storm Event Information

Storm Event: Rainfall (inches and duration) 2 yr.: ________________ 10 yr.: ________________
100 yr.: ________________ WQ DS: ________________

Runoff Computation Method (circle one):
NRCS: Dimensionless Unit Hydrograph NRCS: Delmarva Unit Hydrograph Rational Modified Rational
Other: ____________________

Basin Specifications (answer all that apply)
If more than one basin, attach multiple sheets

1. Type of Basin: Surface/Subsurface (circle one)
2. Owner (circle one):
   Public Private: If so, Name: Phone number:
3. Basin Construction Completion Date:
4. Drain Down Time (hr.):
5. Design Soil Permeability (in./hr.):
6. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
7. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
8. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
9. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Comments:____

____

____

Name of Person Filling Out This Form: ________________________ Signature: ________________________

Title: ____ Date: ________________________

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*
10. Type of Basin: Surface/Subsurface (circle one)
11. Owner (circle one): Public Private: If so, Name: Phone number:
12. Basin Construction Completion Date:
13. Drain Down Time (hr.):
14. Design Soil Permeability (in./hr.):
15. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
16. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
17. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
18. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*
19. Type of Basin: Surface/Subsurface (circle one)
20. Owner (circle one): Public Private: If so, Name: Phone number:
21. Basin Construction Completion Date:
22. Drain Down Time (hr.):
23. Design Soil Permeability (in./hr.):
24. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
25. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
26. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
27. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*
28. Type of Basin: Surface/Subsurface (circle one)
29. Owner (circle one): Public Private: If so, Name: Phone number:
30. Basin Construction Completion Date:
31. Drain Down Time (hr.):
32. Design Soil Permeability (in./hr.):
33. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
34. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
35. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
36. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Name of Person Filling Out This Form: ________________________ Signature: ________________________

Title: ____ Date: _________________________

SPPP Form 6 – Ordinances

All records must be available upon request by NJDEP.

Ordinance permit cite IV.B.1.b.iii	Date of Adoption	Website URL	Was the DEP model ordinance adopted without change?	Entity responsible for enforcement
1. Pet Waste permit cite IV.B.5.a.i	11/14/09	:om/13957478?highlight=pet,pet%20waste,waste,was		Police Department and Local Board of Health
2. Wildlife Feeding permit cite IV.B5.a.ii	11/14/09	:om/13957478?highlight=pet,pet%20waste,waste,was		Police Department and Local Board of Health
3. Litter Control permit cite IV.B5.a.iii	11/14/09	w.ecode360.com/13957427?highlight=litter,littering#1		Police Department and Local Board of Health
4. Improper Disposal of Waste permit cite IV.B.5.a.iv	11/14/09	https://www.ecode360.com/13957576		Police Department and Local Board of Health
5. Containerized Yard Waste/ Yard Waste Collection Program permit cite IV.B.5.a.v	11/14/2009	https://www.ecode360.com/13957497		Police Department and Local Board of Health
6. Private Storm Drain Inlet Retrofitting permit cite IV.B.5.a.vi	11/14/2009	https://www.ecode360.com/13957547		Police Department and Local Board of Health
7. Stormwater Control Ordinance permit cite IV.B.4.g and IV.B.5.a.vii	11/12/2009	https://www.ecode360.com/10347194		Police Department and Local Board of Health
8. Illicit Connection Ordinance permit cite IV.B.5.a.vii and IV.B.6.d	11/14/2009	https://www.ecode360.com/13957509		Police Department and Local Board of Health
9. Optional: Refuse Container/ Dumpster Ordinance permit cite IV.E.2	11/14/2009	https://www.ecode360.com/13957526		

Indicate the location of records associated with ordinances and related enforcement actions:

Moorestown Town Hall, Department of Community Development.
Moorestown Police Department.

Pet Waste Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 203. Stormwater Quality

Article I. Pet Waste

§ 203-1. Purpose.

The purpose of this article is to establish requirements for the proper disposal of pet solid waste in the Township of Moorestown, so as to protect public health, safety and welfare, and to prescribe penalties for failure to comply.

§ 203-2. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

IMMEDIATE
The pet solid waste is removed at once, without delay.

OWNER/KEEPER
Any person who shall possess, maintain, house or harbor any pet or otherwise have custody of any pet, whether or not the owner of such pet.

PERSON
Any individual, corporation, company, partnership, firm, association, or political subdivision of this state subject to municipal jurisdiction.

PET
A domesticated animal (other that a disability assistance animal) kept for amusement or companionship.

PET SOLID WASTE
Waste matter expelled from the bowels of the pet; excrement.

PROPER DISPOSAL
Placement in a designated waste receptacle, or other suitable container, and discarded in a refuse container which is regularly emptied by the municipality or some other refuse collector; or disposal into a system designed to convey domestic sewage for proper treatment and disposal.

§ 203-3. Requirement for disposal.

All pet owners and keepers are required to immediately and properly dispose of their pet's solid waste deposited on any property, public or private, not owned or possessed by that person.

§ 203-4. Exemptions.

Any owner or keeper who requires the use of a disability assistance animal shall be exempt from the provisions of this article while such animal is being used for that purpose.

§ 203-5. Enforcement.

The provisions of this article shall be enforced by the Police Department and the Local Board of Health of the Township of Moorestown.

§ 203-6. Violations and penalties.

Any person(s) who is found to be in violation of the provisions of this article shall be subject to a fine not to exceed $100 for the first offense, $200 for the second offense and $400 for the third and subsequent offenses.

Litter Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 103. Property Maintenance

Article I. Clean Communities Program

§ 103-1. Purpose.

[Amended 9-14-2009 by Ord. No. 22-2009; 4-27-2015 by Ord. No. 8-2015[1]]
The purpose of this article is designed to protect the public safety, health and general welfare of the residents of Moorestown by establishing minimum standards governing appearance, condition and occupancy of residential and nonresidential premises; to avoid, prevent and eliminate the maintenance or creation of hazards to the public; to prevent the creation, continuation, extension or aggregation of blight; to prevent and eliminate conditions on property which constitute nuisances and potential dangers to the life, health or safety of persons on or near the premises on which such conditions exist; to establish minimum standards governing the maintenance and condition of land and premises within the Township; to fix responsibility and duties upon owners, lessees, lending institutions, mortgage holders, operators and occupants of property; and to provide for enforcement, administration and for penalties. The Township further finds that the reduction of litter upon public or private property is an important concern and is necessary to implement its own requirements, as well as the requirements of the New Jersey Department of Environmental Protection's Clean Communities Program.

[1] *Editor's Note: This ordinance also changed the title of this chapter from "Littering" to "Property Maintenance."*

§ 103-2. Definitions.

[Amended 9-14-2009 by Ord. No. 22-2009]
As used in this article, the following terms shall have the meanings indicated:

FRONT YARD
That space on the same lot with a principal building situated between the front street line or lines and the front line of the building projected to the side property lines. The depth of the front yard shall be measured along a line perpendicular to the front street from the point furthest to the foundation of the structure or building furthest from such street line.

INFESTATION
The presence of insects, rodents, vermin or other pests on the premises which constitute a health hazard.

LITTER
Any used or unconsumed substance or waste material which has been discarded, whether made of aluminum, glass, plastic, rubber, paper or other natural or synthetic material or any combination thereof, including but not limited to any bottle, jar or can or any top, cap or combination thereof, including but not limited to any bottle, jar or can or any top, cap or detachable tab of any bottle, jar or can, any unlighted cigarette, cigar, match or any flaming or glowing material or any garbage, trash, refuse, debris, rubbish, grass clippings or other lawn or garden waste, newspaper, magazines, glass, metal, plastic or paper containers or other packaging or construction material, but does not include the waste of the primary processes of tree farming, farming or manufacturing.

LITTER RECEPTACLE

A container suitable for the depositing of litter.

NUISANCE

The following conditions, individually or in combination:

A. Any public or private condition that would constitute a nuisance according to the statutes, laws and regulations of the State of New Jersey, its governmental agencies or the ordinances of the Township of Moorestown.

B. Any condition existing in or on the exterior of any premises which is potentially dangerous, detrimental or hazardous to the life, health or safety of persons near or passing within the proximity of the premises on which such condition exist.

C. Any premises which are unsanitary or which container litter, refuse, rubbish or garbage or which have an uncontrollable growth of weeds, shrubs, trees or vegetation injurious to the health and safety of persons at, adjacent to, adjoining or passing by the premises.

D. Any growth of grass or weeds which exceeds six inches when measured from the ground to the top of the growth.

OCCUPANT

Any person residing, living or sleeping in or on the premises or having actual possession or use of the premises or any part thereof, whether or not the owner thereof, and regardless of the duration of time of such possession or use.

OPERATOR

Any person, persons or entity who is not the owner, but who has charge, care or control of a premises or part thereof with or without the knowledge, consent or authority of the owner.

OWNER

Shall include the title holder, any agent of the title holder having authority to act with respect to a vacant property, any foreclosing entity subject to the provisions of N.J.A.C. 46:10B-51 (P.L. 2008, c. 127, Sec. 17 as amended by P.L. 2009, c. 296), or any other entity determined by the Township to have authority to act with respect to the property.
[Amended 4-27-2015 by Ord. No. 8-2015]

PREMISES

A lot, plot or parcel of land, including the buildings or structures thereon.

REAR YARD

The required open space, the full width of the lot, extending along the rear boundary line or property line of the lot; provided, however, that the following encroachments are permitted: overhanging eaves, gutters or cornices, steps and the exterior portion of a chimney foundation, limited to a maximum encroachment of 36 inches in depth.

SIDE YARD

The required open space from the front yard to the rear yard on the lot extending along the side boundary line or property line of the lot; provided, however, that the following encroachments are permitted: overhanging eaves, gutters or cornices, steps and the exterior portion of a chimney foundation, limited to a maximum encroachment of 36 inches in depth.

VACANT PROPERTY

Any building used or to be used as a residence which is not legally occupied or at which substantially all lawful construction operations or residential occupancy has ceased, and which is in such condition that it cannot legally be reoccupied without repair or rehabilitation, including but not limited to any property meeting the definition of abandoned property in N.J.S.A. 55:19-80; provided, however, that any property where all building systems are in working order, where the building and grounds are maintained in good order, or where the building is in habitable condition,

and where the building is being actively marketed by its owner for sale or rental, shall not be deemed a vacant property for purposes of this article.
[Added 4-27-2015 by Ord. No. 8-2015]

§ 103-5. Littering unlawful.

It shall be unlawful for any person to throw, drop, discard or otherwise place litter of any nature upon any public or private property, other than in a litter receptacle.

§ 103-6. Use of receptacles.

Litter receptacles and their servicing are required at the following public places which exist in the municipality, including: sidewalks used by pedestrians in active retail commercially zoned areas, such as that, at a minimum, there shall be no single linear quarter-mile without a receptacle; buildings held out for use by the public, including schools and government buildings; parks, drive-in restaurants; all street vendor locations; self-service refreshment areas; construction sites; gasoline service station islands; shopping centers; parking lots; and at special events to which the public is invited, including sporting events, parades, carnivals, circuses and festivals. The proprietors of these places or the sponsors of these events shall be responsible for providing and servicing the receptacles so that adequate containers are available.

§ 103-7. Unlawful dumping.

It shall be unlawful for any person to discard or dump along any street or road, on or off any right-of-way, any household or commercial solid waste, rubbish, refuse, junk, vehicle or vehicle parts, rubber tires, appliances, furniture, or private property, except by written consent of the owner of said property, in any place not specifically designated for the purpose of solid waste storage or disposal.

§ 103-8. Storage of household solid waste.

It shall be unlawful for any property owner to store or permit the storage of any bulky household waste, including but not limited to household appliances, furniture and mattresses, except in a fully enclosed structure.

§ 103-9. Storage of tires.

It shall be unlawful for any property owner to store or to permit the storage of tires on a residential property, except in a fully enclosed structure.

§ 103-10. Storage and parking of vehicles.

It shall be unlawful for any property owner to park or permit the parking of any motor vehicle on his or her residential lawn.

§ 103-11. Construction sites.

It shall be unlawful for any owner, agent or contractor in charge of a construction or demolition site to permit the accumulation of litter before, during or after completion of any construction or demolition project. It shall be the duty of the owner, agent or contractor in charge of a construction site to furnish containers adequate to accommodate flyable or nonflyable debris or trash at areas convenient to construction areas and to maintain and empty the receptacles in such a manner and with such a frequency as to prevent spillage or refuse.

§ 103-12. Open and overflowing waste disposal bins.

It shall be unlawful for any residential or commercial property owner to permit open or overflowing waste disposal bins on his or her property.

§ 103-13. Sweeping and deposits in gutters and streets.

It shall be the duty of the owner, lessee, tenant, occupant or person in charge of any structure to keep and cause to be kept the sidewalk and curb abutting the building or structure free from obstruction or nuisances of every kind and to keep sidewalks, areaways, backyards, courts and alleys free from litter and other offensive material. No person shall sweep into or deposit in any gutter, street, catch basin or other public place any accumulation of litter from any public or private sidewalk or driveway. Every person who owns or occupies property shall keep the sidewalk in front of his premises free of litter. All sweepings shall be collected and properly containerized for disposal.

Improper Waste Disposal Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 203. Stormwater Quality

Article II. Improper Disposal of Waste

§ 203-7. Purpose.

The purpose of this article is to prohibit the spilling, dumping, or disposal of materials other than stormwater into the municipal separate storm sewer system (MS4) operated by the Township of Moorestown, so as to protect public health, safety and welfare, and to prescribe penalties for the failure to comply.

§ 203-8. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by the Township of Moorestown or other public body, and is designed and used for collecting and conveying stormwater.

PERSON
Any individual, corporation, company, partnership, firm, association, or political subdivision of this state subject to municipal jurisdiction.

STORMWATER
Water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, is captured by separate storm sewers or other sewerage or drainage facilities, or is conveyed by snow removal equipment.

§ 203-9. Prohibited conduct.

The spilling, dumping, or disposal of materials other than stormwater into the municipal separate storm sewer system operated by the Township of Moorestown is prohibited. The spilling, dumping, or disposal of materials other than stormwater in such a manner as to cause the discharge of pollutants to the municipal separate storm sewer system is also prohibited.

§ 203-10. Exceptions.

Exceptions to the prohibition shall be:

A. Waterline flushing and discharges from potable water sources.

B. Uncontaminated groundwater (e.g., infiltration, crawl space or basement sump pumps, foundation or footing drains, rising groundwaters).

C. Air-conditioning condensate (excluding contact and noncontact cooling water).

D. Irrigation water (including landscape and lawn watering runoff).

E. Flows from springs, riparian habitats and wetlands, water reservoir discharges and diverted stream flows.

F. Residential car washing water and residential swimming pool discharges.

G. Sidewalk, driveway and street wash water.

H. Flows from fire-fighting activities.

I. Flows from rinsing of the following equipment with clean water:

(1) Beach maintenance equipment immediately following their use for their intended purposes; and

(2) Equipment used in the application of salt and de-icing materials immediately following salt and de-icing applications. Prior to rinsing with clean water, all residual salt and de-icing materials must be removed from equipment and vehicles to the maximum extent practicable using dry cleaning methods (e.g., shoveling and sweeping). Recovered materials are to be returned to storage for reuse or properly discarded.

(3) Rinsing of equipment, as noted in the above situation is limited to exterior, undercarriage, and exposed parts and does not apply to engines or other enclosed machinery.

§ 203-11. Enforcement.

This article shall be enforced by the Police Department and/or other municipal officials of the Township of Moorestown.

§ 203-12. Violations and penalties.

Any person(s) who continues to be in violation of the provisions of this article, after being duly notified, shall be subject to a fine not to exceed $100 for the first offense, $200 for the second offense and $400 for the third and subsequent offenses.

Wildlife Feeding Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 203. Stormwater Quality

Article III. Wildlife Feeding

§ 203-13. Purpose.

The purpose of this article is to prohibit the feeding of unconfined wildlife in any public park or on any other property owned or operated by the Township of Moorestown, so as to protect public health, safety and welfare, and to prescribe penalties for failure to comply.

§ 203-14. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

FEED
To give, place, expose, deposit, distribute or scatter any edible material with the intention of feeding, attracting or enticing wildlife. Feeding does not include baiting in the legal taking of fish and/or game.

PERSON
Any individual, corporation, company, partnership, firm, association, or political subdivision of this state subject to municipal jurisdiction.

WILDLIFE
All animals that are neither human nor domesticated.

§ 203-15. Prohibited conduct.

No person shall feed, in any public park or on any other property owned or operated by the Township of Moorestown, any wildlife, excluding confined wildlife (for example, wildlife confined in zoos, parks or rehabilitation centers, or unconfined wildlife at environmental education centers).

§ 203-16. Enforcement.

A. This article shall be enforced by the Police Department and/or other municipal officials of the Township of Moorestown.

B. Any person found to be in violation of this article shall be ordered to cease the feeding immediately.

§ 203-17. Violations and penalties.

Any person(s) who is found to be in violation of the provisions of this article shall be subject to a fine not to exceed $100 for the first offense, $200 for the second offense and $400 for the third and subsequent offenses.

Yard Waste Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 203. Stormwater Quality

Article IV. Yard Waste Collection Program

§ 203-18. Purpose.

The purpose of this article is to establish a yard waste collection and disposal program in the Township of Moorestown, so as to protect public health, safety and welfare, and to prescribe penalties for the failure to comply.

§ 203-19. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

CONTAINERIZED
The placement of yard waste in a trash can, bucket, bag or other vessel, such as to prevent the yard waste from spilling or blowing out into the street and coming into contact with stormwater.

PERSON
Any individual, corporation, company, partnership, firm, association, or political subdivision of this state subject to municipal jurisdiction.

STREET
Any street, avenue, boulevard, road, parkway, viaduct, drive, or other way, which is an existing state, county, or municipal roadway, and includes the land between the street lines, whether improved or unimproved, and may comprise pavement, shoulders, gutters, curbs, sidewalks, parking areas, and other areas within the street lines.

YARD WASTE
Leaves and grass clippings.

§ 203-20. Yard waste collection.

Sweeping, raking, blowing or otherwise placing yard waste that is not containerized at the curb or along the street is only allowed during the seven days prior to a scheduled and announced collection and shall not be placed closer than 10 feet from any storm drain inlet. Placement of such yard waste at the curb or along the street at any other time or in any other manner is a violation of this article. If such placement of yard waste occurs, the party responsible for placement of the yard waste must remove the yard waste from the street or said party shall be deemed in violation of this article.

§ 203-21. Enforcement.

The provisions of this article shall be enforced by the Department of Public Works.

§ 203-22. Violations and penalties.

Any person(s) who is found to be in violation of the provisions of this article shall be subject to a fine not to exceed $50 for the first offense, $100 for the second offense and $250 for the third and subsequent offenses.

Illicit Connection Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 203. Stormwater Quality

Article V. Illicit Connection

§ 203-23. Purpose.

The purpose of this article is to prohibit illicit connections to the municipal separate storm sewer system(s) operated by the Township of Moorestown, so as to protect public health, safety and welfare, and to prescribe penalties for the failure to comply.

§ 203-24. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

DOMESTIC SEWAGE
Waste and wastewater from humans or household operations.

ILLICIT CONNECTION
Any physical or nonphysical connection that discharges domestic sewage, noncontact cooling water, process wastewater, or other industrial waste (other than stormwater) to the municipal separate storm sewer system operated by the Township of Moorestown, unless that discharge is authorized under a NJPDES permit other than the Tier A Municipal Stormwater General Permit (NJPDES Permit Number NJ0141852). Nonphysical connections may include, but are not limited to, leaks, flows, or overflows into the municipal separate storm sewer system.

INDUSTRIAL WASTE
Nondomestic waste, including, but not limited to, those pollutants regulated under Section 307(a), (b), or (c) of the Federal Clean Water Act [33 U.S.C. § 1317 (a), (b), or (c)].

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by the Township of Moorestown or other public body, and is designed and used for collecting and conveying stormwater.

NJPDES PERMIT
A permit issued by the New Jersey Department of Environmental Protection to implement the New Jersey Pollutant Discharge Elimination System (NJPDES) rules at N.J.A.C. 7:14A.

NONCONTACT COOLING WATER

Water used to reduce temperature for the purpose of cooling. Such waters do not come into direct contact with any raw material, intermediate product (other than heat) or finished product. Noncontact cooling water may, however, contain algaecides, or biocides to control fouling of equipment such as heat exchangers, and/or corrosion inhibitors.

PERSON

Any individual, corporation, company, partnership, firm, association, or political subdivision of this state subject to municipal jurisdiction.

PROCESS WASTEWATER

Any water which, during manufacturing or processing, comes into direct contact with or results from the production or use of any raw material, intermediate product, finished product, by-product, or waste product. Process wastewater includes, but is not limited to, leachate and cooling water other than noncontact cooling water.

STORMWATER

Water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, is captured by separate storm sewers or other sewerage or drainage facilities, or is conveyed by snow removal equipment.

§ 203-25. Prohibited conduct.

No person shall discharge or cause to be discharged through an illicit connection to the municipal separate storm sewer system operated by the Township of Moorestown any domestic sewage, noncontact cooling water, process wastewater, or other industrial waste (other than stormwater).

§ 203-26. Enforcement.

This article shall be enforced by the Department of Public Works and/or other municipal officials of the Township of Moorestown

§ 203-27. Violations and penalties.

Any person(s) who is found to be in violation of the provisions of this article shall be subject to a fine not to exceed $500 for the first offense, $750 for the second offense and $1,500 for the third and subsequent offenses.

Refuse Container/Dumpster Ordinance

Township of Moorestown, NJ
Wednesday, August 28, 2019

Chapter 203. Stormwater Quality

Article VI. Refuse Containers/Dumpsters

§ 203-28. Purpose.

This article requires dumpsters and other refuse containers that are outdoors or exposed to stormwater to be covered at all times and prohibits the spilling, dumping, leaking, or otherwise discharging of liquids, semi-liquids or solids from the aforementioned dumpsters and refuse containers to the municipal separate storm sewer system(s) operated by the Township of Moorestown and/or the waters of the state, so as to protect public health, safety and welfare, and to prescribe penalties for the failure to comply.

§ 203-29. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words, and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains) that is owned or operated by the Township of Moorestown and is designed and used for collecting and conveying stormwater.

PERSON
Any individual, corporation, company, partnership, firm, association, or political subdivision of this State subject to municipal jurisdiction.

REFUSE CONTAINER
Any waste container that a person controls, whether owned, leased, or operated, including dumpsters, trashcans, garbage pails, and plastic trash bags.

STORMWATER
Water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewerage or drainage facilities.

WATERS OF THE STATE
The ocean and its estuaries, all springs, streams and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its

jurisdiction.

§ 203-30. Prohibited conduct.

A. Any person who controls, whether owned, leased, or operated, a refuse container or dumpster must ensure that such container or dumpster is covered at all times and shall prevent refuse from spilling out or overflowing.

B. Any person who owns, leases or otherwise uses a refuse container or dumpster must ensure that such container or dumpster does not leak or otherwise discharge liquids, semi-liquids or solids to the municipal separate storm sewer system(s) operated by the Township of Moorestown.

C. Exceptions to prohibition.

(1) Permitted temporary demolition containers.

(2) Litter receptacles (other than dumpsters or other bulk containers).

(3) Individual homeowner trash and recycling containers.

(4) Refuse containers at facilities authorized to discharge stormwater associated with industrial activity under a valid NJPDES permit.

(5) Containers that hold large bulky items (e.g., furniture, bound carpet and padding).

§ 203-31. Enforcement.

This article shall be enforced by the Police Department and/or other municipal officials of the Township of Moorestown.

§ 203-32. Violations and penalties.

Any person(s) who is found to be in violation of the provisions of this article shall be subject to a fine not to exceed $100 for the first offense, $200 for the second offense and $400 for the third and subsequent offenses.

Retrofitting of Storm Drain Inlets Ordinance

Township of Moorestown, NJ
Monday, August 26, 2019

Chapter 203. Stormwater Quality

Article VII. Private Storm Drain Inlet Retrofitting

§ 203-33. Purpose.

This article requires the retrofitting of existing storm drain inlets which are in direct contact with repaving, repairing, reconstruction, or resurfacing or alterations of facilities on private property in the Township of Moorestown to prevent the discharge of solids and floatables (such as plastic bottles, cans, food wrappers and other litter) to the municipal separate storm sewer system(s) operated by the Township of Moorestown so as to protect public health, safety and welfare, and to prescribe penalties for the failure to comply.

§ 203-34. Definitions; word usage.

A. For the purpose of this article, the following terms, phrases, words, and their derivations shall have the meanings stated herein unless their use in the text of this article clearly demonstrates a different meaning. When not inconsistent with the context, words used in the present tense include the future, words used in the plural number include the singular number, and words used in the singular number include the plural number. The word "shall" is always mandatory and not merely directory.

B. As used in this article, the following terms shall have the meanings indicated:

MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4)
A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains) that is owned or operated by the Township of Moorestown and is designed and used for collecting and conveying stormwater.

PERSON
Any individual, corporation, company, partnership, firm, association, or political subdivision of this state subject to municipal jurisdiction.

STORM DRAIN INLET
An opening in a storm drain used to collect stormwater runoff and includes, but is not limited to, a grate inlet, curb-opening inlet, slotted inlet, and combination inlet.

WATERS OF THE STATE
The ocean and its estuaries, all springs, streams and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its jurisdiction.

§ 203-35. Prohibited conduct.

No person in control of private property (except a residential lot with one single-family house) shall authorize the repaving, repairing (excluding the repair of individual potholes), resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen), reconstructing or altering any surface that is in direct contact with an existing storm drain inlet on that property unless the storm drain inlet either:

A. Already meets the design standard in § **203-36** below to control passage of solid and floatable materials; or

B. Is retrofitted or replaced to meet the standard in § **203-36** below prior to the completion of the project.

§ 203-36. Design standard.

Storm drain inlets identified in § **203-35** above shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For exemptions to this standard, see Subsection C below.

A. Grates.

(1) Either of the following grates shall be used whenever a grate located in pavement or other ground surface is used to collect stormwater from that surface and discharge into a storm drain or surface water body under that grate:

(a) The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or

(b) A different grate, if each individual clear space in that grate has an area of no more than 7.0 square inches, or is no greater than 0.5 inches across the smallest dimension.

(2) Examples of grates subject to this standard include grates in grate inlets, the grate portion (non-curb-opening portion) of combination inlets, grates on storm sewer manholes, ditch grates, trench grates, and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors.

B. Curb-opening inlets shall have a curb opening area of no more than 7.0 square inches, or be no greater than 2.0 inches across the smallest dimension.

C. This standard does not apply:

(1) In new development or redevelopment projects where the municipal engineer determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;

(2) In the retrofitting of existing storm drain inlets where the municipal engineer determines that this standard would cause inadequate hydraulic performance;

(3) Where flows from the water quality storm as specified in N.J.A.C. 7:8 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

(a) A rectangular space 4 5/8 inches long and 1 1/2 inches wide (this option does not apply for outfall netting facilities); or

(b) A bar screen having a bar spacing of 0.5 inch.

(4) Where flows are conveyed through a trash rack that has parallel bars with one-inch spacing between the bars to the elevation of the water quality storm as specified in N.J.A.C. 7:8; or

(5) Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.

§ 203-37. Enforcement.

This article shall be enforced by the Police Department and/or other municipal officials of the Township of Moorestown.

§ 203-38. Violations and penalties.

Any person(s) who is found to be in violation of the provisions of this article shall be subject to a fine not to exceed $250 for each storm drain inlet that is not retrofitted to meet the design standard.

Ordinance Enforcement Log

SPPP Form 7 – Street Sweeping

All records must be available upon request by NJDEP.

1. Provide a written description or attach a map indicating which streets are swept as required by the NJPDES permit. Describe the sweeping schedule and indicate if any of the streets are swept by another entity through a shared service arrangement.
Moorestown Township has evaluated its streets and determines which streets will need to be swept monthly. The only street which meets the required criteria is Main Street. The Business blocks of Main Street and Camden Avenue are swept every 2 weeks. See attached sweeping log.
2. Provide a written description or attach a map indicating which streets are swept that are NOT required to be swept by the NJPDES permit. Describe the sweeping schedule and indicate if any of the streets are swept by another entity through a shared service arrangement.
Moorestown Township sweeps all of its streets once annually and does not partner with another entity through a shared service arrangement.
3. Does the municipality provide street sweeping services for other municipalities? If so, please describe the arrangements.
No
4. Indicate the location of records, including sweeping dates, areas swept, number of miles swept and total amount of wet tons collected each month. Note which records correspond to sweeping activities beyond what is required by the NJPDES permit, i.e., sweepings of streets within the municipality that are not required by permit to be swept or sweepings of streets outside of the municipality.
A daily log of all maintenance is kept at the Department of Public Works. The log will be used to record the date and area swept, as well as the amount of materials collected.

Street Sweeping Log

SPPP Form 7A - Street Sweeping Log

Road Name	# of Miles	Date	Amount of Material Collected

SPPP Form 8 – Catch Basins and Storm Drain Inlets

All records must be available upon request by NJDEP.

1. Describe the schedule for catch basin and storm drain inlet inspection, cleaning, and maintenance.
The Township has an annual catch basin cleaning program to maintain function and efficiency. All catch basins will be inspected annually and before major storm events. Basins will not be cleaned if there is no evidence of trash or debris, but will be checked the following year during the annual inspection. At the time of inspection, the catch basin will be inspected for proper function. Maintenance will be scheduled for those in need of repair and the Township will respond to "clogging" reports on a case-buy-case basis and clean out debris where identified.
2. List the locations of catch basins and storm drain inlets with recurring problems, i.e., flooding, accumulated debris, etc.
Collins Ave; #10 Autumn Drive; End if Fernwood Road; Tot Lot on Haines Drive; Lippincott between Walnut and Fullerton; Lippincott across from Jamie Drive; New Albany between Ironpost and Church; N. Stanwick between Oak and Park
3. Describe what measures are taken to address issues for catch basins and storm drain inlets with recurring problems and how they are prioritized.
The Department of Public Works cleans the basins and inlets prior to or after each storm to maintain flow.
4. Describe the inspection schedule and maintenance plan for storm drain inlet labels on storm drains that do not have permanent wording cast into the design.
During the annual catch basin cleaning program, the label condition will be checked to ensure that they are still visible, and are corrected if they are not.
5. Indicate the location of records of catch basin and storm drain inlet inspections and the wet tons of materials collected during catch basin and storm drain inlet cleanings.
A daily log of maintenance is kept at the Department of Public Works.

Attachment C - Design Standards for Storm Drain Inlets

Application of Design Standard

The below design standard applies to the following types of storm drain inlet installation or retrofit projects unless a more stringent standard is specified by the municipality's stormwater control ordinance:

- Storm drain inlets installed as part of new development and redevelopment (public or private) that disturb one acre or more;
  - Storm drain inlets installed as part of new development and redevelopment (public or private) that disturb less than one acre that are part of a larger common plan of development or sale (e.g. phased residential development) that ultimately disturbs one acre or more;
- Tier A Municipality owned or operated storm drain inlets must be retrofitted where the storm drains are (1) in direct contact with any repaving, repairing (excluding individual pothole repair), or resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen); or (2) in direct contact with any reconstruction or alteration of facilities; and
- Privately owned or operated storm drain inlets (e.g. condomium association) must be retrofitted where the storm drains are (1) in direct contact with anyrepaving, repairing (excluding individual pothole repair), or resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen); or (2) in direct contact with any reconstruction or alteration of facilities. This does not include single family homes.

Design Standard

Grates in pavement or other ground surfaces shall meet either of the following standards:

- The New Jersey Department of Transportation (NJDOT) bicycle safe grate standards described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (see www.nj.gov/transportation/publicat/pdf/BikeComp/introtofac.pdf); or
- A grate where each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is not greater than 0.5 inches across the smallest dimension. Note that the Residential Site Improvement Standards at N.J.A.C. 5:21include requirements for bicycle safe grates.

Examples of grates subject to this standard include grates in grate inlets; the grate portion (non-curb opening portion) of combination inlets; grates on storm sewer manholes; ditch grates; trench grates; and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads, (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors used to collect stormwater from the surface into a storm drain or surface water body.

For curb-openings inlets, including curb-opening inlets in combination inlets, the clear space in the curb opening, or each individual clear space if the curb opening has two or more clear spaces, shall have an area of no more than seven (7.0) square inches or be no greater than two (2.0) inches across the smallest dimension.

Exemptions from the Design Standard

- Where each individual clear space in the curb opening in existing curb-opening inlets does not have an area of more than nine (9.0) square inches;

- Where the review agency determines that the standards would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets;

- Where flows from the water quality design storm as specified in N.J.A.C. 7:8 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

  A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or

  A bar screen having a bar spacing of 0.5 inches;

  Note that these exemptions do not authorize any infringement of requirements in the Residential Site Improvement Standards for bicycle safe grates in new residential development (N.J.A.C. 5:21-4.18(b)2 and 7.4(b)1).

- Where flows are conveyed through a trash rack that has parallel bars with one inch (1”) spacing between the bars, to the elevation of the water quality design storm as specified in N.J.A.C. 7:8; or

- Where the Department determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet the standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.

Catch Basin Log

INLET STRUCTURE INSPECTION FORM

Date:_______________ Time:_________ AM __________PM

Current Weather Condition (circle one): (Sunny; Overcast)

Inlet Number: ____

Inlet Location (Street/GPS/Other):____

Inlet Type (grate/curb type/eco-head/bicycle safe/other):_______________________

Conditions at Inlet:

1. **Debris blocking grate: ______YES _______NO**

2. **Casting damaged: ______YES _______NO**
   - **a. grate: ______YES _______NO**
   - **b. curbpiece: ______YES _______NO**
   - **c. medallion: ______YES _______NO**
   - **d. bolts missing:______YES _______NO**

3. **Sink hole near inlet: ______YES _______NO**

4. **Debris inside inlet box: ______YES _______NO**

5. **Is inlet box damaged: ______YES _______NO**
   - **a. cracks: ______YES _______NO**
   - **b. open joints: ______YES _______NO**
   - **c. settlement: ______YES _______NO**

6. **Dry Weather Flow: ______YES* _______NO**

(* If YES, schedule follow up inspection using Illicit Connection Inspection Form.)

Observations/comments:

____

____

____

Inspected by:____

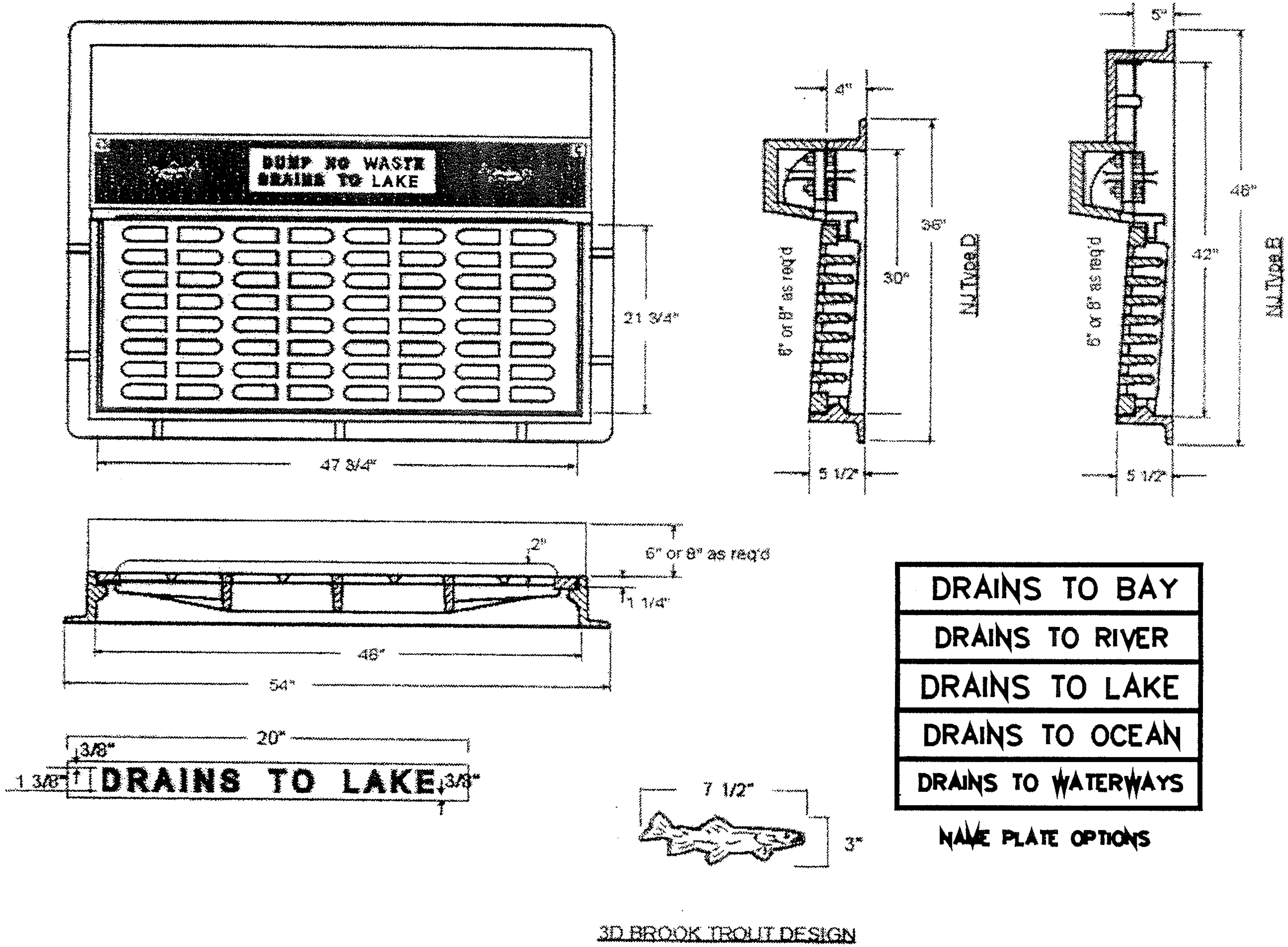
SPPP Form 9 – Storm Drain Inlet Retrofitting

All records must be available upon request by NJDEP.

1. Describe the procedure for ensuring that municipally owned storm drain inlets are retrofitted.
Inlets are inspected during the design phase of capital roadway improvement projects and evaluated for compliance with the regulations. Deficiencies are noted and included as part of the capital project scope.
2. Describe the inspection process to verify that appropriate retrofits are completed on municipally owned storm drain inlets.
Inlets are inspected during construction and prior to final payment.
3. Describe the procedure for ensuring that privately owned storm drain inlets are retrofitted.
For stormwater facilities not owned and operated by the Township, the Township will require the owner/operator to report annually on their operations and maintenance plans, the status of their stormwater facilities, and provide their inspection/maintenance logs. The Township has begun, and will continue, to develop a list of owners/operators who will be notified via mail of due dates and required reporting materials. The Township will provide blank inspection forms with the notifications to assist the owners/operators in maintaining compliance/ The Township will enforce non-compliance issues through its current property maintenance ordinances. Maintenance plans that are submitted will be filed and kept with the SPPP.
4. Describe the inspection process to verify that appropriate retrofits are completed on privately owned storm drain inlets.
Upon review of annual report submissions from private-facility owners, the Township will perform field visits as needed for identified problem areas.


MOORESTOWN
TOWNSHIP
Legend
CATCHBA-MASTER
MOORESTOWN ENVIRONMENTAL ADVISORY COMMITTEE
1/24/2005

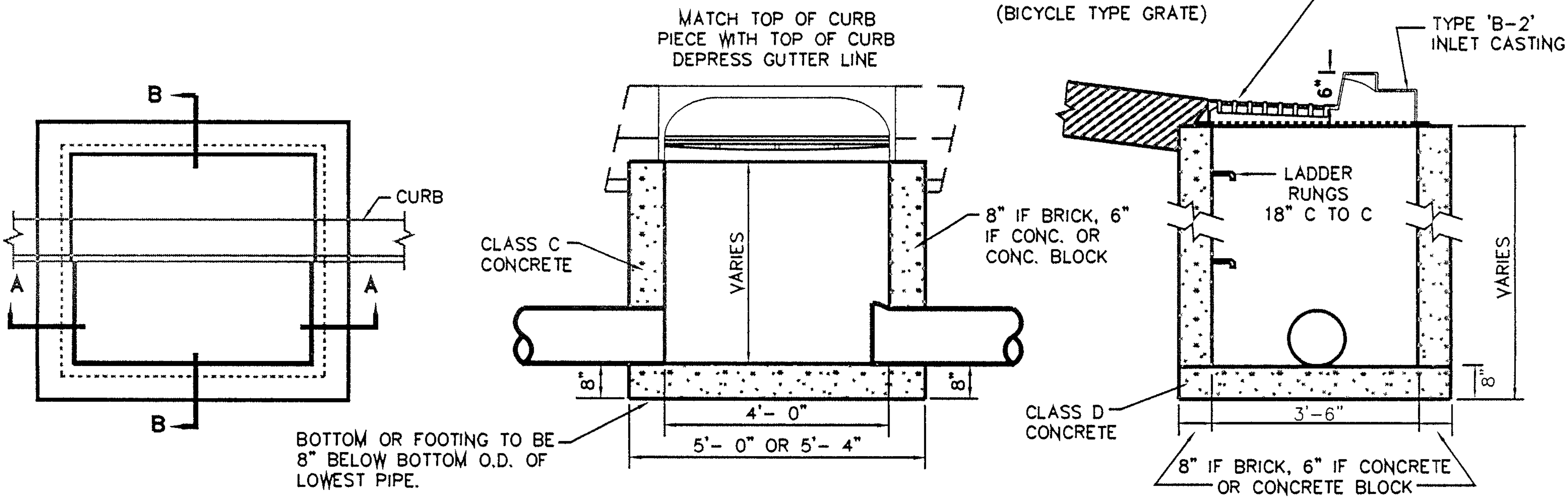
Inlet Details



TYPE P2 – ECO CURB PIECE WITH BICYCLE SAFE GRATE

N.T.S.

NOTE:
THE CURB PIECE SHALL BE 6" UNLESS SPECIFIED OTHERWISE.

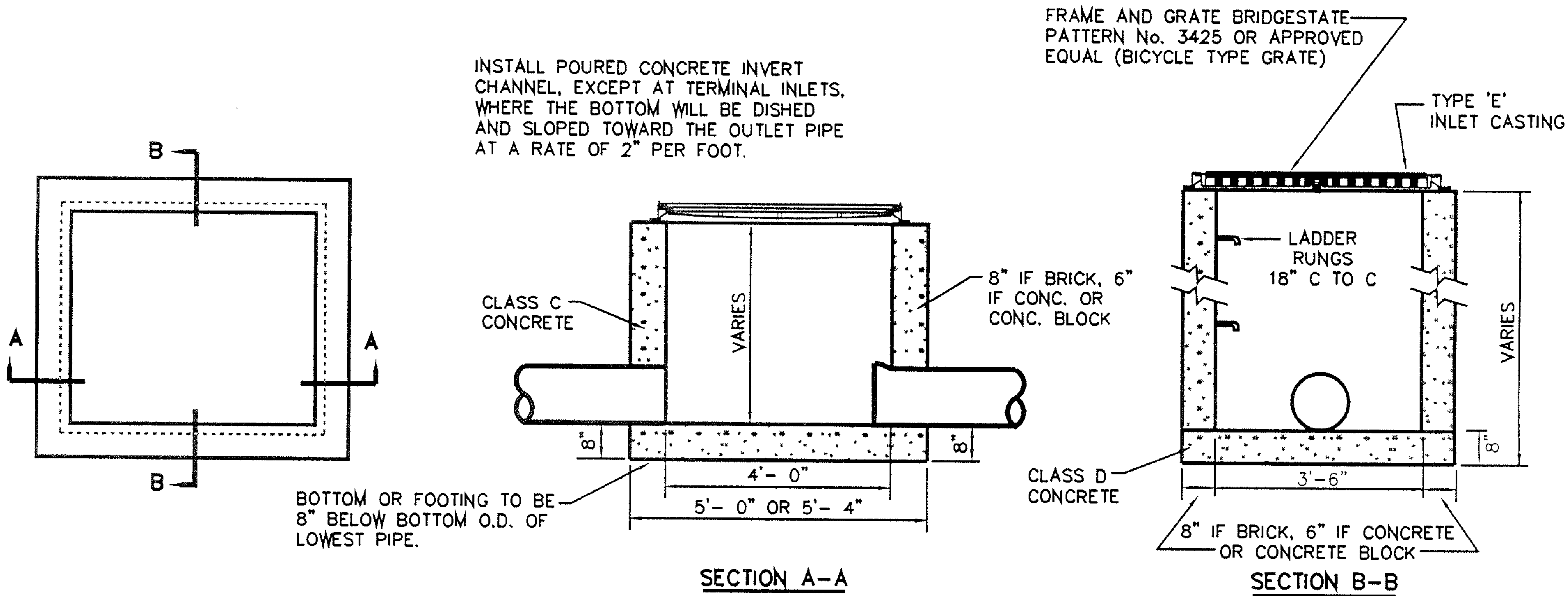


SECTION A-A

SECTION B-B

TYPE 'B' INLET DETAIL

N.T.S.



TYPE 'E' INLET DETAIL

N.T.S.

SPPP Form 10 – Municipal Maintenance Yards and Other Ancillary Operations

All records must be available upon request by NJDEP.

Complete separate forms for each municipal yard or ancillary operation location.

Address of municipal yard or ancillary operation:
Public Works Yard - 601 E Third St. Moorestown, NJ 08057

List all materials and machinery located at this location that are exposed to stormwater which could be a source of pollutant in a stormwater discharge:

Raw materials – See Form 16c

Intermediate products – N/A

Final products – N/A

Waste materials – N/A

By-products – N/A

Machinery – See Form 16c

Fuel – N/A

Lubricants – N/A

Solvents – N/A

Detergents related to municipal maintenance yard or ancillary operations –
N/A

Other –

For each category below, describe the best management practices in place to ensure compliance with all requirements in permit Attachment E. If the activity in the category is not applicable for this location, indicate where it occurs. Indicate the location of inspection logs and tracking forms associated with this municipal yard or ancillary operation, including documentation of conditions requiring attention and remedial actions that have been taken or have been planned.
1. Fueling Operations
All vehicles are fueled at the Mount Laurel fueling facility.
2. Vehicle Maintenance
All vehicles are inspected at least twice annually.
3. On-Site Equipment and Vehicle Washing *See permit attachment E for certification and log forms for Underground Storage Tanks.*
All vehicle washing is done at the Burlington County Bridge Commission facility located near the Tacony Palmyra Bridge.
4. Discharge of Stormwater from Secondary Containment

5. Salt and De-Icing Material Storage and Handling
The Township stores its de-icing materials in a dome that fulfills the requirements of the standards. See attached Form 16b for de-icing material handling procedures.
6. Aggregate Material and Construction Debris Storage
Sand is stored at Public Works a minimum of 50 feet away from waterbodies.
7. Street Sweepings, Catch Basin Clean Out and Other Material Storage
8. Yard Trimmings and Wood Waste Management Sites
9. Roadside Vegetation Management

SPPP Form 10 – Municipal Maintenance Yards and Other Ancillary Operations

All records must be available upon request by NJDEP.

Complete separate forms for each municipal yard or ancillary operation location.
Address of municipal yard or ancillary operation:
List all materials and machinery located at this location that are exposed to stormwater which could be a source of pollutant in a stormwater discharge: Raw materials – Intermediate products – Final products – Waste materials – By-products – Machinery – Fuel – Lubricants – Solvents – Detergents related to municipal maintenance yard or ancillary operations – Other –

Moorestown Township
Standard Operating Procedures - Vehicle Maintenance
SPPP Form 16a

Introduction and Purpose

This SOP contains the basic practices of vehicle maintenance to be implemented at all maintenance yards including maintenance activities at ancillary operations in Moorestown. The purpose of this SOP is to provide a set of guidelines for Township vehicle maintenance yards including maintenance activities at ancillary operations.

Scope

This SOP applies to all maintenance yards including maintenance activities at ancillary operations within the Township.

Standards and Specifications (for vehicle and equipment fueling)

- Conduct vehicle maintenance operation only in designated areas.
- When possible, perform all vehicle and equipment maintenance at an indoor location with a paved floor.
- Always use drip pans.
- Absorbent spill clean-up materials shall be available in maintenance areas and shall be disposed of properly after use.
- For projects that must be performed outdoors that last more than one day, portable tents or tarps must be placed over exposed equipment or machinery when not being worked on.
- Do not dump or dispose oils, grease, fluids, and lubricants onto the ground.
- Do not dump or dispose batteries, used oils, antifreeze and other toxic fluids into a storm drain or watercourse.
- Do not bury tires.
- Collect waste fluids in properly labeled containers and dispose properly.

Moorestown Township
Standard Operating Procedures - Vehicle Maintenance
SPPP Form 16a

Spill Response and Reporting

- Provide spill containment dikes or secondary containment around stored oils and other fluid storage drum(s).
- Conduct cleanups of any fuel spills immediately after discovery.
- Spills are to be cleaned using dry cleaning methods only. Spills shall be cleaned up with a dry, absorbent material (e.g., oil dry, kitty litter, sawdust, etc.) and the rest of the area is to be swept.
- Collected waste is to be disposed of properly.
- Contact the Douglas Nims (Acting Director, Public Works 856-235-3520).

Maintenance and Inspection

- Periodically check for leaks and damaged equipment and make repairs as necessary.

Moorestown Township
Standard Operating Procedures - Good Housekeeping
SPPP Form 16b

Introduction and Purpose

This SOP contains the basic practices of good housekeeping to be implemented at maintenance yards including maintenance activities at ancillary operations in Moorestown. The purpose of this SOP is to provide a set of guidelines for the employees of Moorestown for Good Housekeeping Practices at their maintenance yards including maintenance yards at ancillary operations.

Scope

This SOP applies to all maintenance yards including maintenance activities at ancillary operations in Moorestown.

Standards and Specifications (General)

- All containers should be properly labeled and marked, and the labels must remain clean and visible.
- All containers must be kept in good condition and tightly closed when not in use.
- When practical, chemicals, fluids and supplies should be kept indoors.
- If containers are stored outside, they must be covered and placed on spill platforms.
- Keep storage areas clean and well organized.
- Spill kits and drip pans must be kept near any liquid transfer areas, protected from rainfall.
- Absorbent spill clean-up materials must be available in maintenance areas and shall be disposed of properly after use.
- Collect waste fluids in properly labeled containers and dispose of them properly.

Standards and Specifications (Salt and De-icing Material Handling)

- During loading and unloading of salt and de-icing materials, prevent and/or minimize spills. If salt or de-icing materials are spilled, remove the materials using dry cleaning methods. All collected materials shall be either reused or properly discarded.
- Sweeping should be conducted regularly to get rid of dirt and other debris. Sweeping should also be conducted immediately following, as practicable, loading/unloading activities.
- Minimize the tracking of materials from storage and loading/unloading areas.
- Minimize the distance that salt and de-icing materials are transported during loading/unloading activities.

Spill Response and Reporting

- Conduct clean up of any spill(s) immediately after discovery.
- Spills are to be cleaned using dry cleaning methods only.
- Contact the Douglas Nims (Acting Director, Public Works 856-235-3520).

Maintenance and Inspection

- Periodically check for leaks and damaged equipment and make repairs as necessary.
- Perform monthly inspections of all (indoor and outdoor if applicable) storage locations.

Moorestown Township
Municipal Maintenance Yard Inventory List
SPPP Form 16c

Introduction and Purpose

The following is a list of general categories of all materials or machinery located at the municipal maintenance yard which could be a source of pollutants in a stormwater discharge. Materials or machinery that are not exposed to stormwater are not included on this list.

General Category	**Item**
Machinery	Tractor Van Dump trucks Chipper Pick-up trucks Leaf Loaders
Materials	Rip-rap Cold patch ¾ Clean stone Dense Graded Aggregate Sand

Note: Materials are contained within a concrete "Jersey Barrier" wall system to prevent run-through of stormwater.

Attachment E

Attachment E – Best Management Practices for Municipal Maintenance Yards and Other Ancillary Operations

The Tier A Municipality shall implement the following practices at municipal maintenance yards and other ancillary operations owned or operated by the municipality. Inventory of Materials and Machinery, and Inspections and Good Housekeeping shall be conducted at all municipal maintenance yards and other ancillary operations. All other Best Management Practices shall be conducted whenever activities described below occur. Ancillary operations include but are not limited to impound yards, permanent and mobile fueling locations, and yard trimmings and wood waste management sites.

Inventory of Materials and Machinery

The SPPP shall include a list of all materials and machinery located at municipal maintenance yards and ancillary operations which could be a source of pollutants in a stormwater discharge. The materials in question include, but are not limited to: raw materials; intermediate products; final products; waste materials; by-products; machinery and fuels; and lubricants, solvents, and detergents that are related to the municipal maintenance yard operations and ancillary operations. Materials or machinery that are not exposed to stormwater at the municipal maintenance yard or related to its operations do not need to be included.

Inspections and Good Housekeeping

1. Inspect the entire site, including the site periphery, monthly (under both dry and wet conditions, when possible). Identify conditions that would contribute to stormwater contamination, illicit discharges or negative impacts to the Tier A Municipality's MS4. Maintain an inspection log detailing conditions requiring attention and remedial actions taken for all activities occurring at Municipal Maintenance Yards and Other Ancillary Operations. This log must contain, at a minimum, a record of inspections of all operations listed in Part IV.B.5.c. of this permit including dates and times of the inspections, and the name of the person conducting the inspection and relevant findings. This log must be kept on-site with the SPPP and made available to the Department upon request. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for additional information.

2. Conduct cleanups of spills of liquids or dry materials immediately after discovery. All spills shall be cleaned using dry cleaning methods only. Clean up spills with a dry, absorbent material (i.e., kitty litter, sawdust, etc.) and sweep the rest of the area. Dispose of collected waste properly. Store clean-up materials, spill kits and drip pans near all liquid transfer areas, protected from rainfall.

3. Properly label all containers. Labels shall be legible, clean and visible. Keep containers in good condition, protected from damage and spillage, and tightly closed when not in use. When practical, store containers indoors. If indoor storage is not practical, containers may be stored outside if covered and placed on spill platforms or clean pallets. An area that is graded and/or bermed to prevent run-through of stormwater may be used in place of spill platforms or clean pallets. Outdoor storage locations shall be regularly maintained.

Fueling Operations

1. Establish, maintain and implement standard operating procedures to address vehicle fueling; receipt of bulk fuel deliveries; and inspection and maintenance of storage tanks, including the associated piping and fuel pumps.

   a. Place drip pans under all hose and pipe connections and other leak-prone areas during bulk transfer of fuels.

   b. Block storm sewer inlets, or contain tank trucks used for bulk transfer, with temporary berms or temporary absorbent booms during the transfer process. If temporary berms or booms are being used instead of blocking the storm sewer inlets, all hose connection points associated with the transfer of fuel shall be within the temporarily bermed or boomed area during the loading/unloading of bulk fuels. A trained employee shall be present to supervise the bulk transfer of fuel.

   c. Clearly post, in a prominent area of the facility, instructions for safe operation of fueling equipment. Include all of the following:
      - "Topping off of vehicles, mobile fuel tanks, and storage tanks is strictly prohibited"
      - "Stay in view of fueling nozzle during dispensing"
      - Contact information for the person(s) responsible for spill response.

   d. Immediately repair or replace any equipment, tanks, pumps, piping and fuel dispensing equipment found to be leaking or in disrepair.

Discharge of Stormwater from Secondary Containment

The discharge pipe/outfall from a secondary containment area (e.g. fuel storage, de-icing solution storage, brine solution) shall have a valve and the valve shall remain closed at all times except as described below. A municipality may discharge stormwater accumulated in a secondary containment area if a visual inspection is performed to ensure that the contents of aboveground storage tank have not come in contact with the stormwater to be discharged. Visual inspections are only effective when dealing with materials that can be observed, like petroleum. If the contents of the tank are not visible in stormwater, the municipality shall rely on previous tank inspections to determine with some degree of certainty that the tank has not leaked. If the municipality cannot make a determination with reasonable certainty that the stormwater in the secondary containment area is uncontaminated by the contents of the tank, then the stormwater shall be hauled for proper disposal.

Vehicle Maintenance

1. Operate and maintain equipment to prevent the exposure of pollutants to stormwater.

2. Whenever possible, conduct vehicle and equipment maintenance activities indoors. For projects that must be conducted outdoors, and that last more than one day, portable tents or covers shall be placed over the equipment being serviced when not being worked on, and drip pans shall be used at all times. Use designated areas away from storm drains or block storm drain inlets when vehicle and equipment maintenance is being conducted outdoors.

On-Site Equipment and Vehicle Washing and Wash Wastewater Containment

1. Manage any equipment and vehicle washing activities so that there are no unpermitted discharges of wash wastewater to storm sewer inlets or to waters of the State.

2. Tier A Municipalities which cannot discharge wash wastewater to a sanitary sewer or which cannot otherwise comply with 1, above, may temporarily contain wash wastewater prior to proper disposal under the following conditions:

   a. Containment structures shall not leak. Any underground tanks and associated piping shall be tested for integrity every 3 years using appropriate methods determined by "*The List of Leak Detection Evaluations for Storage Tank Systems*" created by the National Work Group on Leak Detection Evaluations (NWGLDE) or as determined appropriate and certified by a professional engineer for the site specific containment structure(s)**.**

   b. For any cathodically protected containment system, provide a passing cathodic protection survey every three years.

   c. Operate containment structures to prevent overfilling resulting from normal or abnormal operations, overfilling, malfunctions of equipment, and human error. Overfill prevention shall include manual sticking/gauging of the tank before each use unless system design prevents such measurement. Tank shall no longer accept wash wastewater when determined to be at 95% capacity. Record each measurement to the nearest ½ inch.

   d. Before each use, perform inspections of all visible portions of containment structures to ensure that they are structurally sound, and to detect deterioration of the wash pad, catch basin, sump, tank, piping, risers, walls, floors, joints, seams, pumps and pipe connections or other containment devices. The wash pad, catch basin, sump and associated drains should be kept free of debris before each use. Log dates of inspection; inspector's name, and conditions. This inspection is not required if system design prevents such inspection.

   e. Containment structures shall be emptied and taken out of service immediately upon detection of a leak. Complete all necessary repairs to ensure structural integrity prior to placing the containment structure back into service. Any spills or suspected release of hazardous substances shall be immediately reported to the NJDEP Hotline (1-877-927-6337) followed by a site investigation in accordance with N.J.A.C. 7:26C and N.J.A.C 7:26E if the discharge is confirmed.

   f. All equipment and vehicle wash wastewater placed into storage must be disposed of in a legally permitted manner (e.g. pumped out and delivered to a duly permitted and/or approved wastewater treatment facility).

   g. Maintain a log of equipment and vehicle wash wastewater containment structure clean-outs including date and method of removal, mode of transportation (including name of hauler if applicable) and the location of disposal. See Underground Vehicle Wash Water Storage Tank Use Log at end of this attachment.

   h. Containment structures shall be inspected annually by a NJ licensed professional engineer. The engineer shall certify the condition of all structures including: wash pad, catch basin, sump, tank, piping, risers to detect deterioration in the, walls, floors, joints, seams, pumps and pipe connections or other containment devices using the attached Engineer's Certification of Annual Inspection of Equipment and Vehicle Wash Wastewater Containment Structure. This certification may be waived for self-contained systems on a case-by-case basis. Any such waiver would be issued in writing by the Department.

3. Maintain all logs, inspection records, and certifications on-site. Such records shall be made available to the Department upon request.

Salt and De-icing Material Storage and Handling

1. Store material in a permanent structure.
2. Perform regular inspections and maintenance of storage structure and surrounding area.
3. Minimize tracking of material from loading and unloading operations.
4. During loading and unloading:
   a. Conduct during dry weather, if possible;
   b. Prevent and/or minimize spillage; and
   c. Minimize loader travel distance between storage area and spreading vehicle.
5. Sweep (or clean using other dry cleaning methods):
   a. Storage areas on a regular basis;
   b. Material tracked away from storage areas;
   c. Immediately after loading and unloading is complete.
6. Reuse or properly discard materials collected during cleanup.
7. Temporary outdoor storage is permitted only under the following conditions:
   a. A permanent structure is under construction, repair or replacement;
   b. Stormwater run-on and de-icing material run-off is minimized;
   c. Materials in temporary storage are tarped when not in use;
   d. The requirements of 2 through 6, above are met; and
   e. Temporary outdoor storage shall not exceed 30 days unless otherwise approved in writing by the Department;
8. Sand must be stored in accordance with Aggregate Material and Construction Debris Storage below.

Aggregate Material and Construction Debris Storage

1. Store materials such as sand, gravel, stone, top soil, road millings, waste concrete, asphalt, brick, block and asphalt based roofing scrap and processed aggregate in such a manner as to minimize stormwater run-on and aggregate run-off via surface grading, dikes and/or berms (which may include sand bags, hay bales and curbing, among others) or three sided storage bays. Where possible the open side of storage bays shall be situated on the upslope. The area in front of storage bays and adjacent to storage areas shall be swept clean after loading/unloading.

2. Sand, top soil, road millings and processed aggregate may only be stored outside and uncovered if in compliance with item 1 above and a 50-foot setback is maintained from surface water bodies, storm sewer inlets, and/or ditches or other stormwater conveyance channels.

3. Road millings must be managed in conformance with the "Recycled Asphalt Pavement and Asphalt Millings (RAP) Reuse Guidance" (see www.nj.gov/dep/dshw/rrtp/asphaltguidance.pdf) or properly disposed of as solid waste pursuant to N.J.A.C. 7:26-1 et seq.

4. The stockpiling of materials and construction of storage bays on certain land (including but not limited to coastal areas, wetlands and floodplains) may be subject to regulation by the Division of Land Use Regulation (see www.nj.gov/dep/landuse/ for more information).

Street Sweepings, Catch Basin Clean Out, and Other Material Storage

1. For the purposes of this permit, this BMP is intended for road cleanup materials as well as other similar materials. Road cleanup materials may include but are not limited to street sweepings, storm sewer clean out materials, stormwater basin clean out materials and other similar materials that may be collected during road cleanup operations. These BMPs do not cover materials such as liquids, wastes which are removed from municipal sanitary sewer systems or material which constitutes hazardous waste in accordance with N.J.A.C. 7:26G-1.1 et seq.

2. Road cleanup materials must be ultimately disposed of in accordance with N.J.A.C. 7:26-1.1 et seq. See the "Guidance Document for the Management of Street Sweepings and Other Road Cleanup Materials" (www.nj.gov/dep/dshw/rrtp/sweeping.htm).

3. Road cleanup materials placed into storage must be, at a minimum:

   a. Stored in leak-proof containers or on an impervious surface that is contained (e.g. bermed) to control leachate and litter; and

   b. Removed for disposal (in accordance with 2, above) within six (6) months of placement into storage.

Yard Trimmings and Wood Waste Management Sites

1. These practices are applicable to any yard trimmings or wood waste management site:

    a. Owned and operated by the Tier A Municipality;
        i. For staging, storing, composting or otherwise managing yard trimmings, or
        ii. For staging, storing or otherwise managing wood waste, and

    b. Operated in compliance with the Recycling Rules found at N.J.A.C. 7:26A.

2. Yard trimmings or wood waste management sites must be operated in a manner that:

    a. Diverts stormwater away from yard trimmings and wood waste management operations; and
    b. Minimizes or eliminates the exposure of yard trimmings, wood waste and related materials to stormwater.

3. Yard trimmings and wood waste management site specific practices:

    a. Construct windrows, staging and storage piles:
        i. In such a manner that materials contained in the windrows, staging and storage piles (processed and unprocessed) do not enter waterways of the State;
        ii. On ground which is not susceptible to seasonal flooding;
        iii. In such a manner that prevents stormwater run-on and leachate run-off (e.g. use of covered areas, diversion swales, ditches or other designs to divert stormwater from contacting yard trimmings and wood waste).

    b. Maintain perimeter controls such as curbs, berms, hay bales, silt fences, jersey barriers or setbacks, to eliminate the discharge of stormwater runoff carrying leachate or litter from the site to storm sewer inlets or to surface waters of the State.

    c. Prevent on-site storm drain inlets from siltation using controls such as hay bales, silt fences, or filter fabric inlet protection.

    d. Dry weather run-off that reaches a municipal stormwater sewer system is an illicit discharge. Possible sources of dry weather run-off include wetting of piles by the site operator; uncontrolled pile leachate or uncontrolled leachate from other materials stored at the site.

    e. Remove trash from yard trimmings and wood waste upon receipt.

    f. Monitor site for trash on a routine basis.

    g. Store trash in leak-proof containers or on an impervious surface that is contained (e.g. bermed) to control leachate and litter;

    h. Dispose of collected trash at a permitted solid waste facility.

    i. Employ preventative tracking measures, such as gravel, quarry blend, or rumble strips at exits.

Roadside Vegetation Management

1. Tier A Municipalities shall restrict the application of herbicides along roadsides in order to prevent it from being washed by stormwater into the waters of the State and to prevent erosion caused by de-vegetation, as follows: Tier A Municipalities shall not apply herbicides on or adjacent to storm drain inlets, on steeply sloping ground, along curb lines, and along unobstructed shoulders. Tier A Municipalities shall only apply herbicides within a 2 foot radius around structures where overgrowth presents a safety hazard and where it is unsafe to mow.

ENGINEERS CERTIFICATION OF ANNUAL INSPECTION OF EQUIPMENT AND VEHICLE WASH WASTEWATER CONTAINMENT STRUCTURE

(Complete a separate form for each vehicle wash wastewater containment structure)

Permittee: ________________________________ NJPDES Permit No: ________________________

Containment Structure Location: ____

The annual inspection of the above referenced vehicle wash wastewater containment structure was conducted on _____________ (date). The containment structure and appurtenances have been inspected for:

1. The integrity of the structure including walls, floors, joints, seams, pumps and pipe connections
2. Leakage from the structure's piping, vacuum hose connections, etc.
2 Bursting potential of tank.
3. Transfer equipment
4. Venting
5. Overflow, spill control and maintenance.
6. Corrosion, splits, and perforations to tank, piping and vacuum hoses

The tank and appurtenances have been inspected for all of the above and have been determined to be:

Acceptable ___________

Unacceptable ___________

Conditionally Acceptable ____________

List necessary repairs and other conditions: ____

____

____

____

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment (N.J.A.C. 7:14A-2.4(d)).

Name (print): ________________________________ Seal:

Signature: ________________________________

Date: ________________________________

Underground Vehicle Wash Water Storage Tank Use Log

Name and Address of Facility ____________________________

Facility Permit Number __________________________________

Tank ID Number __________________ Tank Location __________________

Tank Volume ______________ gallons Tank Height _______________ inches

95% Volume ______________ gallons 95% Volume _______________ inches

Date and Time	Inspector	Height of Product Before Introducing Liquid (inches)	Is Tank Less Than 95% Full? (Y/N)	Visual Inspection Pass? (Y/N)	Comments

Notes: The volume of liquid in the tank should be measured **before** each use.

Liquid **should not be introduced** if the tank contains liquid at 95% of the capacity or greater.

A visual inspection of all exposed portions of the collection system should be performed before each use. Use the comments column to document the inspection and any repairs.

Underground Vehicle Wash Water Storage Tank Pump Out Log

Name and Address of Facility ____________________________

Facility Permit Number ___________________________________

Tank ID Number _________________ Tank Location _________________

Tank Volume _____________ gallons

Date and Time of Pump Out	Volume of Liquid Removed	Waste Hauler *	Destination of the Liquid Disposal *

*** The Permittee must maintain copies of all hauling and disposal records and make them available for inspection**

Inventory List

Inspection Reports

Standard Operating Procedures Report

Consistent with SPPP Form 16 & 16 b-d

For year 01/01/______ - 12/31/______

Best Management Practice (BMP)

Vehicle Maintenance

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
DATE of Inspection												
Was SPPP Form 16b & 16d - SOP - Vehicle Maintenance & Municipal Yard Inventory List on-site at time of inspection? Y or N												
Were all machinery as listed on SPPP form 16d inspected? Y or N												
Number of Areas of Concern or Repairs Identified.												

Good House Keeping

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
DATE of Inspection												
Was SPPP Form 16c - SOP - Good House Keeping on-site at time of inspection? Y or N												
Indoor Inspection (for leaks etc.) for Areas of Concern												
Outdoor Inspection (for leaks etc.) for Areas of Concern												
Number of Areas of Concern Identified												

Insert the the date of the inspection and mark each BMP inspection completed with an X. If during the inspection a spill, leak or area of concern is identified, attach a separate sheet of paper describing the identified problem, method chosen to correct the problem, and anticipated correction date.

Streets Division Facilities Inspections Report

601 E. Third Street Moorestown, New Jersey

Building Inspections	Good	Fair	Poor	Comments
Air Condition				
Dumpsters				
Fire Extinguishers				
Floor Drain Covers				
Garage Doors				
Heater				
Water Hoses				
Hydraulic Oil				
Office				
Oil Spills Inside				
Oil Spills Outside				
Oil Containers				
Rest room (Men)				
Rest room (Ladies)				
Tires				
Yard Inspections				
Salt Storage Dome				
Misc. Stockpiles				
Drainage Ditch				
Other				

Mechanic's Signature: ____ **Date:** ____________

Mechanic's Supervising Signature: __________________________________ **Date:** ____________

SPPP Form 11 – Employee Training

All records must be available upon request by NJDEP.

A. **Municipal Employee Training:** Stormwater Program Coordinator (SPC) must ensure appropriate staff receive training on topics in the chart below as required due to job duties assigned within three months of commencement of duties and again on the frequency below. Indicate the location of associated training sign in sheets, dates, and agendas or description for each topic.

Topic	Frequency	Title of trainer or office to conduct training
1. Maintenance Yard Operations (including Ancillary Operations)	Every year	Department Heads
2. Stormwater Facility Maintenance	Every year	Department Heads
3. SPPP Training & Recordkeeping	Every year	Department Heads
4. Yard Waste Collection Program	Every 2 years	Department Heads
5. Street Sweeping	Every 2 years	Department Heads
6. Illicit Connection Elimination and Outfall Pipe Mapping	Every 2 years	Department Heads
7. Outfall Pipe Stream Scouring Detection and Control	Every 2 years	Department Heads
8. Waste Disposal Education	Every 2 years	Department Heads
9. Municipal Ordinances	Every 2 years	Department Heads
10. Construction Activity/Post-Construction Stormwater Management in New Development and Redevelopment	Every 2 years	Department Heads

B. **Municipal Board and Governing Body Members Training:** Required for individuals who review and approve applications for development and redevelopment projects in the municipality. This includes members of the planning and zoning boards, town council, and anyone else who votes on such projects. Training is in the form of online videos, posted at www.nj.gov/dep/stormwater/training.htm.

Within 6 months of commencing duties, watch *Asking the Right Questions in Stormwater Review Training Tool*. Once per term thereafter, watch at least one of the online DEP videos in the series available under Post-Construction Stormwater Management. Indicate the location of records documenting the names, video titles, and dates completed for each board and governing body member.

C. **Stormwater Management Design Reviewer Training:** All design engineers, municipal engineers, and others who review the stormwater management design for development and redevelopment projects on behalf of the municipality must attend the first available class upon assignment as a reviewer and every five years thereafter. The course is a free, two-day training conducted by DEP staff. Training dates and locations are posted at www.nj.gov/dep/stormwater/training.htm. Indicate the location of the DEP certificate of completion for each reviewer.

Public Works Training Log

TOWNSHIP OF MOORESTOWN
NJDEP STORMWATER REGULATIONS
EMPLOYEE TRAINING PROGRAM

SIGN-IN SHEET

NAME **DATE**

Board and Governing Body Training Log

Municipal board and governing body members that review and approve projects for new and redevelopment projects will complete the online training tool provided by the NJDEP and will continue to review at least one tool found at www.nj.gov/dep/stormwater/trainging.htm once per term of service.

SPPP Form 12 – Outfall Pipes

All records must be available upon request by NJDEP.

1. **Mapping:** Attach an image or provide a link to the most current outfall pipe map. Maps shall be updated at the end of each calendar year.

   Note that ALL maps must be electronic by 21 Dec 2020 via the DEP's designated electronic submission service. For details, see http://www.nj.gov/dep/dwq/msrp_map_aid.htm.

2. **Inspections:** Describe the outfall pipe inspection schedule and indicate the location of records of dates, locations, and findings.

A biennial inspection (stream walk) is performed. The Township will also solicit and involve community groups and volunteers to perform the biennial inspections. A log of all maintenance is kept at the Department of Public Works. Information regarding site inspections, maintenance and repairs will be kept with the SPPP.

3. **Stream Scouring:** Describe the program in place to detect, investigate and control localized stream scouring from stormwater outfall pipes. Indicate the location of records related to cases of localized stream scouring. Such records must include the contributing source(s) of stormwater, recommended corrective action, and a prioritized list and schedule to remediate scouring cases.

See attached list of scouring locations, the estimated date of when repairs are anticipate to be made and completion dates for scour repairs that have been completed.

4. **Illicit Discharges:** Describe the program in place for conducting visual dry weather inspections of municipally owned or operated outfall pipes. Record cases of illicit discharges using the DEP's Illicit Connection Inspection Report Form (www.nj.gov/dep/dwq/tier_a_forms.htm) and indicate the location of these forms and related illicit discharge records.

   Note that Illicit Connection Inspection Report Forms shall be included in the SPPP and submitted to DEP with the annual report.

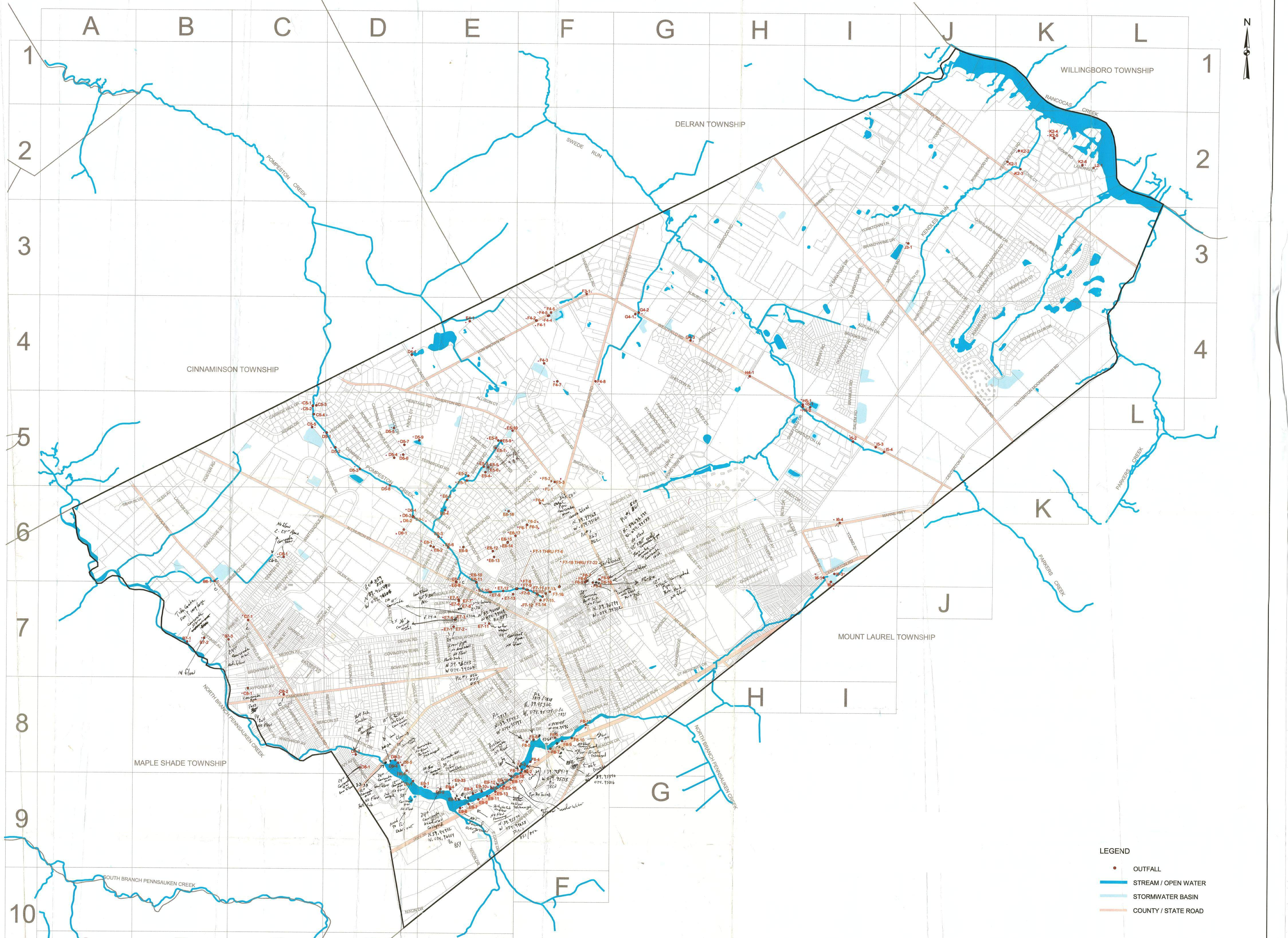
The Township implements and enforces this Illicit Connection Elimination Program and has adopted an illicit connection ordinance.

The DEP Illicit Connection Report Forms are used to conduct these inspections and each of the forms are kept with the SPPP records.The Township will conduct visual dry weather inspections of outfall pipes owned/operated by the Township at least once every 5 years for signs of dry weather flow. Outfall pipes that are found to have a dry weather flow or other evidence of an intermittent non-stormwater flow will be reinspected within 3 months of a complaint/report in order to determine the source of potential illicit connection(s). If the source of the illicit connection is able to be determined (and the connection is within Moorestown Township) the responsible party will be cited for being in violation of the Township's Illicit Connection Ordinance, and the illicit connection will be eliminated as soon as possible. If, after the appropriate amount of investigation, the source of the illicit connection is unable to be determined, a Closeout Investigation Form will be submitted with the Township's Annual Inspection and Recertification. If an illicit connection is found to originate from another public entity, Moorestown Township will report the illicit connection to the entity and to the DEP.

There will be a phone number available, used for reporting spills and illegal dumping, to report any illicit connections.

Dry weather flows believed to be an immediate threat to human health or the environment shall be reported immediately
to the Department's Action Hotline at 1-877-WARNDEP (1-877-927-6337).

We will respond to resident complaints/reports of illicit connections by conducting field investigations of the suspected illicit connection. Investigations will be conducted in accordance with Attachment B of the permit.
Public works employees will report suspected illicit connections to the DPW Director and/or General Supervisor for follow up investigation in accordance
with Attachment B of the permit.



SOURCE:
ROAD NAMES FROM BURLINGTON COUNTY DEPARTMENT OF INFORMATION TECHNOLOGY, GPS ROADS FILE, SEPT. 2011.
PARCEL MAPPING FROM BURLINGTON COUNTY DEPARTMENT OF INFORMATION TECHNOLOGY, FEBRUARY 2002.

APPROVED DATE
Richard A. Alaimo – P.E.
N.J. PROFESSIONAL ENGINEER
LICENCE NO. 13195

REVISIONS | DATE | BY

ALAIMO GROUP
Consulting Engineers
200 High Street, Mount Holly, N.J.
2 Market Street, Paterson, N.J.

STORMWATER MANAGEMENT PLAN
OUTFALL PIPE MAPPING
SCALE: 1" = 900'

CLIENT: MOORESTOWN TOWNSHIP
PROJECT LOCATION: MOUNT LAUREL TOWNSHIP, BURLINGTON COUNTY, NEW JERSEY
PROJECT NO.: A-730-016-000
CONTRACT NO.:
DATE: APRIL 2014
DESIGN BY:
CREATED BY: MAC
CHECKED BY: J.A.R.
MAP 1
FILE NO.:

Illicit Connection Forms

Illicit Connection Inspection Report Form

Public Complex Information

Public Complex: ______________________________

NJPDES # : ____________________ PI ID #: ____________________

Team Member: ______________________________

Date: __________ Effective Date of Permit Authorization (EDPA): __________

Outfall #: ______________ Location: ______________________________

Receiving Waterbody: ______________________________

1. Is there a dry weather flow? Y (☐) N (☐)
2. If "YES", what is the outfall flow estimate? __________ Gpm
   (flow sample should be kept for further testing, and this form will need to be submitted with the Annual Report and Certification)
3. Are there any indications of an intermittent flow? Y (☐) N (☐)
4. If you answered "**NO**" to BOTH question #1 and #3, there is probably not an illicit connection and you can skip to question #7.
   (NOTE: This form **does not** need to be submitted to the Department, but should be kept with your SPPP.)

   If you answered "**YES**" to either question, please continue on to question #5.
   (NOTE: This form will need to be submitted to the Department with the Annual Report and Certification.)

5. **PHYSICAL OBSERVATIONS**:

(a) **ODOR**: none☐ sewage☐ sulfide☐ oil☐ gas☐ rancid/sour☐ other☐: _____

(b) **COLOR**: none☐ yellow☐ brown☐ green☐ red☐ gray☐ other☐: _____

(c) **TURBIDITY**: none☐ cloudy☐ opaque☐

(d) **FLOATABLES**: none☐ petroleum☐ sheen☐ sewage☐ other☐: _____

(e) **DEPOSITS/STAINS**: none☐ sediment☐ oily☐ other☐: _____

(f) **VEGETATION CONDITIONS**: normal☐ excessive growth☐ inhibited growth☐

(g) **DAMAGE TO OUTFALL STRUCTURES**:

IDENTIFY STRUCTURE: ______________________________

DAMAGE: none☐ concrete spalling/cracking☐ peeling paint☐
metal corrosion☐ other damage☐

6. **ANALYSES OF OUTFALL FLOW SAMPLE:**
   * field calibrate instruments in accordance with manufacturer's instructions prior to testing.

(a) **DETERGENTS**: ______________________________ mg/L

(if sample is greater than 0.06 mg/L, the sample is contaminated with detergents [which may be from sanitary wastewater or other sources]. Further testing is required and this outfall should be given the highest priority.)

(if the sample is not greater than 0.06 mg/L and it does not show physical characteristics of sanitary wastewater [e.g., odor, floatables, and/or color] it is unlikely that it is from sanitary wastewater sources, yet there may still be an illicit connection of industrial wastewater, rinse water, backwash or cooling water. Skip to question #6c.)

(b) **AMMONIA (as N) TO POTASSIUM RATIO**: ______________________________

(if the Ammonia to Potassium Ratio is greater than 0.6:1, then it is likely that the pollutant is sanitary sewage)

(if the Ammonia to Potassium Ratio is less than or equal to 0.6:1, then the pollutant is from another washwater source.)

(c) **FLUORIDE**: ______________________________ mg/L

(if the fluoride levels are between 1.0 and 2.5 mg/L, then the flow is most likely from fluoride treated potable water.)

(if the sample tests below a detection limit of 0.1 mg/L for fluoride, it is likely to be from groundwater infiltration, springs or streams. In some cases, however, it is possible that the discharge could originate from an onsite well used for industrial cooling water which will test non-detect for both detergents and fluoride. To differentiate between these cooling water discharges and ground water infiltration, you will have to rely on temperature.)

(d) **TEMPERATURE**: ______________________________ °F

(if the temperature of the sample is over 70°F, it is most likely cooling water)

(if the temperature of the sample is under 70°F, it is most likely from ground water infiltration)

7. Is there a suspected illicit connection? Y (☐) N (☐)

   If "**YES**", what is the suspected source? ______________________________

   If "**NO**", skip to signature block on the bottom of this form.

8. Has the investigation of the suspected illicit connection been completed? Y (☐) N (☐)

   If "**YES**", proceed to question #9.

   If "**NO**", skip to signature block on the bottom of this form.

9. Was the source of the illicit connection found? Y (☐) N (☐)

   If "**YES**", identify the source (including whether the source is from the Public Complex or another entity). ______________________________

   What plan of action will follow to eliminate the illicit connection or report the illicit connection to the NJDEP? ______________________________

   Resolution: ______________________________

   If "**NO**", complete the Closeout Investigation Form and attach it to this Illicit Connection Inspection Report Form.

Inspector's Name: ____________________

Title: ____________________

Signature: ____________________

Date: ____________________

If there is a dry weather flow or evidence of an intermittent flow, be sure to include this form with your Annual Report and Certification.

If there is not a dry weather flow or evidence of an intermittent flow, this form should be retained with your SPPP.

Closeout Investigation Form

Municipality Information	Municipality: *Mooorestown Township* County: *Burlington* NJPDES # : **NJG**0150215 PI ID #: 207630 Team Member / Title: ___________________________

Outfall #: ____Location: ____

Receiving Waterbody: ____

Basis for Submittal:

(☐) A non-stormwater discharge was found, but no source was located within six months.

(☐) An intermittent non-stormwater discharge was observed, and three unsuccessful investigations were conducted to investigate the discharge while it was flowing.

Describe each phase of your investigation, including dates. Attach additional pages as necessary:

Inspector's Name: ____

Title: ____

Signature: ____

Date: ____

Complete and attach this form to the appropriate Illicit Connection Inspection Report Form and submit with the Annual Report and Certification.

SPPP Form 13 – Stormwater Facilities Maintenance

All records must be available upon request by NJDEP.

1. Detail the program in place for the long-term cleaning, operation and maintenance of each stormwater facility owned or operated by the municipality.

The stormwater facilities that are owned by the Township are inspected on an annual basis to ensure they are functioning properly. Preventative maintenance and repairs are performed on all stormwater facilities to ensure proper function. If facilities are found to not be functioning properly and repairs are not made, then the necessary repairs will be documented, prioritized, and scheduled for repairs.

2. Detail the program in place for ensuring the long-term cleaning, operation and maintenance of each stormwater facility NOT owned or operated by the municipality.

Owners/operators will be required to report annually on their operations and maintenance plans, the status of their stormwater facilities and provide their inspection/maintenance logs.

The Township notifies identified private-facility owners with a letter and blank inspection forms for awareness and to encourage proper maintenance.

(Letter attached)

3. Indicate the location(s) of the Stormwater Facilities Inspection and Maintenance Logs listing the type of stormwater facilities inspected, location information, inspection dates, inspector name(s), findings, preventative and corrective maintenance performed.

A log of maintenance is kept at the Department of Public Works.

Note that maintenance activities must be reported in the annual report and records must be available upon request. DEP maintenance log templates are available at http://www.nj.gov/dep/stormwater/maintenance_guidance.htm (select specific logs from choices listed in the Field Manuals section).

Additional Resources: The NJ Hydrologic Modeling Database contains information and maps of stormwater management basins. To view the database map, see https://hydro.rutgers.edu. To download data in an Excel format, see https://hydro.rutgers.edu/public_data/.

Township Facility Maintenance Log

Stormwater Basin Inspection Program – Inspection Checklist

Date Inspector Organization Current Weather Weather, past 72 hours

Basin Database ID Approximate basin Location (municipality and nearest street)

Basin Type: ☐ Detention ☐ Infiltration ☐ Infiltration/Detention combo ☐ Wet Pond ☐ Subsurface ☐ Other

DEP Item #	Inspection Criteria	✓	Comments	Reinspection Date	Reinspection Comments
Farebay	***Note embankment failure, leakage, excessive deposits etc***				
A1.1	Inlet scour or erosion	☐			
A1.2	Clogged pipes or excessive sediment	☐			
A1.3	Damaged outlet /overflow structure	☐			
MTD (pretreat) A2	***Inspect as able***	☐			
BMP (pretreat) A3	***Inspect as able***	☐			
Pond Area	***Note canditians for wet and dry ponds moy differ***				
B1	Standing Water / algae / floatables / mosquitos present	☐			
B2	Excessive Sediment /deltas/emergent vegetation	☐			
B3	Erosion / Channelization/Rip Rap damaged	☐			
B4	Animal Burrows /wildlife/ waterfowl present	☐			
B5	Uneven Bed (dry basin)	☐			
B6	Sink holes or subsidence –dry or wet basin	☐			
B7	Low flow channel damaged or needs cleaning	☐			
B8	Basin liner or aerator damaged	☐			
Vegetatian	***Note if vegetation is being maintained including desirable spp***				
C1	Excessive bare soil	☐			
C2	Overgrown /invasive / design vegetation present	☐			
C3	Tree growth in basin	☐			
Embankment D1	***Basin side slopes – erosian, slides, seeps, bare sail etc***	☐			
Outlet	***Nate outlet structure and discharge point(s)***				
E1	Outlet trash accumulation (20%+)	☐			
E2	Damaged Trash rack	☐			
E3	Outlet Orifi damaged or non-functioning/ retrofit?	☐			
E4	Outlet COP damaged or erosion below outlet	☐			
ES	Standing water in the outlet structure	☐			
Emergency Spillway	***Note candition of spillway and spillway lining***				
F1	Trees on spillway	☐			
F2	Damaged/failed/ obstructed /eroded spillway	☐			
Misc.	***Note condition of appurtenont structures etc.***				
G1	Broken security fence	☐			
G2	Broken/missing Gate	☐			
G3	Damaged/missing sign	☐			
G4	Access to basin blocked (vegetation growth, trash etc)	☐			

Overall Condition: ☐ **Satisfactory** ☐ **Maintenance Required** ☐ **Needs Repair** ☐ **Possible Retrofit Candidate** **Comments:**

Stormwater Structure Inspection Form

Date: ____________________ Weather Conditions: ________________________

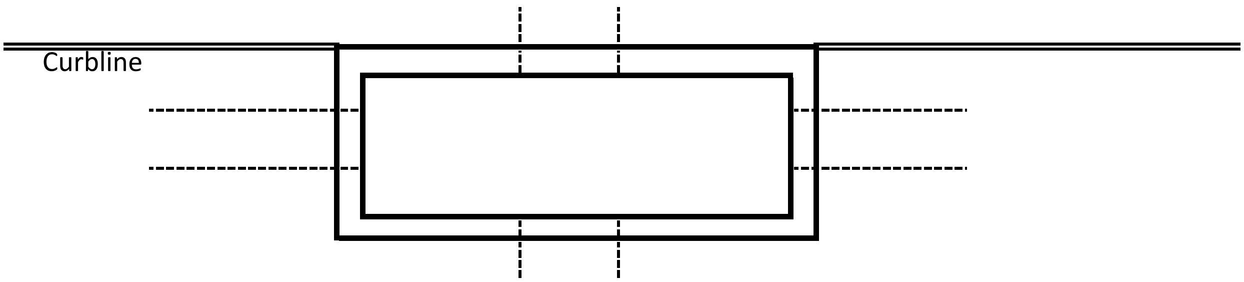
Time: ______________ Inspected By: ________________________________

Structure Type ☐ Type B Inlet ☐ Manhole ☐ Other

Structure #: ______________________

Material: ______________________

Structure Location: ________________________________ Depth: ______________



~ Sketch to include pipe material & step locations

Criteria	**Yes**	**No**	**Comments**
Debris blocking grate			
Bicycle Safe Grate			
Casting Element Damage			
Grate			
Curbpiece			
Medallion			
Missing Bolts			
Parging Required			
Debris inside			
Steps Required or Missing			
Structure in Good Condition			
Cracks			
Open Joint			
Crumbling			

Stormwater Structure Inspection Form

Criteria	Yes	No	Comments
Brick Risers			
Bricks Missing or Leaking			
Precast Risers			
Open Pipe Penetrations			
Settlement Around Structure			
Sink Hole Nearby			
Dry Weather Flow			
	*If yes, schedule follow up inspection using Illicit Connection Inspection Form		

Overall Condition ☐ Satisfactory ☐ Maintenance Required ☐ Repair

Additional Comments:

____

____

____

____

____

____

____

____

____

Outfall Inspection Form

Date: ______________ Weather Conditions: ____________________________

Time: ______________ Inspected By: __________________________________

Outfall Location: _____________________________ Outfall #: ___________________

Existing Conditions	Yes	No	Description/Comments
Vegetation			
Structural Damage			
Trash and Debris			
Dry Weather Flow *			

*If yes, schedule follow up inspection using Illicit Connection Insepection Form

Additional Comments:

____

____

____

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____

Private Facility Maintenance Log

<<Owner Address>>

RE: NJDEP Tier A Municipal Stormwater Discharge Permit
Stormwater Facilities Management
Notification Letter

Dear Private Owner:

This letter is to notify you that beginning in 2019 the City must require that you perform an annual inspection of your stormwater facilities and deliver a copy of the results to ______________________.

BACKGROUND

On January 1, 2018 the New Jersey Department of Environmental Protection ("NJDEP") Tier A Municipal Stormwater Discharge General Permits ("Permit") became effective. One of the new elements of the Permit requires that municipalities implement a program to ensure adequate long-term cleaning, operation, and maintenance of stormwater facilities not owned and operated by the Tier A Municipality.

REPORTING ELEMENTS

You are responsible for the operation and maintenance of the stormwater facilities on your property. The City is currently requesting that you report to us annually on the status of your facilities. Stormwater facilities include but are not limited to:

- drainage inlets,
- detention basins,
- retention basins,
- infiltration basins,
- wet ponds,
- stormwater conveyances (pipes, swales, channels, ditches),
- sand filters,
- constructed wetlands,
- bioretention systems,
- manufactured treatment devices,
- pervious paving systems.

We have enclosed sample inspection reports for your convenience. Please review your site for these facilities and report to us on the condition of each applicable feature. To obtain additional information regarding the inspection, maintenance, and repair of stormwater facilities, please review the guidance documents which are available through NJDEP at https://www.nj.gov/dep/stormwater/maintenance_guidance.htm.

We request that your first annual inspection report be submitted no later than December 31, 2019. Please feel free to contact us with any questions.

Pennoni

515 Grove Street
Suite 1B
Haddon Heights, NJ 08035
T: 856-547-0505
F: 856-547-9174

www.pennoni.com

Stormwater BMP Inspection Form

Section 1. Preliminary Information

NAME:____ DATE: _______________

ADDRESS:________________________________ TAX PARCEL #:_____________________

WEATHER CONDITIONS: __________________ LAST RAIN EVENT: ________________

INSPECTOR: ____

Section 2. System Conditions

Type of BMP(s): ____

General Condition of grounds: Dry Damp Wet Spongy Soggy

Photographs taken: Y/N As-Built Plan available? Y/N

	YES	NO	COMMENTS
DEWATERING			
Standing water observed			
DOWNSPOUTS/ROOF DRAINS			
Roof drains/downspouts clean			
Downspouts in good condition			
Roof drains connected to facility as required			
INLETS/MANHOLES			
Clear of debris			
Good condition			
SEDIMENT TRAPS			
Obviously trapping sediment			
Over 50% of storage volume remaining			
VEGETATION			
Drainage area stabilized			
Evidence of erosion			
OUTLETS/OVERFLOW			
Good condition			
Evidence of erosion			

COMMENTS OF PROPERTY OWNER:

COMMENTS OF INSPECTOR:

INSPECTOR SIGNATURE:

SPPP Form 14 – Total Maximum Daily Load Information

All records must be available upon request by NJDEP.

1. Using the Total Maximum Daily Load (TMDL) reports provided on www.nj.gov/dep/dwq/msrp-tmdl-rh.htm, list adopted TMDLs for the municipality, parameters addressed, and the affected water bodies that impact the municipality's MS4 program.

Pennsauken Creek - Fecal Coliform, Mercury, Polychlorinated Biphenyls (PCB's)
Parkers Creek - PCB's
Pompeston Creek - PCB's
Rancocas Creek - PCB's
Swede Run - PCB's
Strawbridge Lake - Total Phosphorus

2. Describe how the permittee uses TMDL information to prioritize stormwater facilities maintenance projects and to address specific sources of stormwater pollutants.

Th Township will use the TMDL informaion to prioritize any stormwater facility maintenance that is required based on the area in which the facilities are located.

The Township may address the Fecal Coliform TMDL by developing the following BMP's:
- Establish a goose management BMP
- Enforce riparian/lake and "No Mow" buffer restoration.

The Township may address the Mercury TMDL by regulating the common source of mercury pollutants such as factory smoke, solid/medical waste incineration, and some manufacturing processes.

The Township may address the PCB TMDL by collecting PMP reports from all applicable discharge points and ensure that the PMP reports are updated annually.

The Township may address the Total Phosphorus TMDL by continuing to raise awareness concerning fertilizer use through public education.

Total Maximum Daily Load (TMDL) Information

Total Maximum Daily Load (TMDL)
Guidance for Tier A MS4 Permittees

The Draft Tier A Municipal Separate Storm Sewer System (MS4) General Permit proposes to require Tier A MS4 permittees to review approved and adopted TMDL reports to identify any TMDLs that apply to surface water bodies wholly or partially within or bordering the Tier A municipality. The municipality would then use the information to prioritize maintenance of stormwater facilities and to identify and develop optional measures to address specific sources of stormwater-related pollutants contributing to a waterbody with an approved or adopted TMDL.

This guidance document provides examples of potential pollutant sources and responses to reduce pollutant loading for a number of common stormwater-related pollutants. This list does not contain all possible pollutant sources or all appropriate responses; therefore, municipalities must also consider other potential pollutant sources and responses as appropriate for their individual municipality. More detailed information on potential pollutant sources, potential responses, and proposed or completed projects aimed at reducing pollutant loading can be found in each TMDL document.

To use the Department's TMDL Look-Up Tool to find applicable TMDLs for each municipality, please visit www.nj.gov/dep/dwq/msrp-tmdl-rh.htm. To find a spreadsheet of all approved or adopted TMDLs in New Jersey, please visit www.nj.gov/dep/wms/bears/tmdls.html and select "Table of New Jersey TMDLs and Approval Status".

Fecal Coliform/Total Coliform/E. Coli/Enterococcus/Pathogens

Potential Sources	**Potential Responses**
Stormwater management facilities that are improperly designed and/or maintained	Ensure proper operation and maintenance of publicly owned and privately owned stormwater management facilities
	Retrofit existing stormwater management facilities to provide enhanced water quality benefits
Illicit discharges and connections	Identify and eliminate illicit discharges and connections
	Prioritize infrastructure mapping and inspection in TMDL areas
Malfunctioning sewage conveyance facilities	Identify and eliminate illicit discharges and connections
On-site disposal systems that are inadequately designed, operated, maintained, or located	Identify and eliminate illicit discharges and connections
Runoff from impervious surfaces such as sidewalks, roads, rooftops	Encourage green or blue infrastructure and adopt BMPs as necessary especially for any new construction (see www.nj.gov/dep/gi/)
Pets	Enforce pet waste ordinance(s)
	Target public education materials to pet owners
Wildlife	Enforce wildlife feeding ordinance(s)
	Establish goose management BMPs
	Riparian/Lake and "No Mow" buffer restoration

NOTE: This document is intended to provide examples of different pollutant sources and possible strategies for reducing pollutant loading to surface water bodies. This list is not exhaustive and is meant only to aid municipalities in identifying common pollutant sources and in taking optional measures to reduce pollutant loading.

Phosphorus	
Potential Sources	**Potential Responses**
Stormwater management facilities that are improperly designed and/or maintained	Ensure proper operation and maintenance of publicly owned and privately owned stormwater management facilities
	Retrofit existing stormwater management facilities to provide enhanced water quality benefits
Unmanaged urban stormwater runoff	Implement green infrastructure and other stormwater management strategies to reduce the adverse effects of unmanaged stormwater runoff;
	Adopt a stricter stormwater control ordinance, such as reducing the threshold for major development or requiring on-site retention
	Prioritize street sweeping and stormwater inlet cleaning in TMDL areas
Illicit discharges and connections	Identify and eliminate illicit discharges and connections
	Prioritize infrastructure mapping and inspection in TMDL areas
Malfunctioning sewage conveyance facilities	Identify and eliminate illicit discharges and connections
On-site disposal systems that are inadequately designed, operated, maintained, or located	Identify and eliminate illicit discharges and connections
Pets	Enforce pet waste ordinance(s); Target public education materials to pet owners
Wildlife	Enforce wildlife feeding ordinance(s)
	Establish goose management BMPs
	Riparian/Lake and "No Mow" buffer restoration
Fertilizers	Ensure a mechanism is in place for enforcement of the New Jersey Fertilizer Law (see www.nj.gov/dep/healthylawnshealthywater/)

NOTE: This document is intended to provide examples of different pollutant sources and possible strategies for reducing pollutant loading to surface water bodies. This list is not exhaustive and is meant only to aid municipalities in identifying common pollutant sources and in taking optional measures to reduce pollutant loading.

Total Suspended Solids

Potential Sources	Potential Responses
Stormwater management facilities that are improperly designed and/or maintained	Ensure proper operation and maintenance of publicly owned and privately owned stormwater management facilities
	Retrofit existing stormwater management facilities to provide enhanced water quality benefits
Unmanaged urban stormwater runoff	Implement green infrastructure and other stormwater management strategies to reduce the adverse effects of unmanaged stormwater runoff
	Adopt a stricter stormwater control ordinance, such as reducing the threshold for major development or requiring on-site retention
	Prioritize street sweeping and stormwater inlet cleaning in TMDL areas
Illicit discharges and connections	Identify and eliminate illicit discharges and connections
	Prioritize infrastructure mapping and inspection in TMDL areas
Malfunctioning sewage conveyance facilities	Identify and eliminate illicit discharges and connections
Construction site stormwater runoff	Ensure proper soil erosion and sediment control measures are installed on construction sites
Outfall pipe stream scour	Increase frequency of outfall pipe evaluation and repair instances of outfall pipe stream scour

NOTE: This document is intended to provide examples of different pollutant sources and possible strategies for reducing pollutant loading to surface water bodies. This list is not exhaustive and is meant only to aid municipalities in identifying common pollutant sources and in taking optional measures to reduce pollutant loading.

Amendment to the
Lower Delaware Water Quality Management Plan,
Mercer County Water Quality Management Plan,
Monmouth County Water Quality Management Plan,
Ocean County Water Quality Management Plan, and
Tri-County Water Quality Management Plan

Total Maximum Daily Loads for Fecal Coliform to Address 27 Streams in the Lower Delaware Water Region

Watershed Management Area 17
(Maurice, Salem, and Cohansey Rivers)
Watershed Management Area 18
(Big Timber, Mantua, Oldmans, Pennsauken, Raccoon, and Woodbury Creeks and Cooper River)
Watershed Management Area 19
(Rancocas Creek)
Watershed Management Area 20
(Assiscunk, Crosswicks, and Doctors Creeks)

Proposed:	April 21, 2003
Established:	June 27, 2003
Approved (by EPA Region 2):	September 29, 2003
Adopted:	

New Jersey Department of Environmental Protection
Division of Watershed Management
P.O. Box 418
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1.0 Executive Summary

In accordance with Section 305(b) of the Federal Clean Water Act (CWA), the State of New Jersey developed the *2002 Integrated List of Waterbodies*, addressing the overall water quality of the State's waters and identifying impaired waterbodies for which Total Maximum Daily Loads (TMDLs) may be necessary. The *2002 Integrated List of Waterbodies* identified several waterbodies in the Lower Delaware Water Region as being impaired by pathogens, as indicated by the presence of fecal coliform concentrations in excess of standards. This report, developed by the New Jersey Department of Environmental Protection (NJDEP), establishes twenty-seven TMDLs addressing fecal coliform loads to the waterbodies identified in Table 1.

Table 1 **Fecal coliform-impaired stream segments in the Lower Delaware Water Region, identified in Sublist 5 of the 2002 Integrated List of Waterbodies, for which fecal coliform TMDLs are being established.**

TMDL Number	WMA	Station Name/Waterbody	Site ID	County(s)	River Miles
1	17	Little Ease Run at Porchtown	01411458	Gloucester	9.2
2	17	Indian Branch near Malaga	01411466	Gloucester	5.2
3	17	Maurice River at Norma	01411500	Salem	10.5
4	17	Maurice River near Millville	01411800	Cumberland	2.1
5	17	Cohansey River at Seeley	01412800	Salem, Cumberland	33.8
6	17	Salem River at Woodstown	01482500	Salem	17.9
7	17	Salem River at Courses Landing	01482537	Salem	13.9
8	17	Two Penny Run near Danceys Corner	01482560	Salem	8.9
9	18	North Branch Pennsauken Creek near Morrestown	01467069	Burlington	10.1
10	18	South Branch Pennsauken Creek at Cherry Hill	01467081	Camden, Burlington	8.5
11	18	Cooper River at Lidenwold	01467120	Camden	1.6
12	18	Cooper River at Haddonfield	01467150	Camden	14.6
13	18	North Branch Cooper River at Kresson	01467155	Camden, Burlington	9.0
14	18	South Branch Big Timber Creek at Glenloch	01467327	Camden, Gloucester	3.9
15	18	South Branch Big Timber Creek at Blackwood Terrace	01467329	Camden, Gloucester	9.8
16	18	North Branch Big Timber Creek at Glendora	01467359	Camden, Gloucester	18.1
17	18	Still Run near Mickelton	01476600	Gloucester	5.9
18	18	Raccoon Creek near Swedesboro	01477120	Gloucester	8.2
19	18	Oldmans Creek at Jessups Mill	01477440	Salem, Gloucester	7.2
20	18	Oldmans Creek at Porches Mill	01477510	Salem, Gloucester	16.2
21	19	Sharps Run at Rt 541 at Medford	01465884	Burlington	4.1
22	19	North Branch Rancocas Creek at Pine St at Mt Holly	01467006	Burlington	6.5
23	20	Crosswicks Creek at Groveville Rd.	01464504	Monmouth, Mercer, Burlington, Ocean	12.4
24	20	Doctors Creek at Allentown	01464515	Monmouth, Mercer	15.7
25	20	Bacons Creek near Mansfield Square	01464529	Burlington	7.4
26	20	Annaricken Brook near Jobstown	01464578	Burlington	3.7
27	20	North Branch Barkers Brook near Jobstown	01464583	Burlington	4.8

TMDL Number	WMA	Station Name/Waterbody	Site ID	County(s)	River Miles
Total River Miles					270

These twenty-seven TMDLs will serve as management approaches or restoration plans aimed at identifying the sources of fecal coliform and for setting goals for fecal coliform load reductions in order to attain applicable surface water quality standards (SWQS).

As stated in N.J.A.C. 7:9B-1.14(c) of the New Jersey Surface Water Quality Standards, "Fecal coliform levels shall not exceed a geometric average of 200 CFU/100 ml nor should more than 10 percent of the total sample taken during any 30-day period exceed 400 CFU/100 ml in FW2 waters." Nonpoint and stormwater point sources are the primary contributors to fecal coliform loads in these streams and can include storm-driven loads transporting fecal coliform from sources such as geese, farms, and domestic pets to the receiving water. Nonpoint sources also include steady-inputs from sources such as failing sewage conveyance systems and failing or inappropriately located septic systems. Because the total point source contribution other than stormwater (i.e. Publicly-Owned Treatment Works, POTWs) is an insignificant fraction of a percent of the total load, these fecal coliform TMDLs will not impose any change in current practices for POTWs and will not result in changes to existing effluent limits.

Using ambient water quality data monitoring conducted during the water years 1994-2002, summer and all season geometric means were determined for each Category 5 listed segment. Given the two surface water quality criteria of 200 CFU/100 ml and 400 CFU/100 ml in FW2 waters, computations were necessary for both criteria and resulted in two values for percent reduction for each stream segment. The higher (more stringent) percent reduction value was selected as the TMDL and will be applied to nonpoint and stormwater point sources as a whole or apportioned to categories of nonpoint and stormwater point sources within the study area. The extent to which nonpoint and stormwater point sources have been identified or need to be identified or verified varies by segment based on data availability, watershed size and complexity, and pollutant sources. Implementation strategies to achieve SWQS are addressed in this report.

Each TMDL shall be proposed and adopted by the Department as an amendment to the appropriate area wide water quality management plan(s) in accordance with N.J.A.C. 7:15-3.4(g).

This TMDL Report is 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," (Suftin, 2002) which describes the statutory and regulatory requirements for approvable TMDLs.

2.0 Introduction

Sublist 5 (also known as Category 5 or, traditionally, the 303(d) List) of the State of New Jersey's proposed *2002 Integrated List of Waterbodies* identified several waterbodies in the Lower Delaware Water Region as being impaired by pathogens, as evidenced by the presence of high fecal coliform concentrations. This report establishes twenty-seven TMDLs, which address fecal coliform loads to the identified waterbodies. These TMDLs serve as management approaches or restoration plans aimed toward reducing loadings of fecal coliform from various sources in order to attain applicable surface water quality standards for the pathogen indication. Several of these waterbodies are listed in Sublist 5 for impairment caused by other pollutants. These TMDLs address only fecal coliform impairments. Separate TMDL evaluations will be developed to address the other pollutants of concern. The waterbodies will remain on Sublist 5 with respect to these pollutants until such time as TMDL evaluations for all pollutants have been completed and approved by USEPA. With respect to the fecal coliform impairment, the waterbodies will be moved to Sublist 4 following approval of the TMDLs by USEPA.

3.0 Background

In accordance with Section 305(b) of the Federal Clean Water Act (CWA) (33 U.S.C. 1315(B)), the State of New Jersey is required to biennially 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.

In accordance with Section 303(d) of the CWA, the State is also required to biennially prepare and submit to USEPA a report that identifies waters that do not meet or are not expected to meet surface water quality standards (SWQS) after implementation of technology-based effluent limitations or other required controls. This report is commonly referred to as the 303(d) List. In November 2001, USEPA issued guidance that encouraged states to integrate the 305(b) Report and the 303(d) List into one report. This integrated report assigns waterbodies to one of five categories. In general, Sublists 1 through 4 include waterbodies that are unimpaired, have limited assessment or data availability or have a range of designated use impairments, whereas Sublist 5 constitutes the traditional 303(d) List for waters impaired or threatened by one or more pollutants. The Department chose to develop an Integrated Report for New Jersey. New Jersey's proposed *2002 Integrated List of Waterbodies* is based upon these five categories and identifies water quality limited surface waters in accordance with N.J.A.C. 7:15-6 and Section 303(d) of the CWA. Water quality limited waterbodies require total maximum daily load (TMDL) evaluations.

A Total Maximum Daily Load (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 load capacity to known point and nonpoint sources in the form of wasteload allocations (WLAs), load allocations (LAs), and a margin of safety. A TMDL is developed as a mechanism for identifying all the contributors to surface water quality impacts and setting goals for load reductions for pollutants of concern as necessary to meet the SWQS.

Recent EPA guidance (Suftin, 2002) describes the statutory and regulatory requirements for approvable TMDLs, as well as additional information generally needed for USEPA 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. Wasteload 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.

4.0 Pollutant of Concern and Area of Interest

The pollutant of concern for these TMDLs is pathogens, the presence of which is indicated by elevated concentrations of fecal coliform bacteria. Fecal coliform concentrations were found to exceed New Jersey's Surface Water Quality Standards (SWQS), published at N.J.A.C. 7-9B et seq., for the segments in the Lower Delaware Water Region identified in Table 2. As reported in the proposed *2002 Integrated List of Waterbodies*, also identified in Table 2 are the river miles and management response associated with each listed segment. All of these waterbodies have a high priority ranking, as described in the *2002 Integrated List of Waterbodies*.

Table 2 Abridged Sublist 5 of the 2002 Integrated List of Waterbodies, listed for fecal coliform impairment in the Lower Delaware Water Region.

TMDL No.	WMA	Station Name/Waterbody	Site ID	River Miles	Management Response
1	17	Little Ease Run at Porchtown	1411458	9.2	establish TMDL
2	17	Indian Branch near Malaga	1411466	5.2	establish TMDL
3	17	Maurice River at Norma	1411500	10.5	establish TMDL
4	17	Maurice River near Millville	1411800	2.1	establish TMDL
	17	Buckshutem Creek near Laurel Lake	1411950	11.5	water quality monitoring needed to identify if an impairment exists;

TMDL No.	WMA	Station Name/Waterbody	Site ID	River Miles	Management Response
					move to Sublist 3
5	17	Cohansey River at Seeley	1412800	33.8	establish TMDL
6	17	Salem River at Woodstown	1482500	17.9	establish TMDL
7	17	Salem River at Courses Landing	1482537	13.9	establish TMDL
8	17	Two Penny Run near Danceys Corner	1482560	8.9	establish TMDL
9	18	North Branch Pennsauken Creek near Morrestown	1467069	10.1	establish TMDL
10	18	South Branch Pennsauken Creek at Cherry Hill	1467081	8.5	establish TMDL
11	18	Cooper River at Lidenwold	1467120	1.6	establish TMDL
12	18	Cooper River at Haddonfield	1467150	14.6	establish TMDL
13	18	North Branch Cooper River at Kresson	1467155	9.0	establish TMDL
14	18	South Branch Big Timber Creek at Glenloch	1467327	3.9	establish TMDL
15	18	South Branch Big Timber Creek at Blackwood Terrace	1467329	9.8	establish TMDL
16	18	North Branch Big Timber Creek at Glendora	1467359	18.1	establish TMDL
17	18	Still Run near Mickelton	1476600	5.9	establish TMDL
18	18	Raccoon Creek near Swedesboro	1477120	8.2	establish TMDL
19	18	Oldmans Creek at Jessups Mill	1477440	7.2	establish TMDL
20	18	Oldmans Creek at Porches Mill	1477510	16.2	establish TMDL
21	19	Sharps Run at Rt 541 at Medford	1465884	4.1	establish TMDL
	19	North Branch Rancocas Creek at Browns Mills	1465970	3.3	water quality monitoring needed to identify if an impairment exists; move to Sublist 3.
22	19	North Branch Rancocas Creek at Pine St at Mt Holly	1467006	6.5	establish TMDL
23	20	Crosswicks Creek at Groveville Rd.	1464504	12.4	establish TMDL
24	20	Doctors Creek at Allentown	1464515	15.7	establish TMDL
25	20	Bacons Creek near Mansfield Square	1464529	7.4	establish TMDL
26	20	Annaricken Brook near Jobstown	1464578	3.7	establish TMDL
27	20	North Branch Barkers Brook near Jobstown	1464583	4.8	establish TMDL

These twenty-seven TMDLs will address 270 river miles or approximately 95% of the total river miles listed as impaired relative to fecal coliform (285 total fecal coliform impaired river miles) in the Lower Delaware watershed region. Based on a detailed county hydrography stream coverage, 748 stream miles, or 15% of the stream segments in the Lower Delaware region (5164 total miles) are directly affected by the TMDLs due to the fact that the implementation plans cover entire watersheds; not just impaired waterbody segments.

Table 2, identifies two segments (the North Branch Rancocas Creek at Browns Mills #01465970 and Buckshutem Creek near Laurel Lake #01411950) for which TMDLs will not be developed at this time based on investigations following the *2002 Integrated List of Waterbodies* proposal. These segments are identified as needing further monitoring to confirm impairment and will be moved to Sublist 3 of the 2002 Integrated List of Waterbodies. Appendix A provides a further discussion of these segments.

4.1. Description of the Lower Delaware Water Region and Sublist 5 Waterbodies

The Lower Delaware Region includes the Delaware River, Delaware Bay and numerous tributaries from Trenton to southern Cumberland County. The Lower Delaware Region is one of diversity, comprised of a mixture of suburban areas, urban centers, agricultural land, rural towns, forests, and the protected Pinelands ecosystem.

Included in the Lower Delaware Region are large portions of Burlington, Camden, Cumberland, Gloucester, and Salem Counties, as well as parts of Mercer, Monmouth, Ocean and Atlantic Counties. These counties are divided into Watershed Management Area (WMA) 17 (Maurice, Salem, Cohansey), WMA 18 (Lower Delaware Tributaries), WMA 19 (Rancocas Creek) and WMA 20 (Assiscunk, Crosswicks, Doctors Creeks).

4.1.1. Watershed Management Area 17

WMA 17 includes the Cohansey River, Maurice River, Salem River and Alloway, Dividing, Manantico, Manumuskin, Miles, Mill, Stow and Whooping Creeks. This area includes portions of Atlantic, Cumberland, Gloucester, and Salem counties, over 39 municipalities and encompasses 885 square miles.

The Cohansey River, which drains 105 square miles of eastern Salem County, is nearly 30 miles long from its headwaters to Delaware Bay. From the headwaters in Salem County, through Bridgeton, an urban center in Cumberland County, to its mouth in Delaware Bay, it is the second largest river in Cumberland County. The Cohansey River watershed is an area of very low relief, which results in numerous small tributaries. Sunset Lake and Mary Elmer Lake are among 20 major impoundments in this drainage basin. The majority of the land use in this watershed is agriculture, while much of the undeveloped area remains forested.

The Maurice River has a drainage area of 386 square miles and meanders south for 50 miles through Cumberland County to the Delaware Bay. The major tributaries of this river are Scotland Run, Manantico Creek, Muskee Creek, Muddy Run, and the Manumuskin River. Agriculture is also the principal land use in this watershed. Land use in the upper portion of the basin is 48% forested, 27% agricultural, and 25% developed or barren. Portions of the river have been nationally designated as Wild and Scenic. The main stem and tributaries flow through Vineland and Millville, which are local centers of development.

The Salem River drains an area of 114 square miles and flows 32 miles from Upper Pittsgrove Township west to Deepwater, then south to the Delaware River. Much of the lower portions of the river are tidal. Major tributaries of the Salem River include Mannington Creek, Game Creek, Majors Run, and Fenwick Creek. Land use is 43% agricultural, 10% forested and 33% wetlands, and 13% urban/suburban. The major urban center is Salem City.

Sublist 5 Waterbodies in WMA 17

Eight of the twenty-seven impaired waterbody segments addressed in this report are located in WMA 17. Included are the Little Ease Run (#01411458), Indian Branch (#01411466), Maurice River (#01411500 and #01411800), Cohansey River (#01412800), Salem River (#01482500 and #01482537), and Two Penny Run (#01482560). The spatial extent of each segment is identified in Figure 1 and described in Table 3. River miles, watershed sizes and land use/land cover by percent area associated with each segment are listed in Table 4.

Figure 1 Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 17.

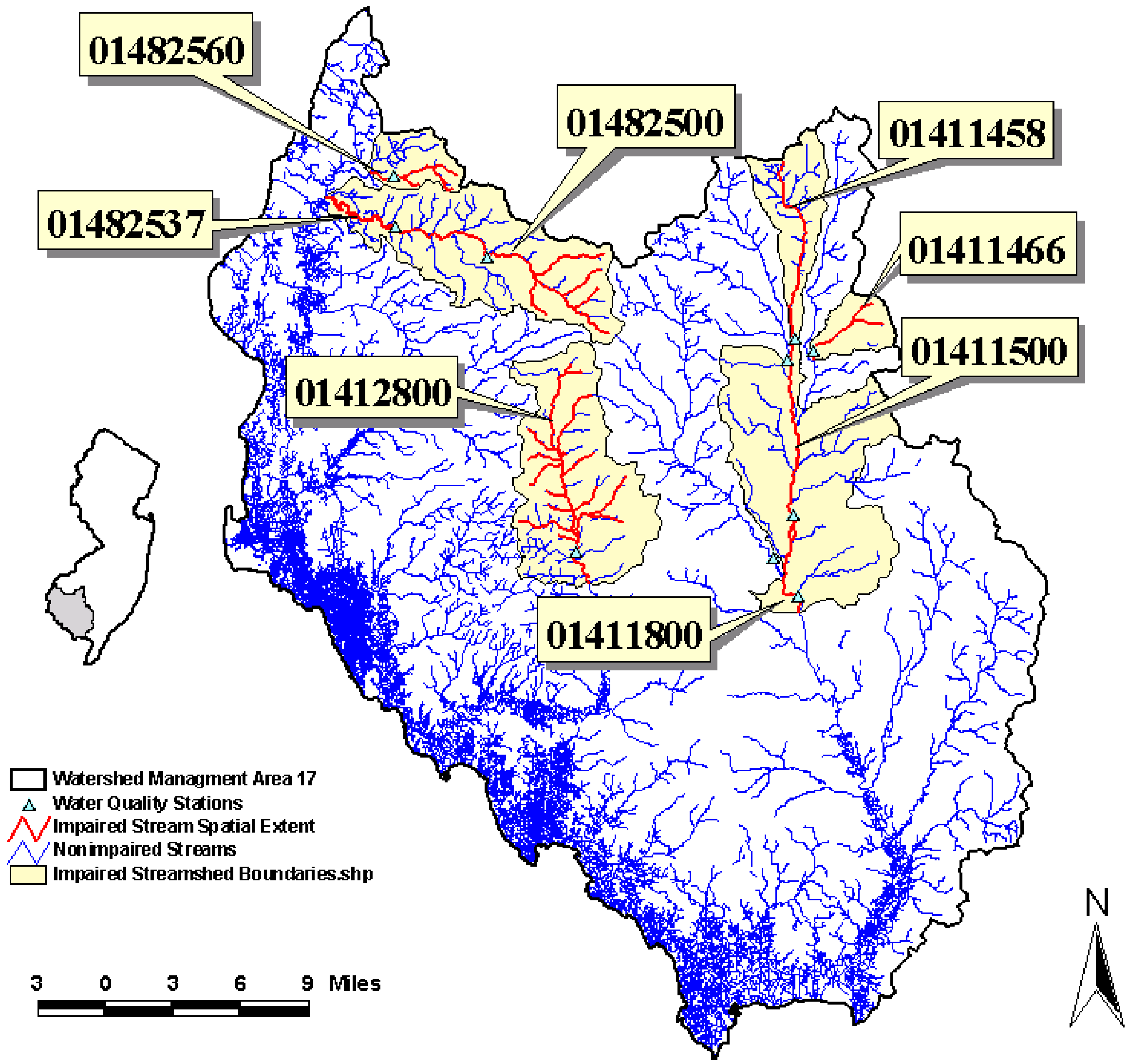


Table 3 **Description of the spatial extent for each Sublist 5 segment, listed for fecal coliform, in WMA 17.**

Segment ID	Watershed area associated with impaired stream segments
01411458, 01411500, 01411800	Mainstem Maurice River watershed upstream of Union Lake.
01411466	The Indian Branch watershed upstream of Malaga Lake.
01412800	The Cohansey River watershed upstream of Sunset Lake
01482500, 01482537	Salem River watershed upstream of its confluence with Game Creek.
01482560	Two Penny Run watershed downstream to Laytons Lake

Table 4 **River miles, Watershed size, and Anderson Land Use classification for eight Sublist 5 segments, listed for fecal coliform, in WMA 17.**

	Segment ID				
	01411458, 01411500, 01411800	**01411466**	**01412800**	**01482500 01482537**	**01482560**
Sublist 5 impaired river miles (miles)	21.9	5.2	33.8	31.8	8.9
Total river miles within the delineated watershed and included in the implementation plan (miles)	88.2	5.9	67.4	73.5	178
Watershed size (acres)	44270	4235	26907	27211	4989
<u>Land Use/ Land Cover</u>					
Agriculture	18.0%	8.4%	69.4%	65.7%	55.4%
Barren Land	1.2%	0.1%	0.3%	0.1%	0.3%
Forest	34.1%	46.3%	12.7%	9.8%	9.7%
Urban	27.9%	16.5%	9.9%	9.9%	8.0%
Water	0.9%	0.0%	0.6%	1.4%	1.2%
Wetlands	17.9%	28.7%	7.2%	13.2%	25.4%

4.1.2. Watershed Management Area 18

WMA 18 includes the Cooper River, Big Timber, Mantua, Newton, Oldmans, Pennsauken, Pompeston, Raccoon, Repaupo, and Woodbury Creeks, as well as Baldwin Run, Swede Run and Maple Swamp. WMA 18 covers all or parts of Burlington, Camden and Gloucester counties, including 68 municipalities covering 391 square miles.

The Cooper River is 16 miles long, and its watershed encompasses an area of 40 square miles. The river flows through Camden County to the Delaware River at Camden City. The largest tributaries are the North Branch Cooper River and Tindale Run. Extensive development exists along the main stem and areas adjacent to the North Branch. Major impoundments are present such as Cooper River Lake, Kirkwood Lake, Evans Pond, Linden Lake, Hopkins Pond, and Square Circle Lake. The land use within the Cooper River watershed is primarily urban and suburban.

Big Timber Creek drains an area of 63 square miles. The main stem and most of the South Branch divide Gloucester and Camden counties before flowing into the Delaware River near Brooklawn, south of Camden City. Major tributaries include Otter Creek, Beaver Brook, and Almonesson Creek. Major impoundments are Blackwood Lake, Grenloch Lake, Hirsch Pond, and Nash's Lake. This watershed is primarily urban/suburban with forested areas at the headwaters and urban areas at the mouth of Big Timber Creek.

Mantua Creek drains an area of 50.9 square miles of land. From its headwaters in Glassboro, Mantua Creek flows 18.6 miles northwest to the Delaware River at Paulsboro. Major tributaries include the Chestnut Branch (7 miles long), Edwards Run (6.9 miles long) and Duffield Run which drains 2.3 square miles (Information provided by the Federation of Gloucester County Watersheds). Land use is urban/suburban along the main branch and most of Chestnut Branch, and agriculture along Edwards Run.

Oldmans Creek drains an area of 44 square miles and flows to the Delaware River. This creek is 20 miles long and marks the boundary between Gloucester and Salem counties. Tidal marshes exist at the mouth of this creek, while the western third of Oldmans Creek is tidal. Major tributaries include Kettle Run and Beaver Creek. For the most part, Oldmans Creek watershed is agricultural and forested, with some residential and industrial development.

The Pennsauken Creek drains 33 square miles of southwestern Burlington County and northern Camden County. This creek flows into the Delaware River near Palmyra. The North Branch of the Pennsauken is in Burlington County, while the South Branch is the boundary between Burlington and Camden Counties. Industry is concentrated at the mouth of the Pennsauken Creek. Much of the watershed is developed as urban/suburban development, with the remainder divided between agricultural and forested land.

The Raccoon Creek watershed is approximately 40 square miles and drains central Gloucester County. The creek itself is 19 miles long and flows from Elk Township to the Delaware River. While there are several minor tributaries, the most significant of these is the South Branch of the Raccoon Creek. Much of the lower half of Raccoon Creek is tidal, and at the mouth are a number of tidal marshes. Evan Lake, Mullica Hill Pond, and Swedesboro Lake are among the many small lakes and ponds in this area. The land use is primarily agricultural, with industrial areas located along the creek's tidal sections.

Woodbury Creek is approximately five miles in length and drains an area of 18 square miles. Woodbury Creek contains two major tributaries: Hessian Run and Matthews Branch. Land use in the Woodbury Creek watershed is characterized by commercial, urban and suburban development. Woodbury Creek is the most densely developed watershed in Gloucester County. Much of the land along the main stem is publicly owned and is used for parks, lakes, active recreation, and conservation areas.

Sublist 5 Waterbodies in WMA 18

Twelve of the twenty-seven TMDLs in the Lower Delaware Region are located in WMA 18. Impaired stream segments include: Pennsauken Creek (#01467069, #01467081), Cooper River (#01467120, #01467150, #01467155), Big Timber Creek (#01467327, #01467329, #01467359), Still Run, (#01476600), Raccoon Creek (#01477120), and Oldmans Creek (#01477440, #01477510). Several of these stream segments are geographically located in close proximity, thus, when these segments were found to contain similar levels of bacteria contamination (geometric mean value), water quality data from these segments were grouped when calculating the TMDL. The spatial extent of each segment is identified in Figure 2 and described in Table 5. River miles, watershed sizes and land use/land cover by percent area associated with each segment are listed in Table 6.

Figure 2 Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 18

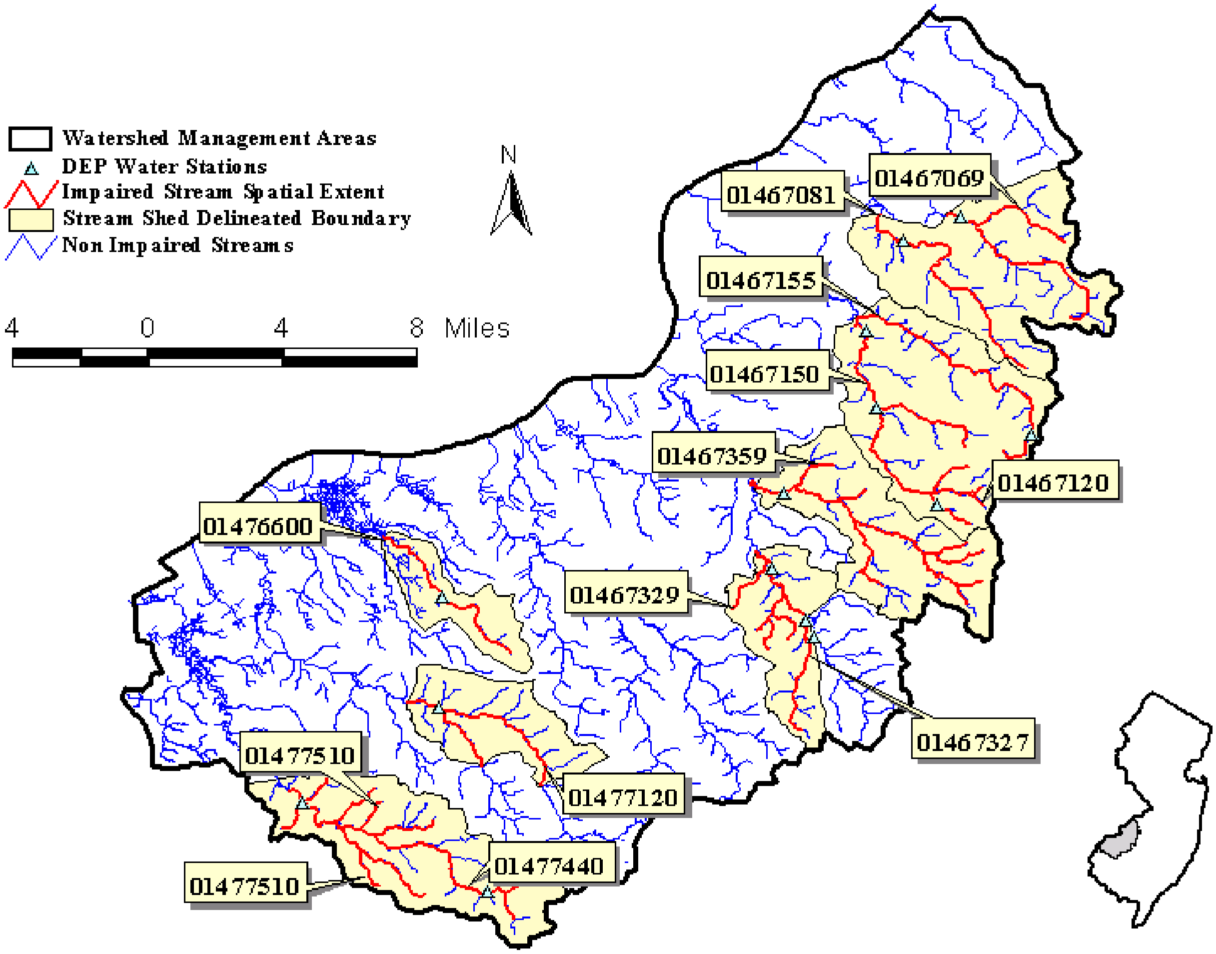


Table 5 **Description of the spatial extent for each Sublist 5 segment, listed for fecal coliform, in WMA 18.**

Segment ID	Watershed area associated with impaired stream segments
01467081, 01467069	North Branch Pennsauken Creek and South Branch Pennsauken Creek watersheds from their respective headwaters to the head-of-tide in each stream.
01467120, 01467150, 01467155	The Cooper River and North Branch Cooper River watersheds upstream of the confluence of the Cooper River with the North Branch Cooper River.
01467327, 01467329	The South Branch of Big Timber Creek watershed upstream of the head-of-tide.
01467359	The North Branch Big Timber Creek watershed upstream of the confluence

	of the North and South Branches of Big Timber Creek.
01476600	Still Run watershed to the confluence of London Branch with Still Run (also named "Repaupo Creek).
01477120	From the head of tide on Raccoon Creek approximately 6 miles upstream on Raccoon Creek and approximately 2.2 miles upstream on the South Branch Raccoon Creek.
01477440, 01477510	Oldmans Creek watershed to the head-of-tide downstream of Jessups Mill

Table 6 River miles, Watershed size, and Anderson Land Use classification for twelve Sublist 5 segments, listed for fecal coliform, in WMA 18.

	Segment ID						
	01467081 01467069	**01467120 01467150 01467155**	**01467327 01467329**	**01467359**	**01476600**	**01477120**	**01477440 01477510**
Sublist 5 impaired river miles (miles)	28.8	25.2	13.7	18.1	5.9	8.2	23.5
Total river miles within the delineated watershed and included in the implementation plan (miles)	42.5	45.2	20.7	31.4	15.3	19.3	37.6
Watershed size (acres)	16584	18484	7151	12560	4634	7265	14897
<u>Land Use/ Land Cover</u>							
Agriculture	4.0%	2.3%	5.8%	1.2%	56.8%	45.5%	53.2%
Barren Land	1.0%	2.2%	2.6%	2.5%	0.2%	2.1%	0.7%
Forest	7.9%	15.3%	20.1%	23.3%	11.9%	19.2%	18.5%
Urban	71.2%	67.8%	59.3%	62.5%	15.2%	24.0%	13.8%
Water	0.8%	0.7%	1.1%	1.0%	1.3%	0.4%	0.6%
Wetlands	15.2%	11.8%	11.1%	9.5%	14.6%	8.8%	13.2%

4.1.3. Watershed Management Area 19

WMA 19, the Rancocas Creek Watershed, is the largest watershed in south central New Jersey and is comprised of Mill Creek and the North Branch, South Branch and main stem of Rancocas Creek. Portions of Burlington, Camden and Ocean counties, and approximately 33 municipalities, are within this management area which covers 360 square miles, and reaches deep into the Pinelands Preservation Area.

Of the 360 square miles, the North Branch drains 167 square miles, and 144 miles is drained by the South Branch. The North Branch, 31 miles in length, is fed by the Greenwood Branch, McDonalds Branch and Mount Misery Brook. The major tributaries of the South Branch include the Southwest Branch Rancocas Creek, Jade Run, Haynes Creek, and Friendship Creek. The South/Southwest Branches are approximately 13 miles long. The drainage area is 144 square miles.

The main stem of Rancocas Creek flows approximately 8 miles, draining an area of about 49 square miles before emptying into the Delaware River at Delanco and Riverside. Tidal influence occurs for about 15 stream miles, extending through the entire length of the main stem (8 miles) to the dam at Mount Holly on the North Branch, Vincentown on the South Branch, and Kirby Mills on the Southwest Branch. Land use within the Rancocas Creek Watershed is 40% forested, with the remainder comprised of 30% developed land and 17% devoted to agricultural use, including cranberry cultivation.

Sublist 5 Waterbodies in WMA 19

Two of the twenty-seven TMDLs in this report are located in WMA 19. Included are Sharps Run, a tributary to the South Branch Rancocas Creek (#01465884), and a segment of the North Branch Rancocas Creek (#01467006). The spatial extent of each segment is identified in Figure 3 and described in Table 7. River miles, watershed sizes and land use/land cover by percent area associated with each segment are listed in Table 8.

Figure 3 **Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 19**

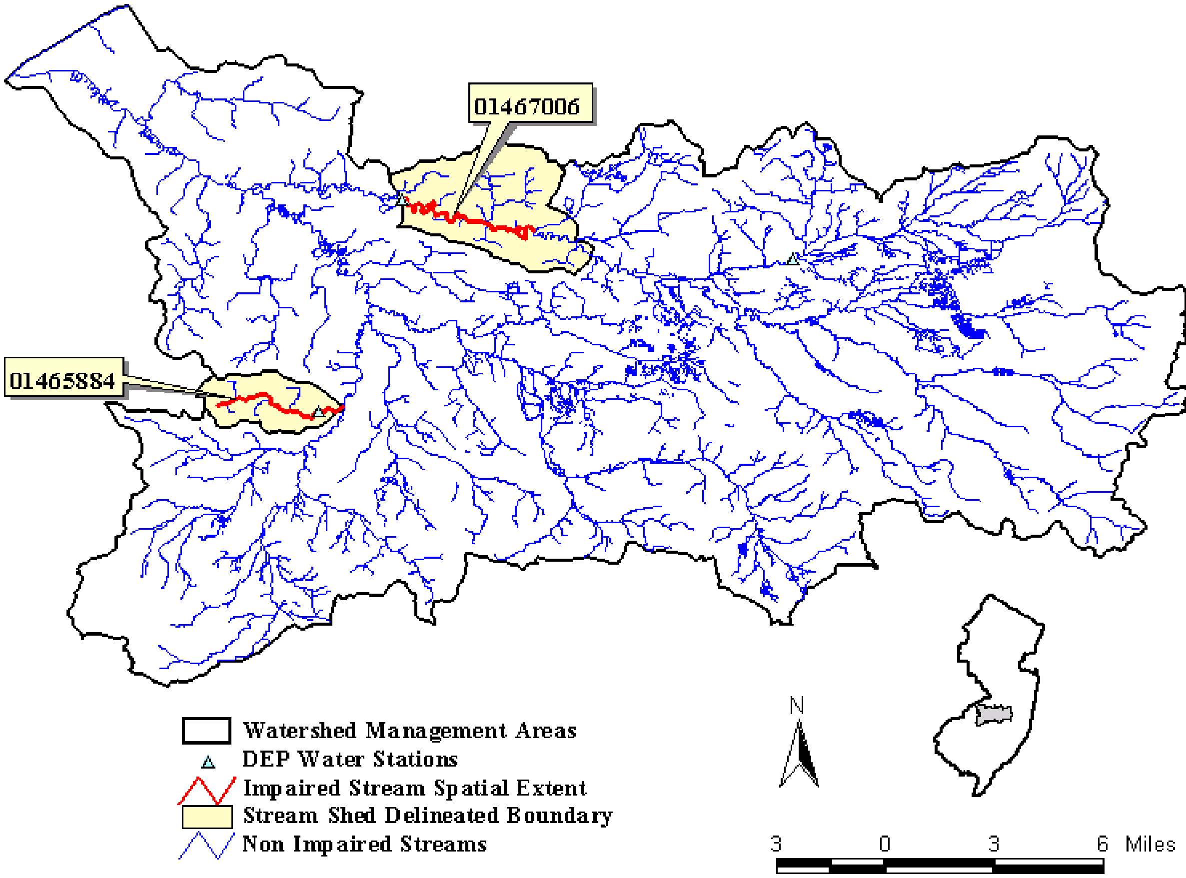


Table 7 Description of the spatial extent for each Sublist 5 segment, listed for fecal coliform, in WMA 19.

Segment ID	Watershed area associated with impaired stream segments
01465884	Sharps Run watershed downstream to the confluence of Sharps Run with the South Branch Rancocas Creek.
01467006	The North Branch Rancocas Creek watershed area contained between the confluence of Indian Run with the North Branch Rancocas Creek to the town of Mount Holly.

Table 8 River miles, Watershed size, and Anderson Land Use classification for two Sublist 5 segments, listed for fecal coliform, in WMA 19.

	Segment ID	
	01465884	**01467006**
Sublist 5 impaired river miles (miles)	4.1	6.5
Total river miles within the delineated watershed and included in the implementation plan (miles)	7.3	27.1
Watershed size (acres)	3079	8256
Land Use/Land Cover		
Agriculture	19.9%	34.7%
Barren Land	0.4%	2.9%
Forest	7.3%	14.9%
Urban	23.3%	24.3%
Water	0.3%	1.5%
Wetlands	48.9%	21.7%

4.1.4. Watershed Management Area 20

WMA 20 includes the Assiscunk, Blacks, Crafts, Crosswicks, Doctors, Duck and Mill Creeks. This watershed management area is comprised of 26 municipalities spanning four counties: Burlington, Mercer, Monmouth and Ocean encompassing 253 square miles. Crosswicks Creek, entering the Delaware River at Bordentown, is 25 miles long and drains an area of 146 square miles. Major tributaries include Jumping Brook, Lahaway Creek, North Run and Doctors Creek. Tides affect this stream up to the Crosswicks Mill Dam. Allentown Lake, Oxford Lake, Prospertown Lake, and Imlaystown Lake are major impoundments in the Crosswicks Creek Watershed. Important land uses in this watershed include agriculture, residential/commercial development and military installations, with the remainder covered by woodland areas.

Sublist 5 Waterbodies WMA 20

Five of the twenty-seven TMDLs in this report are located in WMA 20. Included are segments in the Crosswicks Creek (#01464504), Doctors Creek (#01464515), Bacons Creek (#01464529), Annaricken Brook (#01464578), and North Branch Barkers Brook (#01464583). The spatial extent of each segment is identified in Figure 4 and described in Table 9. River miles, watershed sizes and land use/land cover by percent area associated with each segment are listed in Table 10.

Figure 4 **Spatial extent of Sublist 5 segments for which TMDLs are being developed in WMA 20**

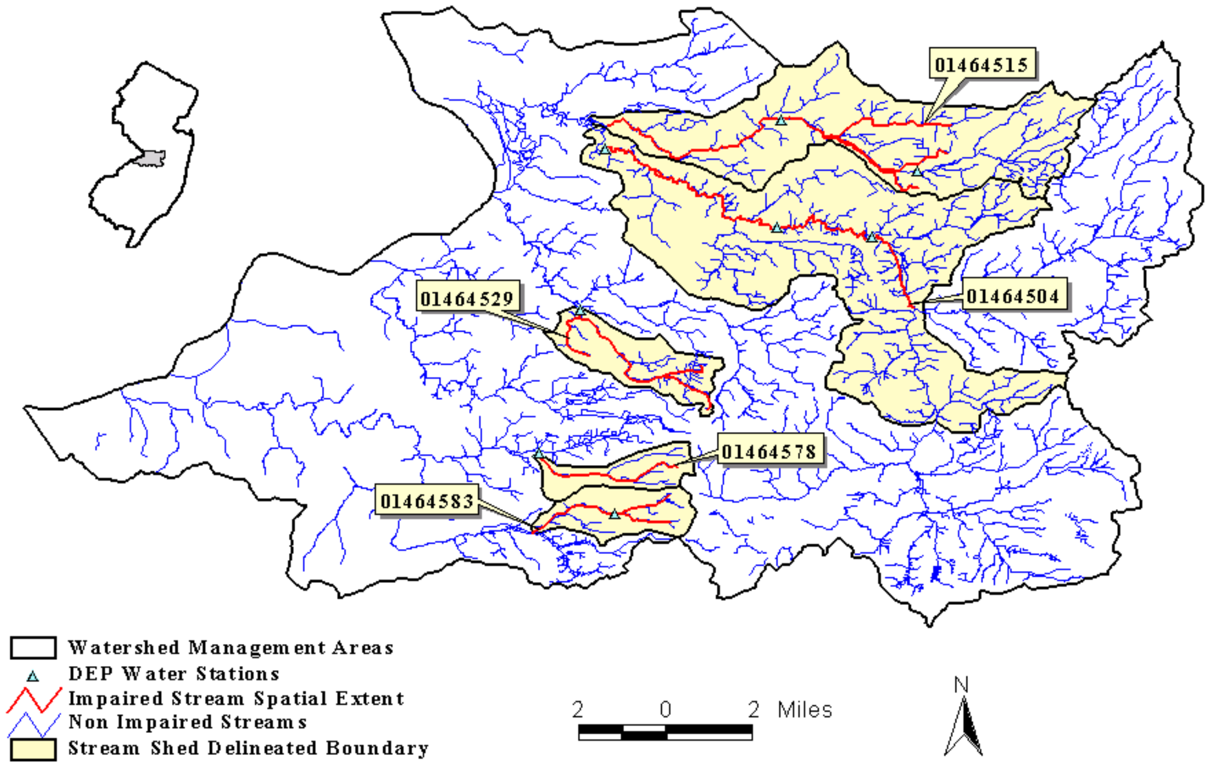


Table 9 **Description of the spatial extent for each Sublist 5 segment, listed for fecal coliform, in WMA 20.**

Segment ID	Watershed area associated with impaired stream segments
01464504	Watershed area begins at Crosswicks Creek near New Egypt and extends downstream to the confluence of Doctors Creek with Crosswicks Creek. Tributaries included in this watershed include Beaverdam Brook, Deep Run, Miry Run, Pleasant Run, Schoolhouse Brook, Shoppen Run, and Stony Ford Brook.
01464515	Doctors Creek watershed from headwaters, near Nelsonville, extending west to approximately 0.5 miles upstream from the confluence of Doctors and Crosswicks Creeks. Tributaries included in this watershed include Buckhole Creek and Negro Run
01464529	Bacons Creek watershed upstream of its confluence with Blacks Creek.
01464578	Annaricken Brook watershed upstream of the confluence of Annaricken Brook and the Assiscunk Creek.
01464583	North Branch of Barkers Brook watershed upstream of the confluence of the North and South Branches of Barkers Brook.

Table 10 **River miles, Watershed size, and Anderson Land Use classification for five Sublist 5 segments, listed for fecal coliform, in WMA 20.**

	Segment ID				
	01464504	**01464515**	**01464529**	**01464578**	**01464583**
Sublist 5 impaired river miles (miles)	12.4	15.7	7.4	3.7	4.8
Total river miles within the delineated watershed and included in the implementation plan (miles)	118.5	69.5	21.8	14.4	8.9
Watershed size (acres)	22762	13389	3613	2607	2365
Land Use/Land Cover					
Agriculture	50.3%	49.5%	50.8%	40.2%	44.6%
Barren Land	0.3%	0.6%	0.0%	0.3%	1.6%
Forest	14.0%	13.1%	9.2%	6.6%	13.4%
Urban	14.5%	14.5%	11.6%	9.6%	6.5%
Water	0.8%	1.3%	0.1%	0.0%	0.3%
Wetlands	20.2%	21.1%	28.3%	43.3%	33.7%

4.2. Data Sources

The Department's Geographic Information System (GIS) was used extensively to describe the Lower Delaware watershed characteristics. In concert with USEPA's November 2001 listing guidance, the Department is using Reach File 3 (RF3) in the 2002 Integrated Report to represent rivers and streams. The following is general information regarding the data used to describe the watershed management area:

- Land use/Land cover information was taken from the 1995/1997 Land Use/Land cover Updated for New Jersey DEP, published 12/01/2000 by Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA), delineated by watershed management area.
- 2002 Assessed Rivers coverage, NJDEP, Watershed Assessment Group, unpublished coverage.
- County Boundaries: Published 11/01/1998 by the NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA), "NJDEP County Boundaries for the State of New Jersey." Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/stco.zip
- Detailed stream coverage (RF3) by County: Published 11/01/1998 by the NJDEP, Office of Information Resources Management (OIRM), Bureau of Geographic Information and Analysis (BGIA). "Hydrography of XXX County, New Jersey (1:24000)." Online at: http://www.state.nj.us/dep/gis/digidownload/zips/strm/

- NJDEP 14 Digit Hydrologic Unit Code delineations (DEPHUC14), published 4/5/2000 by Department of Environmental Protection (NJDEP), New Jersey Geological Survey (NJGS) Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dephuc14.zip
- NJPDES Surface Water Discharges in New Jersey, (1:12,000), published 02/02/2002 by Division of Water Quality (DWQ), Bureau of Point Source Permitting - Region 1 (PSP-R1).
- Dams statewide coverage. Published 5/16/2000 by Dam Safety Section. Titled "NJDEP Dams for the State of New Jersey." New Jersey Department of Environmental Protection(NJDEP).
  Online at: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dams.zip

5.0 Applicable Water Quality Standards

5.1. New Jersey Surface Water Quality Standards for Fecal Coliform

As stated in N.J.A.C. 7:9B-1.14(c) of the New Jersey SWQS, the following are the criteria for freshwater fecal coliform:

> "Fecal coliform levels shall not exceed a geometric average of 200 CFU/100 ml nor should more than 10 percent of the total samples taken during any 30-day period exceed 400 CFU/100 ml in FW2 waters".

All of the waterbodies covered under these TMDLs have a FW2 classification (NJAC 7:9B-1.12). The designated use, i.e. surface water uses, both existing and potential, that have been established by the Department for waters of the State, for all of the waterbodies in the Lower Delaware Water Region is as stated below:

In all FW2 waters, the designated uses are:
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.

5.2. Pathogen Indicators in New Jersey's Surface Water Quality Standards (SWQS)

A subset of total coliform, fecal coliform originates from the intestines of warm-blooded animals. Therefore, because they do not include organisms found naturally in soils, fecal coliform is preferred over total coliform as a pathogen indicator. In 1986, USEPA published a document entitled *"Implementation Guidance for Ambient Water Quality Criteria for Bacteria –*

1986" that contained their recommendations for water quality criteria for bacteria to protect bathers from gastrointestinal illness in recreational waters. The water quality criteria established levels of indicator bacteria *Escherichia coli* (*E. coli*) for fresh recreational water and enterococci for fresh and marine recreational waters in lieu of fecal coliforms. Historically, New Jersey has listed water bodies for exceedances of the fecal coliform criteria. Therefore, the Department is obligated to develop TMDLs for Sublist 5 water bodies based upon fecal coliform, until New Jersey makes the transition to *E. coli* and enterococci in its SWQS and sufficient data have been collected to assess impairment in accordance with the revised indicators.

6.0 Source Assessment

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

6.1. Assessment of Point Sources other than Stormwater

Point sources of fecal coliform, namely sewage treatment discharges, for these TMDLs are listed in Appendix B. Sewage treatment plants, whether municipal or industrial, are required to disinfect effluent prior to discharge and to meet surface water quality criteria for fecal coliform in their effluent. In addition, New Jersey's Surface Water Quality Standards at N.J.A.C. 7:9B-1.5(c)4 reads "No mixing zones shall be permitted for indicators of bacterial quality including, but not limited to, fecal coliforms and enterococci". This mixing zone policy is applicable to both municipal and industrial sewage treatment plants.

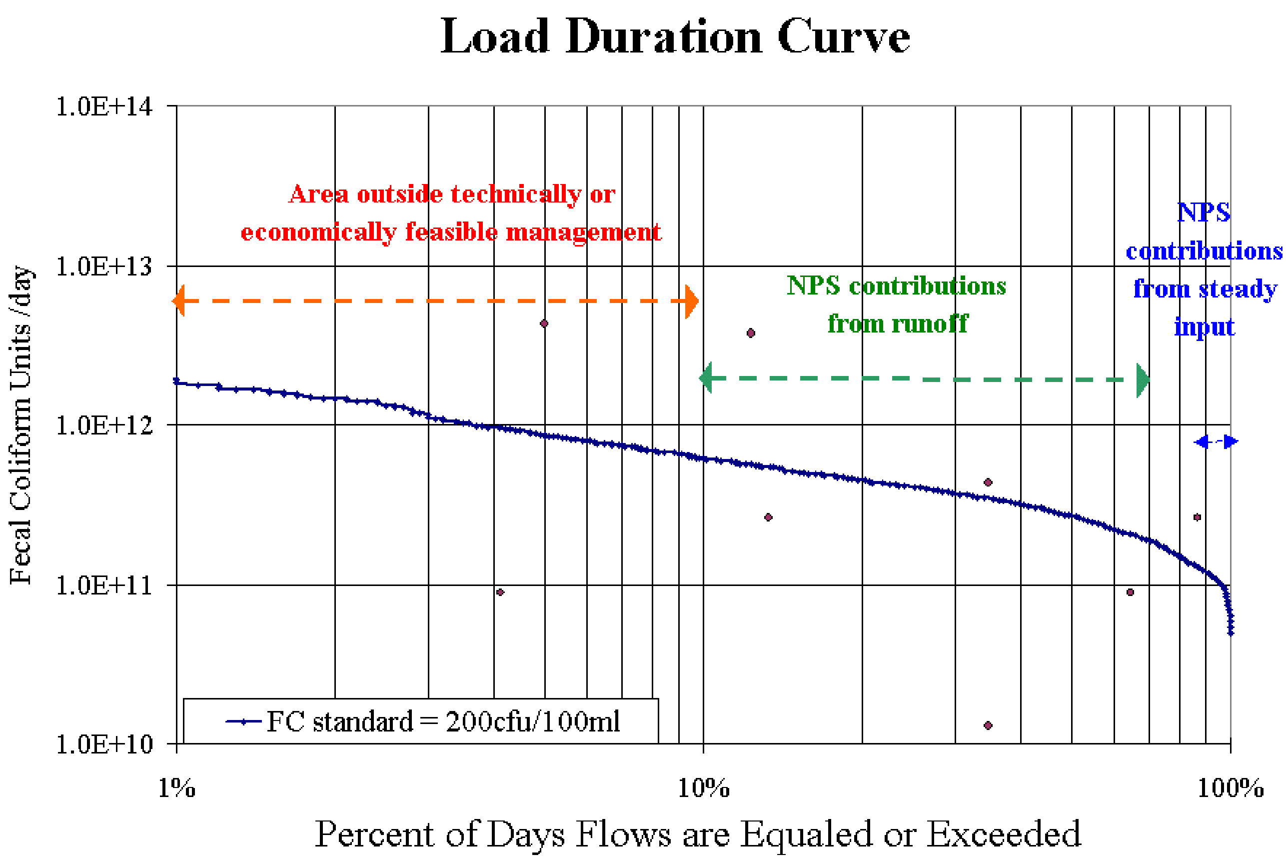
Since sewage treatment plants routinely achieve essentially complete disinfection (less than 20 CFU/100ml), the requirement to disinfect results in fecal coliform concentrations well below the criteria and permit limit. The percent of the total point source contribution is an insignificant fraction of the total load. Consequently, these fecal coliform TMDLs will not impose any change in current practices for POTWs and industrial treatment plants and will not result in changes to existing effluent limits.

6.2. Assessment of Nonpoint and Stormwater Point Sources

Nonpoint and stormwater point sources include storm-driven loads such as runoff from various land uses that transport fecal coliform from sources such as geese, farms, and domestic pets to the receiving water. Domestic pet waste, geese waste, as well as loading from storm water detention basins will be addressed by the Phase II MS4 program. Nonpoint sources also include steady-inputs from "illicit" sources such as failing sewage conveyance systems, sanitary sewer overflows (SSOs), and failing or inappropriately located septic systems. When "illicit" sources are identified, either through the Phase II MS4 requirements or trackdown studies conducted by the Department, appropriate enforcement measures will be taken to eliminate them.

When streamflow gage information is available, a load duration curve (LDC) is useful in identifying and differentiating between storm-driven and steady-input sources. As an example, Figure 5 represents a LDC using the 200 CFU/100 ml criterion.

Figure 5 Example Load Duration Curve (LDC)



The load duration curve method is based on comparison of the frequency of a given flow event with its associated water quality load. A LDC can be developed using the following steps:

1. Plot the Flow Duration Curve, Flow vs. % of days flow exceeded.
2. Translate the flow-duration curve into a LDC by multiplying the water quality standard, the flow and a conversion factor; the result of this multiplication is the maximum allowable load associated with each flow.
3. Graph the LDC, maximum allowable load vs. percent of time flow is equaled or exceeded.
4. Water quality samples are converted to loads (sample water quality data multiplied by daily flow on the date of sample).
5. Plot the measured loads on the LDC.

Values that plot below the LDC represent samples below the concentration threshold whereas values that plot above represent samples that exceed the concentration threshold. Loads that plot above the curve and in the region between 85 and 100 percent of days in which flow is exceeded indicate a steady-input source contribution. Loads that plot in the region between 10 and 70 percent suggest the presence of storm-driven source contributions. A combination of both storm-driven and steady-input sources occurs in the transition zone between 70 and 85 percent. Loads that plot above 99 percent or below 10 percent represent values occurring during either extreme low or high flows conditions and are thus considered to be outside the region of technically and economically feasible management. In this report, LDCs are used only for TMDL implementation and not in calculating TMDLs.

LDCs for listed segments in the Lower Delaware region are located in Appendix D. In each case, thirty (30) years of USGS gage flow data (water years 1970-2000), from the listed station, were used in generating the curve. When a recent 30-year period was not available at the listed station, an adjacent station was selected based on station correlation information in US Geological Survey Open File Report 81-1110 (USGS, 1982). When an adjacent station was used in the manner, flows were adjusted to the station of interest based on a ratio of watershed size. LDCs were not developed for stations in which a satisfactory correlation could not be found.

7.0 Water Quality Analysis

Relating pathogen sources to in-stream concentrations is distinguished from quantifying that relationship for other pollutants given the inherent variability in population size and dependence not only on physical factors such as temperature and soil characteristics, but also on less predictable factors such as re-growth media. Since fecal coliform loads and concentrations can vary many orders of magnitude over short distances and over time at a single location, dynamic model calibrations can be very difficult to calibrate. Options available to control nonpoint sources of fecal coliform typically include measures such as goose management strategies, pet waste ordinances, agricultural conservation management plans, and septic system replacement and maintenance. However, the effectiveness of these control measures is not easily measured. Given these considerations, detailed water quality modeling may not provide adequate insight or guidance toward the development of implementation plans for fecal coliform reductions.

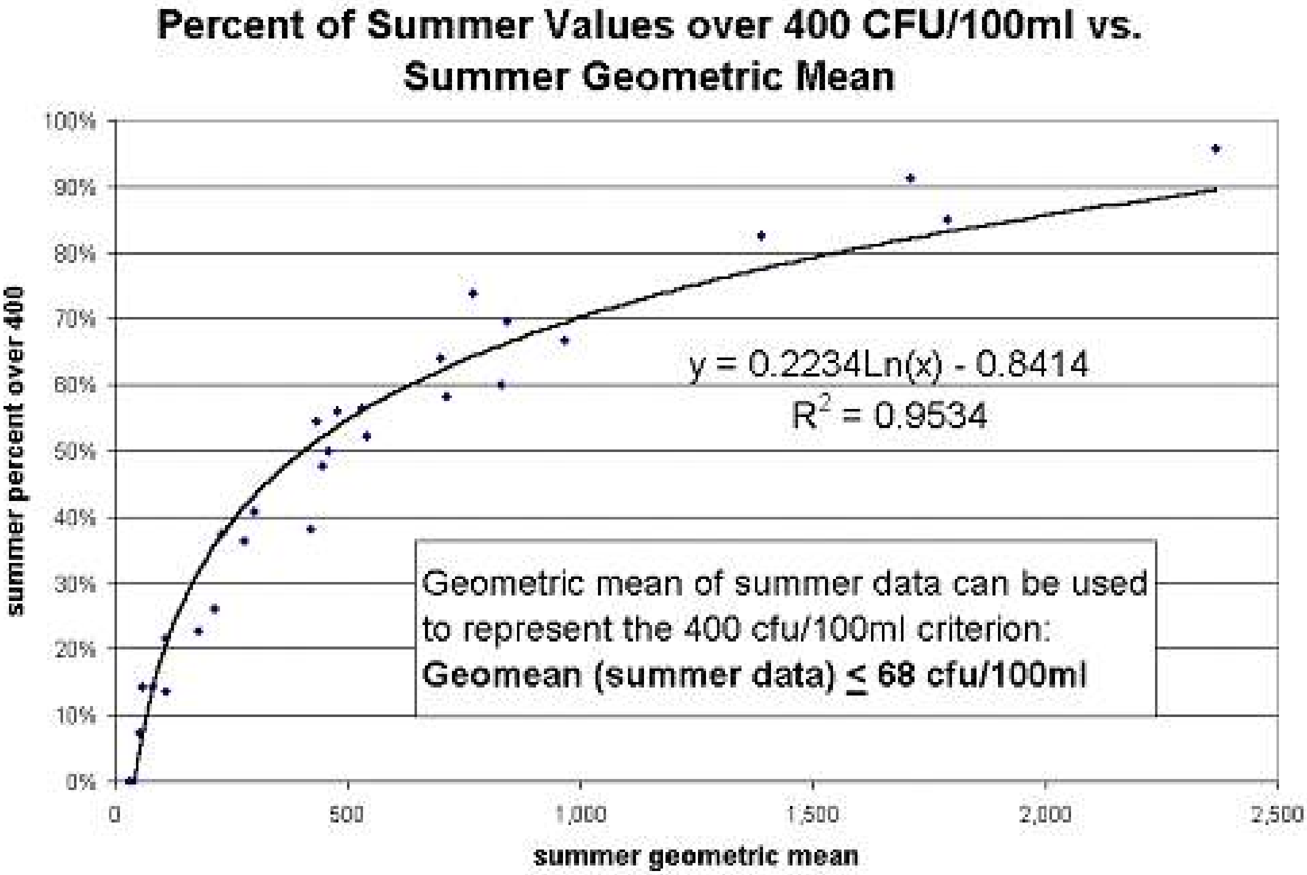
As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a waterbody can receive without violating water quality standards (40 C.F.R. 130.2). The loadings are required to be expressed as either mass-per-time, toxicity, or other appropriate measures (40 C.F.R. 130.2(i)). For these TMDLs, the load capacity is expressed as a concentration set to meet the state water quality standard. For bacteria, it is appropriate and justifiable to express the components of a TMDL as percent reduction based on concentration. The rationale for this approach is that:

- expressing a bacteria TMDL in terms of concentration provides a direct link between existing water quality and the numeric target;
- using concentration in a bacteria TMDL is more relevant and consistent with the water quality standards, which apply for a range of flow and environmental conditions; and
- follow-up monitoring will compare concentrations to water quality standards.

Given the two criteria of 200 CFU/100 ml and 400 CFU/100 ml in FW2 waters, computations were necessary for both criteria and resulted in two percent reduction values. The higher percent reduction value was applied in the TMDL so that both the 200 CFU/100 ml and 400 CFU/100 ml criteria were satisfied.

To satisfy the 200 CFU/100ml criteria, the geometric mean of all available data between water years 1994-2002 was compared to an adjusted target concentration. The adjusted target accounts for an explicit margin of safety and is equal to 200 minus the margin of safety. A calculation incorporating all available data is generally conservative since most samples are taken during the summer when fecal coliform is generally higher. A geometric mean of summer data was used to develop a percent reduction to satisfy the 400 CFU/100 ml criteria. A summer geometric mean can be used to represent the 400 criteria by regressing the percent over 400 CFU/100 ml against the geometric mean (Figure 6). Thus, each datapoint on Figure 6 represents all the data from one individual monitoring station. Sites with 20 or more summer data points were used to develop this regression, in order to make use of more significant values for percent exceedance. A statewide regression was used rather than regional regressions because the regression shape was not region-specific and the strength of the correlation was highest when all statewide data were included. The resulting regression has an r-squared value of 0.9534. Solving for X when Y is equal to 10% yields a geometric mean threshold of 68 CFU/100ml. This means that, using summer data, a geometric mean of 68 can be used to represent the 400 CFU/100ml criterion. Since the geometric mean is a more reliable statistic than percentile when limited data are available, 68 CFU/100ml was used to represent the 400 CFU/100ml criterion for all sites. The inclusion of all data from summer months (May through September) to compare with the 30-day criterion is justified because summer represents the critical period when primary and secondary contact with water bodies is most prevalent. A more detailed justification for using summer data can be found in Section 7.1, "Seasonal Variation and Critical Conditions."

Figure 6 Percent of summer values over 400 CFU/100ml as a function of summer geometric mean values



$y = 0.2234 Ln(x) - 0.8414$ Equation 1

$R^2 = 0.9534$

Geometric mean, and summer geometric mean, and percent reductions were determined at each location for both criteria using Equations 2 through 4. To satisfy the 200 CFU/100ml criteria, equations 2 and 3 were applied. Equations 2 and 4 were used in satisfying the 400 CFU/100ml criteria.

$$Geometric\ Mean\ \ for\ 200CFU\ \ criteria = \sqrt[n]{y_1 y_2 y_3 y_4 .... y_n}$$ Equation 2

where:
y = sample measurement
n = total number of samples

$$200\ CFU\ \ criteria\ Percent\ \mathrm{Re}\,duction = \frac{(Geometric\ mean - (200 - e))}{Geometric\ mean} \times 100\ \%$$ Equation 3

$$400\ CFU\ \ criteria\ Percent\ \mathrm{Re}\,duction = \frac{(SummerGeometric\ mean - (68 - e))}{SummerGeometric\ mean} \times 100\ \%$$ Equation 4

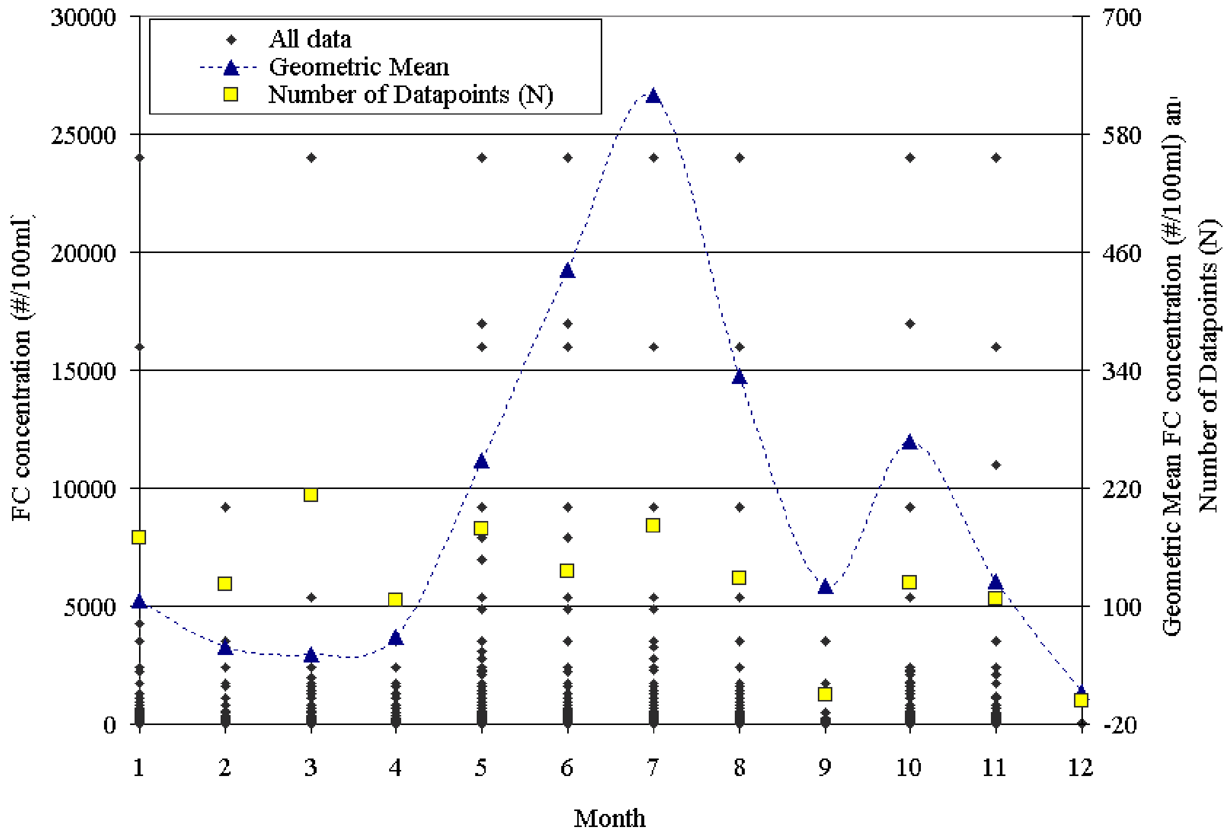
where:
e = (margin of safety)

This percent reduction can be applied to nonpoint and stormwater point sources as a whole or be apportioned to categories of nonpoint and stormwater point sources within the study area. The extent to which nonpoint and stormwater point sources have been identified or need to be identified varies by study area based on data availability, watershed size and complexity, and pollutant sources.

7.1. Seasonal Variation/Critical Conditions

These TMDLs will attain applicable surface water quality standards year round. The approach outlined in this paper is conservative given that in most cases fecal coliform data were collected during the summer months, a time when in-stream concentrations are typically the highest. This relationship is evidenced when calculating, on a monthly basis, the geometric mean of fecal coliform data collected statewide. Statewide fecal coliform geometric means during water years 1994-1997 were compared on a monthly basis and are shown in Figure 7. The 1994-1997 period was chosen for this analysis so that the significance of the number of individual datapoints for any given month was minimized. During the 1994-1997 period year-round sampling for fecal coliform was conducted by sampling four times throughout the year. Following 1997, the fecal coliform sampling protocol was changed to five samples during a 30-day period in the summer months. As evident in Figure 7, higher monthly geometric means are observed between May and September with the highest values occurring during mid-summer. This relationship is also evident when using the entire 1994-2002 dataset or datasets from individual water years. Given this relationship, summer is considered the critical period for violating fecal coliform SWQS and, as such, sampling during this period is considered adequate for meeting year round protections and designated uses.

Figure 7 **Statewide monthly fecal coliform geometric means during water years 1994-1997 using USGS/NJDEP data.**



7.2. Margin of Safety

A Margin of Safety (MOS) is provided to account for "lack of knowledge concerning the relationship between effluent limitations and water quality" (40 CFR 130.7(c)). For these TMDLs calculations, both an implicit and explicit Margin of Safety (MOS) are incorporated. Implicitly, a MOS is inherent in the estimates of current pollutant loadings, the targeted water quality goals (New Jersey's SWQS) and the allocations of loading. This was accomplished by taking conservative assumptions throughout the TMDL evaluation and development. Examples of some of the conservative assumptions include treating fecal coliform as a conservative substance, applying the fecal coliform criteria to stormwater point sources, and applying the fecal coliform criteria to the stream during all weather conditions. Fecal coliforms decay in the environment (i.e. outside the fecal tract) relatively rapidly, yet this analysis assumes a linear relationship between fecal load and instream concentration. Furthermore, it is generally recognized that fecal contamination from stormwater poses much less risk of illness than fecal contamination from sewage or septic system effluent (Cabelli, 1989). Finally, much of the fecal coliform is flushed into the system during rainfall events and passes through the system in a short time. Primary and secondary recreation generally occur during dry periods.

An explicit MOS is provided by incorporating a confidence level multiplier associated with log-normal distributions in the calculation of the load reduction for both the 200 and 400 standards. Using this method, the 200 and 400 targets are reduced based on the number of data points and the variability within each data set. For these TMDLs, a confidence level of 90% was used in calculating the MOS. As a result, and as identified in Appendix C, the target value will be different for each stream segment or grouped segments. The explicit margin of safety is calculated using the following steps:

1- fecal coliform data (x) will transformed to Log form data (y),
2- the mean of the Log- transformed data (y) is determined, $\bar{y}$
3- Determine the standard deviation of the Log-transformed data, S_y using the following equation:

$$S_y = \sqrt{\frac{\sum_i (y_i - \bar{y})^2}{N-1}}$$

4- Determine the Geometric mean of the fecal coliform data (GM)
5- Determine the standard deviation of the mean (standard error of the mean), $s_{\bar{y}}$, using the following equation:

$$s_{\bar{y}} = \frac{s_y}{\sqrt{N}}$$

6- For the 200 standard (x_{standard}), y_{standard} = Log(200)= 2.301, thus for a confidence level of 90%, the target value will be the lower confidence limit (n= -1.64), $y_{target} = y_{std} - n \cdot s_{\bar{y}}$, for example, the 200 criteria: y_{target} = 2.301- n* $s_{\bar{y}}$
7- The target value for x, $x_{\text{target}} = 10^{y\ \text{target}}$
8- The margin of safety (e) therefore will be e = $x_{\text{standard}} - x_{\text{target}}$
9- Finally, the load reduction = $\frac{GM - x_{target}}{GM} \cdot 100\%$, for example the 200 criteria will be defined as: $\frac{(GM - (200 - e))}{GM} \cdot 100\%$

The 400 criteria would be defined as: $\frac{(GM - (68 - e))}{GM} \cdot 100\%$

8.0 TMDL Calculations

Because these TMDLs are calculated based on ambient water quality data, the allocations are provided in terms of percent reductions. In the same way, the loading capacity of each stream is expressed as a function of the current load:

$LC = (1 - PR) \times L_o$, where

LC = loading capacity for a particular stream;
PR = percent reduction as specified in Tables 7-10;

L_o = current load.

8.1. Wasteload Allocations and Load Allocations

For the reasons discussed previously, these TMDLs do not include WLAs for traditional point sources (POTWs, industrial, etc.). WLAs are hereby established for all NJPDES-regulated point sources (including NJPDES-regulated stormwater), while LAs are established for all stormwater sources that are not subject to NJPDES regulation, and for all nonpoint sources. Both WLAs and LAs are expressed as percentage reductions for particular stream segments.

Table 11 identifies the required percent reduction necessary for each stream segment or group of segments to meet the fecal coliform SWQS. The reductions reported in these tables include a margin of safety factor and represent the higher percent reduction (more stringent) required of the two criteria. Reductions that are required under each criteria are located in Appendix C. In all cases, the 400 CFU/100ml criteria was the more stringent of the two criteria, thus values reported in Table 11 were equal to the percent required to meet the 400 CFU/100ml criteria.

Table 11 TMDLs for fecal coliform-impaired stream segments in the Lower Delaware Water Region as identified in Sublist 5 of the 2002 Integrated List of Waterbodies. The reductions reported in this table represent the higher, or more stringent, percent reduction required of the two fecal colifom criteria.

TMDL Number	WMA	303(d) Category 5 Segments	Water Quality Stations	Station Names	Load Allocation (LA) and Margin of Safety (MOS)					Wasteload Allocation (WLA)
					Summer N	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	
1	17	01411466	01411466	Indian Branch near Malaga	20	70	47%	3%	49%	49%
2 3 4	17	01411458 01411500 01411800	01411458 01411500 01411800	Little Ease Run at Porchtown, Maurice River at Norma, Maurice River near Millville	30	130	36%	48%	67%	67%
5	17	01412800	01412800	Cohansey River at Seeley	27	122	39%	44%	66%	66%
6 7	17	01482500 01482537	01482500 01482537	Salem River at Woodstown, Salem River at Courses Landing	29	251	39%	73%	84%	84%
8	17	01482560	01482560	Two Penny Run near Danceys Corner	5	408	39%	83%	90%	90%

TMDL Number	WMA	303(d) Category 5 Segments	Water Quality Stations	Station Names	Load Allocation (LA) and Margin of Safety (MOS)					Wasteload Allocation (WLA)
					Summer N	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	
9 10	18	01467069 01467081	01467069 01467081	North Branch Pennsauken Creek near Morrestown, South Branch Pennsauken Creek at Cherry Hill	8	17677	54%	99.6%	99.8%	99.8%
11 12 13	18	01467120 01467150 01467155	01467120 01467150 01467155	Cooper River at Lidenwold, Cooper River at Haddonfield, North Branch Cooper River at Kresson	36	1473	33%	95%	97%	97%
14 15	18	01467327 01467329	01467327 01467329	South Branch Big Timber Creek at Glenloch, South Branch Big Timber Creek at Blackwood Terrace	18	298	36%	77%	85%	85%
16	18	01467359	01467359	North Branch Big Timber Creek at Glendora	14	928	41%	93%	96%	96%
17	18	01476600	01476600	Still Run near Mickelton	5	249	32%	73%	82%	82%
18	18	01477120	01477120	Raccoon Creek near Swedesboro	28	387	30%	82%	88%	88%
19 20	18	01477440 01477510	01477440 01477510	Oldmans Creek at Jessups Mill, Oldmans Creek at Porches Mill	13	774	43%	91%	95%	95%
21	19	01465884	01465884	Sharps Run at Rt 541 at Medford	5	264	52%	74%	88%	88%
22	19	01467006	01467006	North Branch Rancocas Creek at Pine St at Mt Holly	5	417	60%	84%	94%	94%
23	20	01464504	01464500 01464504 01464420 2	Crosswicks Creek at Extonville, Crosswicks Creek at Groveville Rd. at Groveville, Crosswicks Creek near New Egypt, Crosswicks Creek at Walnford Rd In Upper Freehold	42	380	22%	82%	86%	86%
24	20	01464515	01464515 3	Doctors Creek at Allentown, Doctors Creek at Route 539 In Upper Freehold	33	346	27%	80%	86%	86%
25	20	01464529	01464529	Bacons Creek near Mansfield Square	5	399	61%	83%	93%	93%
26	20	01464578	01464578	Annaricken Brook near Jobstown	6	432	68%	84%	95%	95%
27	20	01464583	01464583	North Branch Barkers Brook near Jobstown	10	813	54%	92%	96%	96%

[1] MOS as a percent of target is equal to: $\frac{e}{200\ CFU/100ml}$ or $\frac{e}{68\ CFU/100ml}$ where "e" is defined as the MOS in Section 7.2

8.2. 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 (Section 8.0), and both WLAs and LAs are expressed as percentage reductions for particular stream segments (Section 8.1). Therefore, the percent reductions from current levels must be attained in consideration of any new sources that may accompany future development. Strategies for source reduction will apply equally well to new development as to existing development.

9.0 Follow - up Monitoring

In association with the Water Resources Division of the U.S. Geological Survey, the NJDEP 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. Bacteria monitoring, as part of the ASMN network, are conducted five times during a consecutive 30-day summer period each year. The data from this network has been used to assess the quality of freshwater streams and percent load reductions. Although other units also perform monitoring functions, the ASMN will remain a principal source of fecal coliform monitoring.

10.0 Implementation

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).

Development of effective management measures depends on accurate source assessment. Fecal coliform is contributed to the environment from a number of categories of sources including human, domestic or captive animals, agricultural practices, and wildlife. Fecal coliform from these sources can reach waterbodies directly, through overland runoff, or through sewage or stormwater conveyance facilities. Each potential source will respond to one or more management strategies designed to eliminate or reduce that source of fecal coliform. Each management strategy has one or more entities that can take lead responsibility to effect the strategy. Various funding sources are available to assist in accomplishing the management strategies. The Department will address the sources of impairment through systematic source trackdown, matching strategies with sources, selecting responsible entities and aligning available resources to effect implementation.

For example, the stormwater discharged to the impaired segments through "small municipal separate storm sewer systems" (small MS4s) will be regulated under the Department's proposed Phase II NJPDES stormwater rules for the Municipal Stormwater Regulation Program. Under those proposed rules and associated draft general permits, many municipalities (and various county, State, and other agencies) in the Lower Delaware Region will be required to implement various control measures that should substantially reduce bacteria loadings, including measures to eliminate "illicit connections" of domestic sewage and other waste to the small MS4, adopt and enforce a pet waste ordinance, prohibit feeding of unconfined wildlife on public property, clean catch basins, perform good housekeeping at maintenance yards, and provide related public education and employee training. Sewage conveyance facilities are potential sources of fecal coliform in that equipment failure or operational problems may result in the release of untreated sewage. These sources, once identified, can be eliminated through appropriate corrective measures that can be effected through the Department's enforcement authority. Inadequate on-site sewage disposal can also be a source of fecal coliform. Systems that were improperly designed, located or maintained may result in surfacing of effluent and illicit remedies such as connections to storm sewers or streams add human waste directly to waterbodies. Once these problems have been identified through local health departments, sanitary surveys or other means, alternatives to address the problems can be evaluated and the best solution implemented. The Department has committed a portion of its CWA 319(h) pass through grant funds to assist municipalities in meeting Phase II requirements. In addition, The New Jersey Environmental Infrastructure Financing Program, which includes New Jersey's State Revolving Fund, provides low interest loans to assist in correction of water quality problems related to stormwater and wastewater management.

Agricultural activities are another example of potential sources of fecal coliform. Possible contributors are direct contributions from livestock permitted to traverse streams and stream corridors, manure management from feeding operations, or use of manure as a soil fertilizer/amendment. Implementation of conservation management plans and best management practices are the best means of controlling agricultural sources of fecal coliform. Several programs are available to assist farmers in the development and implementation of conservation management plans and best management practices. 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). The New Jersey Departments of Environmental Protection and Agriculture, in partnership with the Farm Service Agency and Natural Resources Conservation Service, has recently submitted a proposal to the USDA to offer financial incentives for agricultural landowners to voluntarily implement conservation practices on agricultural lands through CREP. NJ CREP will be part of the USDA's Conservation Reserve Program (CRP). 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.

- **The Soil & Water Conservation Cost-Sharing Program** is available to participants in a Farmland Preservation Program pursuant to the Agriculture Retention and Development Act. A Farmland Preservation Program (FPP) means any voluntary FPP or municipally approved FPP, the duration of which is at least 8 years, which has as its principal purpose as long term preservation of significant masses of reasonably contiguous agricultural land within agricultural development areas. The maintenance and support of increased agricultural production must be the first priority use of the land. Eligible practices include erosion control, animal waste control facilities, and water management practices. Cost sharing is provided for up to 50% of the cost to establish eligible practices.

10.1. Source Trackdown

Through the watershed management process and New Jersey Watershed Ambassador Program, river assessments and visual surveys of the impaired segment watersheds were conducted to identify potential sources of fecal coliform. Watershed partners, who are intimately familiar with local land use practices, were able to share information relative to potential fecal coliform sources. The New Jersey Watershed Ambassadors Program is a community-oriented AmeriCorps environmental program designed to raise awareness about watershed issues in New Jersey. Through this program, AmeriCorps members are placed in watershed management areas across the state to serve their local communities. Watershed Ambassadors monitor the rivers of New Jersey through River Assessment Teams (RATs) and Biological Assessment Teams (BATs) volunteer monitoring programs. Supplemental training was provided through the fall/winter of 2002 to prepare the members to perform river assessments on the impaired segments. Each member was provided with detailed maps of the impaired segments within their watershed management area. The Department worked with and through watershed partners and AmeriCorps members to conduct RATs surveys in fall of 2002. The Department reviewed monitoring data, RATs surveys, other information supplied by watershed partners, load duration curves, and aerial photography of the impaired segments to formulate segment specific strategies. Segment specific monitoring strategies in combination with generic strategies appropriate to the sources in each segment will lead to reductions in fecal coliform loads in order to attain SWQS.

10.2. Short Term Management Strategies

Short term management measures include projects recently completed, underway or planned that are designed to address the targeted impairment. Pertinent projects in the Lower Delaware are as follows:

WMA 17

- **Parvin Branch and Tarklin Brook Assessment and Monitoring**
  Citizens United to Protect the Maurice River and its Tributaries was awarded a $56,450 319(h) grant for a project that targets two moderately impaired AMNET monitoring sites in an area where the surrounding tributaries are all listed as unimpaired. This project will help to identify the root causes of these impairments via intensive physical, biological and chemical monitoring, and attempt to remediate them through extensive education and outreach on NPS pollution. Parvin Branch and Tarklin Brook are tributaries to the Maurice River in Cumberland County.

WMA 18

- **Nonpoint Source Pollution Control and Management, Strawbridge Lake Watershed Burlington County**
  The American Littoral Society - Delaware Riverkeeper Network were awarded $161,250 in 319(h) grant money to complete the above project. The project includes four components which were identified as needed in the Strawbridge Lake TMDL. The components include 1.) characterization of existing phosphorus and bacteria loadings from various land uses and long-term sedimentation, b.) a completed stormwater inventory and land use mapping for the Strawbridge Lake watershed, c.) the development of a restoration master plan, and d.) an assessment of the effectiveness of BMPs currently constructed in this watershed.

- **Retrofitting Stormwater Management Facilities**
  Moorestown Board of Education was awarded $64,000 in 319(h) money to complete a project that will retrofit several detention basins and drainage swales associated with Moorestown Twp. Schools, Burlington County. In addition to the retrofits, these basins will be used to serve as "living classrooms" for students attending Moorestown's schools. Work anticipated is to begin Spring of 2003.

WMA 19

- **Rutgers Cooperative Extension Buffer Project**
  The Forestry Extension Program of Rutgers Cooperative Extension was awarded a $110,000 319(h) grant to complete this four-phase project. An inventory of the existing riparian butters was completed and priority areas were identified. Best management practices were implemented by planting two three-zone multi-species riparian buffer

systems. Throughout the project education and outreach to the community and to other agencies to promote riparian forest buffer systems were performed. The project was completed in Fall 2002 resulting in 30,000 feet of new riparian buffer consisting of over 1100 native trees and 15000 native plants.

- **Riparian Forest Buffer, Streambank Stabilization & Education Program for the Mill Dam/Ironworks Park along the Rancocas Creek, Burlington County**
  In January of 2000 Burlington County SCD was awarded $ 250,000 in State funds to build on the previous work of Rutgers Cooperative Extension and to implement streambank stabilization measures and extend the riparian buffer that was installed along the Rancocas Creek in Ironworks Park, Mount Holly Township. The stabilization and buffer installation are complete with ongoing maintenance to ensure vitality of the plants.

- **Woolman Lake Restoration Plan, Mount Holly Twp, Burlington County**
  The Heritage Conservancy was awarded a $ 83,000 319(h) grant in 1998 to decrease the NPS pollution Woolman Lake in the Buttonwood Tributary to the Rancocas Creek. The project resulted in the restoration of 1000 feet of shoreline to its natural habitat through implementation of various BMPs. Nonstructural BMPs were used including the use of coconut fiber rolls, biodegradable erosion control mats and native plant species to create a vegetative riparian buffer along the lake shoreline.

- **Biofilter Wetland at Woolman Lake, Mount Holly**
  Mount Holly Township received $145,215 in 319(h) money to design and contruct a biofilter wetland to treat NPS pollution and reduce loadings to the Rancocacas Creek. The wetland at Woolman Lake will be designed and built to treat stromwater that currently discharges directly into the lake. A second objective of this project is the evauluation of the "Drop-In Drain-Inceptors", that can be retrofit to existing stormwater catch basins. Two of these devices will be deployed and the pollution removal capability evaluated.

WMA 20

- **Crosswicks Creek - Oakford Lake and Paradise Park Streambank Restoration**
  Oakford Lake is upstream of a moderately impaired AMNET monitoring site. Both parks have a growing Canada Goose problem since they provide ideal habitat for resident Canada geese and have severe erosion problems due to human and waterfowl activities. Plumstead Township was awarded a $96,925 319(h) grant to create a vegetated stream bank buffer to stabilize the stream banks, block waterfowl access and to serve as a biofilter for stormwater run-off.

10.3. Long–Term Management Strategies

Long term strategies include source trackdown as well as selection and implementation of specific management measures that will address the identified sources. Source categories and responses are summarized below:

Source Category	Responses	Potential	Funding options

		Responsible Entity	
Human Sources			
Inadequate (per design, operation, maintenance, location, density) on-site disposal systems	Confirm inadequate condition; evaluate and select cost effective alternative, such as rehabilitation or replacement of systems, or connection to centralized treatment system	Municipality, MUA, RSA	CWA 604(b) for confirmation of inadequate condition; Environmental Infrastructure Financing Program for construction of selected option
Inadequate or improperly maintained stormwater facilities; illicit connections	Measures required under Phase II Stormwater permitting program plus Alternative measures as determined needed through TMDL process	Municipality, State and County regulated entities, stormwater utilities	CWA 319(h)
Malfunctioning sewage conveyance facilities	Identify through source trackdown	Owner of malfunctioning facility--compliance issue	User fees
Domestic/captive animal sources			
Pets	Pet waste ordinances	Municipalities for ordinance adoption and compliance	
Horses, livestock, zoos	Confirm through source trackdown: SCD/NRCS develop conservation management plans	Property owner	EQIP, CRP, CREP (when approved),
Agricultural practices	Confirm through source trackdown; SCD/NRCS develop conservation management plans	Property owner	EQIP, CRP, CREP (when approved)
Wildlife			
Nuisance concentrations, e.g. resident Canada geese	Feeding ordinances; Goose Management BMPs	Municipalities for ordinance; Community Plans for BMPs	CBT, CWA 319(h)

Source Category	Responses	Potential Responsible Entity	Funding options
Indigenous wildlife	Confirm through trackdown; consider revising designated uses	State	NA

10.4. Segment Specific Recommendations

10.4.1. Watershed Management Area 17

Little Ease Run at Porchtown (Site ID # 01411458)

Geese observed at Franklinville Lake. There are many older homes on septic along the stream corridor as well as surrounding Franklinville Lake. Additionally there is a cattle farm and a sheep farm next to Franklinville Lake. Load duration curve inconclusive. Response: Monitoring: fecal coliform to narrow the scope of impairment; coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural BMPs; organize local community based goose management programs.

Indian Branch Near Malaga (Site ID # 01411466)

Majority of the land use is forest. Small horse farms and cattle farms observed near DEP monitoring site as well as some homes on septic systems, possibly cesspools. Response: Monitoring: coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural BMPs.

Maurice River at Norma (Site ID # 01411500)

Majority of the reach flows through a forested area with good riparian buffers. Bathing beach and park on Almond Road, in summer dogs observed in lake. Horse farms, poultry processing plant and animal shelter within the watershed. Load duration curve consistent with rainfall induced sources. Strategies: prioritize for EQIP funds to install agricultural BMPs.

Maurice River at Millville (Site ID # 01411800)

The impaired segment flows through the Union Lake Wildlife Management Area with no potential sources other than wildlife. There are residential areas with the possibility of associated pets; geese were observed throughout the watershed. Basis for listing is old data. Response: verify impairment through monitoring.

Cohansey River (Site ID # 01412800)

The land use of the watershed is 69% agriculture with poor riparian buffers. Many cow, horse and chicken farms observed, as well as livestock in the stream. Upstream of monitoring site there are old homes on septic systems around Seeley Lake. This lake also attracts a large Canada Goose population. Load duration curve consistent with storm driven sources. Strategies: prioritize for EQIP funds to install agricultural BMPs; organize local community based goose management programs.

Salem River at Woodstown (Site ID# 01482500) and Courses Landing (Site ID #01482537)

There are horse farms, dairy farms, a poultry farm, an agricultural products operation, and a rodeo in the watershed. Cattle were observed in the stream. Both Woodstown Lake and Avis Mill Pond attract large Canada Goose population. The Township of Woodstown receives sewer service; the remainder of the watershed is on septic systems. Monitoring: Long segment would benefit from fecal coliform sampling to narrow scope of impairment.

Two Penny Run (Site ID # 01482560)

Majority of watershed is agricultural land, good buffer on one side of stream. Many horse farms as well as a large cow and sheep farm observed. Potential septic impacts from home on septic systems, including trailer parks. Monitoring: coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural BMPs.

10.4.2. Watershed Management Area 18

North Branch Pennsauken Creek near Moorestown (Site ID # 01467069) & South Branch Pennsauken Creek at Cherry Hill (Site ID # 01467081)

This watershed is highly urbanized. Strawbridge Lake in Moorestown as well as golf courses and athletic fields throughout the watershed attract Canada geese. Due to the large amount of residential areas, domestic pets are a potential fecal source. Strategies: Phase II stormwater program.

Cooper River at Lindenwold (Site ID #01467120), Cooper River at Haddonfield (Site ID #01467150), and North Branch Cooper River at Kresson (Site ID # 01467155)

This watershed is also highly urbanized. There are 10 lakes throughout the watershed and multiple public parks. Potential fecal sources include Canada geese and domestic pets. Strategies: Phase II stormwater program.

South Branch Big Timber Creek at Glenloch (Site ID # 01467327) and South Branch Big Timber Creek at Blackwood Terrace (Site ID # 01467329)

Predominant land use in the watershed is residential. Glenloch Lake attracts large populations of Canada geese. Strategies: Phase II stormwater program; encourage community based goose management programs.

North Branch Big Timber Creek at Glendora (Site ID # 01467359)

This primary land use within this watershed is urban. There are at least nine lakes within this watershed that may attract Canada geese. Potential fecal sources would include geese and domestic pets. Strategies: Phase II stormwater program; encourage community based goose management programs.

Still Run near Mickleton (Site ID # 1476600)

The predominant land use of this watershed is agriculture. Potential fecal sources include geese and livestock, and possibly septic systems. Monitoring: coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural BMPs; encourage community based goose management programs.

Raccoon Creek near Swedesboro (Site ID # 1477120)

The predominant land uses of this watershed are agriculture with good riparian buffers and residential. There are at least 5 lakes within the watershed that may attract Canadian geese. Load duration curve consistent with storm driven sources. Strategies: prioritize for EQIP funds to install agricultural BMPs; encourage community based goose management programs; Phase II stormwater program.

Oldmans Creek at Jessups Mill (Site ID # 1477440) and Porches Mill (Site ID #1477510)

The predominant land use of this watershed is agriculture and there are several lakes. Streamside land uses include crops, raising livestock, pastureland for horses, scattered homes and open space. Monitoring: coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural BMPs; encourage community based goose management programs.

10.4.3. Watershed Management Area 19

Sharps Run at Rt. 541 at Medford (Site ID #1465884)

Large amount of residential development on sewers with potential for pet impacts. Canada geese observed on athletic fields and inactive farm fields. At least 2 large horse farms present within the watershed. Strategies: prioritize for EQIP funds to install agricultural BMPs; encourage community based goose management programs; Phase II stormwater program.

North Branch Rancocas Creek at Pine St at Mt Holly (Site ID # 01467006)

Potential septic system impacts from streamside homes located in the Ewansville section of Southampton Township. Multiple properties housing livestock also observed in Ewansville. Trailer parks located off Route 206 also potential septic impacts. Geese and evidence of geese as well as dog walking observed at Mill Dam Park in Mount Holly Township. Monitoring: coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural

BMPs; encourage community based goose management programs; Phase II stormwater program.

10.4.4. Watershed Management Area 20

Annaricken Brook near Jobstown (Site ID # 0146478)

The watershed that drains to this segment is approximately 40 percent agricultural land with poor riparian buffers. There are horse farms, including a large horseracing track located within 300 feet of the stream. Strategies: prioritize for EQIP funds to install agricultural BMPs.

North Branch Barkers Brook near Jobstown (Site ID # 01464583)

Watershed is largely agricultural with cultivation and pasturing up to the water's edge. Large flocks of Canada geese and birds were observed on farm fields and in ponds found on the farms. Strategies: prioritize for EQIP funds to install agricultural BMPs; encourage community based goose management programs.

Bacons Creek near Mansfield Square (Site ID # 01464529)

Watershed is over 50 percent agricultural land, some of which supports livestock. Significant portion of the impaired reach was bordered by homes on septic systems. Within the headwater portion of the watershed, horse farms where observed. Monitoring: fecal survey to narrow scope of impairment; coliphage to determine if septic systems are a source. Strategies: prioritize for EQIP funds to install agricultural BMPs.

Doctors Creek at Allentown (Site ID # 01464515)

Large amount of Canada geese observed on Conines Millpond in Allentown. Agricultural lands supporting livestock observed, along with residential areas. Load duration curve consistent with storm driven sources. Strategies: prioritize for EQIP funds to install agricultural BMPs; encourage community based goose management programs.

Crosswicks Creek at Groveville Rd. (Site ID# 01464504)

Stream has a well-developed buffer throughout the reach, ranging from 23 to over 300 feet. Downstream portions of the creek flow through a highly residential area that receives sewer service. In the upstream portion of the segment between Extonville Road in Extonville to Arneytown-Hornerstown Road in Hornerstown there are areas of residential homes on septic and pastureland for horses streamside. Load duration curve is consistent with storm driven sources. Strategies: prioritize for EQIP funds to install agricultural BMPs; Phase II stormwater program.

10.5. Pathogen Indicators and Bacterial Source Tracking

Advances in microbiology and molecular biology have produced several methodologies that discriminate among sources of fecal coliform and thus more accurately identify pathogen sources. The numbers of pathogenic microbes present in polluted waters are few and not readily isolated nor enumerated. Therefore, analyses related to the control of these pathogens must rely upon indicator microorganisms. The commonly used pathogen indicator organisms are the coliform groups of bacteria, which are characterized as gram-negative, rod-shaped bacteria. Coliform bacteria are suitable indicator organism because they are generally not found in unpolluted water, are easily identified and quantified, and are generally more numerous and more resistant than pathogenic bacteria (Thomann and Mueller, 1987).

Tests for fecal organisms are conducted at an elevated temperature (44.5°C), where the growth of bacteria of non-fecal origin is suppressed. While correlation between indicator organisms and diseases can vary greatly, as seen in several studies performed by the EPA and others, two indicator organisms *Esherichia coli* (*E. coli*) and enterococci species showed stronger correlation with incidence of disease than fecal coliform (USEPA, 2001). Recent advances have allowed for more accurate identification of pathogen sources. A few of these methods, including, molecular, biochemical, and chemical are briefly described in the following paragraph.

Molecular (genotype) methods are based on the unique genetic makeup of different strains, or subspecies, of fecal bacteria (Bowman et al, 2000). An example of this method includes "DNA fingerprinting" (i.e., a ribotype analysis which involves analyzing genomic DNA from fecal *E. coli* to distinguish human and non-human specific strains of *E. coli*.). Biochemical (phenotype) methods include those based on the effect of an organism's genes actively producing a biochemical substance (Graves et al., 2002; Goya et al 1987). An example of this method is multiple antibiotic resistance (MAR) testing of fecal *E. coli*. In MAR testing, *E. coli* are isolated from fecal samples and exposed to 10-15 different antibiotics. In theory, *E. coli* originating from wild animals should show resistance to a smaller number of antibiotics than *E. coli* originating from humans or pets. Given this general trend, MAR patterns or '"signatures" can be defined for each class of *E. coli* species. Chemical methods are based on finding chemical compounds associated with human wastewater, and useful in determining if the sources are human or non-human. Such methods measure the presence of optical brighteners, which are contained in all laundry detergents, and soap surfactants in the water column. Unlike the optical brightener method, the measurement of surfactants may allow for some quantification of the source.

BST methods have already been successfully employed at the NJDEP in the past decade. Since 1988, the Department's Bureau of Marine Water Monitoring has worked cooperatively with the University of North Carolina in developing and determining the application of RNA coliphage as a pathogen indicator. This research was funded through USEPA and Hudson River Foundation grants. These studies showed that the RNA coliphages are useful as an indicator of fecal contamination, particularly in chlorinated effluents and that they can be serotyped to distinguish human and animal fecal contamination. Through these studies, the Department has developed an extensive database of the presence of coliphages in defined contaminated areas (point human, non-point human, point animal, and non-point animal). More recently, MAR and DNA fingerprinting analyses of *E. coli* are underway in the Manasquan estuary to identify potential pathogen sources (Palladino and Tiedemann, 2002). These studies along with additional sampling within the watershed will be used to implement the necessary percent load reduction.

10.6. Reasonable Assurance

With the implementation of follow-up monitoring, source identification and source reduction as described for each segment, the Department has reasonable assurance that New Jersey's Surface Water Quality Standards will be attained for fecal coliform. The Department proposes to undertake the identified monitoring responses beginning in 2003-2004. As a generalized strategy, the Department proposes the following with regard to categorical sources: 1) As septic system sources are identified through the monitoring responses, municipalities will be encouraged to enter the Environmental Infrastructure Financing Program, which includes New Jersey's State Revolving Fund, to evaluate, select and implement the best overall solution to such problems; 2) To address storm water point sources, the Phase II stormwater permitting program will require control measures to be phased in from the effective date of authorization to 60 months from that date; 3) The locations of impaired segments with significant agricultural land uses will be provided to the State Technical Committee for consideration in the FFY 2004 round of EQIP project selection; 4) Through continuing engagement of watershed partners, measures to identify and address other sources will be pursued, including encouragement and support of community based goose management programs, where appropriate. The Department has dedicated a portion of its Corporate Business Tax and FY 2002 Clean Water Act Section 319(h) funds to carry out the segment specific source trackdown recommendations. A portion of FY 2003 319(h) funds will be dedicated to assisting municipalities in implementing the requirements of the Phase II municipal stormwater permitting program.

The fecal coliform reductions proposed in these TMDLs assume that existing NJPDES permitted municipal facilities will continue to meet New Jersey's Surface Water Quality Standard requirements for disinfection. Any future facility will be required to meet water quality standards for disinfection.

The Department's ambient monitoring network will be the means to determine if the strategies identified have been effective. Where trackdown monitoring has been recommended, the results of this monitoring as well as ambient monitoring will be evaluated to determine if additional strategies for source reduction are needed.

11.0 Public Participation

The Water Quality Management Planning Rules 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 areawide water quality management plan in accordance with procedures at N.J.A.C. 7:15-3.4(g). As part of the public participation process for the development and implementation of the TMDLs for fecal coliform in the Lower Delaware Water Region, the Department worked collaboratively with a series of stakeholder groups throughout New Jersey as part of the Department's ongoing watershed management efforts.

The Department's watershed management process includes a comprehensive stakeholder process that includes of members from major stakeholder groups, (agricultural, business and industry, academia, county and municipal officials, commerce and industry, purveyors and dischargers, and environmental groups). As part of this watershed management planning process, Public Advisory Committees (PACs) and Technical Advisory Committees (TACs) were created in all 20 WMAs. The PACs serve in an advisory capacity to the Department, examining and commenting on a myriad of issues in the watersheds. The TACs are focused on scientific, ecological, and engineering issues relevant to the issues of the watershed, including water quality impairments and management responses to address them.

Through a series of presentations and discussions the Department engaged the WMA 17, 18, 19 and 20 PACs and TACs in a process that culminated in the development of the 27 TMDLs for Streams Impaired by Fecal Coliform in the Lower Delaware Water Region. One or two meetings, as specified below, were held in each WMA. At the PAC meetings, the expedited fecal coliform TMDL protocols and the executed Memorandum of Agreement between the Department and EPA Region 2 were described, including the associated schedule for completing TMDLs. The PACs were asked to review impaired segments and provide local insights as to fecal coliform sources. Maps with aerial photography and topography of the impaired segments were provided to facilitate the conversation. In most cases, a second meeting was held with the TAC and/or a smaller working group to identify potential sources of impairment based on their local knowledge. The impaired segment maps were marked to indicate any areas of concern and TAC members were encouraged to provide any additional source information through the formal comment period after advertisement of the TMDL proposal in the New Jersey Register. The dates of the meetings were as follows:

WMA	PAC Meeting	TAC Meeting
17	December 10, 2002	January 22, 2003
18	December 3, 2002	December 3, 2002
19	November 13, 2002	December 10, 2002
20	November 13, 2002	December 3, 2002

Additional input was received through the NJ EcoComplex (NJEC). The Department contracted with NJEC in July 2001. The NJEC consists of a review panel of New Jersey University professors whose role is to provide comments on the Department's technical approaches for development of TMDLs and management strategies. The New Jersey

Statewide Protocol for Developing Fecal TMDLs was presented to NJEC on August 7, 2002 and was subsequently reviewed and approved. The protocol was also presented at the SETAC Fall Workshop on September 13, 2002 and met with approval.

Amendment Process

In accordance with N.J.A.C. 7:15–7.2(g), these TMDLs are hereby proposed by the Department as an amendment to Lower Delaware Water Quality Management Plan (WQMP), Mercer, Monmouth and Ocean Counties WQMP, and Tri-County WQMP.

Notice proposing these TMDLs was published April 21, 2003 in the New Jersey Register and in newspapers of general circulation in the affected area in order to provide the public an opportunity to review the TMDLs and submit comments. In addition, a public hearing will be held on May 22, 2003. Notice of the proposal and the hearing has also been provided to applicable designated planning agencies and to affected municipalities.

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Appendix A: Explanation of stream segments in Sublist 5 of the *2002 Integrated List of Waterbodies* for which TMDLs will not be developed in this report.

River segments to be moved from Sublist 5 to Sublist 3 for fecal coliform.

- **#01465970, North Branch Rancocas Creek at Browns Mills**
- **#01411950, Buckshutem Creek near Laurel Lake**

Station #01465970 was included on Sublist 5 based on its inclusion on previous 303(d) lists (based on water quality data prior 1991) with no recent data to assess their current attainment status. Station #01411950 was included on Sublist 5 of the 2002 Integrated List based on less than five data points. Therefore, further monitoring will be needed to confirm impairment and to establish TMDL for these streams.

Appendix B: Municipal POTWs Located in the TMDLs' Project Areas

WMA	Station #	NJPDES	Facility Name	Discharge Type[a]	Receiving waterbody
17	1482500	NJ0022250.001A	Woodstown SA	MMI	Salem River
17	1482560	NJ0022250.001A	Woodstown SA	MMI	Salem River
18	1467081	NJ0024040.001A	Evesham Twp MUA - Woodstream	MMJ	Pennsauken Creek S B
18	1467081	NJ0024040.SL3A	Evesham Twp MUA - Woodstream	MMJ	Sludge Application
18	1467081	NJ0024040.SL3B	Evesham Twp MUA - Woodstream	MMJ	Sludge Application
18	1467081	NJ0024040.SL3M	Evesham Twp MUA - Woodstream	MMJ	Sludge Application
18	1467081	NJ0025071.001A	Cherry Hill Twp - Kingston	MMJ	Pennsauken Creek South Branch
18	1467081	NJ0025089.002A	Cherry Hill Twp - Pennsauken	MMJ	Pennsauken Creek South Branch
18	1467081	NJ0025089.001A	Cherry Hill Twp - Pennsauken	MMJ	Pennsauken Creek South Branch
18	1467081	NJ0031879.001A	Maple Shade - Kings Hwy WTP	MMI	Pennsauken Ck South Branch
18	1477120	NJ0020532.001A	Harrison Twp - Mullica Hill STP	MMI	Racoon Creek
18	1467359	NJ0020320.001A	Clementon Boro	MMJ	Big Timber Creek North Branch via storm sewer
18	1467359	NJ0022624.001A	Stratford S A	MMJ	Big TImber Creek North Branch
18	1467359	NJ0026468.001A	Gloucester Twp MUA - Chewa Landing	MMJ	Big Timber Creek North Branch
18	1467150	NJ0025046.002A	Cherry Hill Twp - Barclay Farms	MMJ	Cooper River
18	1467150	NJ0025046.001A	Cherry Hill Twp - Barclay Farms	MMJ	Cooper River
18	1467150	NJ0025054.001A	Cherry Hill Twp - Old Orchard	MMJ	Cooper River
19	1467006	NJ0024821.001A	Pemberton Twp MUA	MMJ	Rancocas Creek N B
19	1467006	NJ0028665.001A	Mobile Estates of Southhampton	MMI	Rancocas River via unnamed trib
20	1464504	NJ0026719.001A	NJDC - A C Wagner	MMI	Crosswicks Creek via unnamed trib
20	1464529	NJ0022381.001A	North Burlington County BOE - High School	MMI	Bacons Run
20	1464515	NJ0020206.001A	Allentown Boro WTP	MMI	Doctors Creek
20	1464515	NJ0020737.001A	NJ Tpk Auth - Hamilton Twp	MMI	Doctors Creek via storm sewer

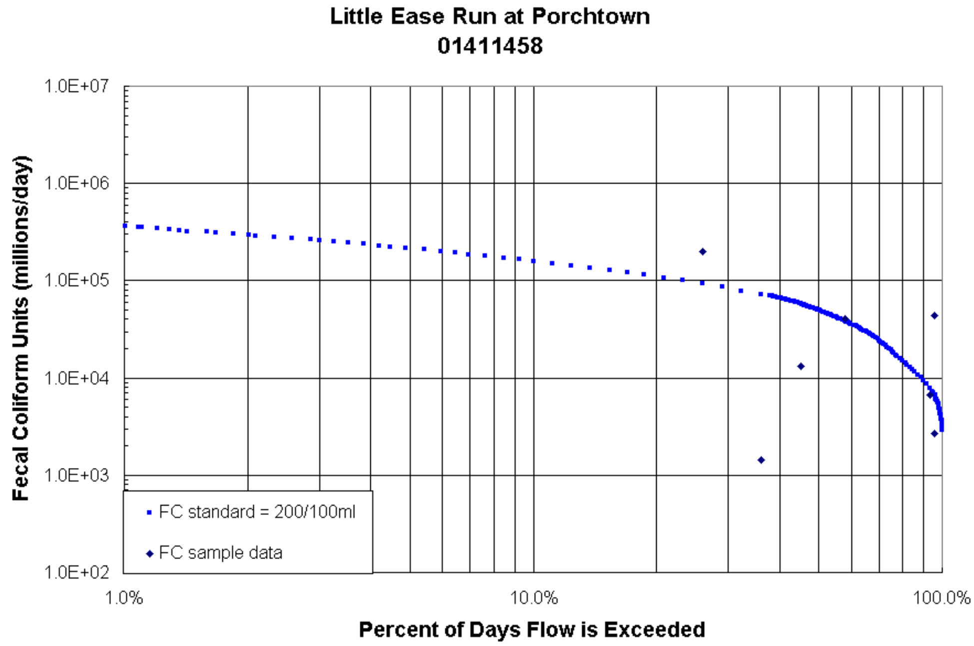
[a] "MMI" indicates a Municipal Minor discharge and "MMJ" indicates Municipal Major discharge.

Appendix C: TMDL Calculations

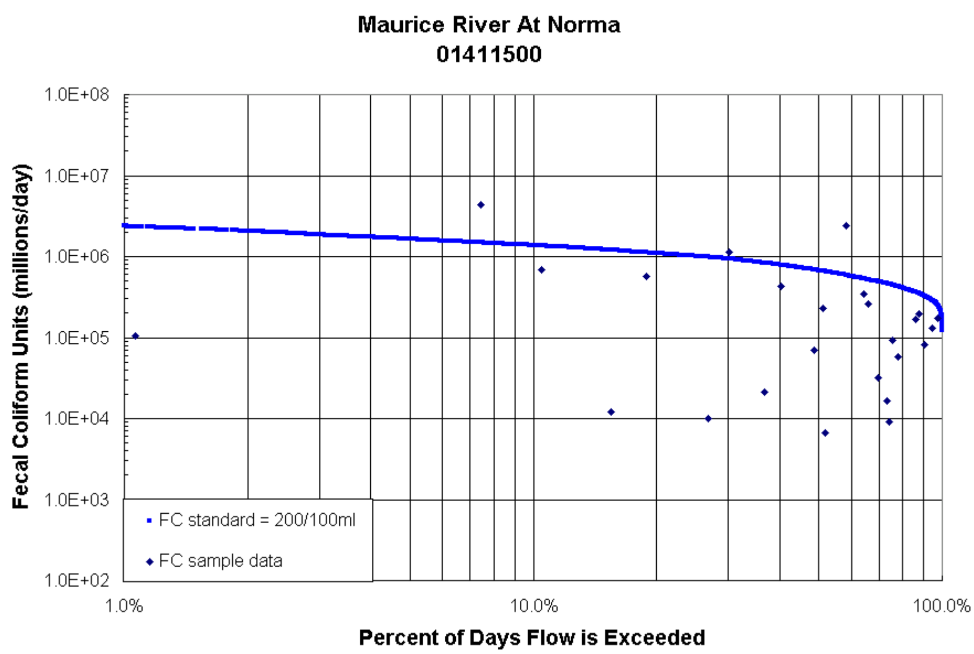
WMA	303(d) Category 5 Segments	Water Quality Stations	Station Names	Load Allocation (LA) and Margin of Safety (MOS) 200 FC/100ml Standard N (# of values)	Geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	400 FC/100ml Standard Summer N	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	Wasteload Allocation (WLA)	Period of record used in analysis
17	01411466	01411466	Indian Branch near Malaga	20	70	47%	-187%	-51%	20	70	47%	3%	49%	49%	6/4/98 - 8/7/01
17	01411458, 01411500, 01411800	01411458, 01411500, 01411800	Little Ease Run at Porchtown, Maurice River at Norma, Maurice River near Millville	42	54	36%	-273%	-139%	30	130	36%	48%	67%	67%	2/9/94 - 7/26/01
17	01412800	01412800	Cohansey River at Seeley	37	93	39%	-115%	-32%	27	122	39%	44%	66%	66%	2/16/94 - 7/26/01
17	01482500, 01482537	01482500, 01482537	Salem River at Woodstown, Salem River	39	277	39%	28%	56%	29	251	39%	73%	84%	84%	2/17/94 - 7/12/01
17	01482560	01482560	Two Penny Run near Danceys Corner	5	408	39%	51%	70%	5	408	39%	83%	90%	90%	7/5/00 - 8/1/00
18	01467069, 01467081	01467069, 01467081	NB Pennsauken Creek near Morrestown, SB Pennsauken Creek at Cherry Hill	19	2917	54%	93%	97%	8	17677	54%	99.6%	99.8%	99.8%	2/17/94 - 7/23/97
18	01467120, 01467150, 01467155	01467120, 01467150, 01467155	Cooper River at Lidenwold, Cooper River at Haddonfield, NB Cooper River at Kresson,	46	1103	33%	82%	88%	36	1473	33%	95%	97%	97%	2/15/94 - 7/5/01
18	01467327, 01467329	01467327, 01467329	SB Big Timber Creek at Glenloch, SB Big Timber Creek at Blackwood	28	227	36%	12%	44%	18	298	36%	77%	85%	85%	2/15/94 - 8/31/99
18	01467359	01467359	NB Big Timber Creek at Glendora	14	928	41%	78%	87%	14	928	41%	93%	96%	96%	6/9/98 - 7/5/01
18	01476600	01476600	Still Run near Mickelton	5	249	32%	20%	46%	5	249	32%	73%	82%	82%	7/15/99 - 8/12/99
18	01477120	01477120	Raccoon Creek near Swedesboro	38	274	30%	27%	49%	28	387	30%	82%	88%	88%	2/17/94 - 8/7/01

WMA	303(d) Category 5 Segments	Water Quality Stations	Station Names	Load Allocation (LA) and Margin of Safety (MOS) 200 FC/100ml Standard					400 FC/100ml Standard					Wasteload Allocation (WLA)	Period of record used in analysis
				N (# of values)	Geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS	Summer N	Summer geometric mean CFU/100ml	MOS as a percent of the target concentration	Percent reduction without MOS	Percent reduction with MOS		
18	01477440, 01477510	01477440, 01477510	Oldmans Creek at Jessups Mill, Oldmans Creek at Porches Mill	23	307	43%	35%	63%	13	774	43%	91%	95%	95%	2/17/94 - 8/1/00
19	01465884	01465884	Sharps Run at Rt 541 at Medford	5	264	52%	24%	64%	5	264	52%	74%	88%	88%	8/2/99 - 8/30/99
19	01467006	01467006	NB Rancocas Creek at Pine St at Mt Holly	5	417	60%	52%	81%	5	417	60%	84%	94%	94%	6/9/98 - 7/22/98
20	01464504	01464500, 01464504, 01464420, 2	Crosswicks Creek at Extonville, Crosswicks Creek at Groveville Rd. at Groveville, Crosswicks Creek near New Egypt, Crosswicks Creek at Walnford Rd In Upper Freehold	74	220	22%	9%	29%	42	380	22%	82%	86%	86%	2/14/94 - 6/11/01
20	01464515	01464515, 3	Doctors Creek at Allentown, Doctors Creek at Route 539 In Upper Freehold	64	174	27%	-15%	16%	33	346	27%	80%	86%	86%	2/15/94 - 8/30/01
20	01464529	01464529	Bacons Creek near Mansfield Square	5	399	61%	50%	81%	5	399	61%	83%	93%	93%	8/2/99 - 8/30/99
20	01464578	01464578	Annaricken Brook near Jobstown	6	432	68%	54%	85%	6	432	68%	84%	95%	95%	6/18/98 - 9/9/98
20	01464583	01464583	NB Barkers Brook near Jobstown	10	813	54%	75%	89%	10	813	54%	92%	96%	96%	6/2/98 - 8/30/99

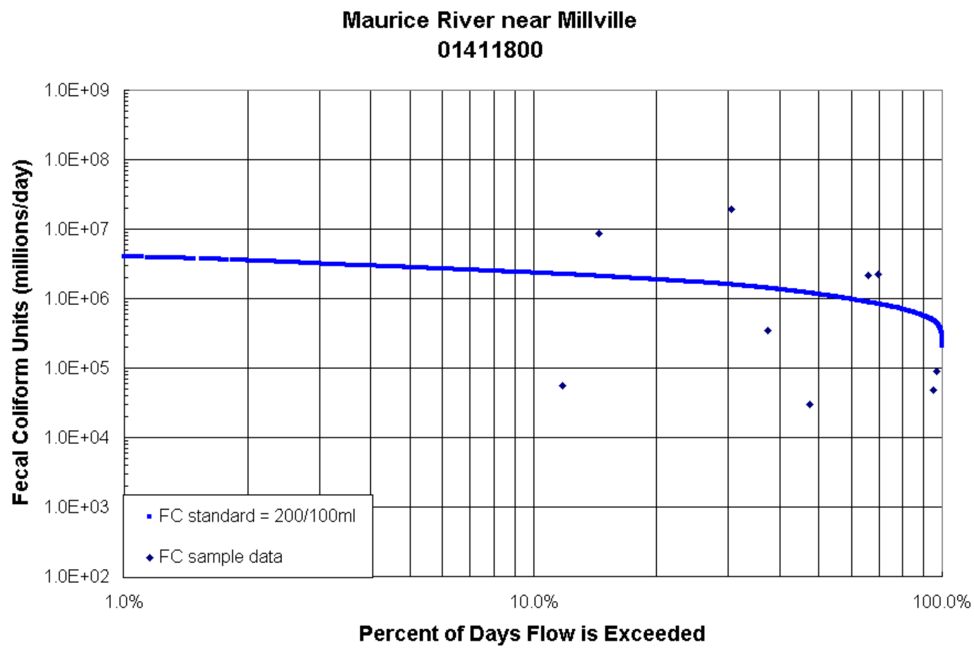
Appendix D: Load Duration Curves for selected listed waterbodies



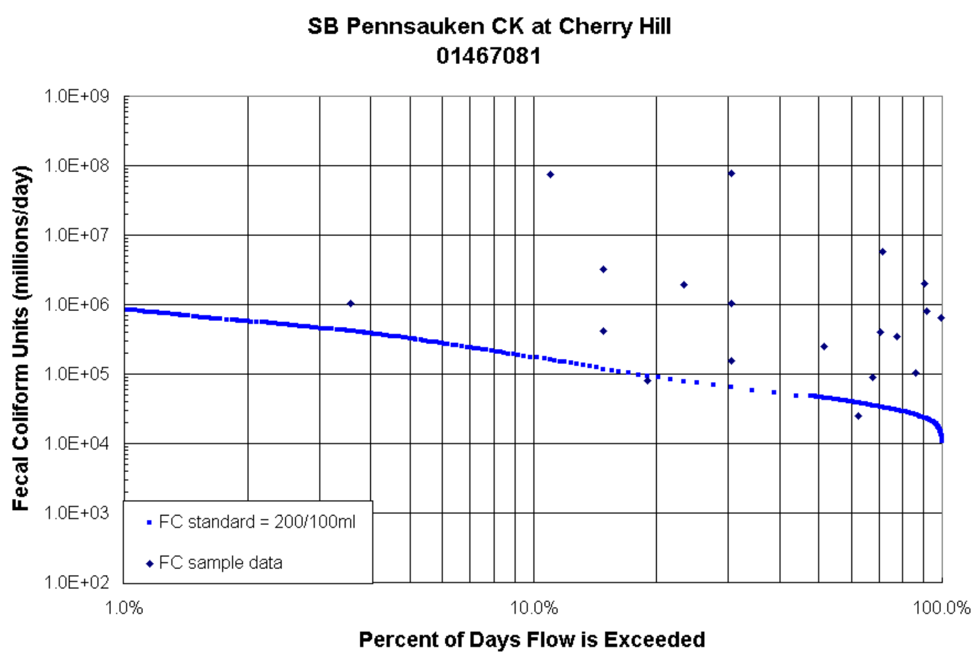
Load Duration Curve for Little Ease Run at Porchtown. Fecal coliform data from USGS station # 01411458 during the period 2/9/94 through 9/17/98. Water years 1970-2001 from USGS station # 01411456 (Little Ease Run near Clayton) were used in
generating the FC standard curve.



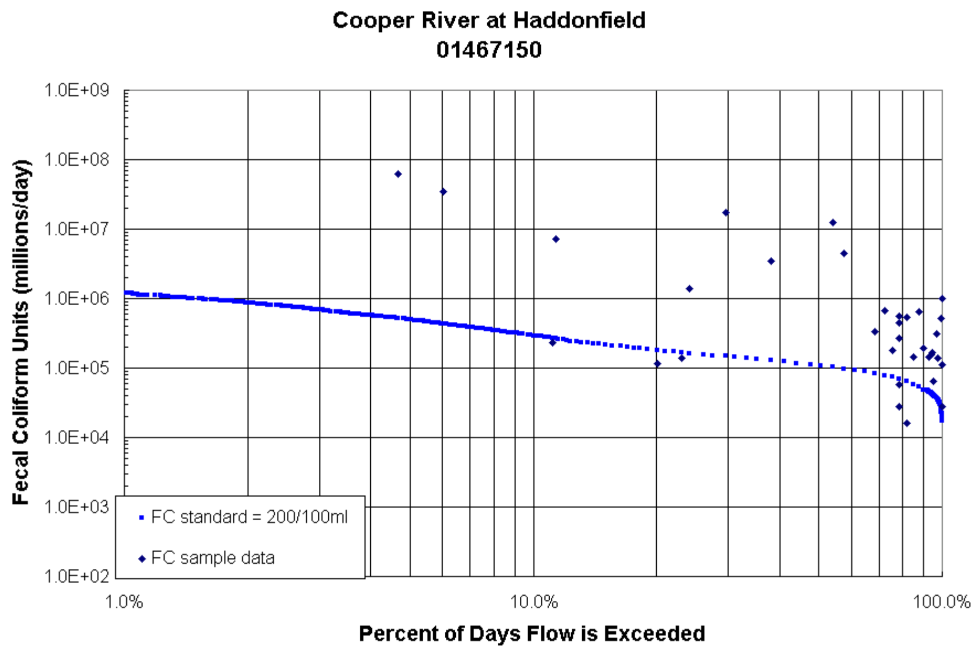
Load Duration Curve for Maurice River at Norma. Fecal coliform data from USGS station # 01411500 during the period 2/9/94 through 7/26/01. Water years 1970-2001 from USGS station # 01411500 were used in generating the FC standard curve.



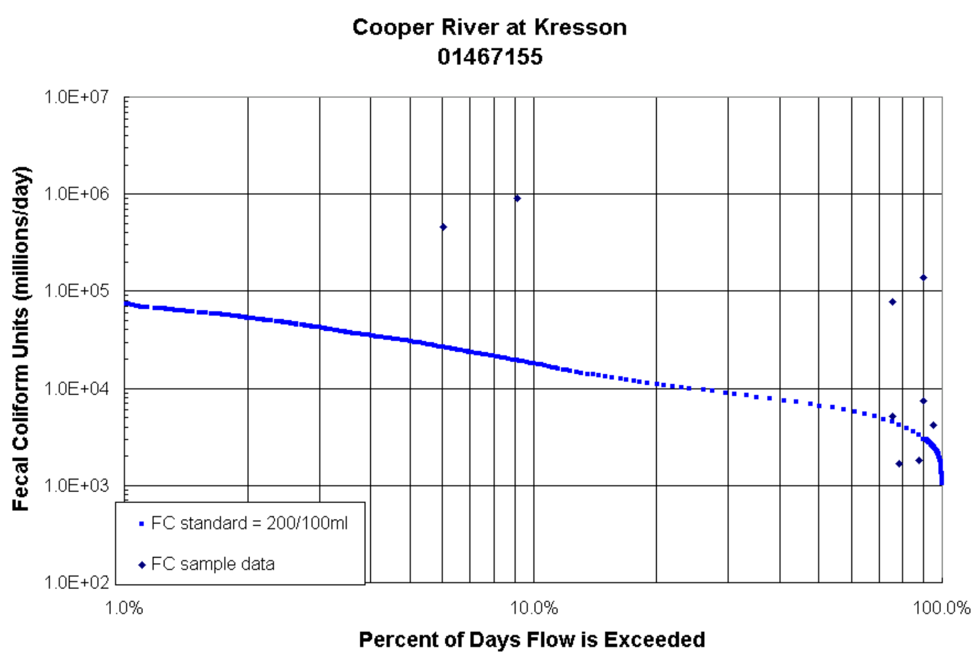
Load Duration Curve for Maurice River near Millville. Fecal coliform data from USGS station # 01411800 during the period 2/16/94 through 9/17/98. Water years 1970-2001 from USGS gaging station # 01411500 (Maurice River at Norma) were used in generating the FC standard curve.



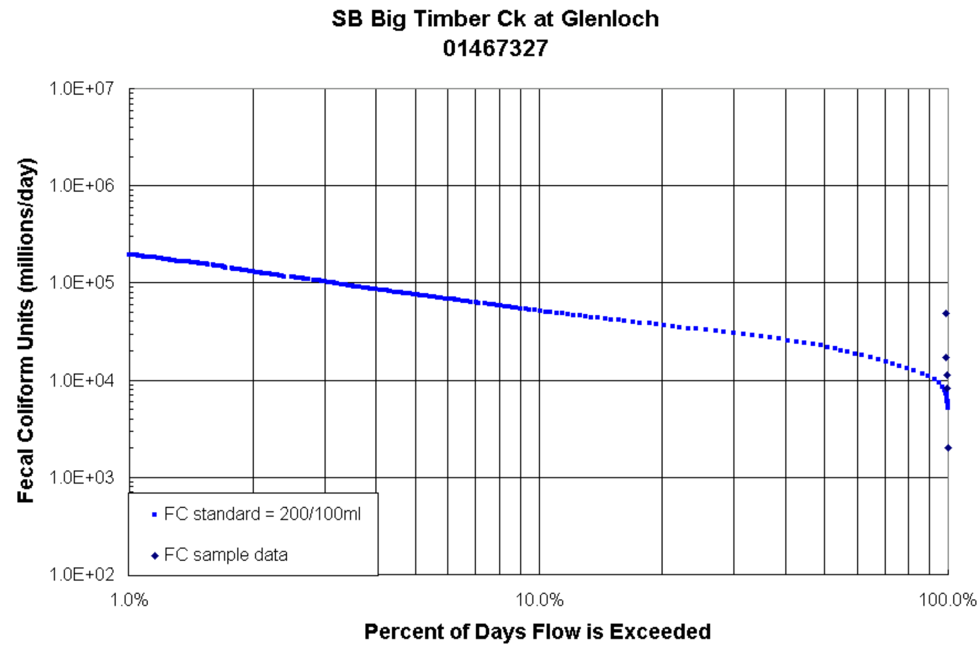
Load Duration Curve for SB Pennsauken CK at Cherry Hill. Fecal coliform data from USGS station # 01467081 during the period 2/17/94 through 7/23/97. Water years 1970-2001 from USGS gaging station # 01467081 were used in generating the FC standard curve



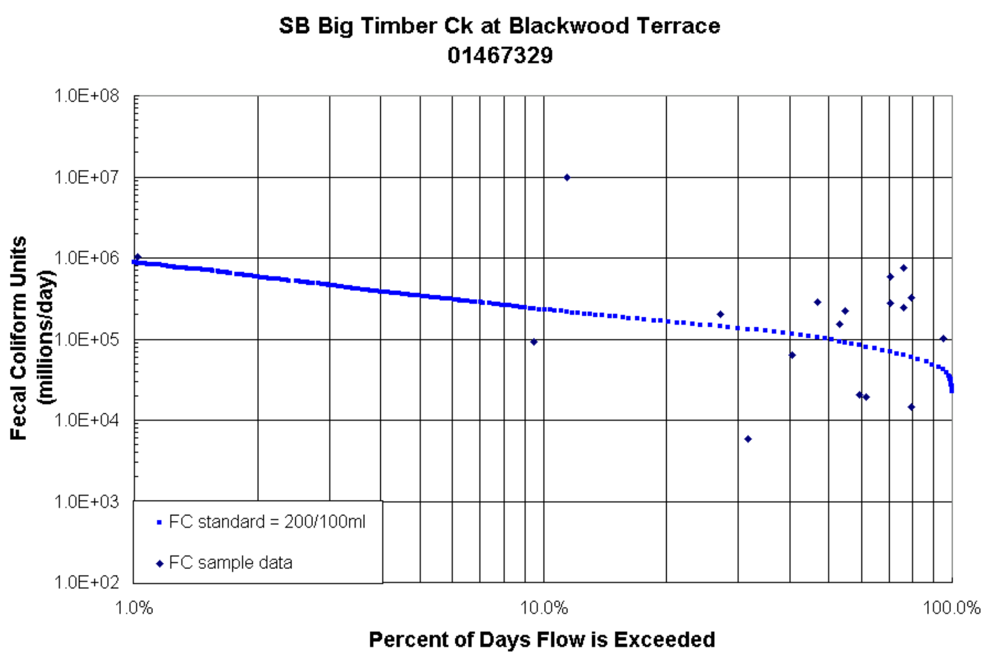
Load Duration Curve for Cooper River At Haddonfield. Fecal coliform data from USGS station # 01467150 during the period 2/15/94 through 7/53/01. Water years 1970-2001 from USGS gaging station # 01467150 were used in generating the FC standard curve



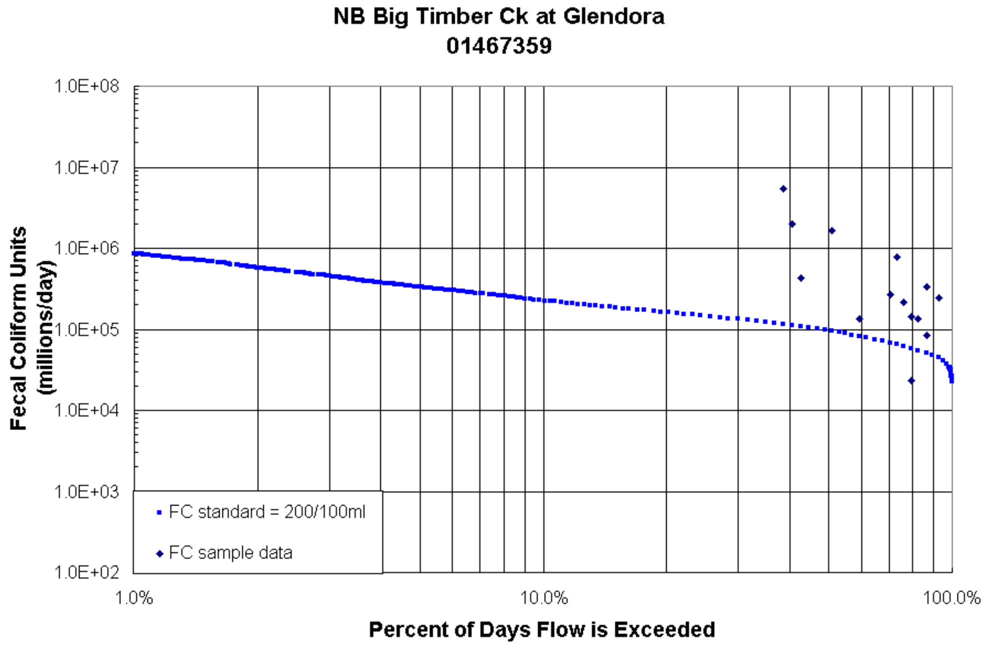
Load Duration Curve for Cooper River At Kresson. Fecal coliform data from USGS station # 01467155 during the period 6/1/98 through 7/5/01. Water years 1970-2001 from USGS gaging station # 01467150 (Cooper River at Haddonfield) were used in generating the FC standard curve



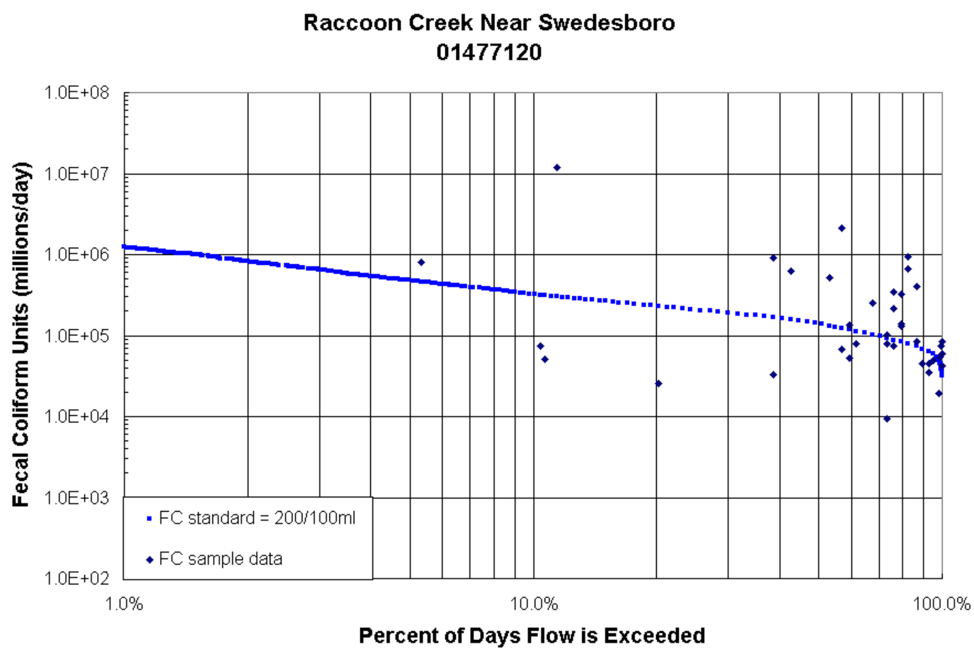
Load Duration Curve for SB Big Timber CK at Glenloch. Fecal coliform data from USGS station # 01467327 during the period 8/1/99 through 8/31/99. Water years 1970-2001 from USGS gaging station # 01477120 (Raccoon CK at Swedesboro) were used in generating the FC standard curve



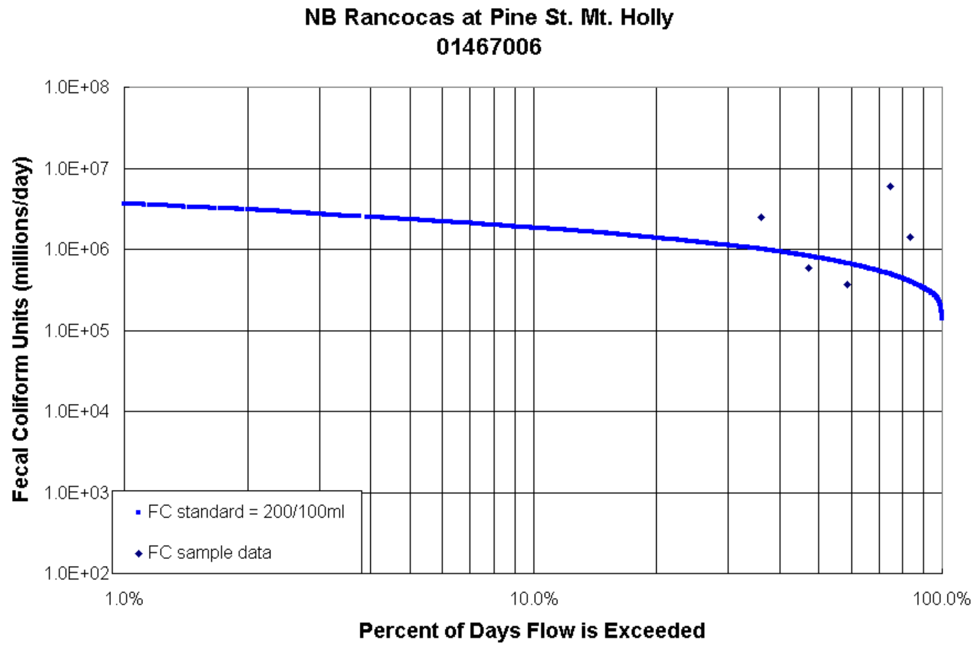
Load Duration Curve for SB Big Timber CK at Blachwood Terrace. Fecal coliform data from USGS station # 01467329 during the period 2/15/94 through 8/4/97. Water years 1970-2001 from USGS gaging station # 01477120 (Raccoon CK at Swedesboro) were used in generating the FC standard curve



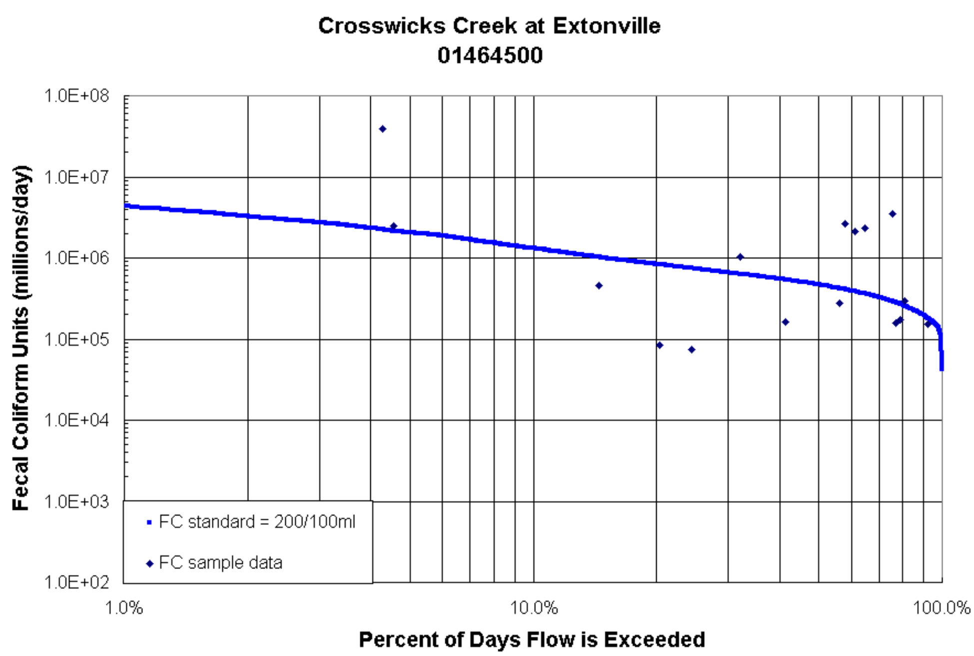
Load Duration Curve for NB Big Timber CK at Glendora. Fecal coliform data from USGS station # 01467359 during the period 6/9/98 through 7/5/01. Water years 1970-2001 from USGS gaging station # 01477120 (Raccoon CK near Swedesboro) were used in generating the FC standard curve



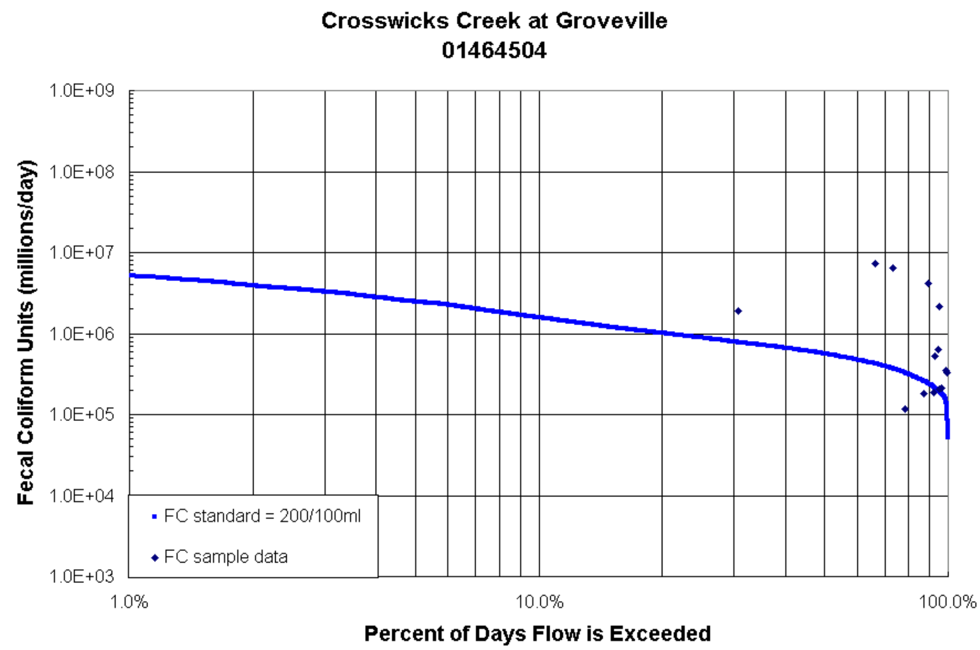
Load Duration Curve for Raccoon CK near Swedesboro. Fecal coliform data from USGS station # 01477120 during the period 2/17/94 through 8/7/01. Water years 1970-2001 from USGS gaging station # 01477120 (Raccoon CK near Swedesboro) were used in generating the FC standard curve



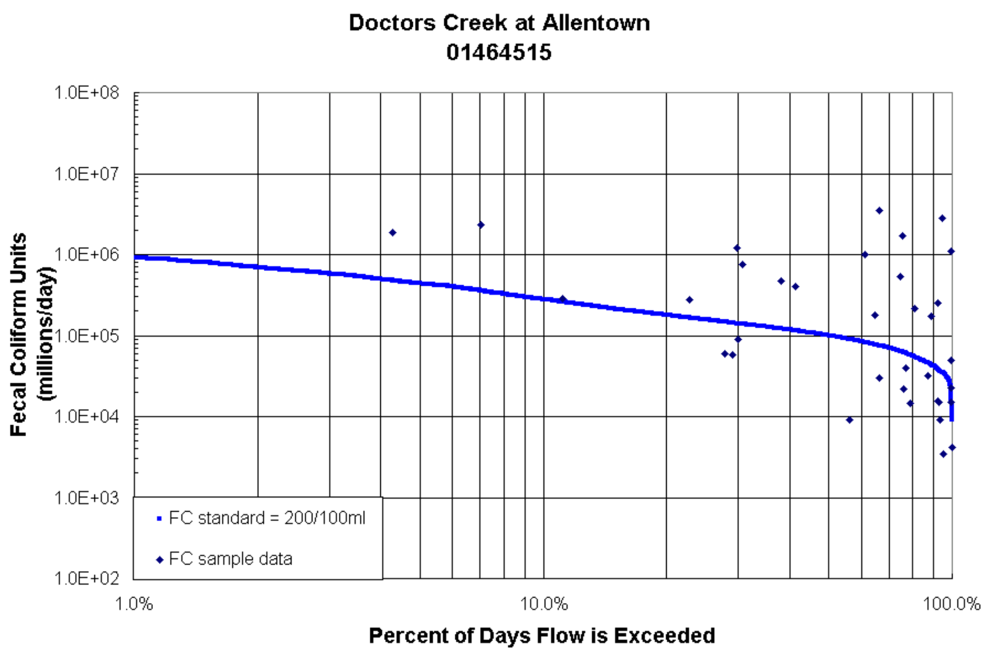
Load Duration Curve for NB Rancocas at Pine St. Mt. Holly. Fecal coliform data from USGS station # 01467006 during the period 6/9/98 through 7/22/98. Water years 1970-2001 from USGS gaging station # 01467000 (NB Rancocas CK at Pemberton) were used in generating the FC standard curve



Load Duration Curve for Crosswicks Creek at Extonville. Fecal coliform data from USGS station # 01464500 during the period 2/14/94 through 7/31/97. Water years 1970-2001 from USGS gaging station # 01464500 were used in generating the FC standard curve



Load Duration Curve for Crosswicks Creek at Groveville. Fecal coliform data from USGS station # 01464504during the period 6/8/98 through 8/3/00. Water years 1970-2001 from USGS gaging station # 01464500 (Crosswicks Creek at Extonville) were used in generating the FC standard curve



Load Duration Curve for Doctors Creek at Allentown. Fecal coliform data from USGS station # 01464515 during the period 2/15/94 through 8/30/01. Water years 1970-2001 from USGS gaging station # 01464500 (Crosswicks Creek at Extonville) were used in generating the FC standard curve

Amendment to the Atlantic, Cape May, Lower Delaware, Lower Raritan-Middlesex, Mercer, Monmouth, Northeast, Ocean, Sussex, Tri-County, Upper Delaware and Upper Raritan Water Quality Management Plans

Total Maximum Daily Load for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition to Address 122 HUC 14s Statewide

Proposed: June 15, 2009
Established: September 10, 2009
Approved: September 25, 2009
Adopted: June 10, 2010

New Jersey Department of Environmental Protection
Division of Watershed Management
P.O. Box 418
Trenton, New Jersey 08625-0418

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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 or NJDEP) published the *2008 Integrated Water Quality Monitoring and Assessment Report*, which provides information on water quality conditions and trends, and various management strategies and actions being employed to protect and improve water quality. The report includes the List of Water Quality Limited Waters, also known as the 303(d) List, which identifies waters that do not attain an applicable designated use because of a known pollutant and for which a TMDL must be established. On March 3, 2008, the Department proposed the *2008 List of Water Quality Limited Waters* (40NJR4835(c)) 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 in accordance with the Water Quality Management Planning rules at N.J.A.C. 7:15-6.4(a). The Environmental Protection Agency has approved this list. The *2008 List of Water Quality Limited Waters* identifies 256 waters as impaired with respect to mercury, as indicated by the presence of mercury concentrations in fish tissue in excess of New Jersey fish consumption advisories and/or not complying with the Surface Water Quality Standards (SWQS) for mercury at N.J.A.C. 7:9B.

A TMDL has been developed to address mercury impairment in 122 waters identified in Table 1 below. These are waters whose main source of contamination is air deposition. Waters that are tidal, where there are other significant sources of mercury or where cooperative efforts have been or are expected to be undertaken are not addressed in this TMDL pending additional study.

Table 1. Assessment Units Covered by this TMDL

Watershed Management Area (WMA)	Assessment Unit ID	Waterbody Name	2006 Integrated list	2008 Integrated list
01	02040104090020	Clove Brook (Delaware R)	Sublist 5	Sublist 5
01	02040104130010	Little Flat Brook (Beerskill and above)	Sublist 5	Sublist 5
01	02040104140010	Big Flat Brook (above Forked Brook)	Sublist 5	Sublist 5
01	02040105030020	Swartswood Lake and tribs	Sublist 5	Sublist 5
01	02040105030030	Trout Brook	Sublist 5	Sublist 5
01	02040105050040	Yards Creek	Sublist 3	Sublist 3*
01	02040105090040	Mountain Lake Brook	Sublist 5	Sublist 5
01	02040105140040	Merrill Creek	Sublist 5	Sublist 5
01	02040105140060	Pohatcong Ck (Springtown to Merrill Ck)	Sublist 3	Sublist 3*
01	02040105150020	Lake Hopatcong	Sublist 5	Sublist 5
01	02040105150060	Cranberry Lake / Jefferson Lake & tribs	Sublist 5	Sublist 5
02	02020007040040	Highland Lake/Wawayanda Lake	Sublist 5	Sublist 5
03	02030103050020	Pacock Brook	Sublist 5	Sublist 5
03	02030103050030	Pequannock R (above OakRidge Res outlet)	Sublist 5	Sublist 5
03	02030103050040	Clinton Reservior/Mossmans Brook	Sublist 5	Sublist 5

03	02030103050060	Pequannock R(Macopin gage to Charl'brg)	Sublist 5	Sublist 5
03	02030103050080	Pequannock R (below Macopin gage)	Sublist 5	Sublist 5
03	02030103070030	Wanaque R/Greenwood Lk(aboveMonks gage)	Sublist 5	Sublist 5
03	02030103070050	Wanaque Reservior (below Monks gage)	Sublist 5	Sublist 5
03	02030103110020	Pompton River	Sublist 5	Sublist 5
06	02030103010170	Passaic R Upr (Rockaway to Hanover RR)	Sublist 5	Sublist 5
06	02030103020040	Whippany R(Lk Pocahontas to Wash Val Rd)	Sublist 5	Sublist 5
06	02030103020080	Troy Brook (above Reynolds Ave)	Sublist 5	Sublist 5
06	02030103030030	Rockaway R (above Longwood Lake outlet)	Sublist 5	Sublist 5
06	02030103030040	Rockaway R (Stephens Bk to Longwood Lk)	Sublist 5	Sublist 5
06	02030103030070	Rockaway R (74d 33m 30s to Stephens Bk)	Sublist 5	Sublist 5
06	02030103030090	Rockaway R (BM 534 brdg to 74d 33m 30s)	Sublist 5	Sublist 5
06	02030103030110	Beaver Brook (Morris County)	Sublist 5	Sublist 5
06	02030103030140	Rockaway R (Stony Brook to BM 534 brdg)	Sublist 5	Sublist 5
06	02030103030150	Rockaway R (Boonton dam to Stony Brook)	Sublist 5	Sublist 5
06	02030103030170	Rockaway R (Passaic R to Boonton dam)	Sublist 5	Sublist 5
08	02030105010030	Raritan River SB(above Rt 46)	Sublist 5	Sublist 5
08	02030105010040	Raritan River SB(74d 44m 15s to Rt 46)	Sublist 3	Sublist 3*
08	02030105010050	Raritan R SB(LongValley br to 74d44m15s)	Sublist 3	Sublist 3*
08	02030105010060	Raritan R SB(Califon br to Long Valley)	Sublist 3	Sublist 3*
08	02030105020040	Spruce Run Reservior / Willoughby Brook	Sublist 5	Sublist 5
08	02030105020090	Prescott Brook / Round Valley Reservior	Sublist 5	Sublist 5
08	02030105020100	Raritan R SB(Three Bridges-Prescott Bk)	Sublist 3	Sublist 3*
08	02030105040010	Raritan R SB(Pleasant Run-Three Bridges)	Sublist 3	Sublist 3*
08	02030105040040	Raritan R SB(NB to Pleasant Run)	Sublist 3	Sublist 3*
09	02030105080020	Raritan R Lwr (Rt 206 to NB / SB)	Sublist 3	Sublist 3*
09	02030105080030	Raritan R Lwr (Millstone to Rt 206)	Sublist 3	Sublist 3*
09	02030105120080	South Fork of Bound Brook	Sublist 3	Sublist 3*
09	02030105120100	Bound Brook (below fork at 74d 25m 15s)	Sublist 3	Sublist 3*
09	02030105120140	Raritan R Lwr(I-287 Piscatway-Millstone)	Sublist 5	Sublist 5
09	02030105130050	Lawrence Bk (Church Lane to Deans Pond)	Sublist 3	Sublist 3*
09	02030105130060	Lawrence Bk (Milltown to Church Lane)	Sublist 3	Sublist 3*

09	02030105140020	Manalapan Bk(incl LkManlpn to 40d16m15s)	Sublist 3	Sublist 3*
09	02030105140030	Manalapan Brook (below Lake Manalapan)	Sublist 5	Sublist 5
09	02030105160030	Duhernal Lake / Iresick Brook	Sublist 3	Sublist 3*
10	02030105090050	Stony Bk(Province Line Rd to 74d46m dam)	Sublist 3	Sublist 3*
10	02030105100130	Bear Brook (below Trenton Road)	Sublist 3	Sublist 5
10	02030105110020	Millstone R (HeathcoteBk to Harrison St)	Sublist 3	Sublist 5
10	02030105110110	Millstone R (BlackwellsMills to BedenBk)	Sublist 3	Sublist 3*
10	02030105110140	Millstone R(AmwellRd to BlackwellsMills)	Sublist 3	Sublist 3*
10	02030105110170	Millstone River (below Amwell Rd)	Sublist 3	Sublist 3*
12	02030104060020	Matawan Creek (above Ravine Drive)	Sublist 3	Sublist 3*
12	02030104060030	Matawan Creek (below Ravine Drive)	Sublist 5	Sublist 5
12	02030104070070	Swimming River Reservior / Slope Bk	Sublist 3	Sublist 3*
12	02030104070090	Nut Swamp Brook	Sublist 3	Sublist 5
12	02030104090030	Deal Lake	Sublist 3	Sublist 3*
12	02030104090080	Wreck Pond Brook (below Rt 35)	Sublist 3	Sublist 5
12	02030104100050	Manasquan R (gage to West Farms Rd)	Sublist 5	Sublist 5
13	02040301030040	Metedeconk R SB (Rt 9 to Bennetts Pond)	Sublist 5	Sublist 5
13	02040301060050	Dove Mill Branch (Toms River)	Sublist 5	Sublist 5
13	02040301070010	Shannae Brook	Sublist 5	Sublist 5
13	02040301070030	Ridgeway Br (Hope Chapel Rd to HarrisBr)	Sublist 5	Sublist 5
13	02040301070040	Ridgeway Br (below Hope Chapel Rd)	Sublist 5	Sublist 5
13	02040301070080	Manapaqua Brook	Sublist 3	Sublist 5
13	02040301070090	Union Branch (below Blacks Br 74d22m05s)	Sublist 5	Sublist 5
13	02040301080030	Davenport Branch (above Pinewald Road)	Sublist 3	Sublist 5
13	02040301090050	Cedar Creek (GS Parkway to 74d16m38s)	Sublist 5	Sublist 5
13	02040301130030	Mill Ck (below GS Parkway)/Manahawkin Ck	Sublist 3	Sublist 3*
13	02040301130050	Westecunk Creek (above GS Parkway)	Sublist 5	Sublist 5
13	02040301140020	Mill Branch (below GS Parkway)	Sublist 3	Sublist 3*
13	02040301140030	Tuckerton Creek (below Mill Branch)	Sublist 3	Sublist 3*
14	02040301150080	Batsto R (Batsto gage to Quaker Bridge)	Sublist 5	Sublist 5
14	02040301160030	Mullica River (Rt 206 to Jackson Road)	Sublist 5	Sublist 5
14	02040301160140	Mullica River (39d40m30s to Rt 206)	Sublist 5	Sublist 5
14	02040301160150	Mullica R (Pleasant Mills to 39d40m30s)	Sublist 5	Sublist 5
14	02040301180060	Oswego R (Andrews Rd to Sim Place Resv)	Sublist 3	Sublist 3*
14	02040301180070	Oswego River (below Andrews Road)	Sublist 5	Sublist 5

14	02040301190050	Wading River WB (Jenkins Rd to Rt 563)	Sublist 5	Sublist 5
14	02040301200010	Beaver Branch (Wading River)	Sublist 5	Sublist 5
14	02040301200050	Bass River EB	Sublist 3	Sublist 3*
15	02040302030020	GEHR (AC Expressway to New Freedom Rd)	Sublist 5	Sublist 5
15	02040302040050	Collings Lakes trib (Hospitality Branch)	Sublist 5	Sublist 5
15	02040302040130	GEHR (Lake Lenape to Mare Run)	Sublist 5	Sublist 5
15	02040302050120	Middle River / Peters Creek	Sublist 3	Sublist 3*
16	02040206210050	Savages Run (above East Creek Pond)	Sublist 5	Sublist 5
16	02040206210060	East Creek	Sublist 5	Sublist 5
17	02040206030010	Salem River (above Woodstown gage)	Sublist 5	Sublist 5
17	02040206070030	Canton Drain (above Maskell Mill)	Sublist 5	Sublist 5
17	02040206080050	Cohansey R (incl CornwellRun - BeebeRun)	Sublist 3	Sublist 5
17	02040206090030	Cohansey R (Rocaps Run to Cornwell Run)	Sublist 5	Sublist 5
17	02040206100060	Nantuxent Creek (above Newport Landing)	Sublist 3	Sublist 3*
17	02040206130010	Scotland Run (above Fries Mill)	Sublist 5	Sublist 5
17	02040206130040	Scotland Run (below Delsea Drive)	Sublist 5	Sublist 5
17	02040206140010	MauriceR(BlkwtrBr to/incl WillowGroveLk)	Sublist 5	Sublist 5
17	02040206150050	Muddy Run (incl ParvinLk to Palatine Lk)	Sublist 3	Sublist 3*
17	02040206180050	Menantico Creek (below Rt 552)	Sublist 3	Sublist 3*
18	02040202100020	Pennsauken Ck NB (incl StrwbrdgLk-NJTPK)	Sublist 3	Sublist 5
18	02040202110030	Cooper River (above Evesham Road)	Sublist 5	Sublist 5
18	02040202110040	Cooper R (Wallworth gage to Evesham Rd)	Sublist 5	Sublist 5
18	02040202110050	Cooper River (Rt 130 to Wallworth gage)	Sublist 5	Sublist 5
18	02040202120010	Big Timber Creek NB (above Laurel Rd)	Sublist 5	Sublist 5
18	02040202120020	Big Timber Creek NB (below Laurel Rd)	Sublist 5	Sublist 5
18	02040202120030	Big Timber Creek SB (above Lakeland Rd)	Sublist 5	Sublist 5
18	02040202120040	Big T Ck SB(incl Bull Run to LakelandRd)	Sublist 5	Sublist 5
18	02040202120050	Big Timber Creek SB (below Bull Run)	Sublist 5	Sublist 5
18	02040202120060	Almonesson Creek	Sublist 5	Sublist 5
18	02040202120090	Newton Creek (LDRV-Kaighn Ave to LT Ck)	Sublist 5	Sublist 5
18	02040202120100	Woodbury Creek (above Rt 45)	Sublist 5	Sublist 5
18	02040202130030	Chestnut Branch (above Sewell)	Sublist 5	Sublist 5
18	02040202150020	Raccoon Ck (Rt 45 to/incl Clems Run)	Sublist 3	Sublist 3*
18	02040202150040	Raccoon Ck (Russell Mill Rd to Rt 45)	Sublist 5	Sublist 5
19	02040202030050	Bucks Cove Run / Cranberry Branch	Sublist 5	Sublist 5
19	02040202050050	Friendship Ck (below/incl Burrs Mill Bk)	Sublist 3	Sublist 3*

19	02040202050060	Rancocas Creek SB(above Friendship Ck)	Sublist 3	Sublist 3*
19	02040202050080	Rancocas Ck SB (Vincentown-FriendshipCk)	Sublist 3	Sublist 3*
19	02040202050090	Rancocas Ck SB (BobbysRun to Vincentown)	Sublist 3	Sublist 3*
20	02040201090030	LDRV tribs (Assiscunk Ck to Blacks Ck)	Sublist 5	Sublist 5

* Data became available in these assessment units after the 2008 list was approved indicating fish tissue levels that would result in listing of these waters in accordance with the current listing methodology; therefore, these assessment units will also be addressed in this TMDL.

The target for the TMDL is a concentration of 0.18 μg/g in fish tissue, which is the concentration at which the recommended rate of fish consumption for the high risk population is not more than 1 meal per week of top trophic level fish. At this concentration unlimited consumption is appropriate for the general population. An overall reduction of 84.3% in existing mercury loads is required to achieve the target. In its *New Jersey Mercury Reduction Plan*, the Department outlines measures needed to achieve these reductions.

The TMDLs in this report were proposed on June 15, 2009 and, having completed the public participation process, shall be adopted by the Department as amendments to the Atlantic, Cape May, Lower Delaware, Lower Raritan-Middlesex, Mercer, Monmouth, Northeast, Ocean, Sussex, Tri-County, Upper Delaware and Upper Raritan Water Quality Management Plans in accordance with N.J.A.C. 7:15-6.4. This TMDL report was developed consistent with the United States Environmental Protection Agency's (USEPA or EPA) May 20, 2002 guidance document entitled, "Guidelines for Reviewing TMDLs under Existing Regulations issued in 1992" (Sutfin, 2002), which describes the general statutory and regulatory requirements for approvable TMDLs, as well as EPA's more specific guidance memo for the subject type of TMDL, dated September 29, 2008 and entitled "Elements of Mercury TMDLs Where Mercury Loadings are Predominantly from Air Deposition" (Hooks, 2008).

1.0. Introduction

Mercury is a persistent, bio-accumulative toxin that can be found in solid, liquid, or vapor form. Mercury can cause a variety of harmful health effects including damage to the brain, central nervous system, and kidneys and is particularly harmful to children and pregnant and nursing women. Mercury comes from various natural and anthropogenic sources, including volcanic activity, burning of some forms of coal, use in dental procedures and manufacturing, use and disposal of products containing mercury. Most often, mercury enters the environment in gas or particulate form and is deposited on surfaces, often through precipitation, which washes deposited mercury into waterways. There it undergoes a natural chemical process and is converted to a more toxic form – methyl mercury. The methyl mercury builds up in the tissues of fish and animals, increasing its concentration as it moves up through the food chain, which results in high levels of mercury in some of the foods we eat. At certain levels, fish consumption advisories are triggered.

Mercury contamination in the environment is ubiquitous, not only in New Jersey, but worldwide. Mercury contamination is a global issue because the overwhelming source of mercury is air deposition. Consequently, mercury pollution will not be abated on a state by state basis alone, but must be controlled by regional, national and international efforts. In recognition of this, the New England Interstate Water Pollution Control Commission (NEIWPCC) established the *Northeast Regional Mercury Total Maximum Daily Load* dated October 24, 2007 (Northeast Regional TMDL), a regional TMDL for the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont which addressed impairments due to mercury contamination of waterbodies where the main source of mercury contamination is air deposition. It was approved by EPA on December 20, 2007. As EPA has approved establishment of regional TMDLs for mercury impairments where the primary source is air deposition using the NEIWPCC approach, the Department has determined that it is appropriate for New Jersey to develop a similar TMDL for comparable impairments in New Jersey, not only to recommend a course of action to reduce mercury contamination in New Jersey, but to further emphasize that substantial source reductions from outside New Jersey will be needed to achieve water quality objectives. Therefore, New Jersey has developed a statewide TMDL that will complement the Northeast Regional TMDL developed for the northeast states.

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 Surface Water Quality Standards (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 Department combines these reports into the Integrated Water Quality Monitoring and Assessment Report and assigns each designated use within the assessment unit to one of five sublists. An assessment unit is listed as Sublist 1 if all designated uses are assessed and attained. (The Department does not include the fish consumption use for this sublist.) If some but not all uses are attained, an assessment unit is placed on Sublist 2 for attained uses. If the Department did not have data to assess a use, the assessment unit is placed on Sublist 3 for that use. If a use is not attained, the assessment unit will be placed on Sublist 5, or Sublist 4 if there is an approved TMDL, there are other enforceable management measures in effect or the impairment is due to pollution, not a pollutant. Sublist 5 constitutes the list of waters for which a TMDL may be required, also known as the 303(d) list. In accordance with the *2008 Integrated Water Quality Monitoring and Assessment Methods*, although there is a State-wide fish consumption advisory for mercury, only waters with actual fish tissue monitoring data that exceed the threshold which results in a consumption restriction (greater than 0.07 mg/kg) are placed on Sublist 5. All other assessment units are listed on Sublist 3 for this use. Based on the TMDL analysis, which demonstrates that reduction of natural sources of mercury would be needed in order to achieve the level necessary to allow unlimited consumption for high risk populations, the Department intends to revise its Assessment Method when developing future Integrated Water Quality Monitoring and Assessment Reports to allow that a limit of 1 meal per week for the high risk population would be considered as attaining the use with respect to mercury-based fish consumption (listing threshold would be results greater than 0.18 μg/g).

The *2008 List of Water Quality Limited Waters* currently identifies 256 Assessment Units as impaired due to mercury in surface water and/or fish tissue. This report establishes 122 TMDLs for mercury contamination based on fish tissue concentration whose source is largely air deposition. Waters where there are other significant sources of mercury in a waterbody, as indicated by a water column concentration in excess of the Surface Water Quality Standards, documentation of high levels of mercury in ground water or the presence of hazardous waste sites where mercury is a contaminant of concern, are deferred at this time, pending additional study. Tidal waters are also excluded because the approach used in this TMDL is intended for waters not affected by tidal dynamics. In addition, areas that are included in the spatial extent of the on-going interstate effort to address mercury impairments in the New York/New Jersey Harbor are excluded from this TMDL. A similar interstate effort is an appropriate means of addressing mercury impairments in the shared waters of the Atlantic Ocean and the Delaware River and Estuary, and these waters are deferred as well.

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 load 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).

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. EPA has also issued guidance for the development of TMDLs for mercury impairments that are due primarily to air deposition (Hooks, 2008).

2.0. Pollutant of Concern, Applicable Surface Water Quality Standards, and Area of Interest

2.1 Pollutant of Concern

The pollutant of concern for these TMDLs is mercury. According to the current assessment methodology, an assessment unit is listed as impaired for mercury if the data show water column concentrations in excess of the Surface Water Quality Standards (SWQS) or fish tissue concentrations that would result in any limitations on fish consumption. These advisories are not SWQS, but they do indicate a limitation on the use of the waters. As previously discussed, this TMDL is limited to assessment units where impairment is attributed to fish tissue in excess of advisory thresholds, where the mercury is primarily from air deposition. The assessment units addressed are identified in Table 1. These listings have a medium priority ranking in the *2008 List of Water Quality Limited Waters* (40NJR4835(c)).

2.2 Applicable Surface Water Quality Standards and Fish Consumption Advisory Criteria

Most of the waters addressed in this report are classified in the Surface Water Quality Standards (SWQS) at N.J.A.C. 7:9B as Fresh Water 2 (FW2), either Non-Trout (NT), Trout Maintenance (TM) or Trout Production (TP). Some waters are classified as Pinelands (PL) or Freshwater 1 (FW1). A few Assessment Units include waters classified as FW2-NT/SE1 or FW2-NT/SE2. If the measured salinity is less than 3.5 parts per thousand at mean high tide, the FW2-NT classification applies. The TMDL does not apply to fresh or saline tidal waters. If the majority of the waters in the HUC 14 subwatershed are fresh and non-tidal, that assessment unit was included in this TMDL. Therefore, even though portions of some assessment units are noted as including the SE (Saline Estuarine) designation, these designations are not affected and are not discussed below. Table 2 below lists the surface water classifications for the assessment units addressed in this document and Table 3 provides the numeric criteria for mercury.

Table 2. Surface Water Classifications for the Assessment Units Addressed Under this TMDL

WMA	Assessment Unit ID	Waterbody Name	Surface Water Classifications
01	2040104090020	Clove Brook (Delaware River)	FW1, FW1-TP, FW2-TPC1, FW2-TPMC1
01	2040104130010	Little Flat Brook (Beerskill And Above)	FW1, FW2-TP, FW2-TPC1, FW2-NTC1
01	2040104140010	Big Flat Brook (Above Forked Brook)	FW1, FW2-NTC1
01	2040105030020	Swartswood Lake And Tributaries	FW2-TM, FW2-TMC1, FW2-NT, FW2-NTC1
01	2040105030030	Trout Brook	FW2-TPC1, FW2-NT
01	2040105050040	Yards Creek	FW2-TPC1, FW2-NT
01	2040105090040	Mountain Lake Brook	FW2-TM, FW2-NT

01	2040105140040	Merrill Creek	FW2-TPC1, FW2-TM
01	2040105140060	Pohatcong Creek (Springtown To Merrill Creek)	FW2-TPC1, FW2-TMC1
01	2040105150020	Lake Hopatcong	FW2-TM, FW2-NT
01	2040105150060	Cranberry Lake / Jefferson Lake & Tributaries	FW2-TMC1, FW2-NT, FW2-NTC1
02	2020007040040	Highland Lake/Wawayanda Lake	FW2-NT, FW2-NTC1
03	2030103050020	Pacock Brook	FW1, FW1-TP, FW2-NTC1
03	2030103050030	Pequannock River (Above Oak Ridge Reservoir Outlet)	FW1-TP, FW1-TM, FW2-TP, FW2-TPC1, FW2-TMC1, FW2-NT
03	2030103050040	Clinton Reservior/Mossmans Brook	FW1, FW2-TPC1, FW2-TP, FW2-TMC1, FW2-NTC1
03	2030103050060	Pequannock River (Macopin Gage To Charl'brg)	FW1-TM, FW2-TPC1, FW2-TP, FW2-TM, FW2-TMC1, FW2-NT
03	2030103050080	Pequannock River (Below Macopin Gage)	FW2-TPC1, FW2-TP, FW2-NTC1, FW2-TM, FW2-NT
03	2030103070030	Wanaque River /Greenwood Lake (Above Monks Gage)	FW2-TPC1, FW2-TM, FW2-TMC1, FW2-NT, FW2-NTC1
03	2030103070050	Wanaque Reservoir (Below Monks Gage)	FW2-TPC1, FW2-TMC1, FW2-NTC1
03	2030103110020	Pompton River	FW2-NT
06	2030103010170	Passaic River Upper (Rockaway To Hanover Rr)	FW2-NT
06	2030103020040	Whippany River(Lake Pocahontas To Washington Valley Rd)	FW2-TM, FW2-NT
06	2030103020080	Troy Brook (Above Reynolds Ave)	FW2-NT
06	2030103030030	Rockaway River (Above Longwood Lake Outlet)	FW2-NTC1
06	2030103030040	Rockaway River (Stephens Brook To Longwood Lake)	FW2-NTC1
06	2030103030070	Rockaway RIVER (74d 33m 30s To Stephens Brook)	FW1, FW2-NTC1, FW2-TPC1, FW2-TMC1
06	2030103030090	Rockaway River (BM 534 Bridge To 74d 33m 30s)	FW2-NTC1, FW2-NT
06	2030103030110	Beaver Brook (Morris County)	FW2-TPC1, FW2-TMC1, FW2-NTC1
06	2030103030140	Rockaway River (Stony Brook To BM 534 Bridge)	FW2-NTC1
06	2030103030150	Rockaway River (Boonton Dam To Stony Brook)	FW2-TMC1, FW2-NTC1, FW2-NT
06	2030103030170	Rockaway River (Passaic River To Boonton Dam)	FW2-NT
08	2030105010030	Raritan River South Branch (Above Route 46)	FW2-NT, FW2-TM, FW2-NTC1
08	2030105010040	Raritan River South Branch(74d 44m 15s To Route 46)	FW2-NTC1, FW2-TPC1, FW2-NT, FW2-TMC1

08	2030105010050	Raritan River South BRANCH(Longvalley Brook To 74d44m15s)	FW2-TPC1, FW2-NT
08	2030105010060	Raritan River South Branch(Califon Brook To Long Valley)	FW2-TPC1, FW2-NT
08	2030105020040	Spruce Run Reservior / Willoughby Brook	FW2-TPC1, FW2-TMC1, FW2-TM, FW2-NT
08	2030105020090	Prescott Brook / Round Valley Reservoir	FW2-TPC1, FW2-TM, FW2-NT
08	2030105020100	Raritan River South Branch(Three Bridges-Prescott Brook)	FW2-TM, FW2-NT
08	2030105040010	Raritan River South Branch(Pleasant Run-Three Bridges)	FW2-NT
08	2030105040040	Raritan River South Branch(North Branch To Pleasant Run)	FW2-NT
09	2030105080020	Raritan River Lower (Route 206 To North Branch / South Branch)	FW2-NT
09	2030105080030	Raritan River Lower (Millstone To Route 206)	FW2-NT
09	2030105120080	South Fork Of Bound Brook	FW2-NT
09	2030105120100	Bound Brook (Below Fork At 74d 25m 15s)	FW2-NT
09	2030105120140	Raritan River Lwr(I-287 Piscatway-Millstone)	FW2-NT
09	2030105130050	Lawrence Brook (Church Lane To Deans Pond)	FW2-NT
09	2030105130060	Lawrence Brook (Milltown To Church Lane)	FW2-NT
09	2030105140020	Manalapan Brook(Incl Lakemanlpn To 40d16m15s)	FW2-NT
09	2030105140030	Manalapan Brook (Below Lake Manalapan)	FW2-NT
09	2030105160030	Duhernal Lake / Iresick Brook	FW2-NT
10	2030105090050	Stony Brook(Province Line Rd To 74d46m Dam)	FW2-NT
10	2030105100130	Bear Brook (Below Trenton Road)	FW2-NT
10	2030105110020	Millstone River (Heathcotebk To Harrison St)	FW2-NT
10	2030105110110	Millstone River (Blackwellsmills To Beden Brook)	FW2-NT
10	2030105110140	Millstone River(Amwellrd To Blackwellsmills)	FW2-NT
10	2030105110170	Millstone River (Below Amwell Rd)	FW2-NT
12	2030104060020	Matawan Creek (Above Ravine Drive)	FW2-NT/SE1
12	2030104060030	Matawan Creek (Below Ravine Drive)	FW2-NT/SE1
12	2030104070070	Swimming River Reservoir / Slope Brook	FW2-NTC1
12	2030104070090	Nut Swamp Brook	FW2-NT/SE1
12	2030104090030	Deal Lake	FW2-NT/SE1
12	2030104090080	Wreck Pond Brook (Below Route 35)	FW2-NT, FW2-NT/SE1
12	2030104100050	Manasquan River (Gage To West Farms Road)	FW2-TMC1, FW2-NTC1

13	2040301030040	Metedeconk River South Branch (Rt 9 To Bennetts Pond)	FW2-TMC1, FW2-NTC1
13	2040301060050	Dove Mill Branch (Toms River)	FW2-NTC1, PL
13	2040301070010	Shannae Brook	FW2-NT, PL
13	2040301070030	Ridgeway Brook (Hope Chapel Rd To Harrisbrook)	PL
13	2040301070040	Ridgeway Brook (Below Hope Chapel Rd)	PL, FW2-NT/SE1
13	2040301070080	Manapaqua Brook	PL, FW2-NT/SE1
13	2040301070090	Union Branch (Below Blacks Brook 74d22m05s)	PL, FW2-NT/SE1
13	2040301080030	Davenport Branch (Above Pinewald Road)	PL
13	2040301090050	Cedar Creek (GS Parkway To 74d16m38s)	PL
13	2040301130030	Mill Creek (Below Gs Parkway)/Manahawkin Creek	PL, FW2-NT, FW2-NTC1/SE1
13	2040301130050	Westecunk Creek (Above Garden State Parkway)	PL
13	2040301140020	Mill Branch (Below Garden State Parkway)	FW2-NT/SE1
13	2040301140030	Tuckerton Creek (Below Mill Branch)	PL, FW2-NTC1/SE1, FW2-NT/SE1
14	2040301150080	Batsto River (Batsto Gage To Quaker Bridge)	FW1, PL
14	2040301160030	Mullica River (Route 206 To Jackson Road)	PL
14	2040301160140	Mullica River (39d40m30s To Rt 206)	PL
14	2040301160150	Mullica RIVER (Pleasant Mills To 39d40m30s)	PL
14	2040301180060	Oswego River (Andrews Rd To Sim Place Reservoir)	PL
14	2040301180070	Oswego River (Below Andrews Road)	PL
14	2040301190050	Wading River West Branch (Jenkins Road To Route 563)	PL
14	2040301200010	Beaver Branch (Wading River)	PL
14	2040301200050	Bass River East Branch	PL, FW1
15	2040302030020	Great Egg Harbor (Atlantic City Expressway To New Freedom Road)	PL, FW2-NT
15	2040302040050	Collings Lakes Tributary (Hospitality Branch)	PL
15	2040302040130	Great Egg Harbor (Lake Lenape To Mare Run)	PL
15	2040302050120	Middle River / Peters Creek	FW1, /SE1 C1, FW2-NTC1/SE1
16	2040206210050	Savages Run (Above East Creek Pond)	FW1, PL,
16	2040206210060	East Creek	FW1, PL, FW2-NTC1/SE1, FW2-NT/SE1
17	2040206030010	Salem River (Above Woodstown Gage)	FW2-NTC1, FW2-NT
17	2040206070030	Canton Drain (Above Maskell Mill)	FW2-NT/SE1

17	2040206080050	Cohansey River (Including Cornwell Run – Beebe Run)	FW2-NT/SE1
17	2040206090030	Cohansey R (Rocaps Run To Cornwell Run)	FW2-NT/SE1
17	2040206100060	Nantuxent Creek (Above Newport Landing)	FW1, FW2-NTC1/SE1, FW2-NT/SE1
17	2040206130010	Scotland Run (Above Fries Mill)	FW2-NT
17	2040206130040	Scotland Run (Below Delsea Drive)	FW2-NT
17	2040206140010	Mauriceriver(Blackwater Book To Include Willow Grovelake)	FW2-NT, FW2-NTC1
17	2040206150050	Muddy Run (Including Parvin Lake To Palatine Lake)	FW2-NT, FW2-NTC1
17	2040206180050	Menantico Creek (Below Route 552)	FW2-NT, FW2-NTC1
18	2040202100020	Pennsauken Creek North Branch (Including Strawbridge Lake-Njtpk)	FW2-NT
18	2040202110030	Cooper River (Above Evesham Road)	FW2-NT
18	2040202110040	Cooper River (Wallworth Gage To Evesham Road)	FW2-NT
18	2040202110050	Cooper River (Route 130 To Wallworth Gage)	FW2-NT
18	2040202120010	Big Timber Creek North Branch (Above Laurel Road)	FW2-NT
18	2040202120020	Big Timber Creek North Branch (Below Laurel Road)	FW2-TPC1, FW2-NT
18	2040202120030	Big Timber Creek South Branch (Above Lakeland Road)	FW2-NT
18	2040202120040	Big Timber Creek South Branch(Including Bull Run To Lakeland Road)	FW2-NT
18	2040202120050	Big Timber Creek South Branch (Below Bull Run)	FW2-NT
18	2040202120060	Almonesson Creek	FW2-NT
18	2040202120090	Newton Creek (Ldrv-Kaighn Ave To Lt Creek)	FW2-NT
18	2040202120100	Woodbury Creek (Above Rt 45)	FW2-NT/SE2
18	2040202130030	Chestnut Branch (Above Sewell)	FW2-NT/SE2
18	2040202150020	Raccoon Creek (Rt 45 To/Include Clems Run)	FW2-NT/SE2
18	2040202150040	Raccoon Creek (Russell Mill Road To Route 45)	FW2-NT/SE2
19	2040202030050	Bucks Cove Run / Cranberry Branch	PL
19	2040202050050	Friendship Creek (Below/Including Burrs Mill Brook)	PL
19	2040202050060	Rancocas Creek South Branch(Above Friendship Creek)	PL
19	2040202050080	Rancocas Creek South Branch (Vincentown-Friendship Creek)	PL, FW2-NT
19	2040202050090	Rancocas Creek South Branch (Bobbys Run To Vincentown)	FW2-NT
20	2040201090030	Lower Delaware River Tributaries (Assiscunk Creek To Blacks Creek)	FW2-NT

C1 refers to Category One, a specific category of water relevant with respect to the antidegradation policies in the SWQS.

In all FW1 waters, the designated uses are (NJAC 7:9B-1.12):

1. Set aside for posterity to represent the natural aquatic environment and its associated biota;
2. Primary and secondary contact recreation;
3. Maintenance, migration and propagation of the natural and established aquatic biota; and
4. Any other reasonable 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.

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

1. Cranberry bog water supply and other agricultural uses;
2. Maintenance, migration and propagation of the natural and established biota indigenous to this unique ecological system;
3. 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;
4. Primary and secondary contact recreation; and
5. Any other reasonable uses.

Table 3. Mercury Water Column Criteria (µg/l)

Toxic substance	Fresh Water (FW2) Criteria		
	Aquatic		Human Health
	Acute	Chronic	
Mercury	1.4(d) (s)	0.77(d) (s)	0.05(h)(T)

d = criterion expressed as a function of the water effects ratio
T = total
h = noncarcinogenic effect-based human health criteria
s = dissolved

Surface water quality criteria for FW1 waters are that they shall be maintained as to quality in their natural state. PL waters shall be maintained as to quality in their existing state or that quality necessary to attain or protect the designated uses, whichever is more stringent.

In addition N.J.A.C. 7:9B-1.5(a) 4 includes the requirement that "Toxic substances in water shall not be at levels that are toxic to humans or the aquatic biota so as to render them unfit for human consumption."

Fish consumption advisories are jointly issued by the New Jersey Department of Environmental Protection and the New Jersey Department of Health and Senior Services. They provide advice to the general population and high-risk individuals (for example, women of childbearing age and children) concerning the number of meals that represent safe levels of consumption of recreational fish from New Jersey waters. Fish consumption advisories for mercury include information on how to limit risk by providing guidance on the types and sizes of fish and the number of meals to eat. They are not promulgated standards, but they are used for determining whether the fish consumption use is met. Where fish tissue levels exceed the advisory thresholds, a waterbody is listed on the 303(d) list. The New Jersey fish consumption advisories are as follows:

Table 4. New Jersey Fish Consumption Advisory Thresholds (from Toxics in Biota Committee 1994)

Advisories for the high risk population*	
Mercury (TR) Concentration in Fish Tissue	**Advisory**
Greater than 0.54 µg/g (ppm)	Do not eat
Between 0.19 and 0.54 µg/g (ppm)	One meal per month
Between 0.08 and 0.18 µg/g (ppm)	One meal per week
0.07 µg/g (ppm) or less	Unlimited consumption
Advisories for the general population	
Mercury (TR) Concentration in Fish Tissue	**Advisory**
Greater than 2.81 µg/g (ppm)	Do not eat
Between 0.94 and 2.81 µg/g (ppm)	One meal per month
Between 0.35 and 0.93 µg/g (ppm)	One meal per week
0.34 µg/g (ppm) or less	Unlimited consumption

TR – Total Recoverable Mercury

* The high risk population consists of women of childbearing years, pregnant and nursing mothers and children.

Under the current assessment methodology, an assessment unit was listed as not attaining the fish consumption use if fish tissue data indicated that any restriction of consumption would be necessary, in other words if the fish tissue concentration was above 0.07 µg/g. However, based on this TMDL analysis, this level in fish tissue can be caused solely by natural sources of mercury in some waters (see Section 5 *TMDL Calculations* below). Therefore, the Department intends to revise the assessment methodology in the development of future lists (2010) to reflect a minimal level of consumption advisory for the high risk population. It is expected that the future assessment method will use a tissue concentration of greater than 0.18 µg/g as the listing threshold, which would allow consumption by the high risk population of one meal per week. Therefore, the target for this TMDL is 0.18 µg/g total mercury fish tissue concentration. Big Timber Creek would not have been listed using this listing threshold, however, because it is listed on the 2008 303(d) list, it will be included in this TMDL document. All other waters included in this TMDL exceed the 0.18 ug/g fish tissue target.

Because fish consumption advisories are not SWQS and a TMDL must demonstrate attainment of the applicable SWQS, it is necessary to demonstrate that using this fish tissue target will also attain the applicable SWQS for mercury. This is done using bioaccumulation factors (BAFs), to convert the levels found in the fish tissue to a water column value so there can be a direct comparison with the State's current water quality criterion of 0.050 µg/L as total mercury. There is no numerical standard for waters classified as PL or FW1. The 0.18 ug/g fish tissue target is a human health endpoint which is protective of all waters, regardless of a waterbody's designation. NJAC 7:9B-1.5(a) 4's narrative standard regarding toxic substances is applicable to all waters. Absent a numeric standard for FW1 and PL waters, the narrative standard was applied and implemented using the 0.18 ug/g mercury fish tissue target. In addition the target of 0.18 µg/L requires the reduction of mercury to near natural background levels (see TMDL calculations in section 5 below) and as such is protective of waters with PL and FW1 designations.

New Jersey is engaged in an ongoing effort to develop regional BAFs. As this work is not complete, the EPA national default values will be used for this TMDL. A BAF of 1,690,000 L/kg was selected, which is based on the averaging of EPA national default values for trophic level 3 and trophic level 4 fish of 2,700,000 and 680,000 L/kg, respectively. Averaging the two values assumes a diet of 50% of these higher trophic level fish. This BAF is for methyl mercury. A further conversion to a corresponding total mercury concentration in the water column can be calculated by using the ratio of dissolved methyl mercury to total mercury. Data available from the various regions of New Jersey show that the ratios range from 0.059 to 0.005 (pers. comm. G. A. Buchanan, NJDEP, May 5, 2009). A ratio of 0.055 can be calculated from national data (EPA, 1997). The water column mercury concentration, 0.021 ug/L, expressed as total mercury using the selected BAF and the most conservative conversion factor (0.005) is lower than the mercury surface water criterion of 0.050 ug/L. Therefore, the use of a fish tissue criterion as a TMDL target ensures that the SWQS will be met if the TMDL fish tissue target is met.

The following formula was used for this comparison:

WCV (µg/L) =[Fish Tissue Value (mg/kg)/BAF (L/kg) x 1000 µg/mg] / dissolved MeHg to total Hg

Where:

WCV = water column mercury concentration
Fish Tissue Value = 0.18 mg/kg
BAF = 1,690,000 L/kg

Therefore:

WCV (µg/L)(as total Hg) = [<u>0.18 mg/Kg/1,690,000 L/kg</u> x 1000 µg/mg]/ 0.005 = **0.021 µg/L total Hg**

In other words, when a fish tissue target of 0.18 mg/kg is met, the water column mercury concentration would be 0.021 μg/L, which is below the surface water quality criterion of 0.050 μg/L).

2.3 Area of Interest

In accordance with the *2008 Integrated Water Quality Monitoring and Assessment Methods*, although there is a State-wide fish consumption advisory for mercury, only waters with actual fish tissue monitoring data that exceed the threshold which results in a consumption restriction (greater than 0.07 mg/kg) are placed on Sublist 5. All other assessment units are listed on Sublist 3 for this use.

The *2008 List of Water Quality Limited Waters* currently identifies 256 assessment units as impaired due to mercury in surface water and/or fish tissue. This report establishes 122 TMDLs for mercury contamination based on fish tissue concentration whose source is largely air deposition. Waters where there are other significant sources of mercury in a waterbody, as indicated by a water column concentration in excess of the Surface Water Quality Standards (61 listings), documentation of high levels of mercury in ground water (15 listings) or the presence of hazardous waste sites where mercury is a contaminant of concern (8), are deferred at this time, pending additional study. Tidal waters (35) are also excluded because the approach used in this TMDL is intended for waters not affected by tidal dynamics. In addition, areas that are included in the spatial extent of the on-going interstate effort to address mercury impairments in the New York/New Jersey Harbor are excluded from this TMDL (6). A similar interstate effort is an appropriate means of addressing mercury impairments in the shared waters of the Atlantic Ocean (37) and the Delaware River and Estuary (9) and these waters are deferred as well. See Appendix A for a listing of the deferred assessment units.

Additional fish tissue data not available when the *2008 List of Water Quality Limited Waters* was developed were evaluated and 37 additional assessment units were found to have fish tissue concentrations that would have resulted in listing of those assessment units under the current assessment methodology (see those indicated with an asterisk in Table 1). These assessment units also meet the other criteria for being addressed under this TMDL (no other significant sources, non-tidal, outside the spatial extent of interstate study). Therefore, these assessment units will be addressed under this TMDL.

As additional fish tissue data is obtained, it is expected that other assessment units will be identified that conform to the parameters established for this TMDL approach and would appropriately be addressed by this TMDL, had the data been available. Therefore, in addition to the impaired waters listed Table 1, this TMDL may, in appropriate circumstances, also apply to waterbodies that are identified in the future as being impaired for mercury. For such waterbodies, this TMDL may apply if, after listing the waters for mercury impairment and taking into account all relevant comments submitted on the Impaired Waters List, the Department determines, with EPA approval of the list, that this TMDL should apply to future mercury impaired waterbodies. Under these circumstances, the assessment units will be placed on Sublist 4.

The assessment units addressed in this TMDL are listed in Table 1 and depicted in Figure 1. The assessment units encompass 724,236 acres throughout the state.

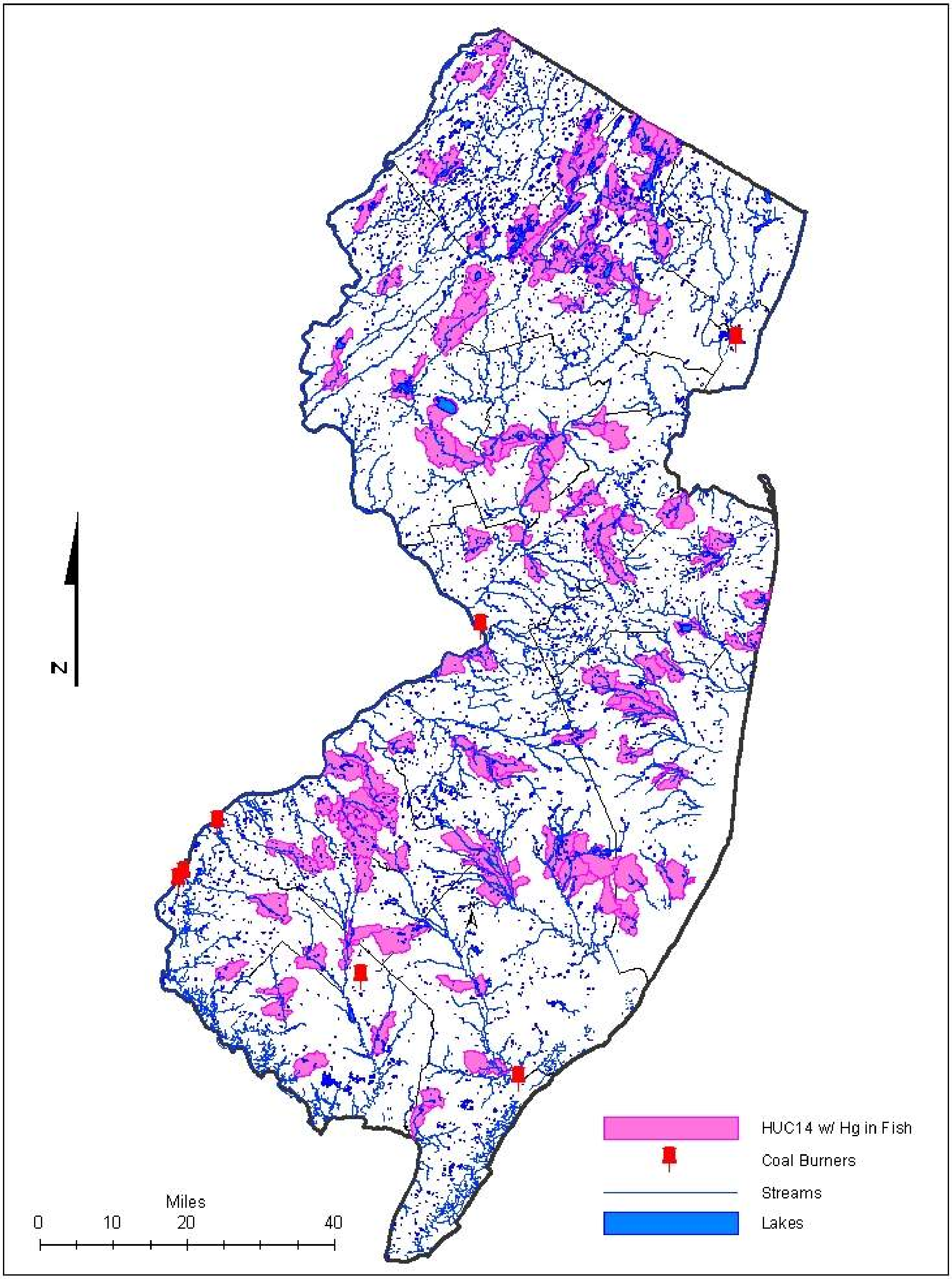


Figure 1. **Assessment Units Addressed in this TMDL**

3.0. Data Analysis

3.1 Fish Tissue Data

Beginning in 1994, research on freshwater fish found mercury concentrations exceeding the risk-based health advisories established by the State of New Jersey. Additional data were developed and reported in Academy of Natural Sciences, Philadelphia (ANSP) (1999), Ashley and Horwitz (2000), Horwitz et al. (2005) and Horwitz et al. (2006). The Department's Routine Monitoring Program for fish tissue began in 2002. The purpose of this monitoring program is to enhance waterbody assessments; amend existing advisories or, if necessary, develop new advisories; assist the NJDEP in evaluating trends in contaminant concentrations of these selected species; and to determine the need for additional research and monitoring studies. The sampling program is based on a rotating assessment of contamination in five regions of the state on a 5-year cycle. The regions consist of:

1. Passaic River Region;
2. Marine/Estuarine Coastal Region;
3. Raritan River Region;
4. Atlantic Coastal Inland Waterways Region; and
5. Upper and Lower Delaware River Region.

Sampling in the Passaic Region was conducted in 2002-2003 and the Marine/Estuarine Region in 2004-06. The results were reported in Horwitz, et al. (2005 and 2006). In the third year of the cycle, the Raritan River Region was sampled for freshwater fish, blue crabs and marine fish. In 2006-2007, species important to recreational anglers in the Raritan estuaries and adjacent oceanic waters and in two southern New Jersey coastal bays were sampled.

The initial data set consulted included 2,474 samples that had been analyzed for mercury in fish tissue in the waters of New Jersey collected through the above sampling programs and from localized investigations. All fish were analyzed using microwave digestion and cold vapor atomic absorption. Based on an evaluation of data quality, all samples before 1990 were excluded because of issues with background contamination in the labs analyzing samples. A small number of fish tissue samples were derived from whole fish samples. Only samples where the fillets were analyzed were retained to ensure a consistent basis for comparison. Locations with known mercury contamination from other sources were eliminated to avoid influences beyond air deposition (water column exceedances, presence of hazardous sites with mercury, groundwater levels with elevated mercury). All tidal areas were excluded, including those from the areas of on-going or anticipated interstate studies (New York/New Jersey Harbor, Atlantic Ocean and Delaware River and Bay). The final data set used for this TMDL analysis included 1,368 samples from 26 different species (see Appendix B).

This TMDL is based on the linear relationship between mercury levels in the air and water and that a BAF can relate fish tissue concentration to water column concentration. This means that if the existing load is responsible for the observed mercury levels in fish, then one can calculate the load that will result in the target concentration in fish and the associated water column concentration using the BAF, to ensure the SWQS are attained. The steady state bioaccumulation equation is:

$$C_{\text{fish } t1} = BAF * C_{\text{water } t1}$$

where:

$C_{\text{fish } t1}$ and $C_{\text{water } t1}$ represent methyl mercury concentration in fish and water at time t_1, respectively;

BAF represents the bioaccumulation factor, which is constant for a given age and length fish in a specific water body.

For a future time, t_2, when mercury concentrations have changed, but all other parameters remain constant, the following equation applies:

$$C_{\text{fish } t2} = BAF * C_{\text{water } t2}.$$

Combining both equations produces the following:

$$C_{\text{fish } t1}/C_{\text{fish } t2} = C_{\text{water } t1}/C_{\text{water } t2}.$$

Then, with methyl mercury water column concentrations being proportional to mercury air deposition load, therefore:

$$C_{\text{fish } t1}/C_{\text{fish } t2} = L_{\text{air } t1}/L_{\text{air } t2}$$

where:

$L_{\text{air } t1}$ and $L_{\text{air } t2}$ represent mercury loads from the air deposition at time 1 and time 2.

Mercury concentration in fish increases with both age and length (see Figure 2). In order to derive a representative existing fish tissue concentration as a basis to calculate the load reduction required to achieve the target concentration, it is necessary to statistically standardize the data. The fish tissue mercury concentrations were statistically adjusted to a “standard-length fish”. Because many fish are larger than the standard length and therefore higher in mercury, the TMDL analysis targets the 90^{th} percentile mercury tissue concentration of the distribution of all length-standardized fish evaluated. This will provide an implicit margin of safety and be more protective than using a mean or median concentration value. In addition, because growth rates and levels of mercury accumulation will vary between waterbodies, using the 90^{th} percentile tissue concentration will be protective of waterbodies with higher levels of accumulation.

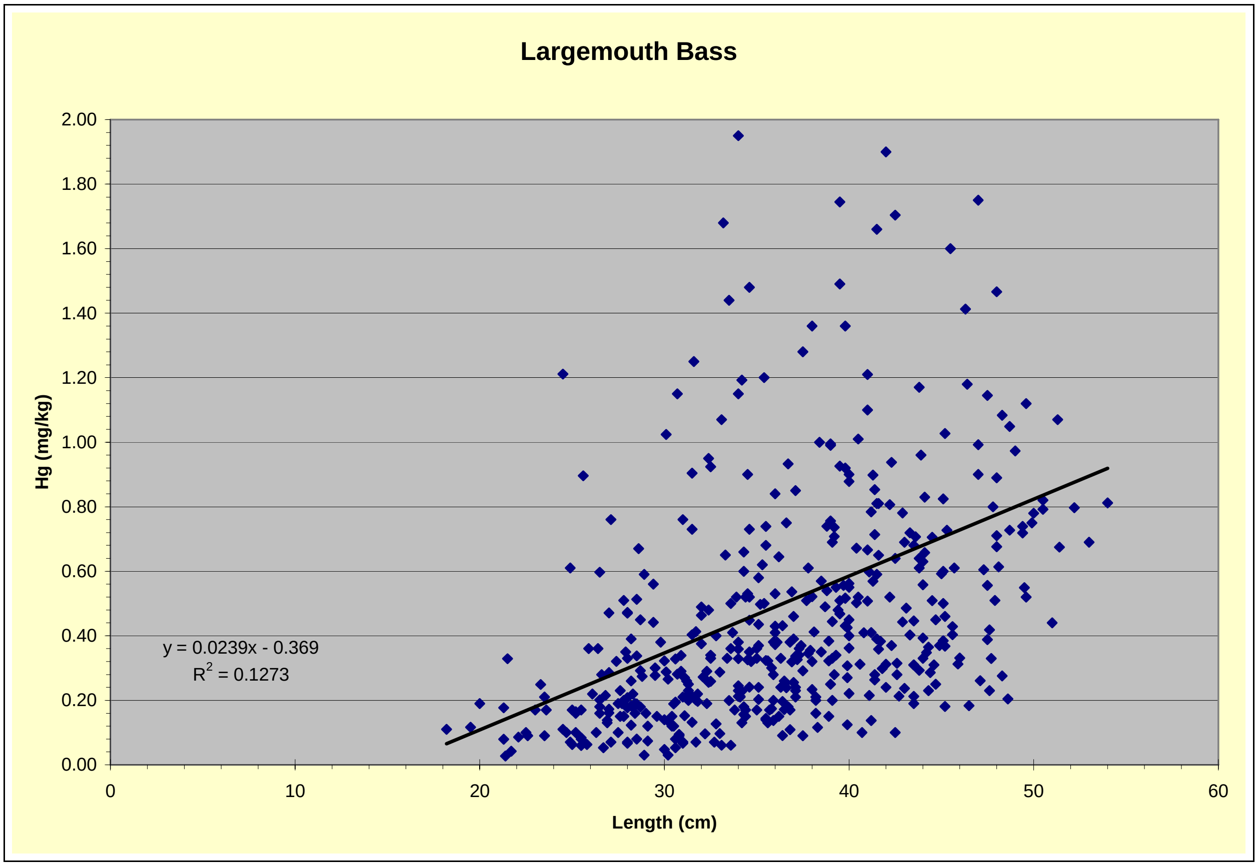


Figure 2. Relationship Between Length and Mercury Concentration in Fish Tissue

The Northeast Regional TMDL analyzed four different species of top trophic level fish, comparing the mean, 80^{th} and 90^{th} percentile concentrations. The authors chose the smallmouth bass (*Micropterous dolomieu*), because of the rate of bioaccumulation of mercury and its ubiquitous distribution throughout the Northeast States. The smallmouth bass is not well distributed throughout New Jersey, therefore it was not an appropriate indicator species for this TMDL. However, the largemouth bass (*Micropterus salmoides*), of the same genus and with the same diet of crayfish, frogs and fish, is well distributed throughout New Jersey. Samples are available from 69% of the listed assessment areas. The chain pickerel was also considered because it is represented by the second largest number of samples in the data set and has a high average mercury concentration (see tables 5 and 6 below). Its diet consists of invertebrates and fish. However, it is not as well distributed throughout New Jersey. Because of the larger sample size and better distribution, the largemouth bass was chosen to be the indicator for this TMDL effort. Using either fish yields a similar reduction factor.

Table 5. **Data on Methyl Mercury Concentration in Fish Fillet Samples (n = number of samples, Average = arithmetic mean concentration)**

Species List	2000-2007		1990-1999	
	n	Average	n	Average
American Eel	72	0.4	6	0.47
Black Crappie	15	0.15	32	0.19
Bluegill	75	0.14	2	0.03
Bluegill Sunfish	3	0.07	20	0.18
Brown Bullhead	32	0.07	79	0.19
Brown Trout	2	0.08	1	0.2
Chain Pickerel	82	0.658	166	0.685
Channel Catfish	9	0.22	10	0.15
Common Carp	36	0.11	5	0.04
Hybrid Striped Bass	0		6	0.27
Lake Trout	5	0.14	12	0.46
Largemouth Bass	152	0.54	224	0.56
Mud sunfish	0		3	1.01
Northern Pike	6	0.29	6	0.24
Pike	0		3	0.39
Pumpkinseed Sunfish	0		19	0.37
Rainbow Trout	0		6	0.11
Redbreast Sunfish	16	0.16	4	0.24
Rock Bass	19	0.33	4	0.46
Smallmouth Bass	13	0.34	22	0.47
Striped x White Bass Hybrid	5	0.29	0	
Walleye	10	0.4	6	0.74
White Catfish	8	0.19	15	0.27
White perch	12	0.18	22	0.42
White Sucker	3	0.23	0	
Yellow Bullhead	33	0.23	32	0.63
Yellow Perch	27	0.36	28	0.51

An analysis of covariance model was used to estimate the length-adjusted concentrations of mercury in largemouth bass. Scatter plots indicated that a log transformation for mercury would approximately linearize the relationship between mercury and length, so the model used the log to the base 10 of mercury as the dependent variable. The independent variables were length and water body. Water bodies were considered to be fixed effects. The result of this analysis was to create a length-adjusted mercury concentration for each water body.

A model was also run in order to determine whether the length-adjusted concentrations changed over time. In order to do this, an independent variable defining the decade in which the sample was taken (1992 – 1999 vs. 2000 – 2007) was included in the model along with length and water body. This model was significant ($p < 0.001$) with an R-square of 82%. Mercury concentrations varied significantly ($p < 0.001$) with length, waterbody and the decade in which the samples were taken.

Because decade was a significant effect, the two decades were analyzed separately. The adjusted estimates were calculated at the mean length of 35.11cm for data collected from 1992-1999 and 39.78 cm for data collected from 2000-2007.

For the 1992-1999, the data set included 49 water bodies. The number of fish sampled from each water body ranged from 1 to 12. The independent variables included length and water body. This model run was significant ($p < 0.001$) with an R-square of 89%. Mercury concentration varied significantly ($p < 0.001$) with both length and waterbody. The 90th percentile of the length-adjusted mercury concentration is $10^{(0.0448)} = 1.109$ µg/g.

The 2000-2007 dataset included 46 water bodies. The number of fish sampled from each water body ranged from 3 to 5. The independent variables included length and water body. This model run was significant ($p < 0.001$) with an R-square of 85%. Mercury concentration varied significantly ($p < 0.001$) with both length and waterbody. The 90th percentile of the length adjusted mercury concentration is $10^{(0.0607)} = 1.150$ µg/g.

The statistical analyses were performed in SAS version 9.1.3.

Because the mercury concentration varies with the waterbody, the 90th percentile fish tissue concentration is used to calculate the reduction factor. This will be protective of all the waterbodies, even those with higher fish tissue mercury concentrations.

Table 6. Mercury Concentrations Related to Fish Length for 2000-2007 Data

Species	Standard Length (cm)	Mean Hg Concentration (ppm) at Standard Length	80th percentile Hg Concentration (ppm) at Standard Length	90th percentile Hg Concentration (ppm) at Standard Length
Largemouth bass	35.11	0.531	0.64	1.15
Chain pickerel	41.61	0.59	1.26	1.29

Figure 3 shows the distribution of methyl mercury concentrations in all species in the 2000–2007 data set and concentrations in the largemouth bass for the same period. The graph shows that targeting the 90th percentile concentration in largemouth bass corresponds to the 93rd percentile concentration for all fish species. Therefore, targeting the concentration of 90th percentile for largemouth bass, means that approximately 93% of all fish populations tested will comply with the TMDL target concentration. There is much environmental variability. Some lakes will show decreases in mercury more quickly, some more slowly. Both the Minnesota and the Northeast States regional TMDLs were based on the 90th percentile concentration. Therefore the 90th percentile target is in keeping with mercury TMDLs EPA has previously approved.

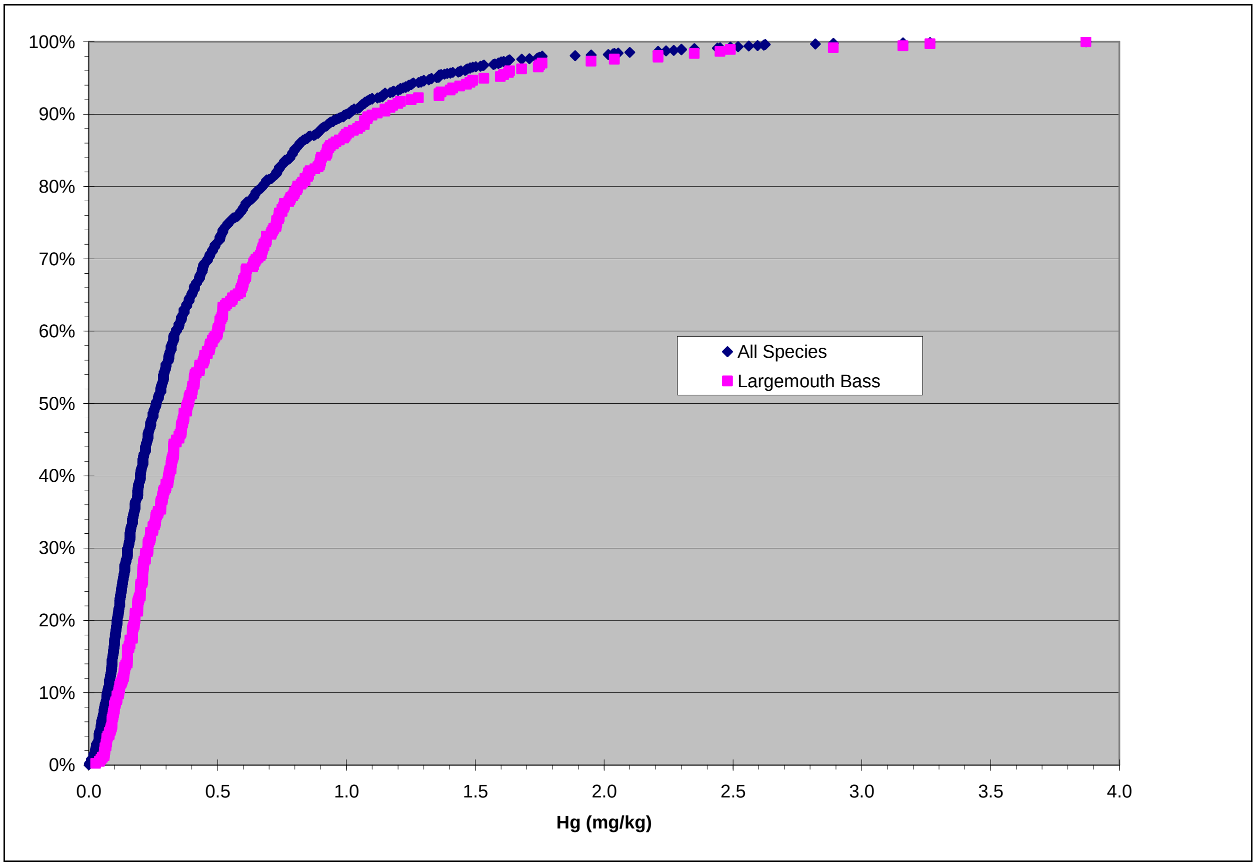


Figure 3. Cumulative Distribution of Mercury Concentrations in Fish Tissues

Based on the linear relationship premise, a Reduction Factor (RF) based on the existing and target fish tissue concentrations is calculated as follows:

RF= (EFMC-TFMC)/EFMC

where:
EFMC = the existing fish mercury concentration for the selected fish species.
TFMC = target fish mercury concentration

or:
0.84 = (1.15 µg/g-0.18 µg/g) /1.15 µg/g

As discussed above, the EFCM for this study is 1.15 µg/g, which represents the 90th percentile concentration based on standard length for largemouth bass. The target fish tissue concentration is 0.18 µg/g, which will allow a consumption rate of 1 meal per week for the high risk population. For unlimited consumption of fish for the high risk population, the reduction factor would need to be 0.94. As discussed below, natural sources of mercury, which cannot be reduced, make this reduction factor unattainable. However, the TMDL calculation includes an implicit margin of safety based on a number of conservative assumptions. Therefore, it is possible that unlimited consumption for the high risk population may be attainable if the identified anthropogenic reductions are achieved. In any case, although this TMDL target will not allow unlimited consumption of top trophic level fish for high risk groups using the multiple conservative assumptions in this analysis, mercury will be reduced at all trophic levels, allowing greater options for safe consumption of fish at the lower trophic levels and one meal per week of the top trophic levels by the high risk population.

4.0. Source Assessment

In order to evaluate and characterize mercury loadings on a statewide basis source assessments are critical. Source assessments include identifying the types of sources and their relative contributions to mercury loadings and are necessary to develop proper management responses to reduce loadings and attain water quality targets.

Air deposition is the primary source of the mercury impairments addressed in this TMDL. A recent study was undertaken in partnership with the states and USEPA Regional Air and Water Offices to use atmospheric deposition modeling to quantify contributions of specific sources and source categories to mercury deposition within each of the lower 48 states (ICF, 2008). The annual simulation was performed based on data that represented late 90's emission profiles for most source categories. The primary modeling system used for this study is the Regional Modeling System for Aerosols and Deposition (REMSAD). REMSAD is a three-dimensional grid model designed to calculate the concentrations of pollutants by simulating the physical and chemical processes in the atmosphere that affect pollutant concentrations. REMSAD simulates both wet and dry deposition of mercury. REMSAD also includes algorithms for the reemission of previously deposited mercury (originating from anthropogenic and natural sources) into the atmosphere from land and water surfaces. The Particle and Precursor Tagging Methodology (PPTM) feature allows the user to tag or track emissions from selected sources or groups of sources, and quantify their contribution to mercury deposition throughout the modeling domain and simulation period. Results from the Community Multiscale Air Quality (CMAQ) modeling system were used to enhance the analysis of the effects of global background on mercury deposition. The outputs from three global models were used to specify the boundary conditions for both REMSAD and CMAQ and thus represent a plausible range of global background contributions based on current scientific understanding.

Preparation and quality assurance of the mercury emissions inventory were critical for the air deposition load modeling. Based on the emissions data utilized by USEPA in the Clean Air Mercury Rule (CAMR) modeling, detailed summaries of the top emitters in the CAMR mercury inventory for each state were prepared and provided to the appropriate EPA regional offices and state agencies for review. An effort was made to update emissions to the 2001 timeframe in addition to the general QA/QC that performed by the states and EPA regions. Then based on the state's input, any errors in the data were corrected. Table 7 lists New Jersey's emission inventory as it was used in the model. This inventory was developed based on the Department's 2001 mercury emission estimates (ICF, 2008). For the total of the three forms of mercury emission load, approximately 60% was due to air point sources and 40% from air nonpoint sources. Air point sources include fuel combustion-electric utilities, industrial facilities and other combustion facilities. Air nonpoint sources include human cremation, fluorescent lamp breakage, miscellaneous volatilization and other non-stationary sources.

Table 7. Summary of Emissions Inventory of New Jersey in Tons per Year (tpy) (ICF, 2008)

Facility Name	HG0* (tpy)	HG2* (tpy)	HGP* (tpy)	Total (tpy)
B.L. England	0.094	0.016	0.004	0.114
Hudson*	0.011	0.028	0.003	0.041
Mercer	0.030	0.015	0.011	0.057
Deepwater	0.002	0.004	0.000	0.006
Logan Generating Company - L.P.	0.001	0.000	0.000	0.002
Chambers Cogeneration - L.P.	0.010	0.006	0.004	0.021
Co Steel Raritan	0.090	0.011	0.011	0.112
Atlantics States Cast Iron Pipe	0.033	0.004	0.004	0.041
U.S. Pipe & Fndy. Co	0.019	0.011	0.000	0.030
Co Steel Sayreville*	0.178	0.022	0.022	0.222
Essex County RRF*	0.047	0.123	0.042	0.212
Camden RRF*	0.011	0.029	0.010	0.050
Union County RRF	0.003	0.008	0.003	0.014
Gloucester County	0.002	0.005	0.002	0.009
Warren Energy RF	0.001	0.001	0.001	0.003
Howarddown	0.002	0.001	0.001	0.004
Hoeganese	0.005	0.003	0.002	0.010
Camden County Muassi	0.005	0.003	0.002	0.010
Stony Brook Regional Sewerage Authority	0.011	0.007	0.005	0.023
Bayshore Regional Sewerage Authority	0.004	0.002	0.002	0.008
Somerset Raritan Valley Sewerage Authority	0.007	0.004	0.003	0.014
Northwest Bergen County Utilities Authority	0.005	0.003	0.002	0.010
Parsippany – Troy Hills Township WWTP	0.004	0.003	0.002	0.009
Atlantic County Utilities Authority	0.003	0.002	0.001	0.006
Gloucester County Utilities Authority	0.001	0.001	0.000	0.002
Point Source Total	0.579	0.312	0.137	1.030
Non-point Source	0.464	0.096	0.055	0.613
Total	1.043	0.408	0.192	1.643

*HG0 - elemental mercury vapor; HG2 - divalent mercury compounds in gas phase; HGP - divalent mercury compounds in particulate phase.

As summarized in Table 8 below, a total of 594 kg of annual mercury load due to air deposition was estimated for New Jersey. "Background" refers to the effects of initial and boundary concentrations and embodies the effects of global emissions, altogether, about 52% of the total load. Emissions from New Jersey are contributing 12.5% of the total load. The emissions from five surrounding states contribute 26% of the total load.

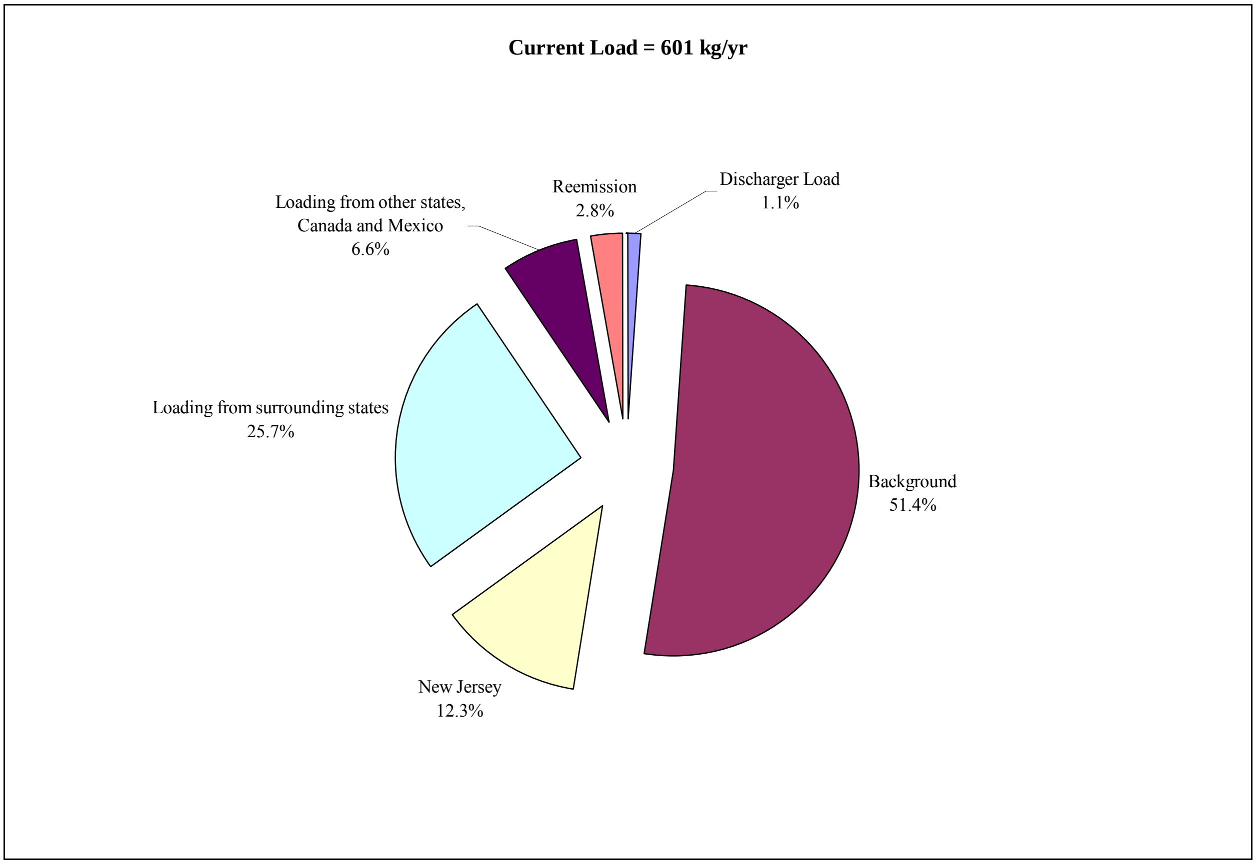
Table 8. Mercury Air Deposition Load for New Jersey (pers. com. D. Atkinson, March 26, 2009, see Appendix D)

Category	Load (kg/yr)	Percent of Total Load
Background	309.0	52.0%
Background-reemission	16.9	2.8%
New Jersey	74.1	12.5%
Loading from the surrounding state (Total)	154.6	26.0%
Pennsylvania	102.8	17.3%
Maryland	25.1	4.2%
New York	13.7	2.3%
Delaware	11.1	1.9%
Connecticut	1.8	0.3%
Loading from other states, Canada and Mexico	39.6	6.7%
Total	594.2	100%

Under the Clean Water Act (CWA), air deposition is a nonpoint source of mercury. Mercury deposited from air sources reaches the surface water as the result of direct deposition on the water surface and through stormwater runoff. Under the CWA, stormwater discharges subject to regulation under the National Pollutant Discharge Elimination System (NPDES) are a point source. In New Jersey, 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. Stormwater discharges that are not subject to regulation under NPDES, such as Tier B municipalities regulated under the NJPDES municipal stormwater permitting program, and direct stormwater runoff from land surfaces are nonpoint sources. Stormwater point sources derive their pollutant load from runoff from land surfaces and the necessary load reduction for this TMDL will be accomplished in the same way as for stormwater that is a nonpoint source, that is by reducing the air deposition load. The distinction is that, under the Clean Water Act stormwater point sources are assigned a WLA while nonpoint sources are assigned a LA. For this TMDL, the proportion of the air deposition loading attributed to stormwater point sources has been estimated by determining the amount of urban land located within Tier A municipalities. Based on NJDEP's 2002 land use coverage, the area of urban land use within the Tier A municipalities is about 25.6% of the entire state. Applying this percentage to the entire load due to air deposition is the best approximation of the air deposition load subject to stormwater regulation and this proportion of the air deposition load will be assigned a WLA.

Surface water discharges of sanitary and industrial wastewater that have the potential to discharge mercury are the other potential point source category which must be assigned a WLA. The Department reviewed over 240 existing major and minor municipal surface water discharge locations. Industrial surface water dischargers with mercury limits in their permits regulated under the New Jersey Pollutant Discharge Elimination System (NJPDES) were also included as the potential point sources for this TMDL. Since this TMDL is limited to non-tidal water, facilities discharging to coastal water were excluded. By examining the locations of the outfall pipes, approximately two-thirds of initially identified municipal and industrial surface water discharge facilities were used to estimate the point source loading from them.

Various sources of data were assessed in order to estimate an appropriate loading to attribute to discharge facilities. Due to the high detection limit of the standard method for analyzing the samples collected from the dischargers, mercury concentrations reported to date were generally listed as non-detected in the Monitoring Report Forms. Dental facilities are believed to be the largest source of mercury reaching wastewater treatment plants. Through the recently adopted New Jersey Pollutant Discharge Elimination System, Requirements for Indirect Users – Dental Facilities rules, N.J.A.C. 7:14A-21.12, dental facilities that generate amalgam waste are required to comply with best management practices and install amalgam separators. The amalgam separators will allow the mercury containing amalgam to be collected and recycled, thereby reducing the amount entering the environment through sludge incineration. The Department required major wastewater treatment facilities to carryout baseline monitoring of their effluent to determine mercury levels prior to implementation of the new dental requirements. However, the data from this monitoring effort are not yet available for use in this TMDL. As part of the New York-New Jersey Harbor TMDL development, in 2000 and 2001 a total of 30 samples were collected from 11 Publicly Owned Treatment Works (POTWs) in New Jersey which discharge to the Harbor (GLEC, 2008). Total recoverable mercury concentrations ranged from 8.32 to 74.9 ng/L, with a mean of 30.09 ng/L and a median of 19.75 ng/L. The Department believes that the mercury effluent concentrations found in these facilities will serve as an appropriate representation of effluent quality in the state. Therefore, the median concentration of 19.75 ng/L was used as a typical mercury concentration for treatment facilities. The total permitted flows for selected facilities is about 250 MGD. Using that flow and the selected median concentration, the total mercury load from these facilities is estimated to be 6.8 kg/year. This loading (6.8 kg/yr) is also a conservative assumption of the existing point source load since the permitted flow was used instead of the actual flow. The loading attributed to discharge facilities is insignificant at approximately 1% of the total load. Figure 4 shows the distribution of the current total load of mercury.



Note: Load from stormwater is not distinguished because it is derived from and is a subset of the air deposition load from the different air sources identified.

Figure 4. Distribution of the Current Mercury Load

5.0. TMDL Calculation

Methods similar to those used in the *Northeast Regional TMDL* (2007) are employed below to calculate the TMDL. A total source load (TSL), described in Section 4, and reduction factor (RF), as described in Section 3, are used to define the TMDL by applying the reduction factor to the total source load, as shown in Equation 1 below.

$$TMDL = TSL \times (1-RF)$$

where:

- TMDL is the total maximum daily load (kg/yr) that is expected to result in attainment of the target fish tissue mercury concentration.
- TSL is the existing total source load (kg/yr), and is equal to the sum of the existing point source load and the existing nonpoint source load
- RF is the reduction factor required to achieve the target fish mercury concentration.

To allow a consumption rate for the high risk population of one meal per week, the required reduction is 84.3 % (1 - 0.18/1.15 = 84.3%). The total existing loading from air deposition and the treatment facilities discharging into non-tidal waters is 601.kg/yr. In this load, 6.8 kg/yr (about 1%) comes from NJPDES regulated facilities with discharges to surface water in non-tidal waters. Due to the insignificant percentage contribution from this source category, reductions from this source category are not required in this TMDL. Therefore, individual WLAs are not being assigned to the various facilities through this TMDL. Individual facilities have been and will continue to be assessed to determine if a water quality based effluent limit should be assigned to prevent localized exceedances of SWQS and to ensure that the aggregate WLA is not exceeded. As discussed above and in the Reasonable Assurance section below, the recently implemented dental amalgam rules are expected to significantly reduce the amounts of mercury entering wastewater treatment facilities. At this time, it is not known what effect this will have on effluent concentrations. The post-implementation monitoring will be assessed to determine the effect of best management practices (BMPs) for the handling of dental amalgam waste and installation and proper operation of amalgam separators and the need for adaptive management with regard to this source in air deposition impacted waterbodies. Waterbodies that may be impacted by NJPDES regulated facilities with discharges to surface water (those with water column exceedances of the SWQS) have been excluded from the TMDL and will be addressed individually at a later date.

Based on results of several paleolimnological studies (NEIWPCC, et.al. 2007) in the Northeast, the natural mercury deposition is estimated to range between 15 % and 25 % of deposition fluxes for circa 2000. Natural sources cannot be controlled and are expected to remain at the same long-term average. It is assumed, in this study, that 25% of the background and background reemission is due to natural sources and can not be reduced (Ruth Chemerys and John Graham Pers. Comm. April 28, 2009). Twenty-five percent of the background and background reemission load is about 81.5 kg/yr, which is 13.6% of the total existing load. Including the load of 6.8 kg/yr attributed to surface water dischargers, the portion of the existing load that is not expected to be reduced is about 14.7%. If 0.07 ug/g (the fish concentration for unlimited consumption by the high risk population) were used as the TMDL target, the required reduction would be 93.9% of the existing load, which is greater than the entire anthropogenic load of 85.3% (1-14.7%) and clearly unattainable. For this reason, the concentration level (0.18 ug/g) that allows the high risk population to consume fish once per week was used as the target for this TMDL and will also be used as the threshold in future assessments of impairment. In order to achieve the overall 84.3% reduction of the existing load to attain the target of 0.18 mg/kg in fish tissue, a reduction of 98.8% of the anthropogenic source load would be needed. An implicit margin of safety (MOS) is used in this study, therefore, the MOS term of the TMDL equation is set to zero. Figure 5 presents the distribution of the TMDL to achieve the target concentration that will allow one meal per week by the high risk population.

Table 9. Mercury TMDL for One Meal per Week by High Risk Population

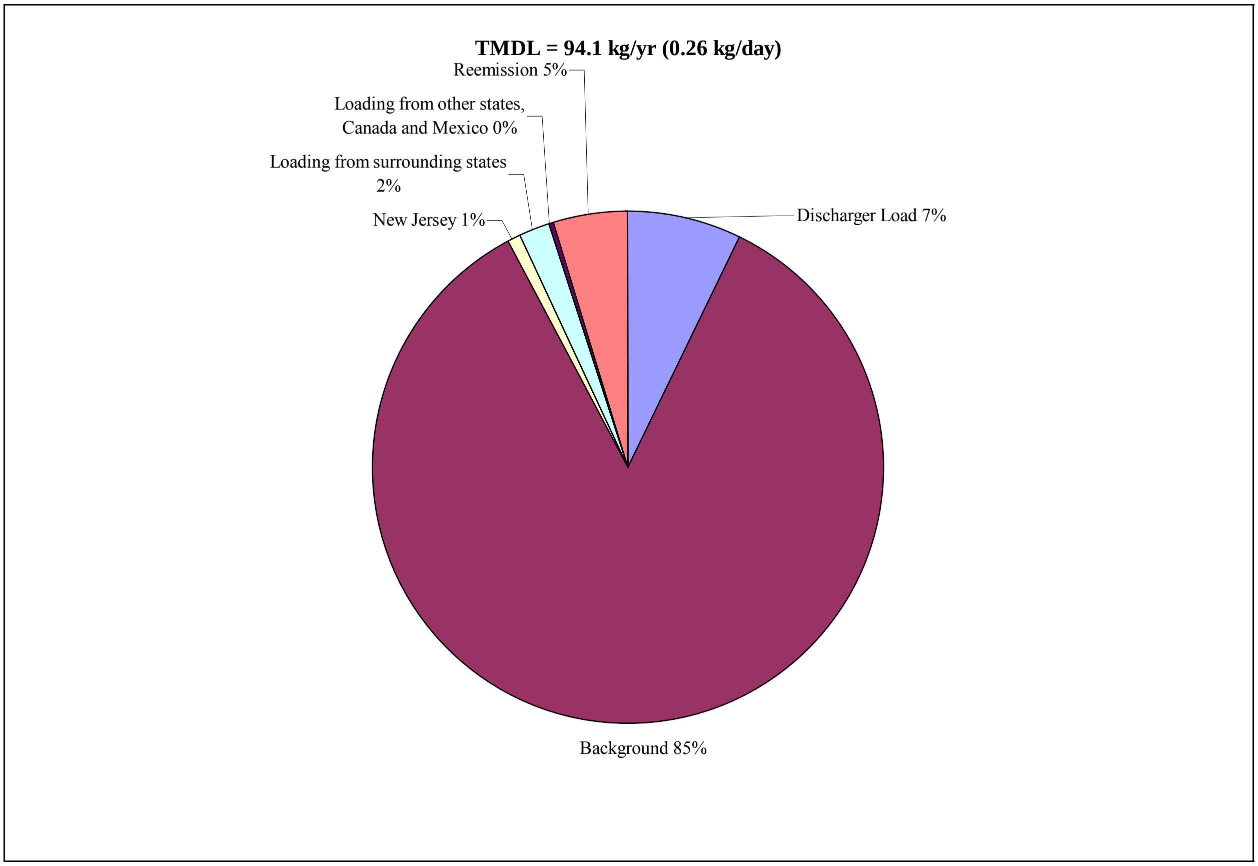
Category	Existing Load (kg/yr)	TMDL Load		Percent Reduction
		kg/yr	kg/day	
Total Annual Load	**601.0**	**94.1**	**0.26**	**84.3%**
Discharger Load (WLA)	6.8	6.8	0.02	-
Air Deposition Load (LA/WLA)	594.2	87.3	0.24	85.3%
Background due to natural source	77.3	77.3	0.21	-
Background due to anthropogenic sources	231.8	2.6	0.01	98.9%
New Jersey	74.1	0.8	0.002	98.9%
Loading from surrounding states	154.6	1.8	0.005	98.9%
Loading from other states, Canada and Mexico	39.6	0.4	0.001	98.9%
reemission due to natural source	4.2	4.2	0.01	-
Reemission due to anthropogenic source	12.7	0.1	0.0004	98.9%

Note: The TMDL loadings presented in the above table were rounded to 0.1 kg/yr. Percents of required reductions were calculated based on values with more significant digits. Using the values from the table to calculate the percent reduction may generate inaccurate results.

Table 10. Distribution of Air Deposition Load between LA and WLA under the TMDL Condition

Air Deposition Load	Annual Load (kg/yr)	Daily Load (kg/day)	Percent of Loading Capacity
Total	87.3	0.24	92.8%
WLA	22.3	0.06	23.7%
LA	65.0	0.18	69.1%

The urban storm water WLA portion of the air deposition load is derived by applying the percentage of urban land within Tier A municipalities (25.6%) to the overall air deposition load (87.3 kg/yr) based on the assumption that this load reaches the water bodies through regulated stormwater sources (see discussion in Section 4). Thus, under the TMDL conditions the WLA has been approximated to be 22.3 kg/yr (87.3 * 0.256), equivalent to 0.06 kg/day (Table 10). The air deposition rate under the TMDL condition is not available to conduct a more precise calculation of the stormwater WLA. More accuracy in developing this WLA is not necessary because the major source of mercury in stormwater is air deposition. Mercury in stormwater must be reduced by reducing air deposition and not through the usual stormwater measures. Therefore a WLA that represents an approximation of the total stormwater load is sufficient for the purposes of this TMDL. Individual stormwater WLAs would not change the response.



Note: Load from stormwater is not distinguished because it is derived from and is a subset of the air deposition load from the different air sources identified.

Figure 5. Distribution of TMDL for One Meal per Week by High Risk Population

As discussed in Section 5.2, multiple conservative assumptions have been made so that the calculated TMDL includes an implicit Margin of Safety (MOS). Therefore, the MOS term of the TMDL equation is set equal to zero. As explained above, a reduction of 85.3% (1-88.3/601) is the highest possible overall reduction that can be expected. The required reduction to achieve unlimited consumption for the high risk population is higher, (1 – 0.07/1.15 = 93.9%). Nevertheless, given the multiple conservative assumptions, this reduction may be achievable. Data gathered following implementation of the TMDL will be used to evaluate success in achieving goals.

5.1. Seasonal Variation/Critical Conditions

40 CFR 130.7(c)(1) requires that "TMDLs shall be established at levels necessary to attain and maintain the applicable narrative and numerical WQS with seasonal variations". Calculated TMDLs shall take into account critical conditions for stream flow, loading, and water quality parameters."

The relative contribution of local, regional, and long-range sources of mercury to fish tissue levels in a waterbody are affected by the speciation of natural and anthropogenic emission sources. The amount of bioavailable methyl mercury in water and sediments is a function of the relative rates of mercury methylation and demethylation. Factors such as pH, length of the aquatic food chain, temperature and dissolved organic carbon can affect bioaccumulation. (EPA, 2009). These factors influence the extent to which mercury bioaccumulates in fish and may vary seasonally and spatially. However, mercury concentrations in fish tissue represent accumulation of the life span of a fish. Use of a fish tissue target integrates spatial and temporal variability, making seasonal variation and critical conditions less significant. In addition, the TMDL fish target value is human health-based, reflecting a longer- term exposure.

In New Jersey, data show levels of mercury in some species of fish in the Pinelands sampling region are generally higher compared to fish in other sampling regions of the state. The reductions called for in this TMDL will attain the target fish tissue concentration in the Pinelands, thereby ensuring that the target is met statewide, within the areas addressed by the TMDL.

5.2. Margin of Safety

A TMDL must include a margin of safety (MOS) to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA 303(d)(1)(C), 40C.F.R.130.7(c)(1)). EPA's 1991 TMDL Guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described.

The MOS included in this TMDL is implicit because of the following conservative assumptions:

- The 90th percentile fish mercury concentration based on the largemouth bass, *Micropterus salmoides*. This species of fish has the highest concentration of the species that are ubiquitous throughout the state
- The percent reduction does not account for additional reductions in methyl mercury that may occur as a result of the implementation of ongoing state and federal programs to reduce sulfur emissions. Reductions in sulfur deposition and sulfate-reducing bacterial activity will decrease the rate of mercury methylation. This TMDL does not account for potential mercury reductions associated with decreased sulfur deposition.

6.0. Monitoring

The Department has engaged in various monitoring efforts that have provided significant insight into mercury contamination issues, some of which are described below. In order to effectively assess progress toward achieving mercury reduction objectives, several monitoring programs are recommended, including:

- A primary monitoring strategy for measuring the levels of mercury and calculating trends is the previously mentioned Routine Fish Monitoring Program for Toxics in Fish. This comprehensive program divides the State's waters into five regions that are sampled on a rotating basis for contaminants in fish. Since mercury is persistent in the environment, accumulates in biological tissue, and biomagnifies in the food chain, adverse impacts to non-aquatic, piscivorous (fish eating) organisms may arise from very low surface water concentrations. Fish tissue sampling provides a cost-effective measure to understanding the effects of mercury in the food chain and the environment.

- A mercury water monitoring program is needed to understand the extent and magnitude of the State's mercury contamination and its effect on aquatic organisms. Such a program must have a comprehensive scope and long-term sampling period. Recent mercury studies from the United State Geological Survey (USGS) have suggested the use of screening tools to target areas where elevated concentrations of mercury may occur. These studies have suggested looking at the presence of wetlands within watersheds, dissolved organic carbon and suspended sediment concentrations, and stream flow. High dissolved oxygen content (DOC) and suspended sediment concentrations, increased stream flow, and larger wetland areas may point to elevated mercury concentrations. The sampling requirements would consist of total and methyl mercury in the water column as well as methyl mercury in fish tissue. The locations would extend to all regions of the state such as the Pinelands, Northern New Jersey, Delaware Estuary, and Atlantic Estuary. Each region would have at least five randomized sampling locations as well as a reference site, which are small undeveloped watersheds with no known sources of mercury contamination other than air deposition. This sampling is not needed on a yearly basis, but quarterly sampling once every 2-5 years is appropriate. An ongoing project, that is targeting local air source reduction by sampling for mercury in fish, water column, and leaves at four locations from 2007 to 2013, is expected to impact the development of the statewide mercury monitoring program by refining sampling frequencies, protocols, and objectives. In addition, an ongoing study in collaboration with USGS involves establishing a baseline for natural background levels for mercury in surface waters to discern the location of impairments that may have anthropogenic sources in addition to atmospheric deposition e.g. mercurial pesticides on orchard, crops and golf courses and which may have other natural sources, e.g. geologic. This evaluative monitoring has been completed in the Inner and Outer Coastal Plain, Raritan River Basin, Papakating and Wallkill River Watersheds. The investigation is ongoing in the Millstone River Basin, Crosswicks Creek Watershed and Passaic River Basin.

- One hundred POTWs in New Jersey submitted baseline data on mercury concentrations in their treatment plant effluent. These samples were analyzed using the most sensitive analytical method for mercury in wastewater, Method 1631E. This baseline data will be used to determine the effectiveness of the implementation of the dental BMPs and the installation of the amalgam separators. These POTWs are required to conduct additional mercury sampling and analyses, using the same analytical method, after amalgam separator installation.

- In-stream monitoring to evaluate effectiveness of the dental amalgam rule is required at target locations upstream and downstream of the POTW discharge. The monitoring sites will be sampled semi-annually to evaluate ambient water quality before and after the rule's implementation to observe the significance of the reductions. Currently, only one site has been targeted. This project needs to expand by selecting suitable locations based on reviewing the POTW effluent data.

- Air sampling under the National Mercury Monitoring Deposition Network is required to continue to monitor long-term loadings and trends from atmospheric deposition. This program currently has only one site in the New Brunswick area. Additional sites in southern and northern portions of the state this network are needed to improve knowledge of depositional rates for different regions of the state and assist in atmospheric deposition source track down.

Monitoring studies already carried out have provided the following information:

- The Department's Air Program has collected speciated ambient mercury concentration data from several Tekran units that can be used to estimate dry deposition. To date, over two years' data from units at two locations, Elizabeth and New Brunswick have been checked for quality and are in the process of being evaluated. Data on wet deposition is being collected in New Brunswick and is analyzed by the National Mercury Deposition Network.

- Water monitoring data collected by NJDEP/USGS in the Ambient and Supplemental Surface Water Networks show that of the 1,752 results since 1997, nearly 67% had concentrations less than the detection levels. None of the total mercury values exceeded the current acute freshwater aquatic life criterion for dissolved mercury of 1.4 microgram per liter (ug/l) or the chronic criterion of 0.77 ug/l, but 3% of the samples exceeded the human health criterion of 0.05 ug/l. Other mercury studies and projects by NJDEP and USGS over the years show similar results, the majority of mercury concentrations are below detection levels. Detection levels have improved since 1997 with detection levels between 0.04 and 0.1 ug/l to detection levels between 0.01 and 0.02 ug/l since 2004.

- In response to the need for detection of low levels of mercury, the Department initiated a preliminary study of low level mercury occurrence in surface waters. Using EPA's method 1631E, the project consisted of 33 filtered samples with accompanying field blanks at 23 unique stations across the state. The detection level at the Wisconsin laboratory being used was 0.04 ppt. Results did not exceed any of the existing surface water quality criteria. Mercury concentrations did not appear to be influenced by land use, but did appear to increase with stream flow. The findings suggest that air deposition is a major influence on in-stream mercury concentrations. In 2007, the Department conducted a follow-up study to determine seasonal variability in total and methyl mercury concentrations at 7 reference stations, small undeveloped watersheds with no known sources of mercury contamination other than air deposition. Although total mercury showed no seasonal patterns, methyl mercury had elevated levels during the summer due to higher methylation rates during the warmer months. In addition, the project verified new sampling protocols that allow one person to conduct low level mercury sampling, thereby reducing manpower requirements and allowing this sampling to be incorporated into an ambient or routine program.

- A 150 well, statewide, shallow Ground Water Quality Monitoring Network, which was stratified as a function of land use, has been established and is sampled on a 5 year cycle for mercury and other contaminants. During the first 5 year sampling cycle from 1999 to 2004, mercury concentrations were found to range from <0.01 to 1.7 ug/L in ground water from 148 wells and only 5 of those were detectable above the laboratory reporting limits. In addition, other ground water data has been collected under the Private Well Testing Act that required private wells in 9 Southern New Jersey counties to test for mercury. A total of 25,270 wells were tested with a concentration range of 114.2 ug/l to "not detected". Approximately 1% had concentrations above the drinking water maximum contaminate level (MCL) of 2 ug/l. An analysis of the data showed no obvious geographic or land use patterns for the elevated mercury results.

7.0. Reasonable Assurance

New Jersey has a long history of working toward the reduction of mercury contamination within the state and working with interstate organizations to reduce the mercury both coming into and leaving the state. Much progress has been made. Because of New Jersey's past successes in the reduction of mercury, the actions New Jersey has underway and its commitment to implementing further actions as necessary, including working with neighboring states to reduce sources originating from outside the state, there is reasonable assurance that the goals of the TMDL will be met.

New Jersey began working to reduce mercury releases to the environment in 1992 with the formation of a Mercury Task Force. That Task Force examined the many routes and sources of mercury exposure and found air emissions to be the number one source of mercury contamination in New Jersey. The Task Force identified the largest source of mercury air emissions in New Jersey as Municipal Solid Waste (MSW) Incinerators. The Task Force recommended a statewide mercury emission standard for MSW Incinerators, which was implemented in 1996. In addition to the MSW incinerator standards, New Jersey passed the "Dry Cell Battery Management Act" in 1992, banning the use of mercury in certain batteries. These two efforts reduced MSW incinerator mercury emissions by 97% between 1992 and 2006.

In 1998, New Jersey convened a second Mercury Task Force. The second Task Force consisted of representatives from government, emission sources, public interest groups, academia, and fishing organizations. This Task Force was charged with reviewing the current science on mercury impacts on human health and ecosystems, inventorying and assessing mercury sources, and developing a comprehensive mercury reduction plan for NJ. The "New Jersey Mercury Task Force Report" published in December 2001 established a goal of the virtual elimination of anthropogenic sources of mercury and provided recommendations and targets for further reducing mercury emissions in New Jersey. The Task Force Report is available at http://www.nj.gov/dep/dsr/mercury_task_force.htm

In 2007 the Department's Mercury Workgroup evaluated New Jersey's progress towards meeting the goals and recommendations of the Task Force and began putting together a Mercury Reduction Plan to identify the necessary additional actions to continue to reduce mercury emissions in New Jersey. The reduction plan will serve as the implementation plan for these TMDLs.

Below is a summary of actions that have been taken to reduce New Jersey's mercury loadings.

- To participate in and support regional, national, and global efforts to reduce mercury uses, releases, and exposures New Jersey is a member of the Interstate Mercury Education and Reduction Clearinghouse (IMERC), a member of the Northeast Waste Management Officials Association (NEWMOA), the Quicksilver Caucus, Northeast States for Consolidated Air Use Management (NESCAUM), Environmental Council of the States (ECOS), and Toxics in Packaging.

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- In conjunction with NEWMOA, informational brochures were developed for tanning salons and property managers concerning the management of mercury containing fluorescent lamps. The brochures were sent to every tanning salon and property management company in the state.

- New Jersey works with interstate organizations to assist in the development of federal legislation that minimizes the use of mercury in products. The Department is a member of and works with the Northeast Waste Management Officials Association (NEWMOA) on mercury issues. The Department will participate in any effort conducted by NEWMOA or other interstate organization to develop federal legislation to minimize the use of mercury in products.

- On December 6, 2004, New Jersey adopted regulations to establish new requirements for coal-fired boilers, in order to decrease emissions of mercury. These rules are located at http://www.state.nj.us/dep/aqm/Sub27-120604.pdf.

- On December 6, 2004, New Jersey adopted regulations to establish new requirements for iron or steel melters in order to decrease emissions of mercury. The Department provided three years to reduce mercury contamination of scrap through elimination and separation measures. If the source reduction measures do not achieve emission reduction, the rule requires the installation and operation of mercury air pollution control and requires achieving mercury standard starting 1/2010. These rules are located at http://www.state.nj.us/dep/aqm/Sub27-120604.pdf.

- On December 6, 2004, New Jersey adopted regulations to establish new requirements for Hospital/medical/infectious waste (HMIW) incinerators in order to prevent or decrease emissions of mercury by ensuring that the mercury emissions from HMIW incinerators will be maintained at low levels. These rules are located at http://www.state.nj.us/dep/aqm/Sub27-120604.pdf.

- The Department has closely monitored mercury sewage sludge levels and has taken action where existing authority would allow the imposition of a sewage sludge limit or a discharge limitation. For example, the POTW with the highest sewage sludge mercury concentrations was identified and the industry responsible voluntarily agreed to shut down all production of mercury-containing diagnostic kits. Increased focus on removing mercury from products, as well as the proposed dental rule noted above, should continue the decreasing trend of detectable concentrations of mercury found in sewage sludge.

- On December 6, 2004, New Jersey adopted revised regulations to establish new requirements for municipal solid waste (MSW) incinerators in order to prevent or decrease emissions of mercury by requiring MSW incinerators to further reduce their mercury emissions. These rules are located at http://www.state.nj.us/dep/aqm/Sub27-120604.pdf.

- The Department has included all mercury containing products in the Universal Waste Rule which allows generators of waste mercury containing products to manage the waste under less stringent regulations than the Hazardous Waste Regulations. In addition, every county in the state holds at least one household hazardous waste (HHW) collection per year. Most counties hold multiple collections and 3 counties (Burlington, Monmouth, and Morris) have permanent collection sites. Households generating mercury containing products can properly dispose of the items at their county's collection.

- Legislation banning the sale of mercury thermometers was passed in April 2005.

- The New Jersey Legislature passed the Mercury Switch Removal Act of 2005 requiring automobile recycling facilities to remove mercury auto switches from vehicles prior to sending the vehicles for recycling. Automobile recyclers located in New Jersey were required to begin removing the mercury auto switches in May 2006. Manufacturers have stopped using mercury switches in convenience lighting.

- The Department adopted new rules on October 1, 2007 to curtail the release of mercury from dental facilities into the environment. The new rules, under most circumstances, exempt a dental facility from the requirement to obtain an individual permit for its discharge to a POTW, if it implements best management practices (BMPs) for the handling of dental amalgam waste and installs and properly operates an amalgam separator. Dental facilities were required to implement the BMPs by October 1, 2008 and must install and operate an amalgam separator by October 1, 2009. These measures are expected to prevent at least 95 percent of the mercury wastes from being sent to the

POTW and result in approximately 2,550 pounds of mercury removed from the environment each year.

- The Department participated in the Quicksilver Caucus, which developed methods for the retirement and sequestering of mercury.

The out of state contributions to the depositional load of mercury are too great for New Jersey to eliminate mercury contamination of fish tissue by reducing sources originating within its borders alone. New Jersey will work with EPA and other states to eliminate mercury sources nationwide. EPAs efforts to issue MACT (Maximum Achievable Control Technology) standards for utilities to reduce the depositional load of mercury are supported by New Jersey. In October 2008, the New England Interstate Water Pollution Control Commission (NEIWPCC), on behalf of seven states, submitted a petition under the Clean Water Act Section 319(g) requesting EPA to convene an interstate conference to address mercury deposition to the Northeast from upwind states. The petition builds on the Northeast States' regional mercury TMDL (approved by EPA in 2007), which indicates that reductions in mercury deposition from outside the region are needed to meet water quality standards. New Jersey will participate actively in this conference when it is held.

8.0. Implementation Plan

The implementation actions below are the recommendations of the Department's Mercury Task Force (NJDEP, 2009) intended to reduce anthropogenic sources of mercury:

1) Consider developing legislation that reflects the provisions of the Mercury Education and Reduction Model Act prepared by the Northeast Waste Management Officials' Association (NEWMOA), as part of the New England Governors' Mercury Action Plan. This plan addresses mercury-containing products and limits the sale of mercury for approved purposes. Provisions of the model legislation have been adopted by 16 states, including all of the New England states.

2) Continue monitoring of mercury in environmental media. Needed follow-up monitoring is described in Section 6 and is essential for determining the effectiveness of the mercury Total Maximum Daily Load (TMDL).

3) New Jersey contributes only 12.5% to the state mercury deposition; 52% is background deposition (natural and anthropogenic) and the remaining percentage comes from surrounding states, Mexico, and Canada. Reductions required in this TMDL can not be achieved from the New Jersey anthropogenic air sources alone. Mercury reductions on the nationwide and global scales are necessary to meet the TMDL targets set up above.

4) The Department plans to update its mercury water quality criteria based upon the EPA recommended Clean Water Act Section 304(a) for methyl mercury in fish tissue. This criterion requires the development of regional bioaccumulation factors (BAFs) to address differences in the rate of methylation based on other water quality parameters such as pH and

dissolved organic carbon. While the EPA's recommended Clean Water Act Section 304(a) water quality criterion is based on a methyl mercury fish tissue concentration value of 0.3 mg/kg, New Jersey plans to develop criteria based upon a methyl mercury fish tissue concentration of 0.18 mg/kg which is based upon consumption of 1 meal per week by high risk individuals. Updating the mercury criteria based on EPA's recommendation will require calculating BAFs for New Jersey that involves additional surface water and fish tissue sampling. This information will also be used to reevaluate the previously proposed wildlife mercury criteria using updated regional BAFs. The revised mercury criteria will be used to develop TMDLs for areas of the State not covered by the Total Maximum Daily Load for Mercury Impairments Based on Concentration in Fish Tissue Caused Mainly by Air Deposition. In calculating an updated, revised mercury SWQS for human health and wildlife, the Department will divide the state into four regional waters: Pinelands, Non-Pinelands, Delaware Estuary tidal waters, and Atlantic tidal waters. Surface water and fish tissue data will be collected and used to develop new BAFs for each region of the state. The data results will then be applied in calculating the mercury criteria for each region. In 2009, the Department expects to begin data collection in the Pinelands region with plans to continue collection in non-Pinelands water the following year. The next action is to collect data for the Delaware Estuary and Atlantic tidal waters.

5) The existing regulations concerning mercury will continue to be implemented, enforced, and evaluated for effectiveness. This includes the regulations on mercury emissions from air sources, the removal of automobile mercury switches and the dental amalgam regulations.

9.0. Public Participation

There have been various efforts to inform and educate the general public as well as the regulated community about the effects of mercury and the need to reduce anthropogenic sources. The regulatory controls regarding mercury are described in Section 7 and some of the outreach to the general public are noted below.

Over the years the Department, in cooperation with the Department of Health and Senior Services has conducted a great deal of public outreach to the fishing community to inform them of the fish consumption advisories. Surveys were done to determine how best to reach the public. As a result the fish advisories are posted in both Spanish and English. Brochures have been developed and are distributed to doctors and WIC (the federal Women, Infants and Children nutrition program) centers. The Department of Health seafood inspectors distribute and check for postings as part of their inspections.

Currently the Department's Urban Fishing Program educates children from the Newark Bay Complex and throughout New Jersey about their local watershed. Children learn about how people's actions affect the water and human health, and what they can do to help. The NJDEP's Divisions of Watershed Management and Science, Research and Technology in conjunction with the Division of Fish and Wildlife, the Hackensack RiverKeeper, the City of Bayonne and the Municipal Utilities Authority of Bayonne have offered the program for over 10 years. The first several years of the Urban Watershed Program were conducted only in the Newark Bay

Complex. The program has now expanded to other urban areas around the state. Trenton and Camden have participated over the last three years, and we hope to add several more cities in the future.

In conjunction with NEWMOA, informational brochures were developed for tanning salons and property managers concerning the management of mercury containing fluorescent lamps. The brochures were sent to every tanning salon and property management company in the state.

There has been additional public outreach and opportunity for comment for the TMDL itself. In accordance with N.J.A.C. 7:15–7.2(g), this TMDL was proposed by the Department as an amendment to the Atlantic, Cape May, Lower Delaware, Lower Raritan-Middlesex, Mercer, Monmouth, Northeast, Ocean, Sussex, Tri-County, Upper Delaware and Upper Raritan Water Quality Management Plans.

Notice proposing this TMDL was published on June 15, 2009 in the New Jersey Register and in newspapers of general circulation in the affected area in order to notify the public of the opportunity to review the TMDL and submit comments. In addition, an informational presentation followed by a public hearing for the proposed TMDL was held on July 15, 2009. Notice of the proposal and the hearing was also provided to affected Designated Planning Agencies and dischargers in the affected watersheds. One member of the public attended the hearing and declined to comment. No comments were submitted during the public comment period. Various minor edits to the proposal document have been made for clarification.

10.0. Data Sources

Geographic Information System (GIS) data from the Department was used extensively to describe the areas addressed in this document.

- State Boundary of New Jersey, Published by New Jersey Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS), May 20, 2008. On line at: https://njgin.state.nj.us/NJ_NJGINExplorer/jviewer.jsp?pg=DataDownloads

- Watersheds (Subwatersheds by name - DEPHUC14), Drainage basins are delineated from 1:24,000-scale (7.5-minute) USGS quadrangles. The delineations have been developed for general purpose use by USGS District staff over the past 20 years. Arc and polygon attributes have been included in the coverage with basin names and ranks of divides, and 14-digit hydrologic unit codes. *Originator:* U.S. Geological Survey, William H. Ellis, Jr. *Publication_Date:* 19991222
http://www.state.nj.us/dep/gis/digidownload/zips/statewide/dephuc14.zip

- NJDEP 2002 Waters of New Jersey (Lakes and Ponds), *Edition* 2008-05-01. The data was created by extracting water polygons which represented lakes and ponds from the 2002 land use/land cover (LU/LC) layer from NJ DEP's geographical information systems (GIS) database http://www.state.nj.us/dep/gis/digidownload/zips/statewide/njwaterbody.zip

- NJDEP 2002 Waters of New Jersey (Rivers, Bays and Oceans), *Version* 20080501; *Edition:* 20080501. The data was created by extracting water polygons which represented Rivers, Bays and Oceans from the 2002 land use/land cover (LU/LC) layer from NJ DEP's geographical information systems (GIS) database. *Online Linkage* http://www.state.nj.us/dep/gis/digidownload/zips/statewide/njarea.zip

- NJPDES Surface Water Discharges in New Jersey, (1:12,000), Version 20090126, *Edition:* 2009-01-26. This is a 2009 update of the 2002 data. New Jersey Pollutant Discharge Elimination System (NJPDES) surface water discharge pipe GIS point coverage compiled from GPSed locations, NJPDES databases, and permit applications. This coverage contains the surface water discharge points and the receiving waters coordinates for the active as well as terminated pipes. *Online Linkeage*: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/njpdesswd.zip

- NJDEP Surface Water Quality Standards of New Jersey *Edition:* 200812. This data is a digital representation of New Jersey's Surface Water Quality Standards in accordance with "Surface Water Quality Standards for New Jersey Waters" as designated in N.J.A.C. 7:9 B. The Surface Water Quality Standards (SWQS) establish the designated uses to be achieved and specify the water quality (criteria) necessary to protect the State's waters. Designated uses include potable water, propagation of fish and wildlife, recreation, agricultural and industrial supplies, and navigation. These are reflected in use classifications assigned to specific waters. When interpreting the stream classifications and anti-degradation designations, the descriptions specified in the SWQS at N.J.A.C. 7:9B-1.15 always take precedence. The GIS layer reflects the stream classifications and anti-degradation designations adopted as of June 16, 2008, and it is only supplemental to SWQS and is not legally binding. http://www.state.nj.us/dep/gis/digidownload/zips/statewide/swqs.zip

- “Water Management Areas”, created 03/2002 by NJDEP, Division of Watershed Management, the last update January, 2009. *Online Linkage*. http://www.state.nj.us/dep/gis/digidownload/zips/statewide/depwmas.zip

- NJDEP Known Contaminated Site List for New Jersey, 2005, *Edition:* 200602; The Known Contaminated Sites List for New Jersey 2005 are those sites and properties within the state where contamination of soil or ground water has been identified or where there has been, or there is suspected to have been, a discharge of contamination. This list of Known Contaminated Sites may include sites where remediation is either currently under way, required but not yet initiated or has been completed. http://www.state.nj.us/dep/gis/digidownload/zips/statewide/kcsl.zip

- Groundwater Contamination Areas (CKE); this data layer contains information about areas in the state which are specified as the Currently Known Extent (CKE) of ground water pollution. CKE areas are geographically defined areas within which the local ground water resources are known to be compromised because the water quality exceeds drinking water and ground water quality standards for specific contaminants. NJDEP Currently Known Extent of Groundwater Contamination (CKE) for New Jersey, 2007. *Edition:* 200703. *Online Linkage*: http://www.state.nj.us/dep/gis/digidownload/zips/statewide/cke.zip

11.0. References

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Appendix A

Listed Assessment units that were excluded from the Statewide TMDL

Waterbody	Name	Reason for Exclusion from TMDL
02030103120070-01	Passaic River Lwr (Fair Lawn Ave to Goffle)	Mercury in surface water
02030103120080-01	Passaic River Lwr (Dundee Dam to F.L. Ave)	Mercury in surface water
02030103120090-01	Passaic River Lwr (Saddle R to Dundee Dam)	Mercury in surface water
02030103150030-01	Passaic River Lwr (Second R to Saddle R)	Mercury in surface water
02030103150040-01	Passaic River Lwr (4th St br to Second R)	Mercury in surface water
02030103150050-01	Passaic River Lwr (Nwk Bay to 4th St brdg)	Mercury in surface water
02030103170030-01	Hackensack River (above Old Tappan gage)	Mercury in surface water
02030103170060-01	Hackensack River (Oradell to Old Tappan gage)	Mercury in surface water
02030103180030-01	Hackensack River (Ft Lee Rd to Oradell gage)	Mercury in surface water
02030103180080-01	Hackensack River (Rt 3 to Bellmans Ck)	Mercury in surface water
02030103180090-01	Hackensack River (Amtrak bridge to Rt 3)	Mercury in surface water
02030103180100-01	Hackensack River (below Amtrak bridge)	Mercury in surface water
02030104010020-01	Kill Van Kull West	Mercury in surface water
02030104010020-02	Newark Bay / Kill Van Kull (74d 07m 30s)	Mercury in surface water
02030104010030-01	Kill Van Kull East	Mercury in surface water
02030104010030-02	Upper NY Bay / Kill Van Kull (74d07m30s)	Mercury in surface water
02030104020030-01	Arthur Kill North	Mercury in surface water
02030104030010-01	Arthur Kill South	Mercury in surface water
02030104050120-01	Arthur Kill waterfront (below Grasselli)	Mercury in surface water
02040105210060-01	Jacobs Creek (above Woolsey Brook)	Mercury in surface water
02040105230050-01	Assunpink Creek (Shipetaukin to Trenton Rd)	Mercury in surface water
02040201050040-01	Crosswicks Creek (Walnford to Lahaway Ck)	Mercury in surface water
02040201050050-01	Crosswicks Creek (Ellisdale trib - Walnford)	Mercury in surface water
02040201050070-01	Crosswicks Creek (Doctors Ck-Ellisdale trib)	Mercury in surface water
02040206140040-01	Blackwater Branch (above/incl Pine Br)	Mercury in surface water
02040206140050-01	Blackwater Branch (below Pine Branch)	Mercury in surface water
02040206200010-01	Middle Branch / Slab Branch	Mercury in surface water
02040206200020-01	Muskee Creek	Mercury in surface water
02040301020040-01	Muddy Ford Brook	Mercury in surface water
02040301070080-01	Manapaqua Brook	Mercury in surface water
02040301170010-01	Hammonton Creek (above 74d43m)	Mercury in surface water
02040301170020-01	Hammonton Creek (Columbia Rd to 74d43m)	Mercury in surface water
02040302020020-01	Absecon Creek SB	Mercury in surface water
02040302020030-01	Absecon Creek (AC Reserviors) (gage to SB)	Mercury in surface water
02030103010180-01	Passaic River Upr (Pine Bk br to Rockaway)	Mercury in surface water
02030103040010-01	Passaic River Upr (Pompton R to Pine Bk)	Mercury in surface water
02030103120100-01	Passaic River Lwr (Goffle Bk to Pompton R)	Mercury in surface water
02030103180060-01	Berrys Creek (above Paterson Ave)	Mercury in surface water
02030103180070-01	Berrys Creek (below Paterson Ave)	Mercury in surface water
02030105160070-01	South River (below Duhernal Lake)	Mercury in surface water
02040202020030-01	Rancocas Creek NB (incl Mirror Lk-Gaunts Bk)	Mercury in surface water
02040202020040-01	Rancocas Creek NB (NL dam to Mirror Lk)	Mercury in surface water
02040202100060-01	Pennsauken Creek (below NB / SB)	Mercury in surface water
02040301020050-01	Metedeconk River NB (confluence to Rt 9)	Mercury in surface water
02040301040020-01	Metedeconk River (Beaverdam Ck to confl)	Mercury in surface water
02040302050060-01	Great Egg Harbor River (Miry Run to Lake Lenape)	Mercury in surface water

02040302050130-01	Great Egg Harbor River (GEH Bay to Miry Run)	Mercury in surface water
Delaware River 1	Delaware River 1C2	Mercury in surface water
Delaware River 2	Delaware River 1C3	Mercury in surface water
Delaware River 3	Delaware River 1C4	Mercury in surface water
Delaware River 4	Delaware River 1D1	Mercury in surface water
Delaware River 5	Delaware River 1D2	Mercury in surface water
Delaware River 6	Delaware River 1D3	Mercury in surface water
Delaware River 7	Delaware River 1D4	Mercury in surface water
Delaware River 8	Delaware River 1D5	Mercury in surface water
Delaware River 9	Delaware River 1D6	Mercury in surface water
Delaware River 10	Delaware River 1E1	Mercury in surface water
Delaware River 11	Delaware River 1E2	Mercury in surface water
Delaware River 12	Delaware River 1E3	Mercury in surface water
Delaware River 13	Delaware River 1E4	Mercury in surface water
Delaware River 14	Delaware River 1E5	Mercury in surface water
Delaware River 15	Delaware River 2	Mercury in surface water
Delaware River 16	Delaware River 3	Mercury in surface water
Delaware River 17	Delaware River 4	DRBC
Delaware River 18	Delaware River 5A	DRBC
Delaware River 19	Delaware River 5B	DRBC
Delaware River 20	Delaware River 5C	DRBC
02040204910010-02	Delaware Bay (Cape May Pt to Dennis Ck) offshore	DRBC
02040204910010-01	Delaware Bay (CapeMay Pt to Dennis Ck) inshore	DRBC
02040204910040-01	Delaware Bay (Cohansey R to FishingCk)	DRBC
02040204910020-02	Delaware Bay (Dennis Ck to Egg Islnd Pt) offshore	DRBC
02040204910020-01	Delaware Bay (DennisCk to Egg Islnd Pt) inshore	DRBC
02040301200030-02	Wading River (below Rt 542)	Tidal
02040301200080-02	Mullica River (GSP bridge to Turtle Ck)	Tidal
02040301210010-02	Mullica River (below GSP bridge)	Tidal
02030104020030-02	Elizabeth River (below Elizabeth CORP BDY)	Tidal
02030104030010-02	Morses Creek / Piles Creek	Tidal
02030104080040-01	Shrewsbury River (above Navesink River)	Tidal
02030104090040-01	Shark River (above Remsen Mill gage)	Tidal
02030104090060-01	Shark River (below Remsen Mill gage)	Tidal
02030104910020-01	Sandy Hook Bay (east of Thorns Ck)	Tidal
02040201030010-01	Duck Creek and UDRV to Assunpink Ck	Tidal
02030104060010-01	Cheesequake Creek / Whale Creek	Tidal
02030104070110-01	Navesink River (below Rt 35) / Lower Shrewsbury	Tidal
02040301080060-01	Toms River Lwr (Rt 166 to Oak Ridge Pkwy)	Tidal
02030104070110-01	Navesink River (below Rt 35) / Lower Shrewsbury	Tidal
02030104060060-01	Pews Creek to Shrewsbury River	Tidal
02040301080060-01	Toms River Lwr (Rt 166 to Oak Ridge Pkwy)	Tidal
02040301200030-02	Wading River (below Rt 542)	Tidal
02030104080010-01	Little Silver Creek / Town Neck Creek	Tidal
02040301200080-02	Mullica River (GSP bridge to Turtle Ck)	Tidal
02040301210010-02	Mullica River (below GSP bridge)	Tidal
02040302020010-01	Absecon Creek NB	Tidal
02040302020040-01	Absecon Creek (below gage)	Tidal

02030104080010-01	Little Silver Creek / Town Neck Creek	Tidal
02030104080020-01	Parkers Creek / Oceanport Creek	Tidal
02030104080030-01	Branchport Creek	Tidal
02040201070030-01	Shady Brook / Spring Lake / Rowan Lake	Tidal
02040202120080-01	Big Timber Creek (below NB/SB confl)	Tidal
02040202130040-01	Mantua Creek (Edwards Run to rd to Sewell)	Tidal
02040202140040-01	Moss Branch / Little Timber Creek (Repaupo)	Tidal
02040202140050-01	Repaupo Creek (below Tomlin Sta Rd) / Cedar Swamp	Tidal
02040202160020-01	Oldmans Creek (Rt 45 to Commissioners Rd)	Tidal
02040206090080-01	Cohansey River (Greenwich to 75d17m50s)	Tidal
02040206090100-01	Cohansey River (below Greenwich)	Tidal
02030104010010-01	Newark Airport Peripheral Ditch	Tidal
02040206100040-01	Cedar Creek (above Rt 553)	Tidal
02040206160030-01	Maurice River (Union Lake to Sherman Ave)	Other sources of Hg
02030103030070-01	Rockaway River (74d 33m 30s to Stephens Bk)	Other sources of Hg
02030103100070-01	Ramapo River (below Crystal Lake bridge)	Other sources of Hg
02040201050060-01	Ellisdale Trib (Crosswicks Creek)	Other sources of Hg
02040201070020-01	Crosswicks Creek (below Doctors Creek)	Other sources of Hg
02030103100060-01	Crystal Lake / Pond Brook	Other sources of Hg
02030104060040-01	Chingarora Creek to Thorns Creek	Other sources of Hg
02030104060050-01	Waackaack Creek	Other sources of Hg
02030105160090-01	Red Root Creek / Crows Mill Creek	Hg in groundwater
02030105160100-01	Raritan River Lwr (below Lawrence Bk)	Hg in groundwater
02040105230020-01	Assunpink Creek (New Sharon Br to/incl Lake)	Hg in groundwater
02040105230030-01	New Sharon Branch (Assunpink Creek)	Hg in groundwater
02040105230040-01	Assunpink Creek (Trenton Rd to New Sharon Br)	Hg in groundwater
02040105240010-01	Shabakunk Creek	Hg in groundwater
02040105240050-01	Assunpink Creek (below Shipetaukin Ck)	Hg in groundwater
02040201030010-01	Duck Creek and UDRV to Assunpink Ck	Hg in groundwater
02040201040040-01	Jumping Brook (Monmouth Co)	Hg in groundwater
02040301160020-01	Mullica River (above Jackson Road)	Hg in groundwater
02040301170040-01	Mullica River (Batsto R to Pleasant Mills)	Hg in groundwater
02040301170060-01	Mullica River (Rt 563 to Batsto River)	Hg in groundwater
02040301170080-01	Mullica River (Lower Bank Rd to Rt 563)	Hg in groundwater
02040301170130-01	Mullica River (Turtle Ck to Lower Bank Rd)	Hg in groundwater
02040301190050-01	Wading River WB (Jenkins Rd to Rt 563)	Hg in groundwater
02040301200020-01	Wading River (Rt 542 to Oswego River)	Hg in groundwater
02030103180040-01	Overpeck Creek	HEP
02030103180050-01	Hackensack River (Bellmans Ck to Ft Lee Rd)	HEP
02030104050060-01	Rahway River (Robinsons Br to Kenilworth Blvd)	HEP
02030104050100-01	Rahway River (below Robinsons Branch)	HEP
02030105120170-01	Raritan River Lwr (Lawrence Bk to Mile Run)	HEP
02030105160100-01	Raritan River Lwr (below Lawrence Bk)	HEP
02040302940010-01	Atlantic Ocean (34th St to Corson Inl) inshore	Tidal
02040302940010-02	Atlantic Ocean (34th St to Corson Inl) offshore	Tidal
02040302920010-01	Atlantic Ocean (Absecon In to Ventnor) inshore	Tidal
02040302920010-02	Atlantic Ocean (Absecon In to Ventnor) offshore	Tidal
02040301920010-02	Atlantic Ocean (Barnegat to Surf City) offshore	Tidal
02040301920010-01	Atlantic Ocean (Barnegat to Surf City)inshore	Tidal

02040302940050-01	Atlantic Ocean (CM Inlet to Cape May Pt) inshore	Tidal
02040302940050-02	Atlantic Ocean (CM Inlet to Cape May Pt) offshore	Tidal
02030902940020-01	Atlantic Ocean (Corson to Townsends Inl) inshore	Tidal
02030902940020-02	Atlantic Ocean (Corson to Townsends Inl) offshore	Tidal
02040302930010-01	Atlantic Ocean (Great Egg to 34th St) inshore	Tidal
02040302930010-02	Atlantic Ocean (Great Egg to 34th St) offshore	Tidal
02040301920030-01	Atlantic Ocean (Haven Bch to Lit Egg) inshore	Tidal
02040301920030-02	Atlantic Ocean (Haven Bch to Lit Egg) offshore	Tidal
02040302940040-01	Atlantic Ocean (Hereford to Cape May In) inshore	Tidal
02040302940040-02	Atlantic Ocean (Hereford to Cape May In) offshore	Tidal
02040301910020-01	Atlantic Ocean (Herring Is to Rt 37) inshore	Tidal
02040301910020-02	Atlantic Ocean (Herring Is to Rt 37) offshore	Tidal
02040302910010-01	Atlantic Ocean (Ltl Egg to Absecon In) inshore	Tidal
02040302910010-02	Atlantic Ocean (Ltl Egg to Absecon In) offshore	Tidal
02040301910010-01	Atlantic Ocean (Manasquan/Herring Is) inshore	Tidal
02040301910010-02	Atlantic Ocean (Manasquan/Herring Is) offshore	Tidal
02030104920020-01	Atlantic Ocean (Navesink R to Whale Pond) inshore	Tidal
02030104920020-02	Atlantic Ocean (Navesink R to Whale Pond) offshore	Tidal
02040301910030-01	Atlantic Ocean (Rt 37 to Barnegat Inlet) inshore	Tidal
02040301910030-02	Atlantic Ocean (Rt 37 to Barnegat Inlet) offshore	Tidal
02030104920010-01	Atlantic Ocean (Sandy H to Navesink R) inshore	Tidal
02030104920010-02	Atlantic Ocean (Sandy H to Navesink R) offshore	Tidal
02030104930020-01	Atlantic Ocean (Shark R to Manasquan) inshore	Tidal
02030104930020-02	Atlantic Ocean (Shark R to Manasquan) offshore	Tidal
02040301920020-01	Atlantic Ocean (Surf City to Haven Be) inshore	Tidal
02040301920020-02	Atlantic Ocean (Surf City to Haven Be) offshore	Tidal
02030902940030-01	Atlantic Ocean (Townsends to Hereford In) inshore	Tidal
02030902940030-02	Atlantic Ocean (Townsends to Hereford In) offshore	Tidal
02040302920020-01	Atlantic Ocean (Ventnor to Great Egg) inshore	Tidal
02040302920020-02	Atlantic Ocean (Ventnor to Great Egg) offshore	Tidal
02030104930010-01	Atlantic Ocean (Whale Pond to Shark R) inshore	Tidal

Appendix B

Fish Tissue Data

Location	Species	Field (or lab) Total Length (cm)	Hg (mg/kg) ug/g wet wt	Year
Alcyon Lake	Largemouth Bass	28.6	0.67	1992
Alcyon Lake	Largemouth Bass	33.7	0.41	1992
Batsto Lake	Yellow Bullhead	23.7	0.23	1992
Batsto Lake	Brown Bullhead	26.5	0.18	1992
Batsto Lake	Chain Pickerel	57.3	1.06	1992
Batsto Lake	Largemouth Bass	27.1	0.76	1992
Batsto Lake	Largemouth Bass	35.4	1.20	1992
Batsto Lake	Largemouth Bass	37.5	1.28	1992
Big Timber Creek	Black Crappie	15.5	0.07	1992
Big Timber Creek	Brown Bullhead	29.4	0.05	1992
Big Timber Creek	Brown Bullhead	31	0.06	1992
Big Timber Creek	Channel Catfish	42.3	0.09	1992
Big Timber Creek	White Catfish	33.4	0.08	1992
Big Timber Creek	White Catfish	29.6	0.09	1992
Big Timber Creek	Largemouth Bass	33.0	0.10	1992
Big Timber Creek	Largemouth Bass	28.2	0.12	1992
Big Timber Creek	Largemouth Bass	25.5	0.06	1992
Clementon Lake	Chain Pickerel	35.5	0.14	1992
Clementon Lake	Chain Pickerel	33	0.16	1992
Clementon Lake	Chain Pickerel	40	0.16	1992
Clementon Lake	Chain Pickerel	50.5	0.32	1992
Clementon Lake	Chain Pickerel	48.6	0.37	1992
Clementon Lake	Chain Pickerel	47.6	0.38	1992
Clementon Lake	Largemouth Bass	35.9	0.28	1992
Clementon Lake	Largemouth Bass	38.7	0.49	1992
Clinton Reservoir	Largemouth Bass	28.2	0.39	1992
Clinton Reservoir	Largemouth Bass	34.3	0.60	1992
Clinton Reservoir	Largemouth Bass	34.6	0.73	1992
Clinton Reservoir	Largemouth Bass	44.1	0.83	1992
Clinton Reservoir	Largemouth Bass	36.0	0.84	1992
Clinton Reservoir	Largemouth Bass	37.1	0.85	1992
Cooper River Park Lake	Black Crappie	16.7	0.04	1992
Cooper River Park Lake	Black Crappie	18.1	0.10	1992
Cooper River Park Lake	Black Crappie	18.4	0.12	1992
Cooper River Park Lake	Largemouth Bass	19.5	0.12	1992
Cooper River Park Lake	Largemouth Bass	21.4	0.03	1992
Cooper River Park Lake	Largemouth Bass	21.7	0.04	1992
Cooper River Park Lake	Largemouth Bass	25.5	0.08	1992
Cooper River Park Lake	Largemouth Bass	28	0.07	1992
Cooper River Park Lake	Largemouth Bass	30.8	0.09	1992

Cooper River Park Lake	Largemouth Bass	32.2	0.10	1992
Cooper River Park Lake	Largemouth Bass	32.8	0.13	1992
Cooper River Park Lake	Largemouth Bass	35.5	0.14	1992
Cooper River Park Lake	Largemouth Bass	43.5	0.31	1992
Cooper River Park Lake	Largemouth Bass	44	0.56	1992
Cooper River Park Lake	Largemouth Bass	22.1	0.09	1992
Cooper River Park Lake	Largemouth Bass	25.5	0.08	1992
Cooper River Park Lake	Largemouth Bass	28	0.07	1992
Cooper River Park Lake	Largemouth Bass	30.8	0.09	1992
Cooper River Park Lake	Largemouth Bass	35.5	0.14	1992
Cooper River Park Lake	Largemouth Bass	43.5	0.31	1992
Cranberry Lake	Chain Pickerel	42.4	0.27	1992
Cranberry Lake	Chain Pickerel	56.9	0.37	1992
Cranberry Lake	Chain Pickerel	55.5	0.37	1992
Cranberry Lake	Hybrid Striped Bass	38.2	0.29	1992
Cranberry Lake	Hybrid Striped Bass	37	0.31	1992
Cranberry Lake	Hybrid Striped Bass	52	0.43	1992
Crystal Lake	Brown Bullhead	19.8	0.02	1992
Crystal Lake	Brown Bullhead	20	0.05	1992
Dundee Lake	Brown Bullhead	27.1	0.19	1992
Dundee Lake	Brown Bullhead	29.3	0.20	1992
East Creek Lake	Chain Pickerel	31.5	0.79	1992
East Creek Lake	Chain Pickerel	34..5	1.03	1992
East Creek Lake	Chain Pickerel	41.4	1.33	1992
East Creek Lake	Chain Pickerel	39	1.33	1992
East Creek Lake	Chain Pickerel	51	1.59	1992
East Creek Lake	Chain Pickerel	40	1.76	1992
East Creek Lake	Chain Pickerel	50	2.30	1992
East Creek Lake	Chain Pickerel	46.2	2.44	1992
East Creek Lake	Chain Pickerel	52.5	2.82	1992
East Creek Lake	Yellow Bullhead	26.8	1.29	1992
East Creek Lake	Yellow Bullhead	27.4	1.47	1992
Evans Lake	Largemouth Bass	27.8	0.15	1992
Evans Lake	Largemouth Bass	21.5	0.33	1992
Harrisville Lake	Chain Pickerel	40	0.99	1992
Harrisville Lake	Chain Pickerel	33.5	1.21	1992
Harrisville Lake	Chain Pickerel	28.3	1.71	1992
Harrisville Lake	Chain Pickerel	45.7	1.74	1992
Harrisville Lake	Chain Pickerel	51.4	2.10	1992
Harrisville Lake	Yellow Bullhead	27.5	1.36	1992
Lake Carasaljo	Chain Pickerel	34.9	0.28	1992
Lake Hopatcong	Chain Pickerel	35.1	0.19	1992
Lake Hopatcong	Chain Pickerel	48	0.22	1992
Lake Hopatcong	Chain Pickerel	47.3	0.35	1992
Lake Hopatcong	Chain Pickerel	45	0.37	1992
Lake Hopatcong	Chain Pickerel	53	0.64	1992
Lake Hopatcong	Largemouth Bass	39.9	0.27	1992
Lake Hopatcong	Largemouth Bass	41.4	0.28	1992
Lake Hopatcong	Largemouth Bass	29.5	0.30	1992

Lake Nummy	Chain Pickerel	35	1.36	1992
Lake Nummy	Yellow Bullhead	26.7	0.32	1992
Lake Nummy	Yellow Bullhead	27.8	0.32	1992
Lake Nummy	Yellow Bullhead	28.1	0.32	1992
Lenape Lake	Chain Pickerel	35.5	0.25	1992
Lenape Lake	Chain Pickerel	44.8	0.54	1992
Lenape Lake	Chain Pickerel	49.7	0.89	1992
Marlton Lake	Largemouth Bass	38	1.36	1992
Maskells Mill Lake	Chain Pickerel	28	0.37	1992
Merrill Creek	Rainbow Trout	25.3	0.04	1992
Merrill Creek	Rainbow Trout	24.7	0.08	1992
Merrill Creek Reservoir	Rainbow Trout	32.1	0.14	1992
Merrill Creek Reservoir	Rainbow Trout	37.5	0.14	1992
Merrill Creek Reservoir	Rainbow Trout	38.6	0.24	1992
Merrill Creek Reservoir	Lake Trout	51.3	0.44	1992
Merrill Creek Reservoir	Lake Trout	51.6	0.77	1992
Merrill Creek Reservoir	Lake Trout	53.2	0.79	1992
Merrill Creek Reservoir	Lake Trout	56.4	0.69	1992
Merrill Creek Reservoir	Largemouth Bass	30.9	0.29	1992
Merrill Creek Reservoir	Largemouth Bass	43.9	0.96	1992
Merrill Creek Reservoir	Largemouth Bass	41.0	1.21	1992
Monksville Reservoir	Chain Pickerel	39.3	0.21	1992
Monksville Reservoir	Chain Pickerel	42.4	0.36	1992
Monksville Reservoir	Chain Pickerel	64	1.14	1992
Monksville Reservoir	Largemouth Bass	28.7	0.45	1992
Monksville Reservoir	Largemouth Bass	33.9	0.52	1992
Monksville Reservoir	Largemouth Bass	38.4	1.00	1992
Mountain Lake	Largemouth Bass	31.8	0.22	1992
Mountain Lake	Largemouth Bass	37.4	0.37	1992
Mountain Lake	Largemouth Bass	47.0	0.90	1992
New Brooklyn Lake	Chain Pickerel	18.7	0.10	1992
New Brooklyn Lake	Chain Pickerel	37.7	0.23	1992
New Brooklyn Lake	Chain Pickerel	46.6	0.79	1992
Newton Creek, North	Brown Bullhead	29	0.02	1992
Newton Creek, North	Brown Bullhead	34.4	0.03	1992
Newton Creek, North	Brown Bullhead	32.3	0.03	1992
Newton Creek, North	Brown Bullhead	32.4	0.03	1992
Newton Creek, North	Channel Catfish	36.5	0.08	1992
Newton Creek, North	Channel Catfish	47.1	0.12	1992
Newton Creek, South	Brown Bullhead	25.9	0.04	1992
Newton Creek, South	Brown Bullhead	26.1	0.06	1992
Newton Creek, South	Brown Bullhead	29.5	0.18	1992
Newton Creek, South	Chain Pickerel	25.3	0.10	1992
Newton Creek, South	Largemouth Bass	37.1	0.23	1992
Newton Creek, South	Largemouth Bass	36.6	0.24	1992
Newton Creek, South	Largemouth Bass	30.7	1.15	1992
Newton Lake	Black Crappie	18.4	0.09	1992
Newton Lake	Black Crappie	19.4	0.11	1992
Newton Lake	Black Crappie	20.4	0.13	1992

Newton Lake	Largemouth Bass	30	0.05	1992
Newton Lake	Largemouth Bass	30.6	0.05	1992
Newton Lake	Largemouth Bass	33.6	0.06	1992
Newton Lake	Largemouth Bass	33.1	0.06	1992
Newton Lake	Largemouth Bass	25.8	0.06	1992
Newton Lake	Largemouth Bass	25.0	0.06	1992
Newton Lake	Largemouth Bass	31.0	0.07	1992
Newton Lake	Largemouth Bass	31.0	0.07	1992
Newton Lake	Largemouth Bass	29.1	0.07	1992
Newton Lake	Largemouth Bass	45.2	0.18	1992
Newton Lake	Largemouth Bass	41.1	0.22	1992
Newton Lake	Largemouth Bass	45.6	0.40	1992
Rancocas Creek	Channel Catfish	45.6	0.11	1992
Rockaway River	Brown Bullhead	31	0.12	1992
Rockaway River	Chain Pickerel	34	0.15	1992
Rockaway River	Chain Pickerel	30.6	0.15	1992
Rockaway River	Chain Pickerel	38.8	0.25	1992
Rockaway River	Chain Pickerel	40.7	0.29	1992
Rockaway River	Chain Pickerel	44.7	0.31	1992
Rockaway River	Rainbow Trout	53.6	0.04	1992
Rockaway River	Yellow Bullhead	21.2	0.15	1992
Rockaway River near Whippany	Largemouth Bass	26.4	0.36	1992
Rockaway River near Whippany	Largemouth Bass	28.9	0.59	1992
Rockaway River near Whippany	Largemouth Bass	31.5	0.73	1992
Round Valley Reservoir	Lake Trout	40	0.06	1992
Round Valley Reservoir	Lake Trout	54.4	0.14	1992
Round Valley Reservoir	Lake Trout	75.5	0.14	1992
Saw Mill Lake	Brown Bullhead	36.5	0.05	1992
Saw Mill Lake	Brown Bullhead	33.1	0.06	1992
Saw Mill Lake	Brown Bullhead	39.5	0.07	1992
Saw Mill Lake	Brown Bullhead	37.9	0.07	1992
Saw Mill Lake	Northern Pike	53.4	0.27	1992
Shadow Lake	Largemouth Bass	29.1	0.12	1992
Shadow Lake	Largemouth Bass	30.4	0.15	1992
Shadow Lake	Largemouth Bass	36.7	0.18	1992
Shadow Lake	Largemouth Bass	31.2	0.26	1992
Spring Lake	Largemouth Bass	37.1	0.21	1992
Spring Lake	Largemouth Bass	49.9	0.75	1992
Spring Lake	Largemouth Bass	47.8	0.80	1992
Spruce Run Reservoir	Hybrid Striped Bass	33.1	0.17	1992
Spruce Run Reservoir	Hybrid Striped Bass	37.1	0.19	1992
Spruce Run Reservoir	Hybrid Striped Bass	38.2	0.22	1992
Spruce Run Reservoir	Largemouth Bass	25.2	0.10	1992
Spruce Run Reservoir	Largemouth Bass	28.4	0.19	1992
Spruce Run Reservoir	Largemouth Bass	41.2	0.41	1992
Spruce Run Reservoir	Largemouth Bass	43.8	0.64	1992
Stafford Forge Main Line	Chain Pickerel	26.6	0.59	1992
Stafford Forge Main Line	Chain Pickerel	27.7	0.63	1992
Stafford Forge Main Line	Chain Pickerel	29.9	0.85	1992

Strawbridge Lake	Black Crappie	15.3	0.13	1992
Strawbridge Lake	Black Crappie	14.8	0.24	1992
Strawbridge Lake	Black Crappie	14.3	0.24	1992
Swartswood Lake	Chain Pickerel	39.6	0.09	1992
Swartswood Lake	Chain Pickerel	43.3	0.10	1992
Swartswood Lake	Chain Pickerel	42.3	0.12	1992
Swartswood Lake	Smallmouth Bass	30.8	0.12	1992
Swartswood Lake	Smallmouth Bass	35.5	0.18	1992
Swartswood Lake	Smallmouth Bass	37.5	0.29	1992
Wading River	Chain Pickerel	39.4	0.66	1992
Wading River	Chain Pickerel	40.8	0.68	1992
Wading River	Chain Pickerel	34.3	0.82	1992
Wading River	Chain Pickerel	37.3	1.09	1992
Wading River	Chain Pickerel	43.6	1.23	1992
Wanaque Reservoir	Chain Pickerel	38.7	0.33	1992
Wanaque Reservoir	Chain Pickerel	55.5	0.93	1992
Wanaque Reservoir	Smallmouth Bass	27.5	0.34	1992
Wanaque Reservoir	Smallmouth Bass	37.9	0.51	1992
Wanaque Reservoir	Largemouth Bass	32.8	0.40	1992
Wanaque Reservoir	Largemouth Bass	37.8	0.61	1992
Wanaque Reservoir	Largemouth Bass	36.6	0.75	1992
Wanaque Reservoir	Largemouth Bass	40.5	1.01	1992
Wanaque Reservoir	Largemouth Bass	43.8	1.17	1992
Wanaque Reservoir	Largemouth Bass	46.4	1.18	1992
Wilson Lake	Chain Pickerel	37.8	0.24	1992
Wilson Lake	Chain Pickerel	36.3	0.38	1992
Wilson Lake	Chain Pickerel	50.6	1.06	1992
Wilson Lake	Chain Pickerel	34.4	1.53	1992
Woodstown Memorial Lake	Black Crappie	17.5	0.08	1992
Woodstown Memorial Lake	Largemouth Bass	24.5	0.11	1992
Woodstown Memorial Lake	Largemouth Bass	27.8	0.20	1992
Woodstown Memorial Lake	Largemouth Bass	27.6	0.23	1992
Woodstown Memorial Lake	Largemouth Bass	39.3	0.34	1992
Woodstown Memorial Lake	Largemouth Bass	45.1	0.50	1992
Big Timber Creek	Channel Catfish	42.3	0.09	1993
Budd Lake	White Catfish	33.8	0.17	1993
Budd Lake	Northern Pike	54.8	0.11	1993
Budd Lake	Northern Pike	64	0.11	1993
Budd Lake	Northern Pike	68.5	0.14	1993
Canistear Reservoir	Largemouth Bass	36	0.41	1993
Canistear Reservoir	Largemouth Bass	42.2	0.52	1993
Canistear Reservoir	Largemouth Bass	40	0.55	1993
Canistear Reservoir	Largemouth Bass	45.7	0.61	1993
Canistear Reservoir	Largemouth Bass	43.5	0.68	1993
Canistear Reservoir	Largemouth Bass	39.1	0.69	1993
Canistear Reservoir	Largemouth Bass	38.8	0.74	1993
Carnegie Lake	Largemouth Bass	39.1	0.20	1993
Carnegie Lake	Largemouth Bass	32.3	0.29	1993
Carnegie Lake	Largemouth Bass	35.1	0.37	1993

Carnegie Lake	Largemouth Bass	44.7	0.45	1993
Carnegie Lake	Largemouth Bass	35.1	0.58	1993
Carnegie Lake	Largemouth Bass	51.3	1.07	1993
Corbin City Impoundment #3	Brown Bullhead	26.7	0.07	1993
Crystal Lake	Black Crappie	19.1	0.04	1993
Crystal Lake	Black Crappie	20.7	0.18	1993
Crystal Lake	Largemouth Bass	23.5	0.09	1993
Crystal Lake	Largemouth Bass	30.0	0.14	1993
Crystal Lake	Largemouth Bass	42.6	0.28	1993
Manasquan Reservoir	Largemouth Bass	31	0.76	1993
Manasquan Reservoir	Largemouth Bass	38.9	2.35	1993
Manasquan Reservoir	Largemouth Bass	36.4	2.45	1993
Manasquan Reservoir	Largemouth Bass	40	2.49	1993
Manasquan Reservoir	Largemouth Bass	38	2.89	1993
Manasquan Reservoir	Largemouth Bass	41.1	3.16	1993
Manasquan Reservoir	Largemouth Bass	40.3	3.87	1993
Maskells Mill Lake	Black Crappie	20.8	0.20	1993
Maskells Mill Lake	Black Crappie	26.3	0.29	1993
Maskells Mill Lake	Brown Bullhead	25.4	0.23	1993
Maskells Mill Lake	Brown Bullhead	28.9	0.31	1993
Maskells Mill Lake	Brown Bullhead	28.9	0.47	1993
Maskells Mill Lake	Largemouth Bass	25.9	0.36	1993
Maskells Mill Lake	Largemouth Bass	32.4	0.48	1993
Mullica River	Chain Pickerel	40.7	1.21	1993
New Brooklyn Lake	Chain Pickerel	46.2	0.82	1993
New Brooklyn Lake	Chain Pickerel	59.7	1.30	1993
Round Valley Reservoir	Largemouth Bass	25.2	0.16	1993
Round Valley Reservoir	Largemouth Bass	37.1	0.24	1993
Round Valley Reservoir	Largemouth Bass	35.1	0.24	1993
Spruce Run Reservoir	Northern Pike	63.2	0.41	1993
Spruce Run Reservoir	Northern Pike	64.2	0.39	1993
Woodstown Memorial Lake	Black Crappie	19.5	0.10	1993
Woodstown Memorial Lake	Black Crappie	37.3	0.22	1993
Batsto Lake	Bluegill sunfish	18.5	0.31	1994
Batsto Lake	Bluegill sunfish	22	0.33	1994
Batsto Lake	Bluegill sunfish	20	0.56	1994
Batsto Lake	Brown bullhead	30.5	0.16	1994
Batsto Lake	Brown bullhead	30	0.16	1994
Batsto Lake	Brown bullhead	28	0.16	1994
Batsto Lake	Brown bullhead	30	0.21	1994
Batsto Lake	Brown bullhead	30	0.25	1994
Batsto Lake	Chain pickerel	29	0.38	1994
Batsto Lake	Chain pickerel	29.5	0.43	1994
Batsto Lake	Chain pickerel	28.5	0.44	1994
Batsto Lake	Chain pickerel	30	0.44	1994
Batsto Lake	Chain pickerel	38	0.79	1994
Batsto Lake	Largemouth bass	27	0.47	1994
Batsto Lake	Largemouth bass	26.5	0.60	1994
Batsto Lake	Largemouth bass	31.5	0.90	1994

Batsto Lake	Largemouth bass	32.5	0.92	1994
Batsto Lake	Largemouth bass	34	1.15	1994
Carnegie Lake	Bluegill sunfish	16.2	0.06	1994
Carnegie Lake	Bluegill sunfish	16.8	0.02	1994
Carnegie Lake	Bluegill sunfish	17.5	0.05	1994
Carnegie Lake	White perch	20	0.13	1994
Carnegie Lake	White perch	20.5	0.19	1994
Carnegie Lake	White perch	21.1	0.11	1994
Carnegie Lake	White perch	21.2	0.20	1994
Carnegie Lake	White perch	21.4	0.19	1994
Carnegie Lake	Largemouth bass	43.0	0.24	1994
Carnegie Lake	Largemouth bass	45.2	0.37	1994
Carnegie Lake	Largemouth bass	43.5	0.45	1994
Carnegie Lake	Largemouth bass	48.0	0.68	1994
Carnegie Lake	Largemouth bass	54.0	0.81	1994
Merrill Creek Reservoir	Largemouth bass	41.0	0.67	1994
Merrill Creek Reservoir	Largemouth bass	39.5	0.93	1994
Merrill Creek Reservoir	Largemouth bass	36.7	0.93	1994
Merrill Creek Reservoir	Largemouth bass	41.0	1.10	1994
Merrill Creek Reservoir	Largemouth bass	49.6	1.12	1994
Monksville Reservoir	Largemouth bass	31.3	0.20	1994
Monksville Reservoir	Largemouth bass	31.2	0.21	1994
Monksville Reservoir	Largemouth bass	28.5	0.51	1994
Monksville Reservoir	Largemouth bass	41.2	0.78	1994
Monksville Reservoir	Largemouth bass	39	1.00	1994
Wilson Lake	Pumpkinseed sunfish	20.4	0.26	1994
Wilson Lake	Pumpkinseed sunfish	18.5	0.60	1994
Wilson Lake	Pumpkinseed sunfish	18.2	1.52	1994
Wilson Lake	Yellow perch	22	0.48	1994
Wilson Lake	Yellow perch	24.5	0.65	1994
Wilson Lake	Yellow perch	26.1	0.72	1994
Wilson Lake	Yellow perch	30	1.08	1994
Wilson Lake	Yellow perch	2.95	1.23	1994
Wilson Lake	Largemouth bass	35.5	0.74	1994
Wilson Lake	Largemouth bass	40.0	0.88	1994
Wilson Lake	Largemouth bass	25.6	0.90	1994
Wilson Lake	Largemouth bass	34.5	0.90	1994
Wilson Lake	Largemouth bass	47.0	1.75	1994
Carnegie Lake	Brown bullhead	30.1	0.03	1995
Carnegie Lake	Brown bullhead	31.1	0.05	1995
Carnegie Lake	Brown bullhead	28.2	0.06	1995
Carnegie Lake	Brown bullhead	28.5	0.10	1995
Carnegie Lake	Brown bullhead	29.4	0.12	1995
Carnegie Lake	Channel catfish	56.6	0.12	1995
Carnegie Lake	Channel catfish	61.8	0.16	1995
Carnegie Lake	Channel catfish	56.2	0.18	1995

Carnegie Lake	Channel catfish	41.2	0.44	1995
East Creek Lake	Brown bullhead	33.2	2.62	1995
East Creek Lake	Chain pickerel	31.2	0.65	1995
East Creek Lake	Chain pickerel	33.5	0.78	1995
East Creek Lake	Chain pickerel	35	0.99	1995
East Creek Lake	Chain pickerel	33.3	1.14	1995
East Creek Lake	Chain pickerel	33.7	1.35	1995
East Creek Lake	Pumpkinseed sunfish	11.3	0.35	1995
East Creek Lake	Pumpkinseed sunfish	11.4	0.43	1995
East Creek Lake	Pumpkinseed sunfish	11.4	0.53	1995
East Creek Lake	Yellow bullhead	11.7	0.30	1995
East Creek Lake	Yellow bullhead	22.3	0.73	1995
East Creek Lake	Yellow perch	18	0.67	1995
East Creek Lake	Yellow perch	20	0.82	1995
East Creek Lake	Yellow perch	22	0.90	1995
East Creek Lake	Yellow perch	24	0.95	1995
East Creek Lake	Yellow perch	20.1	1.01	1995
East Creek Lake	Largemouth bass	33.1	1.07	1995
East Creek Lake	Largemouth bass	33.5	1.44	1995
East Creek Lake	Largemouth bass	34	1.95	1995
East Creek Lake	Largemouth bass	38	2.04	1995
East Creek Lake	Largemouth bass	42	2.21	1995
Harrisville Lake	Chain pickerel	27.5	0.90	1995
Harrisville Lake	Chain pickerel	24.5	0.94	1995
Harrisville Lake	Chain pickerel	25	1.20	1995
Harrisville Lake	Chain pickerel	33.5	1.48	1995
Harrisville Lake	Chain pickerel	45	2.27	1995
Harrisville Lake	mud sunfish	11.1	0.76	1995
Harrisville Lake	mud sunfish	17.5	0.95	1995
Harrisville Lake	mud sunfish	18.5	1.32	1995
Harrisville Lake	Yellow bullhead	15.5	0.96	1995
Harrisville Lake	Yellow bullhead	32.5	2.52	1995
Lake Nummy	Chain pickerel	33.3	0.47	1995
Lake Nummy	Chain pickerel	33.3	0.49	1995
Lake Nummy	Chain pickerel	33.6	0.60	1995
Lake Nummy	Chain pickerel	33.7	0.63	1995
Lake Nummy	Chain pickerel	33.2	0.64	1995
Lake Nummy	Yellow bullhead	25.7	0.21	1995
Lake Nummy	Yellow bullhead	11	0.23	1995
Lake Nummy	Yellow bullhead	25.5	0.31	1995
Lake Nummy	Yellow bullhead	25.1	0.34	1995
Lake Nummy	Yellow perch	22.3	0.52	1995
Lake Nummy	Yellow perch	20	0.53	1995
Lake Nummy	Yellow perch	22.3	0.53	1995
Lake Nummy	Yellow perch	22.3	0.54	1995
Lake Nummy	Yellow perch	22.1	0.59	1995

Manasquan Reservoir	Black crappie	17.5	0.35	1995
Manasquan Reservoir	Black crappie	16.5	0.51	1995
Manasquan Reservoir	Black crappie	16.5	0.53	1995
Manasquan Reservoir	Bluegill sunfish	15	0.16	1995
Manasquan Reservoir	Bluegill sunfish	15.5	0.22	1995
Manasquan Reservoir	Bluegill sunfish	16.8	0.22	1995
Manasquan Reservoir	Bluegill sunfish	16.5	0.31	1995
Manasquan Reservoir	Bluegill sunfish	16.5	0.37	1995
Manasquan Reservoir	Brown bullhead	24	0.06	1995
Manasquan Reservoir	Brown bullhead	21.5	0.11	1995
Manasquan Reservoir	Brown bullhead	22	0.12	1995
Manasquan Reservoir	Brown bullhead	26	0.15	1995
Manasquan Reservoir	Brown bullhead	24	0.16	1995
Manasquan Reservoir	Chain pickerel	21.6	0.08	1995
Manasquan Reservoir	Chain pickerel	20	0.13	1995
Manasquan Reservoir	Chain pickerel	24.1	0.15	1995
Manasquan Reservoir	Chain pickerel	39.8	0.48	1995
Manasquan Reservoir	Yellow perch	19.5	0.11	1995
Manasquan Reservoir	Yellow perch	18	0.12	1995
Manasquan Reservoir	Yellow perch	21	0.17	1995
Manasquan Reservoir	Largemouth bass	27	0.29	1995
Manasquan Reservoir	Largemouth bass	28	0.47	1995
Manasquan Reservoir	Largemouth bass	39.5	1.49	1995
Manasquan Reservoir	Largemouth bass	39.5	1.75	1995
Manasquan Reservoir	Largemouth bass	44.5	2.21	1995
Merrill Creek Reservoir	Black crappie	25.3	0.09	1995
Merrill Creek Reservoir	Black crappie	26.1	0.12	1995
Merrill Creek Reservoir	Bluegill sunfish	14.6	0.05	1995
Merrill Creek Reservoir	Bluegill sunfish	172	0.09	1995
Merrill Creek Reservoir	Bluegill sunfish	25.4	0.16	1995
Merrill Creek Reservoir	Brown bullhead	26	0.12	1995
Merrill Creek Reservoir	Brown bullhead	27.9	0.14	1995
Merrill Creek Reservoir	Brown bullhead	29.5	0.14	1995
Merrill Creek Reservoir	Brown bullhead	25.4	0.16	1995
Merrill Creek Reservoir	Brown bullhead	25.1	0.17	1995
Merrill Creek Reservoir	Lake trout	56.7	0.38	1995
Merrill Creek Reservoir	Lake trout	56.5	0.44	1995
Merrill Creek Reservoir	Lake trout	60	0.46	1995
Merrill Creek Reservoir	Lake trout	58.6	0.51	1995
Merrill Creek Reservoir	Lake trout	64	0.73	1995
Merrill Creek Reservoir	Smallmouth bass	38.5	0.44	1995
Merrill Creek Reservoir	Smallmouth bass	40.1	0.44	1995
Merrill Creek Reservoir	Smallmouth bass	42.5	0.49	1995
Merrill Creek Reservoir	Smallmouth bass	39.3	0.63	1995
Merrill Creek Reservoir	Smallmouth bass	43.3	0.68	1995
Merrill Creek Reservoir	Yellow perch	31.2	0.20	1995
Merrill Creek Reservoir	Yellow perch	30.1	0.22	1995
Merrill Creek Reservoir	Yellow perch	34	0.32	1995
Monksville Reservoir	Brown bullhead	31.8	0.04	1995

Monksville Reservoir	Brown bullhead	31	0.06	1995
Monksville Reservoir	Brown bullhead	29	0.06	1995
Monksville Reservoir	Brown bullhead	28.5	0.09	1995
Monksville Reservoir	Brown bullhead	29.2	0.13	1995
Monksville Reservoir	Brown trout	45	0.20	1995
Monksville Reservoir	Pumpkinseed sunfish	19.2	0.09	1995
Monksville Reservoir	Pumpkinseed sunfish	18.1	0.14	1995
Monksville Reservoir	Pumpkinseed sunfish	18	0.25	1995
Monksville Reservoir	Smallmouth bass	31.6	0.26	1995
Monksville Reservoir	Smallmouth bass	27	0.28	1995
Monksville Reservoir	Smallmouth bass	37	0.33	1995
Monksville Reservoir	Walleye	35.5	0.30	1995
Monksville Reservoir	Walleye	41.4	0.42	1995
Monksville Reservoir	Walleye	42	0.48	1995
Monksville Reservoir	Walleye	47.6	0.80	1995
Monksville Reservoir	Walleye	45.9	0.98	1995
Monksville Reservoir	Walleye	52.2	1.44	1995
Monksville Reservoir	White perch	24.5	0.19	1995
Monksville Reservoir	White perch	26.8	0.55	1995
Monksville Reservoir	White perch	27	0.58	1995
Monksville Reservoir	White perch	28.5	0.74	1995
Monksville Reservoir	White perch	32.1	0.79	1995
Mullica River	Brown bullhead	25.5	0.26	1995
Mullica River	Brown bullhead	24.5	0.28	1995
Mullica River	Brown bullhead	22	0.40	1995
Mullica River	Chain pickerel	23.5	0.25	1995
Mullica River	Chain pickerel	30	0.45	1995
Mullica River	Chain pickerel	33.2	0.49	1995
Mullica River	Chain pickerel	46	0.62	1995
Mullica River	Chain pickerel	50.5	0.92	1995
Mullica River	Pumpkinseed sunfish	13	0.12	1995
Mullica River	Pumpkinseed sunfish	13	0.21	1995
Mullica River	Pumpkinseed sunfish	17	0.52	1995
Mullica River	White catfish	29.6	0.23	1995
Mullica River	White catfish	29	0.25	1995
Mullica River	White catfish	29	0.35	1995
Mullica River	White perch	18.3	0.34	1995
Mullica River	White perch	17.4	0.35	1995
Mullica River	White perch	20	0.36	1995
Mullica River	White perch	19	0.36	1995
Mullica River	White perch	21	0.51	1995
New Brooklyn Lake	Black crappie	21	0.08	1995
New Brooklyn Lake	Black crappie	21.8	0.16	1995
New Brooklyn Lake	Black crappie	21.5	0.19	1995

New Brooklyn Lake	Chain pickerel	20.5	0.13	1995
New Brooklyn Lake	Chain pickerel	29.7	0.20	1995
New Brooklyn Lake	Chain pickerel	34	0.25	1995
New Brooklyn Lake	Chain pickerel	43.9	0.48	1995
New Brooklyn Lake	Chain pickerel	32.5	0.64	1995
New Brooklyn Lake	Pumpkinseed sunfish	15.4	0.22	1995
New Brooklyn Lake	Pumpkinseed sunfish	16	0.28	1995
New Brooklyn Lake	Pumpkinseed sunfish	16.5	0.30	1995
New Brooklyn Lake	Yellow bullhead	20	0.05	1995
New Brooklyn Lake	Yellow bullhead	24.1	0.06	1995
New Brooklyn Lake	Yellow bullhead	23,8	0.08	1995
New Brooklyn Lake	Yellow bullhead	25.9	0.09	1995
New Brooklyn Lake	Yellow bullhead	26.9	0.20	1995
New Brooklyn Lake	Largemouth bass	23.3	0.25	1995
New Brooklyn Lake	Largemouth bass	27.4	0.32	1995
New Brooklyn Lake	Largemouth bass	31.7	0.41	1995
Wading River	Brown bullhead	31.5	0.62	1995
Wading River	Chain pickerel	42.5	0.46	1995
Wading River	Chain pickerel	35.1	0.49	1995
Wading River	Chain pickerel	28.5	0.55	1995
Wading River	Chain pickerel	22.3	0.55	1995
Wading River	Chain pickerel	32	0.71	1995
Wading River	White catfish	30.3	0.49	1995
Wading River	White catfish	30	0.60	1995
Wading River	Yellow bullhead	20.2	1.01	1995
Wading River	Yellow bullhead	30.3	1.59	1995
Wanaque Reservoir	Bluegill sunfish	17.2	0.07	1995
Wanaque Reservoir	Brown bullhead	35.8	0.01	1995
Wanaque Reservoir	Brown bullhead	36.2	0.03	1995
Wanaque Reservoir	Brown bullhead	34	0.07	1995
Wanaque Reservoir	Chain pickerel	51	0.12	1995
Wanaque Reservoir	Chain pickerel	47.5	0.18	1995
Wanaque Reservoir	Chain pickerel	50.5	0.37	1995
Wanaque Reservoir	Chain pickerel	47	0.41	1995
Wanaque Reservoir	Chain pickerel	50.6	0.43	1995
Wanaque Reservoir	Chain pickerel	56	0.73	1995
Wanaque Reservoir	Smallmouth bass	38.5	0.27	1995
Wanaque Reservoir	Smallmouth bass	29.6	0.29	1995
Wanaque Reservoir	Smallmouth bass	46.2	0.36	1995
Wanaque Reservoir	White catfish	41.5	0.12	1995
Wanaque Reservoir	White catfish	40.5	0.17	1995
Wanaque Reservoir	White catfish	37.1	0.17	1995
Wanaque Reservoir	White catfish	37.7	0.28	1995
Wanaque Reservoir	White catfish	42.9	0.33	1995
Wanaque Reservoir	White perch	27.2	0.35	1995
Wanaque Reservoir	White perch	30.7	0.63	1995

Wanaque Reservoir	White perch	36.8	0.65	1995
Wanaque Reservoir	White perch	32.1	0.75	1995
Wanaque Reservoir	White perch	33.9	1.18	1995
Wanaque Reservoir	Yellow bullhead	23.9	0.03	1995
Wanaque Reservoir	Largemouth bass	37.9	0.36	1995
Wanaque Reservoir	Largemouth bass	34.6	0.45	1995
Wanaque Reservoir	Largemouth bass	39.5	0.51	1995
Wanaque Reservoir	Largemouth bass	41.4	0.71	1995
Wanaque Reservoir	Largemouth bass	41.4	0.85	1995
Wilson Lake	Chain pickerel	29.5	0.66	1995
Wilson Lake	Chain pickerel	30.5	0.88	1995
Wilson Lake	Chain pickerel	25.7	0.91	1995
Wilson Lake	Chain pickerel	47	1.14	1995
Wilson Lake	Chain pickerel	47	1.30	1995
Boonton Reservoir	Brown Bullhead	30.5	0.01	1996
Boonton Reservoir	Brown Bullhead	32.8	0.02	1996
Boonton Reservoir	White Catfish	40	0.54	1996
Boonton Reservoir	Largemouth Bass	35	0.33	1996
Boonton Reservoir	Largemouth Bass	45.1	0.60	1996
Boonton Reservoir	Largemouth Bass	41.6	0.81	1996
Butterfly Bogs	Brown Bullhead	30.6	0.08	1996
Butterfly Bogs	Chain Pickerel	33.9	0.78	1996
Cedar Lake	Brown Bullhead	31.5	0.06	1996
Cedar Lake	Chain Pickerel	47.9	0.24	1996
Cedar Lake	Chain Pickerel	49.6	0.31	1996
Cedar Lake	Chain Pickerel	64.7	0.76	1996
Cedar Lake	Largemouth Bass	39	0.25	1996
Cedar Lake	Largemouth Bass	41.5	0.59	1996
Cedar Lake	Largemouth Bass	43.8	0.61	1996
Crater Lake	Brown Bullhead	30	0.39	1996
Crater Lake	Yellow Perch	21.6	0.29	1996
Crater Lake	Yellow Perch	19.9	0.43	1996
Crater Lake	Yellow Perch	27.9	0.58	1996
DeVoe Lake	Brown Bullhead	27	0.09	1996
DeVoe Lake	Chain Pickerel	41.5	0.14	1996
DeVoe Lake	Chain Pickerel	43	0.25	1996
DeVoe Lake	Chain Pickerel	48.5	0.27	1996
DeVoe Lake	Largemouth Bass	31.7	0.07	1996
DeVoe Lake	Largemouth Bass	34.1	0.21	1996
DeVoe Lake	Largemouth Bass	36.5	0.26	1996
Double Trouble Lake	Chain Pickerel	18.1	0.74	1996
Double Trouble Lake	Chain Pickerel	37.7	1.24	1996
Double Trouble Lake	Chain Pickerel	46.7	1.60	1996
Double Trouble Lake	Chain Pickerel	52.4	2.24	1996
Double Trouble Lake	Chain Pickerel	57.6	2.30	1996
Double Trouble Lake	Yellow Bullhead	26.1	0.82	1996
Double Trouble Lake	Yellow Bullhead	28.3	1.09	1996
Double Trouble Lake	Yellow Bullhead	26.6	1.18	1996
Echo Lake Reservoir	Largemouth Bass	30.4	0.12	1996

Echo Lake Reservoir	Largemouth Bass	34.4	0.15	1996
Echo Lake Reservoir	Largemouth Bass	29	0.16	1996
Echo Lake Reservoir	Largemouth Bass	35	0.17	1996
Green Turtle Lake	Chain Pickerel	28.1	0.11	1996
Green Turtle Lake	Chain Pickerel	44.7	0.14	1996
Green Turtle Lake	Chain Pickerel	44.6	0.15	1996
Green Turtle Lake	Yellow Perch	20.8	0.09	1996
Green Turtle Lake	Yellow Perch	24.6	0.10	1996
Green Turtle Lake	Largemouth Bass	23.6	0.17	1996
Green Turtle Lake	Largemouth Bass	26.1	0.22	1996
Green Turtle Lake	Largemouth Bass	34.7	0.32	1996
Greenwood Lake	White perch	18.3	0.00	1996
Greenwood Lake	White perch	19.2	0.02	1996
Greenwood Lake	Largemouth Bass	36.2	0.15	1996
Greenwood Lake	Largemouth Bass	34.3	0.18	1996
Greenwood Lake	Largemouth Bass	31.4	0.21	1996
Greenwood Lake	Largemouth Bass	36.3	0.24	1996
Greenwood Lake	Largemouth Bass	40	0.40	1996
Grovers Mill Pond	Brown Bullhead	33	0.08	1996
Grovers Mill Pond	Brown Bullhead	32.2	0.40	1996
Grovers Mill Pond	Chain Pickerel	35.3	0.12	1996
Grovers Mill Pond	Chain Pickerel	35.2	0.16	1996
Grovers Mill Pond	Chain Pickerel	37.2	0.16	1996
Grovers Mill Pond	Chain Pickerel	36.5	0.18	1996
Grovers Mill Pond	Largemouth Bass	31.3	0.25	1996
Grovers Mill Pond	Largemouth Bass	35.8	0.30	1996
Grovers Mill Pond	Largemouth Bass	35	0.36	1996
Grovers Mill Pond	Largemouth Bass	41.5	0.39	1996
Grovers Mill Pond	Largemouth Bass	28	0.47	1996
Hainesville Pond	Chain Pickerel	39.3	0.14	1996
Hainesville Pond	Chain Pickerel	36.6	0.14	1996
Hainesville Pond	Chain Pickerel	36.5	0.15	1996
Hainesville Pond	Largemouth Bass	30.3	0.13	1996
Hainesville Pond	Largemouth Bass	31.0	0.21	1996
Hainesville Pond	Largemouth Bass	31.3	0.23	1996
Malaga Lake	Chain Pickerel	32	0.73	1996
Malaga Lake	Chain Pickerel	29.3	0.88	1996
Malaga Lake	Chain Pickerel	36.2	0.97	1996
Malaga Lake	Chain Pickerel	31	0.99	1996
Malaga Lake	Chain Pickerel	34	1.38	1996
Malaga Lake	Largemouth Bass	32.4	0.95	1996
Passaic River at Hatfield Swamp	Pumpkinseed Sunfish	12.4	0.08	1996
Passaic River at Hatfield Swamp	Pumpkinseed Sunfish	12.6	0.09	1996
Passaic River at Hatfield Swamp	Black Crappie	18.1	0.30	1996
Passaic River at Hatfield Swamp	Black Crappie	18.9	0.32	1996
Passaic River at Hatfield Swamp	Bluegill Sunfish	18.9	0.19	1996
Passaic River at Hatfield Swamp	Black Crappie	20	0.21	1996

Passaic River at Hatfield Swamp	Black Crappie	20	0.22	1996
Passaic River at Hatfield Swamp	Yellow Bullhead	21.4	0.11	1996
Passaic River at Hatfield Swamp	Largemouth Bass	23	0.17	1996
Passaic River at Hatfield Swamp	Largemouth Bass	23.5	0.21	1996
Passaic River at Hatfield Swamp	Largemouth Bass	36	0.53	1996
Pompton River at Lincoln Park	Pike	27.8	0.17	1996
Pompton River at Lincoln Park	Pike	42	0.41	1996
Pompton River at Lincoln Park	Pike	66.6	0.59	1996
Pompton River at Lincoln Park	Yellow Perch	21	0.21	1996
Pompton River at Lincoln Park	Yellow Perch	24	0.26	1996
Pompton River at Lincoln Park	Largemouth Bass	35.4	0.50	1996
Pompton River at Lincoln Park	Largemouth Bass	35.5	0.68	1996
Raritan River at Millstone River	Brown Bullhead	25.4	0.06	1996
Raritan River at Millstone River	Brown Bullhead	27.5	0.07	1996
Raritan River at Millstone River	Channel Catfish	39.8	0.15	1996
Raritan River at Millstone River	Largemouth Bass	32.5	0.33	1996
Raritan River at Millstone River	Largemouth Bass	36.3	0.33	1996
Raritan River at Millstone River	Largemouth Bass	44.9	0.37	1996
Raritan River at Millstone River	Largemouth Bass	37	0.46	1996
Ridgeway Branch of Tom's River	Brown Bullhead	26.4	0.17	1996
Ridgeway Branch of Tom's River	Brown Bullhead	27	0.44	1996
Ridgeway Branch of Tom's River	Brown Bullhead	22.8	1.15	1996
Ridgeway Branch of Tom's River	Brown Bullhead	25.6	1.57	1996
Ridgeway Branch of Tom's River	Chain Pickerel	36	1.22	1996
Rockaway River near Whippany	Black Crappie	17.9	0.21	1996
Rockaway River near Whippany	Bluegill Sunfish	14.5	0.12	1996
Rockaway River near Whippany	Largemouth Bass	39.8	0.92	1996
South Branch Raritan River at Neshanic Station	Brown Bullhead	17.2	0.08	1996
South Branch Raritan River at Neshanic Station	Redbreast Sunfish	15.7	0.09	1996
South Branch Raritan River at Neshanic Station	Redbreast Sunfish	15.9	0.15	1996
South Branch Raritan River at Neshanic Station	Rock Bass	15	0.09	1996
South Branch Raritan River at Neshanic Station	Smallmouth Bass	20.7	0.18	1996
South Branch Raritan River at Neshanic Station	Largemouth Bass	18.2	0.11	1996
Speedwell Lake	Bluegill Sunfish	18.3	0.12	1996
Speedwell Lake	Bluegill Sunfish	19.7	0.13	1996
Speedwell Lake	Brown Bullhead	21	0.01	1996
Speedwell Lake	Largemouth Bass	27.5	0.10	1996
Speedwell Lake	Largemouth Bass	32.5	0.34	1996
Speedwell Lake	Largemouth Bass	36.1	0.38	1996
Steenykill Lake	Largemouth Bass	26.5	0.16	1996
Steenykill Lake	Largemouth Bass	27.5	0.19	1996
Steenykill Lake	Largemouth Bass	27.7	0.19	1996
Steenykill Lake	Largemouth Bass	27.8	0.15	1996
Steenykill Lake	Largemouth Bass	28.3	0.22	1996

Steenykill Lake	Largemouth Bass	29.6	0.15	1996
Sunset Lake	Bluegill Sunfish	11.2	0.05	1996
Sunset Lake	Chain Pickerel	30.7	0.09	1996
Sunset Lake	Largemouth Bass	22.5	0.10	1996
Sunset Lake	Largemouth Bass	33.8	0.17	1996
Sunset Lake	Largemouth Bass	38.2	0.21	1996
Sunset Lake	Largemouth Bass	38.5	0.35	1996
Sunset Lake	Largemouth Bass	53	0.69	1996
Wawayanda Lake	Chain Pickerel	35	0.25	1996
Wawayanda Lake	Chain Pickerel	39.5	0.28	1996
Wawayanda Lake	Chain Pickerel	40.5	0.29	1996
Wawayanda Lake	Chain Pickerel	37.9	0.31	1996
Wawayanda Lake	Chain Pickerel	42	0.34	1996
Wawayanda Lake	Chain Pickerel	42.4	0.44	1996
Oak Ridge Reservoir	Yellow Bullhead	24.5	0.25	1997
Oak Ridge Reservoir	Chain Pickerel	25	0.24	1997
Oak Ridge Reservoir	Chain Pickerel	28	0.29	1997
Oak Ridge Reservoir	Chain Pickerel	30.6	0.30	1997
Oak Ridge Reservoir	Brown Bullhead	33	0.02	1997
Oak Ridge Reservoir	Brown Bullhead	34.5	0.02	1997
Oak Ridge Reservoir	Smallmouth Bass	40.2	0.49	1997
Oak Ridge Reservoir	Chain Pickerel	58	0.30	1997
Oak Ridge Reservoir	Largemouth Bass	36.8	0.38	1997
Oak Ridge Reservoir	Largemouth Bass	42.5	0.64	1997
Oak Ridge Reservoir	Largemouth Bass	48	0.71	1997
Oak Ridge Reservoir	Largemouth Bass	48	0.89	1997
Pompton River at Pequannock River	Black Crappie	19.3	0.24	1997
Pompton River at Pequannock River	Pumpkinseed Sunfish	14.5	0.35	1997
Pompton River at Pequannock River	Pumpkinseed Sunfish	14.1	0.78	1997
Pompton River at Pequannock River	Redbreast Sunfish	13.7	0.32	1997
Pompton River at Pequannock River	Redbreast Sunfish	15.8	0.41	1997
Pompton River at Pequannock River	Rock Bass	19.2	0.54	1997
Pompton River at Pequannock River	Rock Bass	21.1	0.54	1997
Pompton River at Pequannock River	Rock Bass	22	0.68	1997
Pompton River at Pequannock River	Smallmouth Bass	29.6	0.57	1997
Pompton River at Pequannock River	Smallmouth Bass	36.8	1.02	1997
Pompton River at Pequannock River	Smallmouth Bass	25.4	1.10	1997
Pompton River at Pequannock River	Smallmouth Bass	27.8	1.14	1997
Pompton River at Pequannock River	Yellow Bullhead	26.2	0.80	1997
Pompton River at Pequannock River	Largemouth Bass	39	0.99	1997
Pompton River at Pequannock River	Largemouth Bass	39.8	1.36	1997
Whitesbog Pond	Chain Pickerel	23	0.43	1997
Whitesbog Pond	Chain Pickerel	31.5	0.58	1997
Whitesbog Pond	Chain Pickerel	34.3	0.74	1997
Whitesbog Pond	Chain Pickerel	32.5	0.76	1997
Whitesbog Pond	Chain Pickerel	39.6	1.02	1997
Willow Grove Lake	Brown Bullhead	33	0.23	1997

Willow Grove Lake	Brown Bullhead	32.4	0.28	1997
Willow Grove Lake	Chain Pickerel	31	0.76	1997
Willow Grove Lake	Chain Pickerel	48.1	1.03	1997
Willow Grove Lake	Chain Pickerel	36.5	1.13	1997
Willow Grove Lake	Chain Pickerel	45.2	1.26	1997
Willow Grove Lake	Chain Pickerel	53	1.29	1997
Willow Grove Lake	White Catfish	43	0.17	1997
Willow Grove Lake	Yellow Bullhead	28	0.82	1997
Willow Grove Lake	Yellow Bullhead	30.5	0.91	1997
Willow Grove Lake	Largemouth Bass	33.2	1.68	1997
Mullica River @ Green Bank	American Eel	45.7	0.51	1999
Mullica River @ Green Bank	American Eel	69	0.49	1999
Mullica River @ New Gretna	American Eel	42.5	0.3	1999
Mullica River, below dam @ Batsto Village	American Eel	29.7	0.65	1999
Mullica River, below dam @ Batsto Village	American Eel	39.5	0.04	1999
Mullica River, below dam @ Batsto Village	American Eel	46.3	0.8	1999
Stewart Lake (Woodbury)	Bluegill	15.9	0.03	1999
Stewart Lake (Woodbury)	Bluegill	16.4	0.03	1999
Stewart Lake (Woodbury)	Black Crappie	18.3	0.1	1999
Stewart Lake (Woodbury)	Brown Bullhead	25.4	0.01	1999
Stewart Lake (Woodbury)	Brown Bullhead	27.3	0.01	1999
Stewart Lake (Woodbury)	Brown Bullhead	31.1	0.04	1999
Stewart Lake (Woodbury)	Common Carp	43.8	0.01	1999
Stewart Lake (Woodbury)	Common Carp	49.3	0.04	1999
Stewart Lake (Woodbury)	Common Carp	54.5	0.08	1999
Stewart Lake (Woodbury)	Common Carp	59.8	0.03	1999
Stewart Lake (Woodbury)	Common Carp	65.8	0.03	1999
Stewart Lake (Woodbury)	Largemouth Bass	35.9	0.2	1999
Stewart Lake (Woodbury)	Largemouth Bass	38.9	0.15	1999
Stewart Lake (Woodbury)	Largemouth Bass	43.5	0.19	1999
Boonton Reservoir	rock bass	20.7	0.13	2002
Boonton Reservoir	rock bass	22.2	0.27	2002
Boonton Reservoir	rock bass	22.3	0.22	2002
Boonton Reservoir	rock bass	22.3	0.26	2002
Boonton Reservoir	smallmouth bass	38.9	0.39	2002
Boonton Reservoir	smallmouth bass	41.0	0.39	2002
Boonton Reservoir	smallmouth bass	43.4	0.52	2002
Boonton Reservoir	smallmouth bass	48.4	0.75	2002
Boonton Reservoir	largemouth bass	41.6	0.36	2002
Boonton Reservoir	largemouth bass	45.0	0.59	2002
Boonton Reservoir	largemouth bass	48.3	1.08	2002
Boonton Reservoir	largemouth bass	48.7	0.73	2002
Boonton Reservoir	largemouth bass	52.2	0.80	2002
Branch Brook Park	bluegill	14.5	0.16	2002
Branch Brook Park	bluegill	15.3	0.15	2002
Branch Brook Park	bluegill	15.5	0.24	2002

Branch Brook Park	common carp	60.5	0.10	2002
Branch Brook Park	common carp	69.0	0.19	2002
Branch Brook Park	common carp	69.5	0.19	2002
Branch Brook Park	common carp	72.5	0.07	2002
Canistear Reservoir	bluegill	18.5	0.11	2002
Canistear Reservoir	yellow perch	20.5	0.29	2002
Canistear Reservoir	bluegill	21.0	0.10	2002
Canistear Reservoir	bluegill	21.8	0.11	2002
Canistear Reservoir	yellow bullhead	24.5	0.12	2002
Canistear Reservoir	yellow bullhead	25.1	0.17	2002
Canistear Reservoir	yellow perch	25.3	0.18	2002
Canistear Reservoir	yellow perch	27.5	0.22	2002
Canistear Reservoir	yellow bullhead	27.6	0.16	2002
Canistear Reservoir	yellow bullhead	28.6	0.19	2002
Canistear Reservoir	chain pickerel	41.5	0.19	2002
Canistear Reservoir	chain pickerel	41.8	0.25	2002
Canistear Reservoir	chain pickerel	44.0	0.14	2002
Canistear Reservoir	chain pickerel	47.2	0.16	2002
Canistear Reservoir	bluegill	21.2	0.23	2002
Canistear Reservoir	largemouth bass	41.7	0.38	2002
Canistear Reservoir	largemouth bass	43.8	0.29	2002
Canistear Reservoir	largemouth bass	44.5	0.51	2002
Canistear Reservoir	largemouth bass	51.4	0.67	2002
Clinton Reservoir	redbreast sunfish	12.7	0.25	2002
Clinton Reservoir	redbreast sunfish	13.2	0.19	2002
Clinton Reservoir	redbreast sunfish	13.8	0.16	2002
Clinton Reservoir	redbreast sunfish	14.1	0.16	2002
Clinton Reservoir	rock bass	15.8	0.18	2002
Clinton Reservoir	rock bass	15.9	0.19	2002
Clinton Reservoir	rock bass	18.2	0.65	2002
Clinton Reservoir	yellow bullhead	28.2	0.43	2002
Clinton Reservoir	yellow bullhead	28.3	0.74	2002
Clinton Reservoir	yellow bullhead	28.4	0.44	2002
Clinton Reservoir	yellow bullhead	29.7	0.45	2002
Clinton Reservoir	white sucker	44.5	0.25	2002
Clinton Reservoir	chain pickerel	45.2	0.61	2002
Clinton Reservoir	white sucker	45.5	0.19	2002
Clinton Reservoir	white sucker	46.8	0.24	2002
Clinton Reservoir	chain pickerel	53.0	0.43	2002
Echo Lake Reservoir	bluegill	16.4	0.10	2002
Echo Lake Reservoir	bluegill	17.9	0.06	2002
Echo Lake Reservoir	bluegill	18.5	0.11	2002
Echo Lake Reservoir	bluegill	19.0	0.11	2002
Echo Lake Reservoir	yellow bullhead	22.4	0.09	2002
Echo Lake Reservoir	yellow bullhead	22.9	0.14	2002
Echo Lake Reservoir	yellow bullhead	26.4	0.16	2002
Echo Lake Reservoir	yellow bullhead	28.6	0.07	2002
Echo Lake Reservoir	chain pickerel	43.5	0.20	2002
Echo Lake Reservoir	chain pickerel	45.6	0.27	2002

Echo Lake Reservoir	chain pickerel	62.8	0.37	2002
Echo Lake Reservoir	largemouth bass	45.6	0.43	2002
Echo Lake Reservoir	largemouth bass	48.1	0.61	2002
Echo Lake Reservoir	largemouth bass	49.4	0.72	2002
Echo Lake Reservoir	largemouth bass	50.5	0.79	2002
Green Turtle Lake	bluegill	17.7	0.07	2002
Green Turtle Lake	bluegill	17.9	0.09	2002
Green Turtle Lake	bluegill	18.6	0.14	2002
Green Turtle Lake	bluegill	19.9	0.58	2002
Green Turtle Lake	largemouth bass	31.7	0.20	2002
Green Turtle Lake	largemouth bass	32.5	0.26	2002
Green Turtle Lake	largemouth bass	38.9	0.32	2002
Green Turtle Lake	largemouth bass	40.0	0.36	2002
Green Turtle Lake	largemouth bass	49.4	0.74	2002
Greenwood Lake	bluegill	19.0	0.08	2002
Greenwood Lake	bluegill	19.1	0.13	2002
Greenwood Lake	bluegill	19.2	0.07	2002
Greenwood Lake	bluegill	20.1	0.09	2002
Greenwood Lake	yellow bullhead	21.4	0.06	2002
Greenwood Lake	yellow bullhead	23.6	0.09	2002
Greenwood Lake	yellow bullhead	23.7	0.07	2002
Greenwood Lake	yellow bullhead	23.8	0.11	2002
Greenwood Lake	walleye		0.18	2002
Greenwood Lake	walleye		0.28	2002
Greenwood Lake	walleye		0.28	2002
Greenwood Lake	walleye		0.30	2002
Greenwood Lake	walleye		0.47	2002
Greenwood Lake	largemouth bass	39.9	0.31	2002
Greenwood Lake	largemouth bass	42.0	0.31	2002
Greenwood Lake	largemouth bass	42.6	0.31	2002
Greenwood Lake	largemouth bass	42.7	0.21	2002
Greenwood Lake	largemouth bass	44.4	0.29	2002
Monksville reservoir	bluegill	17.8	0.11	2002
Monksville reservoir	bluegill	18.5	0.08	2002
Monksville reservoir	yellow bullhead	19.4	0.11	2002
Monksville reservoir	bluegill	19.8	0.17	2002
Monksville reservoir	bluegill	19.9	0.13	2002
Monksville reservoir	yellow bullhead	23.0	0.13	2002
Monksville reservoir	yellow perch	27.6	0.17	2002
Monksville reservoir	yellow perch	34.9	0.17	2002
Monksville reservoir	chain pickerel	35.5	0.15	2002
Monksville reservoir	chain pickerel	38.4	0.19	2002
Monksville reservoir	walleye	44.4	0.44	2002
Monksville reservoir	walleye	47.8	0.55	2002
Monksville reservoir	chain pickerel	51.1	0.31	2002
Monksville reservoir	walleye	51.6	0.42	2002
Monksville reservoir	walleye	54.0	0.35	2002
Monksville reservoir	walleye	59.8	0.78	2002
Monksville Reservoir	Largemouth bass	26.5	0.20	2002

Monksville Reservoir	Largemouth bass	28.0	0.18	2002
Monksville Reservoir	Largemouth bass	31.5	0.13	2002
Monksville Reservoir	Largemouth bass	36.9	0.32	2002
Monksville Reservoir	Largemouth bass	44.0	0.39	2002
Oak Ridge Reservoir	bluegill	17.5	0.15	2002
Oak Ridge Reservoir	bluegill	18.1	0.11	2002
Oak Ridge Reservoir	bluegill	19.9	0.24	2002
Oak Ridge Reservoir	bluegill	20.0	0.28	2002
Oak Ridge Reservoir	yellow bullhead	23.8	0.10	2002
Oak Ridge Reservoir	yellow bullhead	28.5	0.23	2002
Oak Ridge Reservoir	largemouth bass	41.3	0.90	2002
Oak Ridge Reservoir	largemouth bass	41.6	0.65	2002
Oak Ridge Reservoir	largemouth bass	42.2	0.81	2002
Oak Ridge Reservoir	largemouth bass	45.1	0.82	2002
Pompton River at Lincoln Park	black crappie	17.5	0.19	2002
Pompton River at Lincoln Park	black crappie	20.3	0.29	2002
Pompton River at Lincoln Park	rock bass	20.8	0.64	2002
Pompton River at Lincoln Park	black crappie	21.4	0.15	2002
Pompton River at Lincoln Park	rock bass	21.5	0.60	2002
Pompton River at Lincoln Park	rock bass	23.7	0.83	2002
Pompton River at Lincoln Park	common carp	49.5	0.22	2002
Pompton River at Lincoln Park	common carp	49.9	0.47	2002
Pompton River at Lincoln Park	common carp	57.5	0.28	2002
Pompton River at Lincoln Park	common carp	58.7	0.39	2002
Pompton River at Lincoln Park	largemouth bass	34.6	0.35	2002
Pompton River at Lincoln Park	largemouth bass	35.2	0.50	2002
Pompton River at Lincoln Park	largemouth bass	39.2	0.74	2002
Rockaway River at Powerville	bluegill	15.8	0.11	2002
Rockaway River at Powerville	bluegill	16.0	0.11	2002
Rockaway River at Powerville	bluegill	16.1	0.13	2002
Rockaway River at Powerville	yellow bullhead	16.6	0.10	2002
Rockaway River at Powerville	yellow bullhead	22.5	0.28	2002
Rockaway River at Powerville	rock bass	23.3	0.29	2002
Rockaway River at Powerville	yellow bullhead	23.5	0.14	2002
Rockaway River at Powerville	rock bass	23.9	0.41	2002
Rockaway River at Powerville	rock bass	24.1	0.34	2002
Rockaway River at Powerville	rock bass	24.5	0.32	2002
Shepherds lake	redbreast sunfish	14.6	0.19	2002
Shepherds lake	rock bass	15.3	0.20	2002
Shepherds lake	redbreast sunfish	15.6	0.18	2002
Shepherds lake	redbreast sunfish	15.9	0.20	2002
Shepherds lake	rock bass	20.9	0.15	2002
Shepherds lake	brown bullhead	28.9	0.06	2002
Shepherds lake	brown bullhead	29.5	0.13	2002
Shepherds lake	brown bullhead	36.1	0.07	2002
Shepherds lake	largemouth bass	39.0	0.76	2002
Shepherds Lake	largemouth bass	39.2	0.71	2002
Shepherds Lake	largemouth bass	39.7	0.56	2002
Shepherds Lake	largemouth bass	40.4	0.67	2002

Shepherds Lake	largemouth bass	41.1	0.60	2002
Speedwell Lake	bluegill	15.4	0.10	2002
Speedwell Lake	bluegill	15.8	0.10	2002
Speedwell Lake	bluegill	18.6	0.13	2002
Speedwell Lake	bluegill	20.5	0.16	2002
Speedwell Lake	chain pickerel	25.9	0.09	2002
Speedwell Lake	chain pickerel	31.8	0.11	2002
Speedwell Lake	common carp	57.7	0.13	2002
Speedwell Lake	chain pickerel	59.6	0.26	2002
Speedwell Lake	common carp	61.7	0.10	2002
Speedwell Lake	common carp	62.5	0.14	2002
Speedwell Lake	common carp	63.6	0.05	2002
Split Rock Reservoir	bluegill	21.2	0.13	2002
Split Rock Reservoir	bluegill	21.4	0.21	2002
Split Rock Reservoir	bluegill	22.0	0.10	2002
Split Rock Reservoir	bluegill	22.6	0.12	2002
Split Rock Reservoir	yellow perch	26.2	0.10	2002
Split Rock Reservoir	yellow perch	29.5	0.15	2002
Split Rock Reservoir	yellow perch	30.0	0.13	2002
Split Rock Reservoir	yellow perch	30.0	0.34	2002
Split Rock Reservoir	brown bullhead	30.7	0.04	2002
Split Rock Reservoir	brown bullhead	39.0	0.04	2002
Split Rock Reservoir	chain pickerel	46.8	0.30	2002
Split Rock Reservoir	chain pickerel	49.0	0.32	2002
Split Rock Reservoir	chain pickerel	54.5	0.30	2002
Split Rock Reservoir	chain pickerel	57.0	0.32	2002
Split Rock Reservoir	chain pickerel	61.0	0.26	2002
Split Rock Reservoir	largemouth bass	35.5	0.32	2002
Split Rock Reservoir	largemouth bass	35.9	0.38	2002
Split Rock Reservoir	largemouth bass	38.0	0.32	2002
Split Rock Reservoir	largemouth bass	39.4	0.48	2002
Split Rock Reservoir	largemouth bass	40.5	0.52	2002
Wanaque Reservoir	yellow bullhead	18.8	0.10	2002
Wanaque Reservoir	yellow bullhead	19.9	0.08	2002
Wanaque Reservoir	bluegill	20.2	0.22	2002
Wanaque Reservoir	bluegill	20.4	0.23	2002
Wanaque Reservoir	bluegill	20.6	0.27	2002
Wanaque Reservoir	bluegill	21.2	0.41	2002
Wanaque Reservoir	yellow bullhead	22.2	0.16	2002
Wanaque Reservoir	yellow bullhead	22.9	0.17	2002
Wanaque Reservoir	largemouth bass	30.7	0.28	2002
Wanaque Reservoir	largemouth bass	34.2	0.23	2002
Wanaque Reservoir	largemouth bass	45.2	1.03	2002
Wanaque Reservoir	largemouth bass	48.0	1.47	2002
Wawayanda Lake	bluegill	17.9	0.14	2002
Wawayanda Lake	bluegill	18.2	0.21	2002
Wawayanda Lake	bluegill	18.3	0.21	2002
Wawayanda Lake	chain pickerel	26.4	0.23	2002
Wawayanda Lake	chain pickerel	27.1	0.23	2002
Wawayanda Lake	yellow bullhead	27.1	0.30	2002

Wawayanda Lake	chain pickerel	28.0	0.23	2002
Wawayanda Lake	yellow bullhead	28.3	0.45	2002
Wawayanda Lake	yellow bullhead	29.9	0.36	2002
Wawayanda Lake	chain pickerel	33.9	0.50	2002
Wawayanda Lake	chain pickerel	44.5	0.44	2002
Wawayanda Lake	largemouth bass	33.0	0.29	2002
Wawayanda Lake	largemouth bass	33.4	0.33	2002
Wawayanda Lake	largemouth bass	42.9	0.78	2002
Wawayanda Lake	largemouth bass	44.1	0.66	2002
Wawayanda Lake	largemouth bass	45.3	0.73	2002
Weequachic Lake	bluegill	16.4	0.12	2002
Weequachic Lake	bluegill	17.3	0.15	2002
Weequachic Lake	bluegill	17.4	0.09	2002
Weequachic Lake	white perch	17.7	0.10	2002
Weequachic Lake	white perch	17.9	0.08	2002
Weequachic Lake	white perch	18.0	0.09	2002
Weequachic Lake	brown bullhead	27.2	0.03	2002
Weequachic Lake	brown bullhead	30.0	0.03	2002
Weequachic Lake	brown bullhead	31.0	0.03	2002
Weequachic Lake	common carp	50.5	0.04	2002
Weequachic Lake	common carp	56.2	0.08	2002
Weequachic Lake	common carp	71.0	0.10	2002
Weequachic Lake	largemouth bass	34.0	0.21	2002
Weequachic Lake	largemouth bass	35.1	0.20	2002
Weequachic Lake	largemouth bass	45.9	0.31	2002
Weequachic Lake	largemouth bass	47.5	0.39	2002
Mullica River	American Eel	49.5	0.29	2004
Mullica River	American Eel	63.5	0.33	2004
Mullica River	American Eel	64.9	0.18	2004
Mullica River	American Eel	73.2	0.2	2004
Mullica River	American Eel	77	0.2	2004
Below New Market Pond Dam	American eel	68.2	0.08673	2006
Below New Market Pond Dam	American eel	69.9	0.11418	2006
Bound Brook @ Shepard Rd.	American eel	51.3	0.08569	2006
Bound Brook @ Shepard Rd.	American eel	54.3	0.08921	2006
Bound Brook @ Shepard Rd.	American eel	61.3	0.20208	2006
Budd Lake	bluegill	17.8	0.09949	2006
Budd Lake	bluegill	18.2	0.1561	2006
Budd Lake	bluegill	18.8	0.12716	2006
Budd Lake	brown bullhead	25.6	0.02337	2006
Budd Lake	brown bullhead	27.2	0.0193	2006
Budd Lake	brown bullhead	31.5	0.01034	2006
Budd Lake	white catfish	34.3	0.18067	2006
Budd Lake	white catfish	35.6	0.21846	2006
Budd Lake	white catfish	42.1	0.27947	2006
Budd Lake	northern pike	74.1	0.30651	2006
Budd Lake	northern pike	78.4	0.45883	2006
Budd Lake	northern pike	81	0.19917	2006
Budd Lake	largemouth bass	35.7	0.16964	2006
Budd Lake	largemouth bass	36.4	0.43134	2006

Budd Lake	largemouth bass	36.9	0.53606	2006
Budd Lake	largemouth bass	43.1	0.48615	2006
Budd Lake	largemouth bass	47.6	0.41803	2006
Carnegie Lake	Bluegill sunfish	16.7	0.06306	2006
Carnegie Lake	Bluegill sunfish	17.9	0.05655	2006
Carnegie Lake	Bluegill sunfish	19	0.10097	2006
Carnegie Lake	white perch	20.8	0.23403	2006
Carnegie Lake	white perch	20.8	0.14171	2006
Carnegie Lake	white perch	21	0.16152	2006
Carnegie Lake	largemouth bass	34.3	0.15636	2006
Carnegie Lake	largemouth bass	38.3	0.11614	2006
Carnegie Lake	largemouth bass	43.3	0.40243	2006
Carnegie Lake	largemouth bass	44.3	0.36529	2006
Carnegie Lake	largemouth bass	49.6	0.51996	2006
Davidson Mill Pond	bluegill	18.1	0.18292	2006
Davidson Mill Pond	bluegill	19	0.0504	2006
Davidson Mill Pond	bluegill	20.3	0.14941	2006
Davidson Mill Pond	chain pickerel	43.5	0.27161	2006
Davidson Mill Pond	chain pickerel	43.9	0.24405	2006
Davidson Mill Pond	chain pickerel	48.3	0.35285	2006
Davidson Mill Pond	American eel	75.2	0.20145	2006
Davidson Mill Pond	American eel	79	0.20049	2006
Davidson Mill Pond	largemouth bass	37.7	0.5091	2006
Davidson Mill Pond	largemouth bass	40.4	0.50194	2006
Davidson Mill Pond	largemouth bass	41.3	0.56886	2006
DeVoe Lake	brown bullhead	30.9	0.07703	2006
DeVoe Lake	brown bullhead	32.5	0.12689	2006
DeVoe Lake	brown bullhead	35.7	0.16058	2006
DeVoe Lake	chain pickerel	45.8	0.26277	2006
DeVoe Lake	chain pickerel	50	0.38873	2006
DeVoe Lake	chain pickerel	50.5	0.50737	2006
Duhernal Lake	bluegill	18.4	0.04042	2006
Duhernal Lake	bluegill	20.2	0.07774	2006
Duhernal Lake	bluegill	22.3	0.16006	2006
Duhernal Lake	brown bullhead	31.6	0.03663	2006
Duhernal Lake	brown bullhead	33.5	0.02588	2006
Duhernal Lake	brown bullhead	34.5	0.05482	2006
Duhernal Lake	largemouth bass	36.4	0.19646	2006
Duhernal Lake	largemouth bass	36.5	0.1712	2006
Duhernal Lake	largemouth bass	39.2	0.2798	2006
Farrington Lake	bluegill	17.2	0.09828	2006
Farrington Lake	bluegill	17.8	0.1512	2006
Farrington Lake	bluegill	18.7	0.11982	2006
Farrington Lake	yellow perch	20.6	0.17985	2006
Farrington Lake	yellow perch	20.7	0.22166	2006
Farrington Lake	yellow perch	25.7	0.41141	2006
Farrington Lake	brown bullhead	29.8	0.03402	2006
Farrington Lake	brown bullhead	34.7	0.04048	2006
Farrington Lake	brown bullhead	36.5	0.01656	2006
Farrington Lake	chain pickerel	43.2	0.19105	2006

Farrington Lake	chain pickerel	45.8	0.20378	2006
Farrington Lake	chain pickerel	48.8	0.48139	2006
Farrington Lake	largemouth bass	39.8	0.51737	2006
Farrington Lake	largemouth bass	41	0.50762	2006
Farrington Lake	largemouth bass	42.3	0.93764	2006
Farrington Lake	largemouth bass	46.3	1.41272	2006
Farrington Lake	largemouth bass	49	0.97277	2006
Lamington River @ Lamington	redbreast sunfish	15.8	0.12666	2006
Lamington River @ Lamington	redbreast sunfish	16.1	0.16744	2006
Lamington River @ Lamington	redbreast sunfish	16.6	0.14858	2006
Lamington River @ Lamington	smallmouth bass	18.6	0.13566	2006
Lamington River @ Lamington	smallmouth bass	20.6	0.18452	2006
Lamington River @ Lamington	smallmouth bass	22	0.12535	2006
Lamington River @ Lamington	brown trout	23.7	0.07503	2006
Lamington River @ Lamington	brown trout	26.1	0.08884	2006
Lamington River @ Lamington	American eel	53.7	0.18808	2006
Lamington River @ Lamington	American eel	60.2	0.39376	2006
Lamington River @ Lamington	American eel	63.2	0.24738	2006
Manalapan Lake	bluegill	18.4	0.04791	2006
Manalapan Lake	bluegill	18.4	0.07113	2006
Manalapan Lake	bluegill	18.6	0.04947	2006
Manalapan Lake	black crappie	21	0.09823	2006
Manalapan Lake	black crappie	21.4	0.10733	2006
Manalapan Lake	black crappie	22.8	0.14389	2006
Manalapan Lake	American eel	49.5	0.07662	2006
Manalapan Lake	American eel	53.4	0.12536	2006
Manalapan Lake	American eel	59.7	0.17554	2006
Manalapan Lake	largemouth bass	38	0.23315	2006
Manalapan Lake	largemouth bass	39.1	0.32996	2006
Manalapan Lake	largemouth bass	40.8	0.40945	2006
New Market Pond	bluegill	16.5	0.06683	2006
New Market Pond	bluegill	17	0.06511	2006
New Market Pond	bluegill	17.3	0.0888	2006
New Market Pond	black crappie	20.6	0.05647	2006
New Market Pond	black crappie	22.5	0.08984	2006
New Market Pond	black crappie	24.1	0.05213	2006
New Market Pond	brown bullhead	33.3	0.02354	2006
New Market Pond	brown bullhead	33.5	0.00063	2006
New Market Pond	American eel	34	0.02819	2006
New Market Pond	brown bullhead	34.5	0.00419	2006
New Market Pond	American eel	46.6	0.04004	2006
New Market Pond	American eel	48.5	0.10651	2006
New Market Pond	common carp	50.7	0.04819	2006
New Market Pond	common carp	52.7	0.05352	2006
New Market Pond	common carp	53	0.03293	2006
New Market Pond	largemouth bass	35.9	0.13736	2006
New Market Pond	largemouth bass	36.8	0.10944	2006
New Market Pond	largemouth bass	41.4	0.26315	2006
Raritan River @ Millstone River	redbreast sunfish	18.2	0.13396	2006
Raritan River @ Millstone River	redbreast sunfish	18.2	0.16323	2006

Raritan River @ Millstone River	redbreast sunfish	19.3	0.10685	2006
Raritan River @ Millstone River	smallmouth bass	30.9	0.29331	2006
Raritan River @ Millstone River	smallmouth bass	31	0.33445	2006
Raritan River @ Millstone River	white catfish	32.6	0.20333	2006
Raritan River @ Millstone River	white catfish	35.7	0.21395	2006
Raritan River @ Millstone River	smallmouth bass	37.3	0.26906	2006
Raritan River @ Millstone River	white catfish	40.1	0.23869	2006
Raritan River @ Millstone River	channel catfish	48.7	0.35862	2006
Raritan River @ Millstone River	channel catfish	53	0.17138	2006
Raritan River @ Millstone River	American eel	57.6	0.10876	2006
Raritan River @ Millstone River	common carp	57.9	0.12682	2006
Raritan River @ Millstone River	common carp	59.7	0.15017	2006
Raritan River @ Millstone River	channel catfish	63.7	0.16402	2006
Raritan River @ Millstone River	common carp	65.9	0.00431	2006
Raritan River @ Millstone River	American eel	70.6	0.24336	2006
Raritan River @ Millstone River	American eel	71	0.29174	2006
Raritan River at Millstone River	largemouth bass	32.4	0.25569	2006
Raritan River at Millstone River	largemouth bass	37.2	0.32619	2006
Raritan River at Millstone River	largemouth bass	43	0.6896	2006
Rosedale Lake in Pennington	bluegill	18.4	0.05062	2006
Rosedale Lake in Pennington	bluegill	18.7	0.06377	2006
Rosedale Lake in Pennington	bluegill	20.2	0.10783	2006
Rosedale Lake in Pennington	black crappie	24.1	0.10195	2006
Rosedale Lake in Pennington	black crappie	25.7	0.11855	2006
Rosedale Lake in Pennington	black crappie	30.8	0.12335	2006
Rosedale Lake in Pennington	common carp	62.2	0.11683	2006
Rosedale Lake in Pennington	common carp	64.1	0.10668	2006
Rosedale Lake in Pennington	common carp	66.8	0.10278	2006
Rosedale Lake in Pennington	largemouth bass	40	0.22114	2006
Rosedale Lake in Pennington	largemouth bass	47.6	0.22991	2006
Rosedale Lake in Pennington	largemouth bass	47.7	0.3298	2006
Round Valley Reservoir	bluegill	21.5	0.11044	2006
Round Valley Reservoir	bluegill	21.9	0.11996	2006
Round Valley Reservoir	bluegill	22	0.09508	2006
Round Valley Reservoir	white catfish	36.8	0.08206	2006
Round Valley Reservoir	white catfish	40	0.0991	2006
Round Valley Reservoir	lake trout	43.9	0.08773	2006
Round Valley Reservoir	channel catfish	50.2	0.11492	2006
Round Valley Reservoir	lake trout	52.2	0.10409	2006
Round Valley Reservoir	lake trout	53.7	0.2057	2006
Round Valley Reservoir	lake trout	54.9	0.12745	2006
Round Valley Reservoir	channel catfish	58.7	0.4599	2006
Round Valley Reservoir	channel catfish	61.8	0.06823	2006
Round Valley Reservoir	lake trout	66.5	0.18896	2006
Round Valley Reservoir	largemouth bass	30.6	0.19463	2006
Round Valley Reservoir	largemouth bass	41.8	0.2981	2006
Round Valley Reservoir	largemouth bass	45.1	0.38514	2006
South Branch Raritan River at Neshanic Station	redbreast sunfish	16.9	0.10381	2006

South Branch Raritan River at Neshanic Station	redbreast sunfish	17.7	0.09302	2006
South Branch Raritan River at Neshanic Station	redbreast sunfish	17.9	0.12138	2006
South Branch Raritan River at Neshanic Station	rock bass	20.4	0.24498	2006
South Branch Raritan River at Neshanic Station	rock bass	20.6	0.16647	2006
South Branch Raritan River at Neshanic Station	rock bass	21.1	0.2056	2006
South Branch Raritan River at Neshanic Station	smallmouth bass	34.9	0.31523	2006
South Branch Raritan River at Neshanic Station	common carp	37.2	0.05298	2006
South Branch Raritan River at Neshanic Station	smallmouth bass	41.1	0.38035	2006
South Branch Raritan River at Neshanic Station	common carp	42.7	0.05706	2006
South Branch Raritan River at Neshanic Station	common carp	46.1	0.04491	2006
South Branch Raritan River at Neshanic Station	smallmouth bass	49.9	0.39461	2006
South Branch Raritan River at Neshanic Station	American eel	63	0.29096	2006
South Branch Raritan River at Neshanic Station	American eel	69.9	0.22739	2006
South Branch Raritan River at Neshanic Station	American eel	72.5	0.25548	2006
South Branch Raritan River at Neshanic Station	largemouth bass	20	0.18969	2006
South Branch Raritan River at Neshanic Station	largemouth bass	21.3	0.17653	2006
South Branch Raritan River at Neshanic Station	largemouth bass	26.9	0.1382	2006
Spring Lake	common carp	48.3	0.04448	2006
Spring Lake	common carp	54.5	0.00202	2006
Spring Lake	common carp	64.6	0.0799	2006
Spruce Run Reservoir	channel catfish	41	0.06091	2006
Spruce Run Reservoir	striped x white bass hybrid	42.4	0.14346	2006
Spruce Run Reservoir	striped x white bass hybrid	48	0.18523	2006
Spruce Run Reservoir	striped x white bass hybrid	49.2	0.22875	2006
Spruce Run Reservoir	striped x white bass hybrid	53.6	0.39913	2006
Spruce Run Reservoir	striped x white bass hybrid	54.3	0.51704	2006
Spruce Run Reservoir	channel catfish	55.6	0.22611	2006
Spruce Run Reservoir	channel catfish	56.3	0.32477	2006
Spruce Run Reservoir	common carp	57.8	0.12598	2006
Spruce Run Reservoir	common carp	58.1	0.12418	2006
Spruce Run Reservoir	common carp	58.3	0.13401	2006
Spruce Run Reservoir	northern pike	65.5	0.31375	2006

Spruce Run Reservoir	northern pike	68.5	0.24939	2006
Spruce Run Reservoir	northern pike	76.8	0.20958	2006
Spruce Run Reservoir	largemouth bass	28.7	0.17957	2006
Spruce Run Reservoir	largemouth bass	35.8	0.17422	2006
Spruce Run Reservoir	largemouth bass	39.8	0.43026	2006
Spruce Run Reservoir	largemouth bass	42.9	0.44294	2006
Spruce Run Reservoir	largemouth bass	47.3	0.60489	2006
Weston Mill Pond	bluegill	17.7	0.06793	2006
Weston Mill Pond	bluegill	18.6	0.11264	2006
Weston Mill Pond	bluegill	18.9	0.2196	2006
Weston Mill Pond	yellow perch	25.3	0.27386	2006
Weston Mill Pond	black crappie	25.8	0.19928	2006
Weston Mill Pond	yellow perch	26.3	0.14497	2006
Weston Mill Pond	black crappie	26.9	0.28312	2006
Weston Mill Pond	black crappie	26.9	0.22769	2006
Weston Mill Pond	brown bullhead	27.1	0.01612	2006
Weston Mill Pond	brown bullhead	28.2	0.05252	2006
Weston Mill Pond	yellow perch	29.3	0.39874	2006
Weston Mill Pond	brown bullhead	35.7	0.0256	2006
Weston Mill Pond	chain pickerel	38.9	0.16182	2006
Weston Mill Pond	chain pickerel	45.9	0.28877	2006
Weston Mill Pond	chain pickerel	48	0.48049	2006
Weston Mill Pond	American eel	49.8	0.10278	2006
Weston Mill Pond	American eel	50.2	0.11332	2006
Weston Mill Pond	American eel	55.1	0.13674	2006
Weston Mill Pond	largemouth bass	38	0.52104	2006
Weston Mill Pond	largemouth bass	38.1	0.41189	2006
Weston Mill Pond	largemouth bass	39.5	0.46808	2006
Atsion Lake	American eel	31.2	0.33	2007
Atsion Lake	American eel	32.1	0.27	2007
Atsion Lake	American eel	51.7	0.52	2007
Atsion Lake	chain pickerel	33.2	0.47	2007
Atsion Lake	chain pickerel	39.6	0.69	2007
Atsion Lake	chain pickerel	44.7	0.82	2007
Batsto Lake	brown bullhead	32.9	0.29	2007
Batsto Lake	brown bullhead	33.4	0.22	2007
Batsto Lake	brown bullhead	36.18	0.16	2007
Batsto Lake	chain pickerel	23.7	0.30	2007
Batsto Lake	chain pickerel	35	0.78	2007
Batsto Lake	chain pickerel	35.5	0.85	2007
Batsto Lake	chain pickerel	35.9	0.44	2007
Batsto Lake	largemouth bass	35.5	1.25	2007
Batsto Lake	largemouth bass	35.6	1.07	2007
Batsto Lake	largemouth bass	36.7	0.85	2007
Batsto Lake	largemouth bass	37.2	0.10	2007
Cedar Lake	American eel	48.7	0.16	2007
Cedar Lake	American eel	54.2	0.18	2007
Cedar Lake	American eel	63.9	0.22	2007
Cedar Lake	largemouth bass	32.8	0.18	2007
Cedar Lake	largemouth bass	38.8	0.31	2007

Cedar Lake	largemouth bass	47	1.63	2007
Cedar Lake	white perch	30.7	0.33	2007
Cedar Lake	white perch	31.8	0.22	2007
Cedar Lake	white perch	37.4	0.51	2007
Cedarville Ponds	chain pickerel	30.6	0.65	2007
Cedarville Ponds	chain pickerel	32.5	0.46	2007
Cedarville Ponds	chain pickerel	34.4	0.53	2007
Cedarville Ponds	chain pickerel	35.4	0.54	2007
Cedarville Ponds	chain pickerel	43.1	0.69	2007
Cedarville Ponds	yellow perch	28	0.31	2007
Cedarville Ponds	yellow perch	28.8	0.33	2007
Cedarville Ponds	yellow perch	29.8	0.35	2007
Deal Lake	American eel	31	0.30	2007
Deal Lake	American eel	60	0.05	2007
Deal Lake	largemouth bass	38	0.09	2007
Deal Lake	largemouth bass	39.8	0.12	2007
Deal Lake	largemouth bass	40.2	0.14	2007
Deal Lake	white perch	16.3	0.02	2007
Deal Lake	white perch	18.1	0.04	2007
Deal Lake	white perch	20.2	0.18	2007
East Creek Lake	American eel	43.2	1.05	2007
East Creek Lake	American eel	51.8	1.02	2007
East Creek Lake	American eel	53.9	1.24	2007
East Creek Lake	chain pickerel	33.6	1.14	2007
East Creek Lake	chain pickerel	41.1	1.46	2007
East Creek Lake	chain pickerel	42.9	1.05	2007
East Creek Lake	largemouth bass	30.5	1.05	2007
East Creek Lake	largemouth bass	39.4	1.40	2007
East Creek Lake	largemouth bass	44.6	1.37	2007
Harrisville Lake	American eel	27.4	0.47	2007
Harrisville Lake	American eel	40.5	0.58	2007
Harrisville Lake	American eel	54.1	0.73	2007
Harrisville Lake	chain pickerel	27.6	1.05	2007
Harrisville Lake	chain pickerel	29.4	0.61	2007
Harrisville Lake	chain pickerel	30.4	0.91	2007
Harrisville Lake	chain pickerel	31.3	1.05	2007
Lake Absegami	American eel	31.6	0.36	2007
Lake Absegami	American eel	32.7	0.29	2007
Lake Absegami	American eel	47.5	0.80	2007
Lake Absegami	chain pickerel	35.3	1.32	2007
Lake Absegami	chain pickerel	35.4	1.26	2007
Lake Absegami	chain pickerel	43.5	1.24	2007
Lake Absegami	chain pickerel	47.6	1.62	2007
Lake Absegami	chain pickerel	58.7	1.39	2007
Lake Manahawkin	American eel	46.3	1.50	2007
Lake Manahawkin	American eel	56.1	1.43	2007
Lake Manahawkin	American eel	79.6	1.89	2007
Lake Manahawkin	largemouth bass	33.6	1.08	2007
Lake Manahawkin	largemouth bass	35.2	0.93	2007

Lake Manahawkin	largemouth bass	45.1	1.76	2007
Lake Nummy	yellow bullhead	29.2	0.44	2007
Lake Nummy	yellow bullhead	29.7	0.26	2007
Lake Nummy	yellow bullhead	33.4	0.79	2007
Lake Nummy	chain pickerel	46.2	1.07	2007
Lake Nummy	chain pickerel	56	2.56	2007
Lake Oswego	American eel	49.6	0.70	2007
Lake Oswego	American eel	60.5	0.46	2007
Lake Oswego	chain pickerel	26.6	0.82	2007
Lake Oswego	chain pickerel	27.7	0.76	2007
Lake Oswego	chain pickerel	42.1	0.42	2007
Lake Oswego	chain pickerel	46.8	2.05	2007
Lefferts Lake	brown bullhead	27.8	0.07	2007
Lefferts Lake	brown bullhead	28.8	0.10	2007
Lefferts Lake	brown bullhead	29.1	0.10	2007
Lefferts Lake	chain pickerel	43.9	0.11	2007
Lefferts Lake	chain pickerel	44.7	0.19	2007
Lefferts Lake	chain pickerel	46.7	0.21	2007
Lefferts Lake	yellow perch	23.8	0.10	2007
Lefferts Lake	yellow perch	24.4	0.12	2007
Lefferts Lake	yellow perch	25.3	0.09	2007
Lenape Lake	American eel	53	0.42	2007
Lenape Lake	American eel	58.7	1.06	2007
Lenape Lake	American eel	62.4	0.89	2007
Lenape Lake	largemouth bass	40	1.60	2007
Lenape Lake	largemouth bass	44.6	1.04	2007
Lenape Lake	largemouth bass	45.9	1.61	2007
Manasquan Reservoir	American eel	54.2	0.08	2007
Manasquan Reservoir	American eel	58	0.05	2007
Manasquan Reservoir	American eel	82.4	0.17	2007
Manasquan Reservoir	largemouth bass	40.1	0.10	2007
Manasquan Reservoir	largemouth bass	44.5	0.21	2007
Manasquan Reservoir	largemouth bass	49.2	0.40	2007
Maple Lake	American eel	44.1	0.81	2007
Maple Lake	American eel	48.6	0.81	2007
Maple Lake	American eel	53.6	1.02	2007
Maple Lake	largemouth bass	33.1	0.43	2007
Maple Lake	largemouth bass	33.7	0.84	2007
Maple Lake	largemouth bass	34.7	0.86	2007
Maple Lake	largemouth bass	38	1.48	2007
Marlu Lake	common carp	64.4	0.04	2007
Marlu Lake	common carp	66.6	0.04	2007
Marlu Lake	common carp	67.9	0.04	2007
Marlu Lake	largemouth bass	34.5	0.08	2007
Marlu Lake	largemouth bass	41.4	0.09	2007
Marlu Lake	largemouth bass	44.2	0.14	2007
Parvin Lake	American eel	63.1	0.12	2007
Parvin Lake	American eel	64.9	0.12	2007
Parvin Lake	chain pickerel	45.7	0.24	2007
Parvin Lake	chain pickerel	47.7	0.21	2007

Parvin Lake	chain pickerel	51.4	0.19	2007
Parvin Lake	largemouth bass	35.9	0.16	2007
Parvin Lake	largemouth bass	39.5	0.21	2007
Parvin Lake	largemouth bass	43.3	0.26	2007
Parvin Lake	largemouth bass	44.6	0.19	2007
Parvin Lake	largemouth bass	49	0.27	2007
Pohatcong Lake	American eel	44.3	0.44	2007
Pohatcong Lake	American eel	45.3	0.95	2007
Pohatcong Lake	American eel	66.2	0.72	2007
Pohatcong Lake	largemouth bass	41.7	0.78	2007
Pohatcong Lake	largemouth bass	41.7	0.69	2007
Pohatcong Lake	largemouth bass	42.7	0.61	2007
Pohatcong Lake	largemouth bass	43	0.64	2007
Pohatcong Lake	yellow perch	26.5	0.14	2007
Pohatcong Lake	yellow perch	31.2	0.36	2007
Pohatcong Lake	yellow perch	34.6	0.83	2007
Shenandoah Lake	American eel	46.8	0.42	2007
Shenandoah Lake	American eel	47.9	0.24	2007
Shenandoah Lake	American eel	75.5	0.42	2007
Shenandoah Lake	chain pickerel	35.3	0.34	2007
Shenandoah Lake	chain pickerel	41.2	0.23	2007
Shenandoah Lake	chain pickerel	41.4	0.32	2007
Shenandoah Lake	largemouth bass	40.5	0.37	2007
Shenandoah Lake	largemouth bass	41.6	0.46	2007
Shenandoah Lake	largemouth bass	43.2	0.65	2007
Swimming River Reservoir	American eel	42.2	0.04	2007
Swimming River Reservoir	American eel	66.1	0.07	2007
Swimming River Reservoir	American eel	68.9	0.08	2007
Swimming River Reservoir	largemouth bass	40	0.09	2007
Swimming River Reservoir	largemouth bass	42.7	0.09	2007
Swimming River Reservoir	largemouth bass	50.1	0.15	2007
Wading River	chain pickerel	36.3	2.60	2007
Wading River	chain pickerel	37.5	2.63	2007
Wading River	chain pickerel	40.7	2.03	2007
Wilson Lake	chain pickerel	34.7	1.58	2007
Wilson Lake	chain pickerel	37	1.36	2007
Wilson Lake	chain pickerel	54.7	2.02	2007
Wilson Lake	largemouth bass	35.4	1.53	2007
Wilson Lake	largemouth bass	38.9	1.63	2007
Wilson Lake	largemouth bass	40.9	3.27	2007
Wilson Lake	yellow perch	28	1.25	2007
Wilson Lake	yellow perch	28	1.46	2007
Wilson Lake	yellow perch	30	0.87	2007

Appendix C

Non-Tidal Surface Water NJPDES Facility List to Quantify Potential Hg Load

NJPDES Permit Number	Facility Name	Permitted Flow	Description
NJ0000876	HERCULES INC - KENVIL	0.7	Industrial
NJ0020036	DEPT OF VETERANS AFFAIRS	0.08	Municipal minor
NJ0020184	NEWTOWN WASTEWATER TREATMENT PLANT	1.4	Municipal major
NJ0020206	ALLENTOWN BORO WWTP	0.238	Municipal minor
NJ0020281	CHATHAM HILL STP	0.03	Municipal minor
NJ0020290	CHATHAM TWP MAIN STP	1	Municipal minor
NJ0020354	BRANCHBURG NESHANIC STP	0.055	Municipal minor
NJ0020389	CLINTON TOWN WWTP	2.03	Municipal major
NJ0020419	LONG POND SCHOOL WTP	0.01	Municipal minor
NJ0020427	CALDWELL WASTEWATER TREATMENT PLANT	4.5	Municipal major
NJ0020532	HARRISON TOWNSHIP TREATMENT PLANT	0.8	Municipal minor
NJ0020605	ALLAMUCHY SEWERAGE TREATMENT PLANT	0.6	Municipal minor
NJ0020711	WARREN CO TECHNICAL SCHOOL STP	0.012	Municipal minor
NJ0021083	VETERANS AFFAIRS NJ HEALTH CARE SYSTEM-LYONS	0.4	Municipal minor
NJ0021091	JEFFERSON TWP HIGH-MIDDLE SCHOOL	0.0275	Municipal minor
NJ0021105	ARTHUR STANLICK SCHOOL	0.013	Municipal minor
NJ0021113	WASHINGTON BORO WWTP	1.5	Municipal major
NJ0021253	INDIAN HILLS HIGH SCHOOL	0.0336	Municipal minor
NJ0021326	MEDFORD LAKES BOROUGH STP	0.55	Municipal minor
NJ0021334	MENDHAM BORO	0.45	Municipal minor
NJ0021342	SKYVIEW/HIBROOK WTP	0.023	Municipal minor
NJ0021369	HACKETTSTOWN MUA	3.48	Municipal major
NJ0021571	SPRINGFIELD TWP ELEM SCH STP	0.0075	Municipal minor
NJ0021636	NEW PROVIDENCE WWTP	1.5	Municipal major
NJ0021717	BUENA BOROUGH MUA	0.4	Municipal major
NJ0021865	FIDDLER'S ELBOW CTRY CLUB WWTP	0.03	Municipal minor
NJ0021890	MILFORD SEWER UTILITY	0.4	Municipal minor
NJ0021954	CLOVERHILL STP	0.5	Municipal minor
NJ0022047	RARITAN TOWNSHIP MUA STP	3.8	Municipal major
NJ0022063	SUSSEX COUNTY HOMESTEAD WTP	0.05	Municipal minor
NJ0022101	BLAIR ACADEMY	0.05	Municipal minor
NJ0022110	EDUCATIONAL TESTING SERVICE	0.08	Municipal minor
NJ0022144	HAGEDORN PSYCHIATRIC HOSPITAL	0.052	Municipal minor
NJ0022250	WOODSTOWN WASTEWATER TREATMENT PLANT	0.53	Municipal minor
NJ0022276	STONYBROOK SCHOOL	0.01	Municipal minor
NJ0022349	ROCKAWAY VALLEY REG SA	12	Municipal major
NJ0022381	NORTHERN BURLINGTON COUNTY	0.0135	Municipal minor
NJ0022390	NPDC SEWAGE TREATMENT PLANT	0.5	Municipal minor
NJ0022438	HELEN A FORT MIDDLE SCHOOL	0.05	Municipal minor

NJ0022489	WARREN TWP SEWERAGE AUTH STAGE I-II STP	0.47	Municipal minor
NJ0022497	WARREN STAGE IV STP	0.8	Municipal minor
NJ0022586	MARLBORO PSYCHIATRIC HOSP STP	1	Municipal major
NJ0022675	ROXBURY TOWNSHIP	2	Municipal major
NJ0022764	RIVER ROAD STP	0.1172	Municipal minor
NJ0022781	POTTERSVILLE STP	0.048	Municipal minor
NJ0022845	HARRISON BROOK STP	2.5	Municipal major
NJ0022918	ROOSEVELT BORO WTP	0.25	Municipal minor
NJ0022985	WRIGHTSTOWN BOROUGH STP	0.337	Municipal minor
NJ0023001	SALVATION ARMY CAMP TECUMSEH	0.018	Municipal minor
NJ0023124	MONTGOMERY HIGH SCHOOL STP	0.035	Municipal minor
NJ0023175	ROUND VALLEY MIDDLE SCHOOL	0.009	Municipal minor
NJ0023311	KINGWOOD TWP SCHOOL	0.0048	Municipal minor
NJ0023493	WASHINGTON TOWNSHIP MUA WTP	0.5	Municipal minor
NJ0023540	NAVAL WEAPONS STATION EARLE	0.37	Municipal minor
NJ0023663	CARRIER FOUNDATION WTP	0.04	Municipal minor
NJ0023698	POMPTON LAKES BORO MUA	1.2	Municipal major
NJ0023728	PINE BROOK STP	8.8	Municipal major
NJ0023736	PINELANDS WASTEWATER COMPANY	0.5	Municipal minor
NJ0023787	EAST WINDSOR WATER POLLUTION CONTROL PLANT	4.5	Municipal major
NJ0023841	LOUNSBERRY HOLLOW MIDDLE SCH STP	0.032	Municipal minor
NJ0023949	LEGENDS RESORT & COUNTRY CLUB	0.35	Municipal minor
NJ0024031	ELMWOOD WTP	2.978	Municipal major
NJ0024040	WOODSTREAM STP	1.7	Municipal major
NJ0024091	UNION TWP ELEMENTARY SCHOOL	0.011	Municipal minor
NJ0024104	UNITED WATER PRINCETON MEADOWS	1.64	Municipal major
NJ0024163	BIG `N` SHOPPING CENTER STP	0.02	Municipal minor
NJ0024414	WEST MILFORD SHOPPING CENTER STP	0.02	Municipal minor
NJ0024457	OUR LADY OF THE MAGNIFICAT	0.0012	Municipal minor
NJ0024465	LONG HILL TOWNSHIP OF STP	0.9	Municipal minor
NJ0024490	VERONA TWP WTP	4.1	Municipal major
NJ0024511	LIVINGSTON WATER POLLUTION CONTROL FACILITY	4.6	Municipal major
NJ0024716	PHILLIPSBURG TOWN STP	3.5	Municipal major
NJ0024759	EWING-LAWRENCE SA WTP	16	Municipal major
NJ0024791	RIDGEWOOD VILLAGE WPC FACILITY	5	Municipal major
NJ0024813	NORTHWEST BERGEN CNTY UA	16.8	Municipal major
NJ0024821	PEMBERTON TOWNSHIP MUA STP	2.5	Municipal major
NJ0024864	SOMERSET RARITAN VALLEY SA	21.3	Municipal major
NJ0024902	HANOVER SEWERAGE AUTHORITY	4.61	Municipal major
NJ0024911	BUTTERWORTH WATER POLLUTION CONTROL UTILITY	3.3	Municipal major
NJ0024929	WOODLAND WATER POLLUTION CONTROL UTILITY(WPCU	2	Municipal major
NJ0024937	MOLITOR WATER POLLUTION CONTROL FACILITY	5	Municipal major
NJ0024970	PARSIPPANY TROY HILLS	16	Municipal major
NJ0025160	HAMMONTON WTPF	1.6	Municipal major
NJ0025330	CEDAR GROVE STP	2	Municipal major

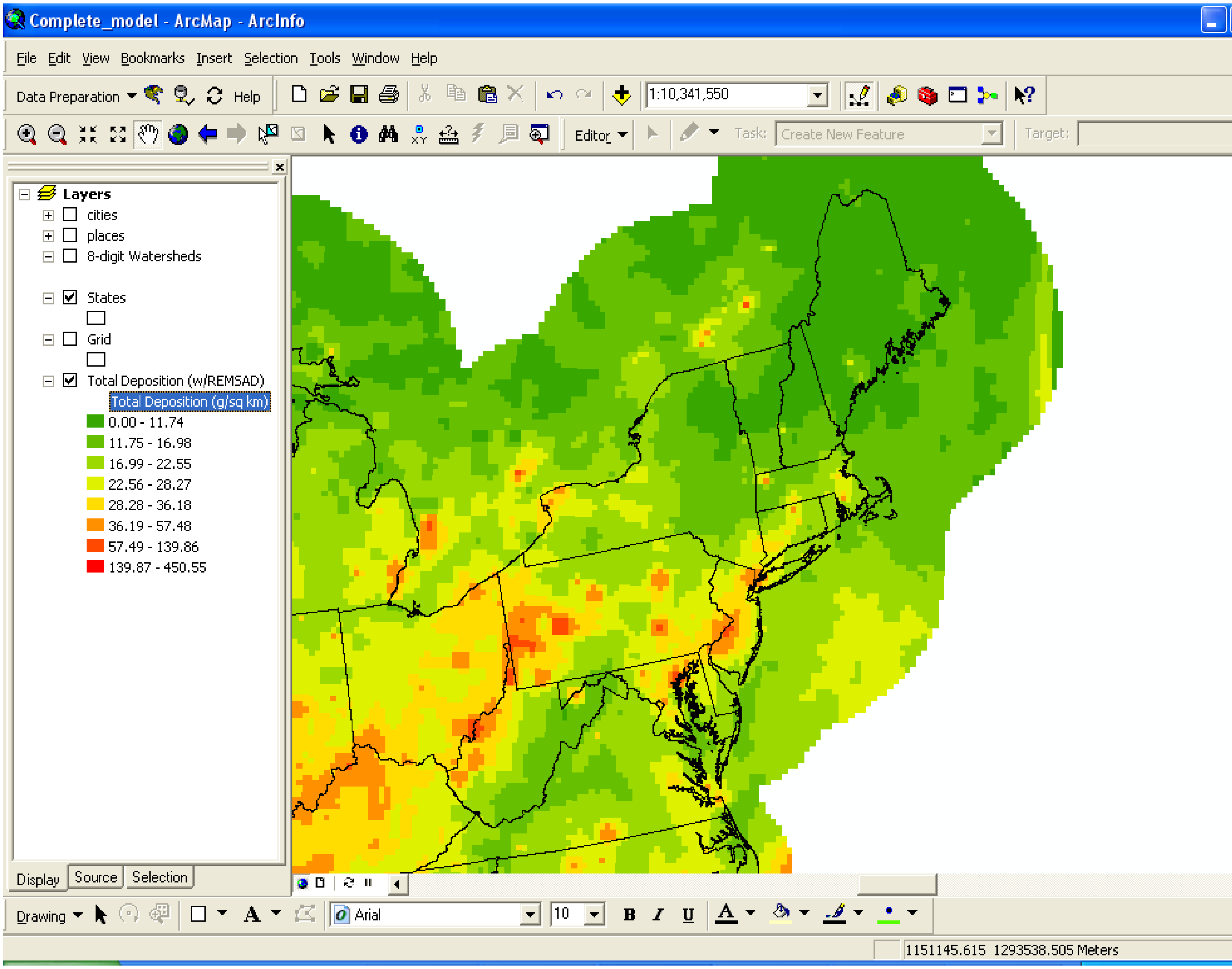
NJ0025496	MORRISTOWN SEWER UTILITY	6.3	Municipal major
NJ0025518	FLORHAM PARK SEWERAGE AUTH	1.4	Municipal major
NJ0026174	CRESCENT PARK STP	0.064	Municipal minor
NJ0026387	BERNARDSVILLE STP	0.8	Municipal minor
NJ0026689	GREYSTONE PARK PSYCH HOSPITAL	0.4	Municipal minor
NJ0026697	READINGTON TWP PUBLIC SCHOOL	0.017	Municipal minor
NJ0026719	ALBERT C WAGNER YOUTH CORRECTIONAL FACILITY	1.3	Municipal minor
NJ0026727	COLORADO CAFE WTP	0.0175	Municipal minor
NJ0026824	CHESTER SHOPPING CENTER	0.011	Municipal minor
NJ0026832	MEDFORD TWP WASTEWATER TREATMENT PLANT	1.75	Municipal major
NJ0026867	WHITE ROCK STP	0.1295	Municipal minor
NJ0026891	BURNT HILL TREATMENT PLANT #1	0.0153	Municipal minor
NJ0026905	STAGE II TREATMENT PLANT	0.48	Municipal minor
NJ0027006	RINGWOOD ACRES TREATMENT PLANT	0.036	Municipal minor
NJ0027031	HOLMDEL BD OF ED VILLAGE SCHOOL STP	0.01	Municipal minor
NJ0027049	POPE JOHN XXIII HIGH SCH WTP	0.022	Municipal minor
NJ0027057	SPARTA PLAZA WTP	0.05	Municipal minor
NJ0027065	SPARTA ALPINE SCHOOL	0.025	Municipal minor
NJ0027227	TRUMP NATIONAL GOLF COURSE	0.0005	Municipal minor
NJ0027464	HANOVER MOBILE VILLAGE ASSOC	0.02	Municipal minor
NJ0027511	CALIFORNIA VILLAGE SEWER PLANT	0.032	Municipal minor
NJ0027529	CAREONE @HOLMDEL	0.025	Municipal minor
NJ0027553	LESTER D. WILSON ELEM SCHOOL	0.0075	Municipal minor
NJ0027561	DELAWARE TOWNSHIP MUA	0.065	Municipal minor
NJ0027596	SPARTAN VILLAGE MOBILE HOME PK	0.038	Municipal minor
NJ0027669	AWOSTING STP	0.045	Municipal minor
NJ0027677	OLDE MILFORD ESTATES STP	0.172	Municipal minor
NJ0027685	HIGHVIEW ACRES STP	0.2	Municipal minor
NJ0027715	MERCER CO CORRECTION CTR STP	0.09	Municipal minor
NJ0027731	PRINCETON HEALTHCARE SYSTEM	0.296	Industrial
NJ0027774	OAKWOOD KNOLLS WWTP	0.035	Municipal minor
NJ0027821	MUSCONETCONG SEWERAGE AUTHORITY	5.79	Municipal major
NJ0027961	BERKELEY HEIGHTS WPCF	3.1	Municipal major
NJ0028002	MOUNTAIN VIEW STP	13.5	Municipal major
NJ0028304	QUALITY INN OF LEDGEWOOD	0.04	Municipal minor
NJ0028436	RARITAN TWP MUA-FLEMINGTON	2.35	Municipal major
NJ0028479	NJ TRAINING SCHOOL FOR BOYS	0.15	Municipal minor
NJ0028487	MOUNTAINVIEW CORRECTIONAL INSTITUTION	0.26	Municipal minor
NJ0028541	BIRCH HILL PARK STP	0.02	Municipal minor
NJ0028665	MOBILE ESTATES OF SOUTHAMPTON INC	0.06	Municipal minor
NJ0028894	KITTATINNY REG HS BD OF ED	0.045	Municipal minor
NJ0029041	REGENCY @ SUSSEX APT	0.08	Municipal minor
NJ0029386	TWO BRIDGES WASTEWATER TREATMENT PLANT	10	Municipal major
NJ0029432	ROBERT ERSKINE SCHOOL STP	0.008	Municipal minor
NJ0029475	HIGHTSTOWN BORO AWWTP	1	Municipal major

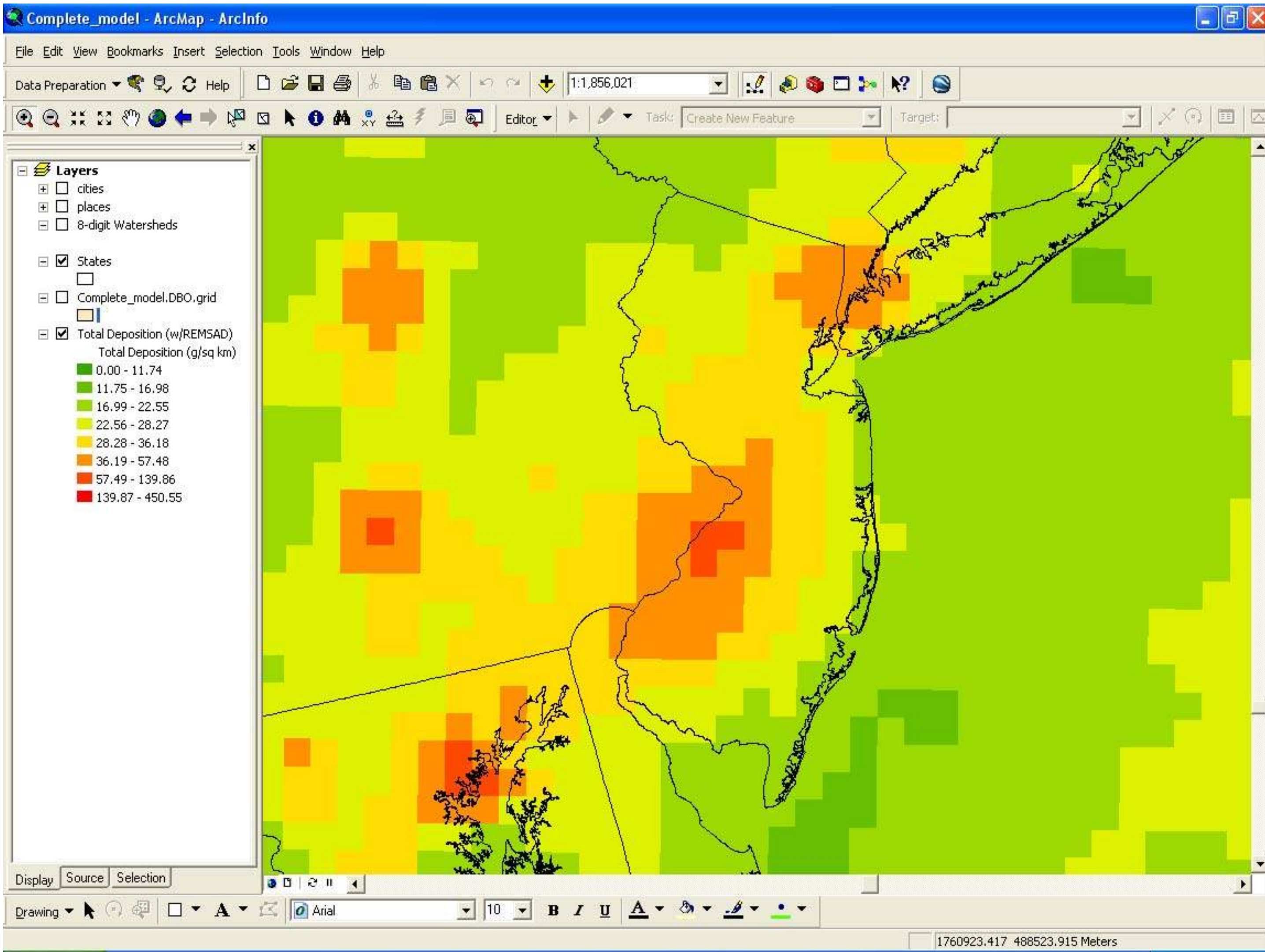
NJ0029831	FRENCHTOWN WASTEWATER TREATMENT PLANT	0.15	Municipal minor
NJ0029858	OAKLAND CARE CENTER INC	0.03	Municipal minor
NJ0031046	NORTH WARREN REG SCH DIST WTF	0.02	Municipal minor
NJ0031119	STONY BROOK RSA- RIVER ROAD STP	13.06	Municipal major
NJ0031585	HIGH POINT REGIONAL HS	0.03	Municipal minor
NJ0031615	CAMDEN COUNTY VOC & TECH SCHOOL	0.058	Municipal minor
NJ0031674	REMINGTON'S RESTAURANT	0.028	Municipal minor
NJ0031771	COLTS NECK INN HOTEL	0.006	Municipal minor
NJ0032395	RINGWOOD PLAZA STP	0.01168	Municipal minor
NJ0033995	ENVIRONMENTAL DISPOSAL CORP	2.1	Municipal major
NJ0035084	EXXONMOBIL RESEARCH & ENGINEERING CO	0.22	Industrial
NJ0035114	BELVIDERE AREA WWTF	0.5	Municipal minor
NJ0035301	STONY BROOK RGNL SEWERAGE AUTH	0.3	Municipal minor
NJ0035319	STONY BROOK RSA	0.3	Municipal minor
NJ0035483	OXFORD AREA WTF	0.5	Municipal minor
NJ0035670	ALEXANDRIA MIDDLE SCHOOL	0.011	Municipal minor
NJ0035718	HOLMDEL WASTEWATER TREATMENT FACILITY	0.04	Municipal minor
NJ0050130	RIVERSIDE FARMS STP	0.145	Municipal minor
NJ0050369	WARREN STAGE V STP	0.38	Municipal minor
NJ0050580	HAMPTON COMMONS WASTEWATER FACILITY	0.05	Municipal minor
NJ0052256	CHATHAM GLEN STP	0.155	Municipal minor
NJ0053112	CHAPEL HILL ESTATES STP	0.01	Municipal minor
NJ0053350	SUSSEX CNTY MUA UPPER WALLKILL FACILITY	3	Municipal major
NJ0053759	WANAQUE VALLEY REGIONAL SEWERAGE AUTHORITY	1.25	Municipal major
NJ0055395	BURLINGTON CNTY RESOURCE RECOVERY COMPLEX	2.075	Industrial
NJ0060038	PIKE BROOK STP	0.67	Municipal minor
NJ0067733	OXBRIDGE WASTEWATER TREATMENT PLANT	0.16	Municipal minor
NJ0069523	CHERRY VALLEY STP	0.286	Municipal minor
NJ0080811	RAMAPO RIVER RESERVE WWTP	0.1137	Municipal minor
NJ0098663	HOMESTEAD TREATMENT UTILITY	0.25	Municipal minor
NJ0098922	READINGTON-LEBANON SA	0.8	Municipal minor
NJ0100528	GLEN MEADOWS/TWIN OAKS STP	0.025	Municipal minor
NJ0102270	EVOINK DEGUSSA CORP	0.015	Industrial
NJ0102563	ROUTE 78 OFFICE AREA WWTF	0.09653	Municipal minor
NJ0109061	LONG VALLEY VILLAGE WTP	0.244	Municipal minor
NJ0136603	MORRIS LAKE WTP	0.2	Municipal minor
NJG0005134	HERCULES GROUNDWATER TREATMT AT GEO SPEC CHEM	0.432	Industrial

Footnote: TMDL Section 4.0 - Source Assessment describes list construction.

Appendix D

Mercury Air Deposition Load for New Jersey (provided by Mr. Dwight Atkinson of EPA)





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Data Preparation
Help
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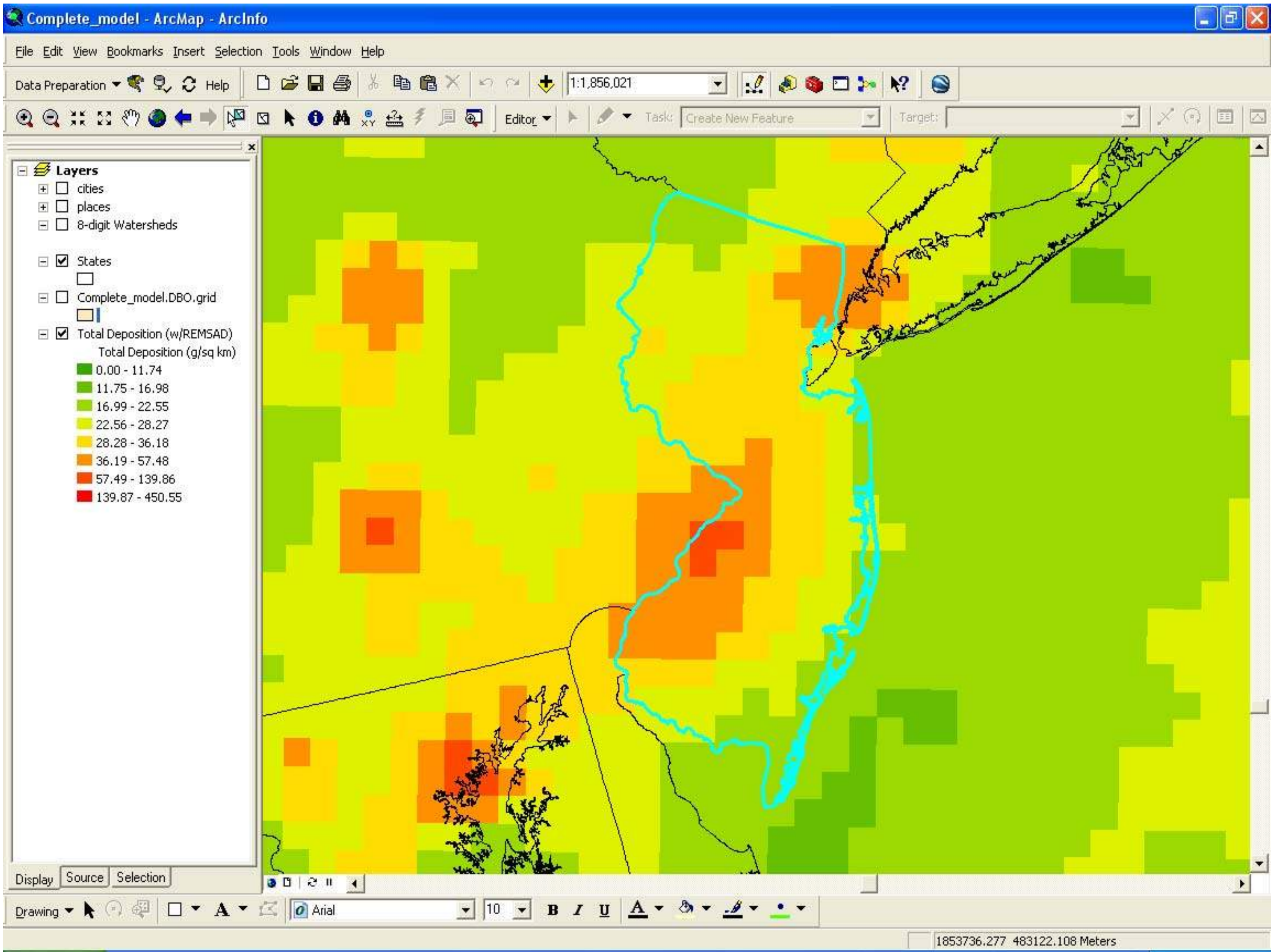
Editor
Task: Create New Feature
Target:
Layers
cities
places
8-digit Watersheds
States
Complete_model.DBO.grid
Total Deposition (w/REMSAD)
Total Deposition (g/sq km)
0.00 - 11.74
11.75 - 16.98
16.99 - 22.55
22.56 - 28.27
28.28 - 36.18
36.19 - 57.48
57.49 - 139.86
139.87 - 450.55
Display
Source
Selection
Drawing
Arial
10
1760923.417 488523.915 Meters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Data Preparation
Help
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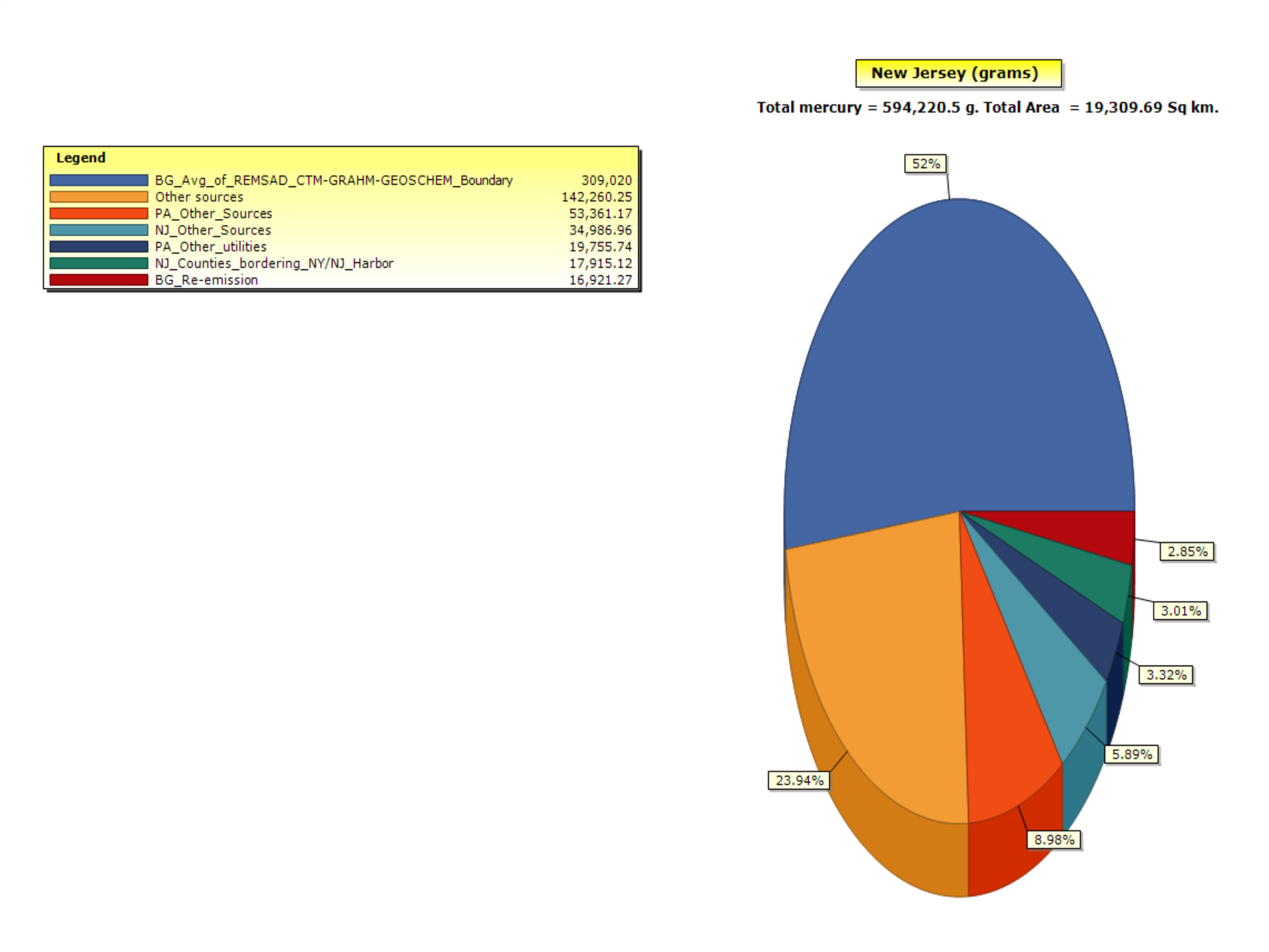
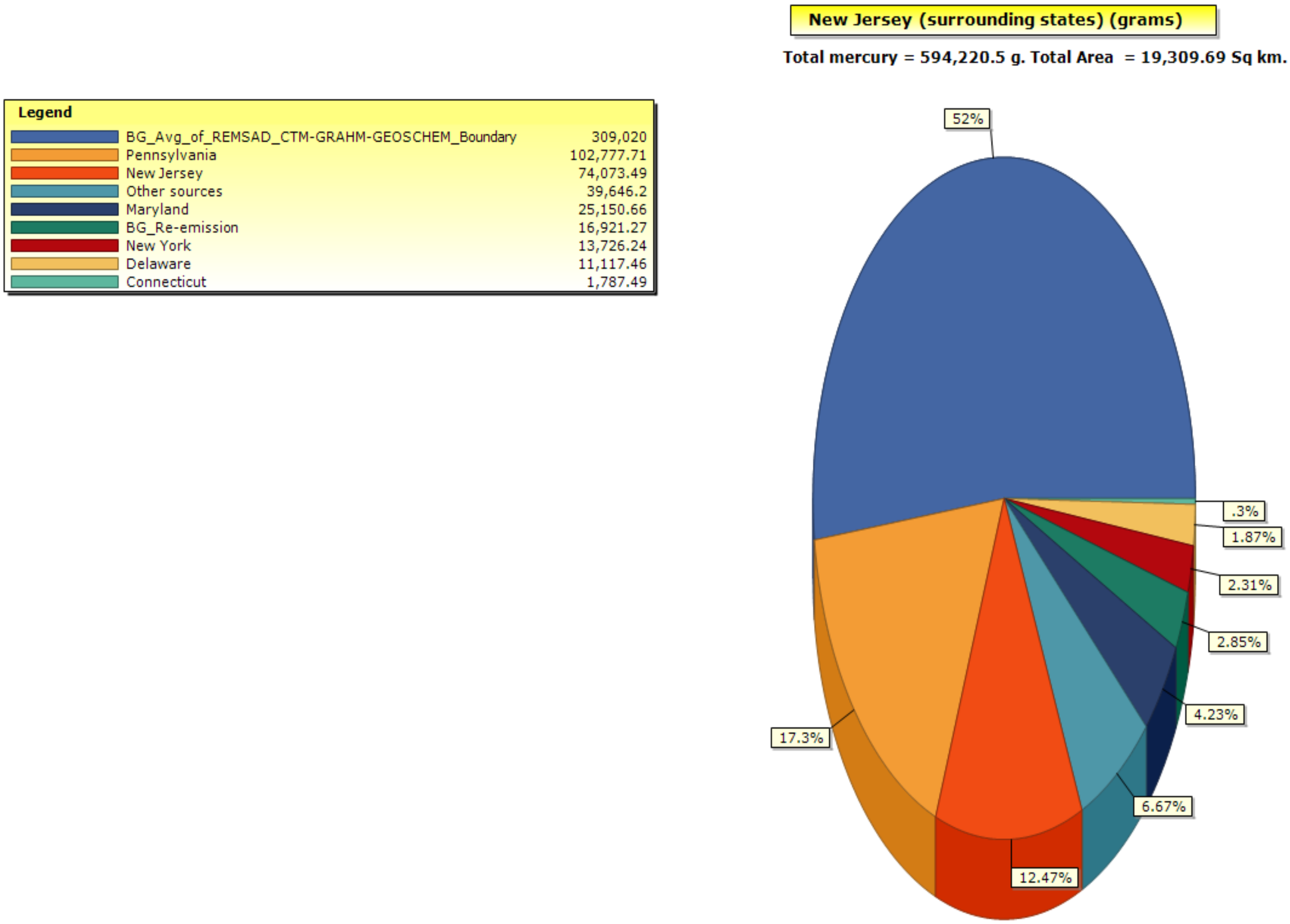
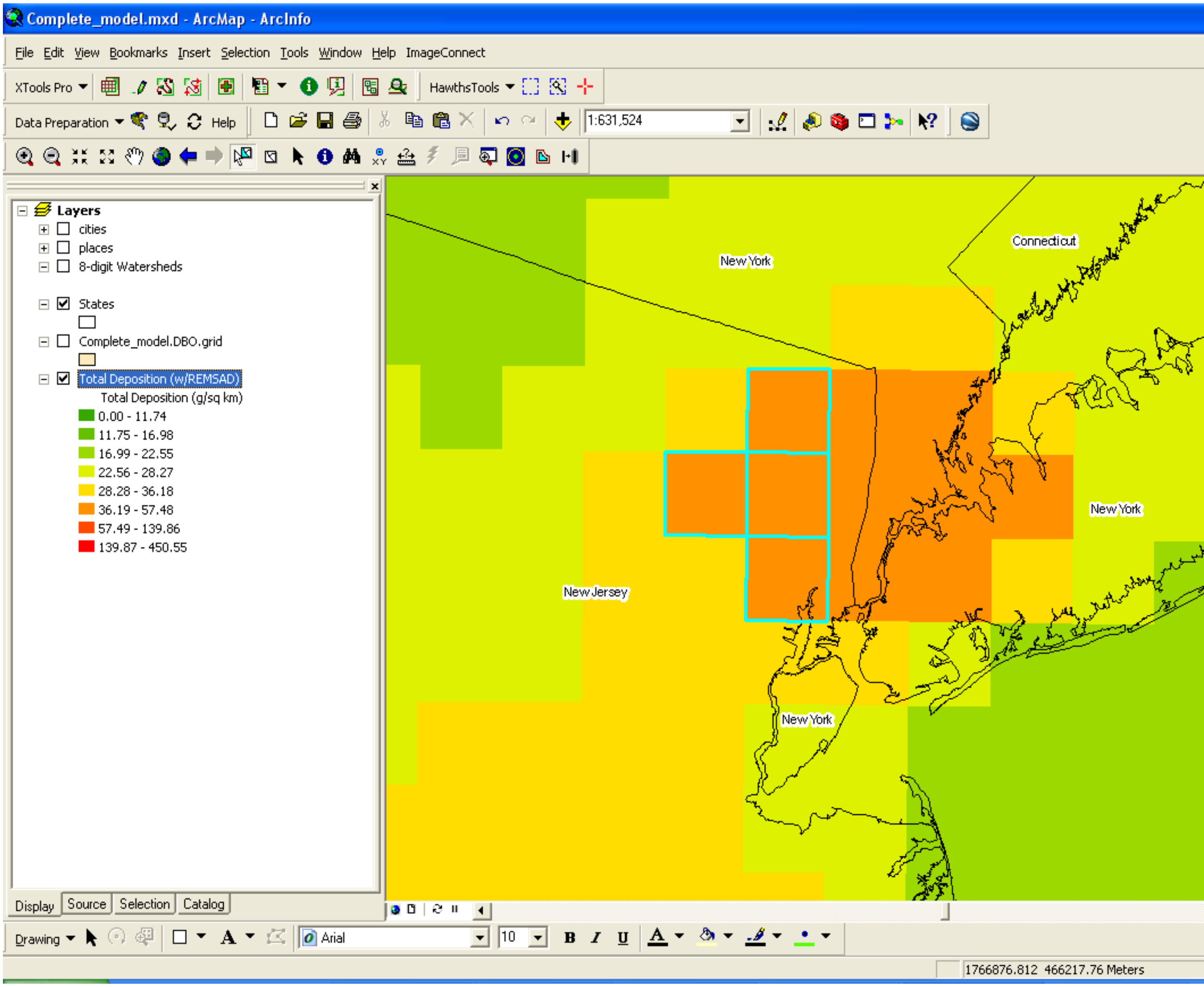
Editor
Task: Create New Feature
Target:
Layers
cities
places
8-digit Watersheds
States
Complete_model.DBO.grid
Total Deposition (w/REMSAD)
Total Deposition (g/sq km)
0.00 - 11.74
11.75 - 16.98
16.99 - 22.55
22.56 - 28.27
28.28 - 36.18
36.19 - 57.48
57.49 - 139.86
139.87 - 450.55
Display
Source
Selection
Drawing
Arial
10
1853736.277 483122.108 Meters


New Jersey (grams)
Total mercury = 594,220.5 g. Total Area = 19,309.69 Sq km.
Legend
BG_Avg_of_REMSAD_CTM-GRAHM-GEOSCHEM_Boundary 309,020
Other sources 142,260.25
PA_Other_Sources 53,361.17
NJ_Other_Sources 34,986.96
PA_Other_utilities 19,755.74
NJ_Counties_bordering_NY/NJ_Harbor 17,915.12
BG_Re-emission 16,921.27
52%
2.85%
3.01%
3.32%
5.89%
8.98%
23.94%



New Jersey (surrounding states) (grams)
Total mercury = 594,220.5 g. Total Area = 19,309.69 Sq km.
Legend
BG_Avg_of_REMSAD_CTM-GRAHM-GEOSCHEM_Boundary 309,020
Pennsylvania 102,777.71
New Jersey 74,073.49
Other sources 39,646.2
Maryland 25,150.66
BG_Re-emission 16,921.27
New York 13,726.24
Delaware 11,117.46
Connecticut 1,787.49
52%
.3%
1.87%
2.31%
2.85%
4.23%
6.67%
12.47%
17.3%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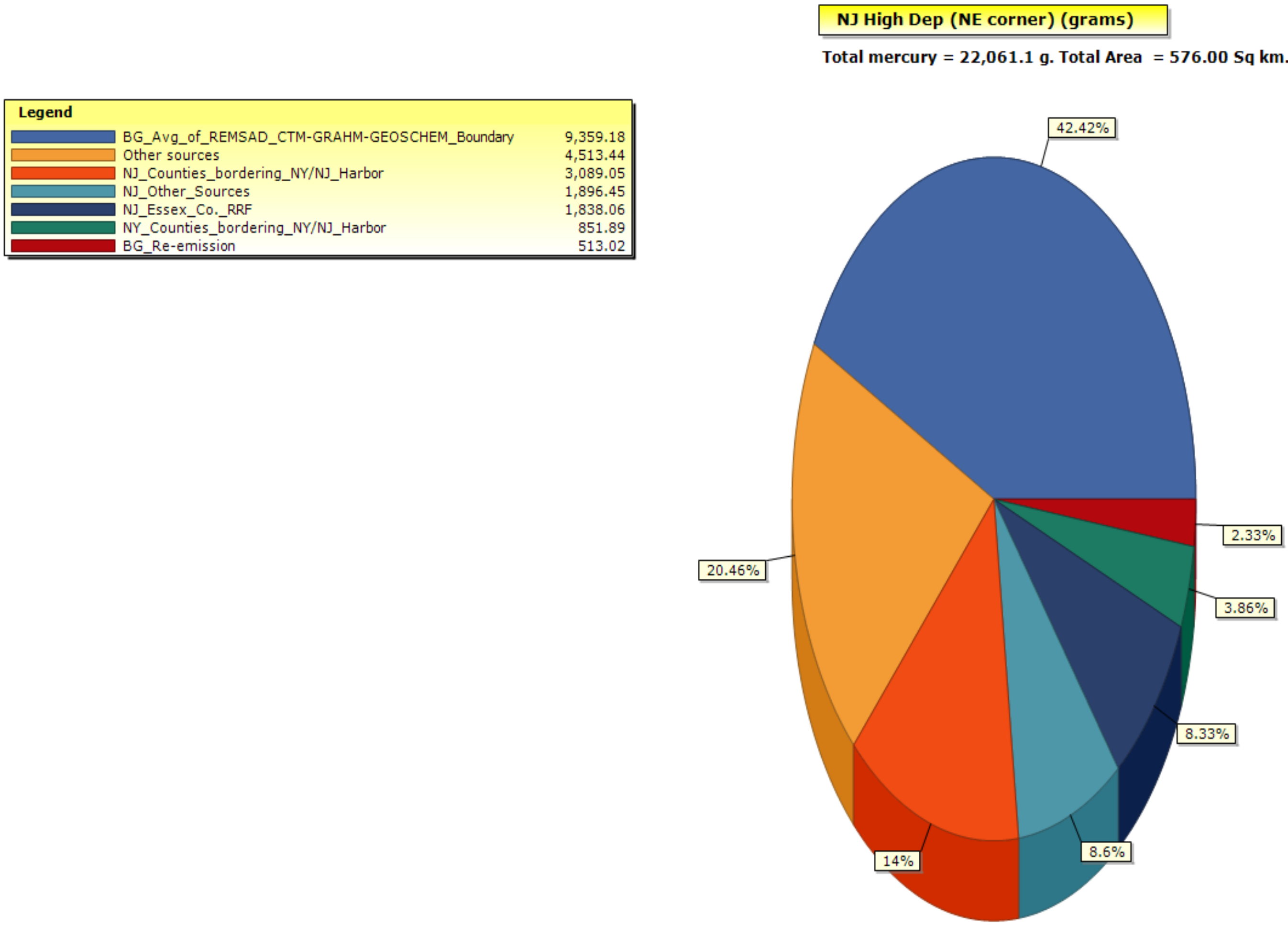
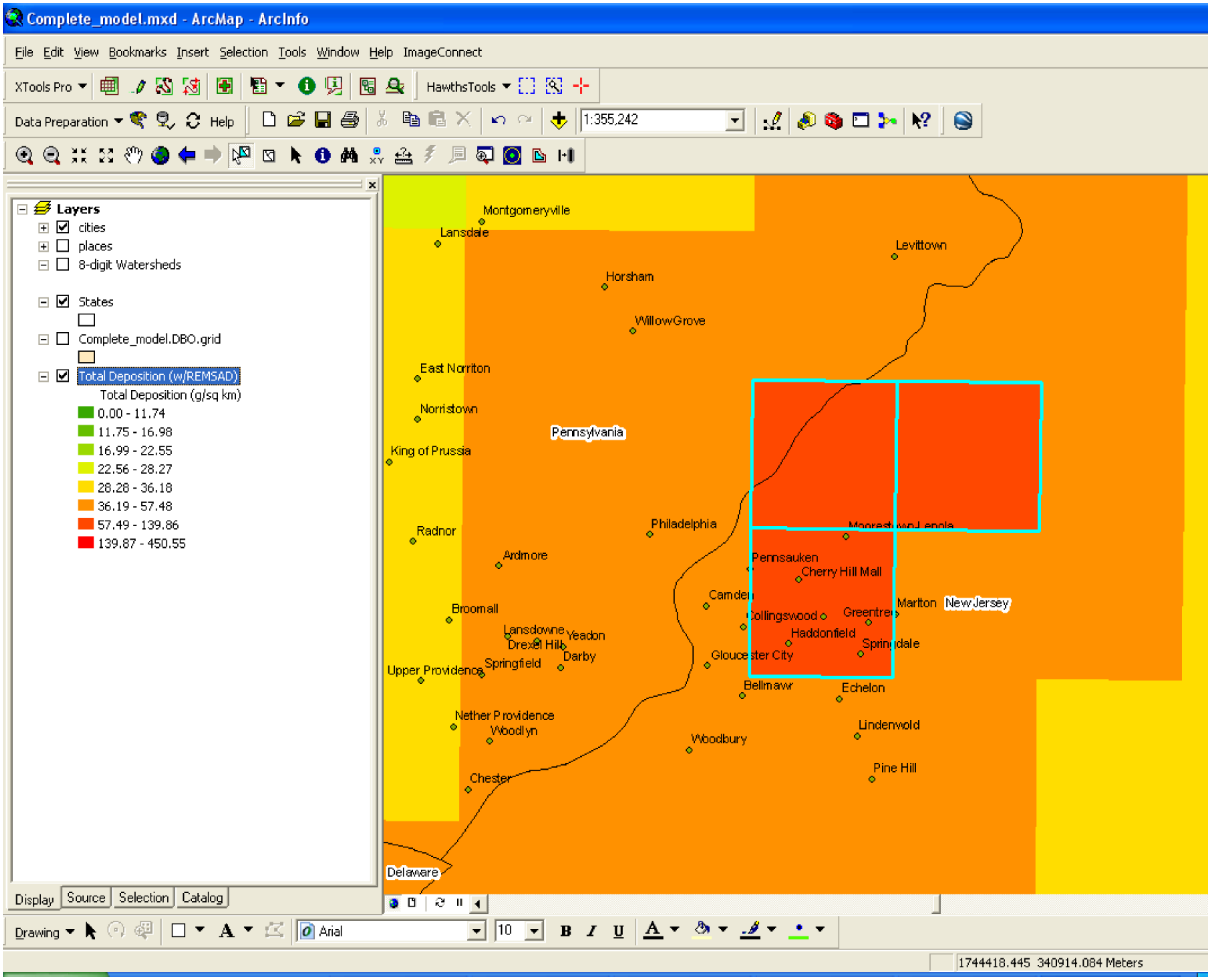
File Edit View Bookmarks Insert Selection Tools Window Help ImageConnect
XTools Pro
HawthsTools
Data Preparation
Help
1:631,524
Layers
cities
places
8-digit Watersheds
States
Complete_model.DBO.grid
Total Deposition (w/REMSAD)
Total Deposition (g/sq km)
0.00 - 11.74
11.75 - 16.98
16.99 - 22.55
22.56 - 28.27
28.28 - 36.18
36.19 - 57.48
57.49 - 139.86
139.87 - 450.55
Display
Source
Selection
Catalog
Connecticut
New York
New York
New Jersey
New York
Drawing
Arial
10
1766876.812 466217.76 Meters


NJ High Dep (NE corner) (grams)
Total mercury = 22,061.1 g. Total Area = 576.00 Sq km.
Legend
BG_Avg_of_REMSAD_CTM-GRAHM-GEOSCHEM_Boundary 9,359.18
Other sources 4,513.44
NJ_Counties_bordering_NY/NJ_Harbor 3,089.05
NJ_Other_Sources 1,896.45
NJ_Essex_Co._RRF 1,838.06
NY_Counties_bordering_NY/NJ_Harbor 851.89
BG_Re-emission 513.02
42.42%
2.33%
3.86%
8.33%
8.6%
14%
20.46%



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File Edit View Bookmarks Insert Selection Tools Window Help ImageConnect
XTools Pro
HawthsTools
Data Preparation
Help
1:355,242
Layers
cities
places
8-digit Watersheds
States
Complete_model.DBO.grid
Total Deposition (w/REMSAD)
Total Deposition (g/sq km)
0.00 - 11.74
11.75 - 16.98
16.99 - 22.55
22.56 - 28.27
28.28 - 36.18
36.19 - 57.48
57.49 - 139.86
139.87 - 450.55
Montgomeryville
Lansdale
Levittown
Horsham
WillowGrove
East Norriton
Norristown
Pennsylvania
King of Prussia
Philadelphia
Radnor
Ardmore
Pennsauken
Cherry Hill Mall
Camden
Marlton
New Jersey
Broomall
Collingswood
Haddonfield
Lansdowne
Yeadon
Drexel Hill
Darby
Springfield
Upper Providence
Bellmawr
Echelon
Nether Providence
Woodlyn
Woodbury
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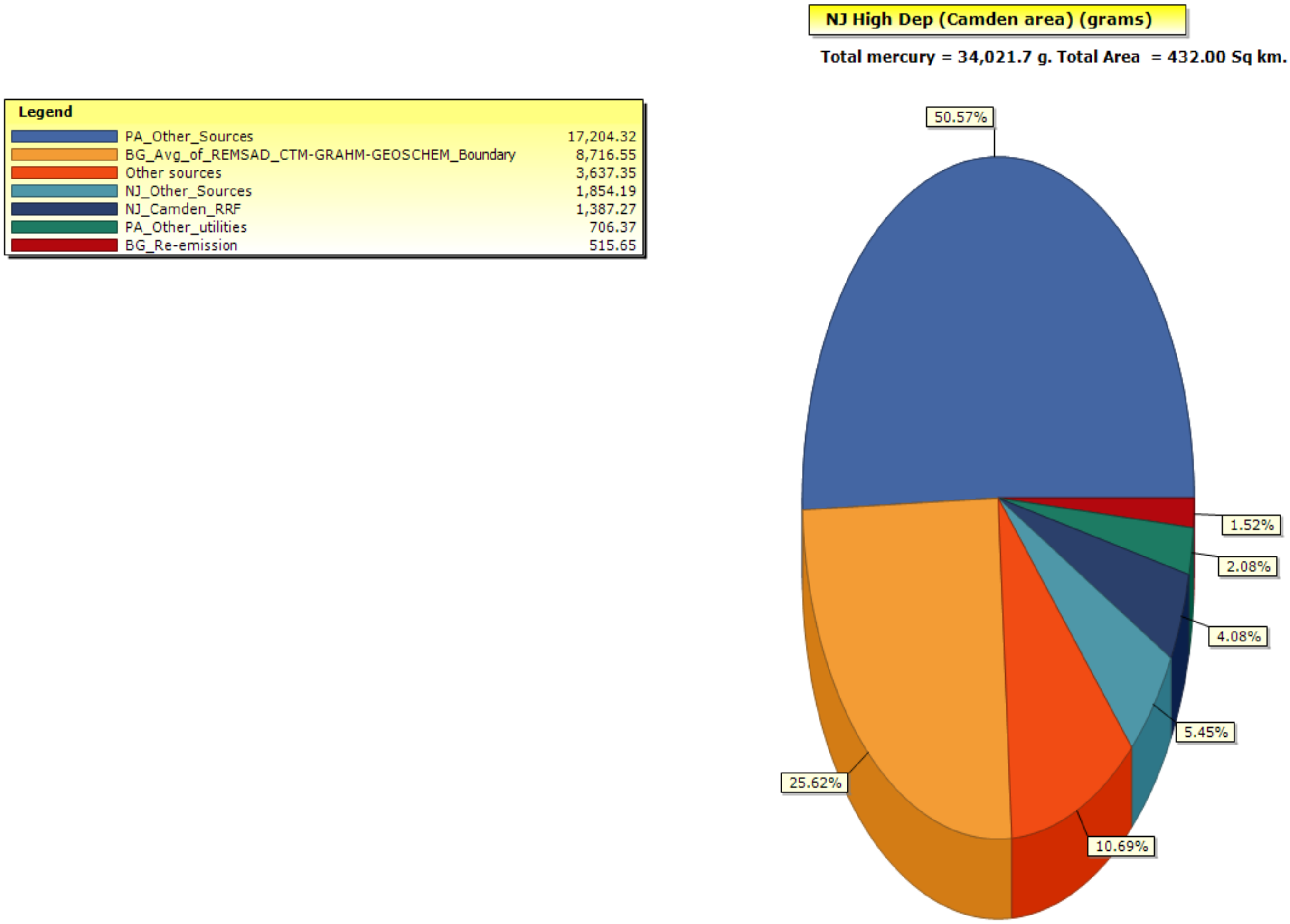
Chester
Delaware
Display Source Selection Catalog
Drawing
Arial
10
1744418.445 340914.084 Meters


NJ High Dep (Camden area) (grams)
Total mercury = 34,021.7 g. Total Area = 432.00 Sq km.
Legend
PA_Other_Sources 17,204.32
BG_Avg_of_REMSAD_CTM-GRAHM-GEOSCHEM_Boundary 8,716.55
Other sources 3,637.35
NJ_Other_Sources 1,854.19
NJ_Camden_RRF 1,387.27
PA_Other_utilities 706.37
BG_Re-emission 515.65
50.57%
1.52%
2.08%
4.08%
5.45%
25.62%
10.69%

TOTAL MAXIMUM DAILY LOADS FOR POLYCHLORINATED BIPHENYLS (PCBs) FOR ZONES 2 - 5 OF THE TIDAL DELAWARE RIVER

Delaware River Basin Commission

DELAWARE • NEW JERSEY
PENNSYLVANIA • NEW YORK
UNITED STATES OF AMERICA

DELAWARE RIVER BASIN COMMISSION
WEST TRENTON, NEW JERSEY

December 2003

Acknowledgements

This report was prepared by the Delaware River Basin Commission staff: Carol R. Collier, Executive Director. Dr. Thomas J. Fikslin and Dr. Namsoo Suk were the principal authors of the report. Dr. Fikslin is the Head of the Commission's Modeling & Monitoring Branch. Dr. Suk is a Water Resources Engineer/Modeler in the Modeling & Monitoring Branch. Significant technical contributions were made by Gregory J. Cavallo, Dr. Daniel S. L. Liao, Dr. Ronald A. MacGillivray, and John R. Yagecic. Richard W. Greene is gratefully acknowledged for his efforts in summarizing fish tissue data for PCBs, and for providing Figures 2 and 3 of the report. Technical recommendations were provided by the Commission's Toxic Advisory Committee and its TMDL Policies and Procedures Subcommittee.

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New Jersey Department of Environmental Protection
Pennsylvania Department of Environmental Protection
U.S. Environmental Protection Agency, Region II
U.S. Environmental Protection Agency, Region III
Rutgers University
Limno-Tech, Inc.

Suggested Citation

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EXECUTIVE SUMMARY

Introduction

On behalf of the states of Delaware, New Jersey and Pennsylvania, and in cooperation with the Delaware River Basin Commission, the United States Environmental Protection Agency Regions II and III (EPA) establish these total maximum daily loads (TMDLs) for polychlorinated biphenyls (PCBs) in the Delaware River Estuary. EPA establishes these TMDLs in order to achieve and maintain the applicable water quality criteria for PCBs designed to protect human health from the carcinogenic effects of eating the contaminated fish now found in the Delaware Estuary. In accordance with Section 303(d) of the Clean Water Act (CWA) and its implementing regulations, these TMDLs provide allocations to point sources (WLAs) discharging PCBs as well as allocations to nonpoint sources (LAs) of PCBs, and an explicit margin of safety to account for uncertainties. This TMDL report and its appendices set forth the basis for these TMDLs and allocations and discusses follow up strategies that will be necessary to achieve these substantial reductions of PCBs. EPA will continue to work with the Commission and the States to develop enhanced Stage 2 PCB TMDLs based on information to be collected and analyzed over the next several years. While EPA acknowledges that implementation of these TMDLs will be difficult and may take decades to fully achieve, the establishment of these TMDLs sets forth a framework and specific goals to protect human health and restore the Delaware River from the effects of PCB pollution.

Background

The states of Delaware, New Jersey and Pennsylvania have identified the Delaware Estuary as impaired on their respective lists pursuant to Section 303(d) of the CWA. The States identified the impairments based on their findings of elevated levels of polychlorinated biphenyls (PCBs) in the tissue of fish caught in this portion of the Delaware River. The listing was based upon failure to attain one of the estuary's primary designated uses – fishable waters and the inherent protection of human health from consumption of unsafe fish. When water quality standards, including a numeric criterion and a designated use, are not attained despite the technology-based control of industrial and municipal wastewater (point sources), the Clean Water Act requires that the impaired water be identified on the state's Section 303(d) list of impaired waters and that a total maximum daily load (TMDL) be developed. A TMDL expresses the maximum amount of a pollutant that a water body can receive and still attain standards. Once the load is calculated, it is allocated to all sources in the watershed – point and nonpoint – which then must reduce loads to the allocated levels in order to achieve and maintain the applicable water quality standards.

For management purposes, the Delaware River Estuary has been designated by the Delaware River Basin Commission (also referred to in this report as the Commission) as that section of the main stem of the Delaware River and the tidal portions of the tributaries thereto, between the head of Delaware Bay (River Mile 48.2) and the head of the tide at Trenton, New Jersey (River Mile 133.4). The portion of the Delaware where the river meets the sea, the estuary is characterized by varying degrees of salinity and complex water movements affected by river flows, wind and ocean tides. A map of the estuary showing the water quality management zones 2 through 5 that comprise the tidal Delaware River appears on the following page.

In the late 1980s, the states of Delaware, New Jersey and Pennsylvania began issuing fish consumption advisories for portions of the Delaware Estuary due to elevated concentrations of PCBs measured in fish tissue. Today, the states' advisories cover the entire estuary and bay. The advisories range from a no-consumption recommendation for all species taken between the C&D Canal and the Delaware-Pennsylvania border to consumption of no more than one meal per month of striped bass or white perch in Zones 2 through 4. Why the need for such advisories? PCBs are classified as a probable human carcinogen by the U.S. Environmental Protection Agency (EPA). They also have been shown to have an adverse impact on human reproductive and immune systems and may act as an endocrine disruptor.

PCBs are a class of synthetic compounds that were typically manufactured through the progressive chlorination of batches of biphenyl to achieve a target percentage of chlorine by weight. Individual PCB compounds called congeners can have up to 10 chlorine atoms attached to a basic biphenyl structure consisting of two connected rings of six carbon atoms each. There are 209 patterns in which chlorine atoms may be attached, resulting in 209 possible PCB compounds. These compounds can be grouped into "homologs" defined by the number of chlorine atoms attached to the carbon rings. Thus, for example, PCB compounds that contain five chlorine atoms comprise a homolog referred to as pentachlorobiphenyls or penta-PCBs.

Blue Marsh Reservoir
Reading
Pottstown
Green Lane
Lake Galena
Trenton
RM 133.4
RM 108.4
Zone 2
Marsh Creek Reservoir
Pennsylvania
Philadelphia
Camden
Geist
Zone 4
RM 95
RM 78.83
Zone 3
Wilmington
Hoopes Res.
New Jersey
Maryland
Zone 5
Salem
C & D Canal
Union Lake
RM 48.23
Zone 6
Delaware
Dover
Delaware Bay
Milford
RM 0
Lewes
Atlantic Ocean
N
0 5 10
Miles

Due to their stable properties, PCBs were used in hundreds of industrial and commercial applications, including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics and rubber products; and in pigments, dyes and carbonless copy paper, among other applications. PCB laden oil is often associated with electrical transformers. More than 1.5 billion pounds of PCBs were manufactured in the United States before their manufacture and general use, with a few small exceptions, was banned by the EPA in the late 1970s. Existing uses in some electrical equipment continue to be allowed. PCBs are hydrophobic and thus tend to bind to organic particles in sediment and soils. Their chemical stability allows them to persist in the environment for years. PCBs accumulate in the tissue of fish and other wildlife, entering the organism through absorption or ingestion. As a result, they may be present in fish and marine mammals at levels many times higher than in the surrounding water and at levels unsuitable for human consumption.

The water quality standards that form the basis for the TMDLs are the current Delaware River Basin Commission water quality criteria for total PCBs for the protection of human health from carcinogenic effects. These criteria were identified as the TMDL targets by a letter dated April 16, 2003 from the Regional Administrators of EPA Regions II and III to the Executive Director of the Delaware River Basin Commission. The criteria are 44.4 picograms per liter in Zones 2 and 3, 44.8 picograms per liter in Zone 4 and the upper portion of Zone 5, and 7.9 picograms per liter in lower Zone 5. The more stringent criterion in the lower estuary reflects a higher fish consumption rate utilized by the Commission and the State of Delaware, based upon an evaluation of fish consumption there. A consequence of the inconsistency in criteria is that a critical location occurs at the point between upper and lower Zone 5 where the criteria drop sharply from 44.8 picograms per liter to 7.9 picograms per liter. Achieving the lower standard in a portion of Zone 5 will require much larger reductions in the upper zones than would otherwise be necessary. Significant reductions are required throughout the estuary in any case, as ambient concentrations of PCBs in the water body currently exceed the criteria by two to three orders of magnitude.

PCBs have been dispersed throughout the environment by human activity. They enter the atmosphere as a gas, spill into soils and waterways, and lodge in sediments. They continue to be generated as a byproduct by some industrial processes. Thus, the sources of PCBs to the Delaware Estuary are multiple. They include loadings from the air, the main stem Delaware River above Trenton, tributaries to the Delaware both above and below Trenton, industrial and municipal point source discharges, combined sewer overflows, and storm water runoff, including runoff from seriously contaminated sites. For purposes of these TMDLs, point sources include all municipal and industrial discharges subject to regulation by the NPDES permit program, including combined sewer overflows and stormwater discharges. All other discharges are considered nonpoint sources.

Interagency and Interstate Cooperation

In the latter half of the 1990s, the three estuary states included the portions of Zones 2 through 5 of the Delaware River within their borders on their lists of impaired waters under Section 303(d) of the Clean Water Act, due to elevated levels of PCBs in estuary fish. This action required the states and EPA to agree upon a schedule for establishing TMDLs for PCBs. In order to provide for a single TMDL adoption process for the shared water body, one date for completion of the TMDLs – December 15, 2003 – was established. This is the date set for completion of the PCB TMDLs by a 1997 Consent Decree and Settlement Agreement in an action entitled *American Littoral Society and Sierra Club v. the United States Environmental Protection Agency et al.*, which established dates for adoption of TMDLs in the Delaware

Estuary. Because a unified legal process for issuance of the TMDLs could not be accomplished easily through independent state actions, at the request of the states, EPA agreed to issue the TMDLs for PCBs in the estuary on the states' behalf.

In the spring of 2000, the states and EPA asked the Delaware River Basin Commission to take the lead in developing the technical basis for the estuary PCB TMDLs. In consultation with its Toxics Advisory Committee (TAC), comprised of representatives from the states, EPA Regions II and III, municipal and industrial dischargers, academia, agriculture, public health, environmental organizations and fish and wildlife interests, the Commission undertook to do so. In September of 2000, the Commission established a panel of scientists expert in the modeling of hydrophobic contaminants such as PCBs to advise it and the TAC on the development of the complex hydrodynamic and water quality model required to develop the TMDLs. The Commission also initiated an extensive program of scientific investigations and data collection efforts. In response to a recommendation of the expert panel, in May of 2002 the Commission engaged a consultant experienced in water quality modeling to work closely with Commission staff to develop the model.

In consultation with the TAC, the Commission staff and the Delaware Estuary Program developed a strategy to address contamination of the Delaware Estuary by PCBs (the PCB Strategy). The PCB Strategy includes the following nine components: (1) determination of the water quality targets for PCBs; (2) characterization of PCB concentrations in the estuary ecosystem; (3) identification and quantification of all point and nonpoint sources and pathways of PCBs; (4) determination of the transport and fate of PCB loads to the estuary; (5) calculation of the TMDLs, including the wasteload and load allocations required for a TMDL;(6) development of an implementation plan to reduce PCBs entering the estuary; (7) initiation of an effort to increase public awareness of toxicity issues in the estuary; (8) long-term monitoring of PCB concentrations in air, water and sediments of the estuary; and (9) long-term monitoring of PCB concentrations in living resources of the estuary and impacts upon living resources of the estuary. The PCB Strategy is one component of EPA's reasonable assurance that the allocations of these TMDLs will ultimately be achieved.

In a cooperative effort, EPA, the Commission, the states, municipal and industrial dischargers and other stakeholders, have now completed the PCB Strategy components necessary for issuance of the TMDLs. This TMDL report discusses the identification of water quality targets for the TMDLs and calculation of the TMDLs in more detail below (components 1 and 5). An extensive program of scientific investigations and data collection efforts to further characterize PCB sources, concentrations and pathways in the estuary ecosystem is ongoing (components 2, 3 and 8). To date, studies have been assembled or undertaken on fish tissue, ambient water quality, sediment, air deposition, air-water exchange, bioaccumulation pathways, tributary loading, point source discharges, and stormwater loadings. The transport and fate of PCBs in the estuary ecosystem (component 4) has been established through the development of a complex mathematical model, also discussed below. The Commission has established a TMDL Implementation Advisory Committee (IAC) to develop strategies over the next two years for reducing PCB loads to the estuary and achieving the TMDLs (component 6). An effort to educate the public about toxicity issues in the estuary (component 7) began with a series of public information sessions in February and March of 2001. In October of 2002, a coalition of municipal and industrial dischargers sponsored a science symposium, at which the various scientific investigators presented their findings to date. A meeting among regulators and stakeholders on the TMDLs and their regulatory implications was held in April, 2003 (see Appendix 1).

EPA with assistance from the Commission and the States held three informational meetings about the proposed TMDLs on September 22, 24 and 25, 2003, and conducted a public hearing on the proposed

TMDLs on October 16, 2003. During the public comment period EPA received numerous written comments in addition to the testimony provided at the public hearing. EPA considered those comments in finalizing these TMDLs and prepared a Response to Comments document that is part of the record of this decision. Ongoing education initiatives regarding these issues continue to be carried out through the Delaware Estuary Program and the Partnership for the Delaware Estuary.

Development of the TMDLs

The three-year schedule for development of the estuary TMDLs by December 15, 2003 resulted in a decision to develop the TMDLs using a staged approach. The Stage 1 and Stage 2 TMDLs will each comply fully with EPA requirements and guidance. The staged approach will provide for adaptive implementation through execution of load reduction strategies while additional monitoring and modeling efforts proceed. As discussed below, these Stage 1 TMDLs are based on the best water quality-related monitoring data, modeling and scientific analysis available at this time. EPA expects that additional monitoring data and modeling results will be collected and developed following issuance of the Stage 1 TMDLs. This additional information will enable a more refined analysis to form the basis of the Stage 2 TMDLs. EPA will continue to work with the Commission and the States to develop and complete the Stage 2 TMDLs. Until the Stage 1 TMDLs are amended or replaced, the Stage 1 TMDLs are the final and effective TMDLs for purposes of the CWA.

EPA's regulations implementing Section 303(d) of the Clean Water Act provide that a TMDL must be expressed as the sum of the individual wasteload allocations (WLA) for point sources plus the load allocation (LA) for nonpoint sources plus a margin of safety (MOS). This definition may be expressed as the equation: TMDL = WLA + LA + MOS. A separate TMDL has been developed for each water quality management zone of the estuary. Each of the TMDLs must provide for achievement of the applicable water quality standards within the zone and also must ensure that water quality in downstream zones is adequately protected.

In June of 2002, the expert panel recommended that for the TMDLs to be completed by December 15, 2003, the Commission should develop and calibrate a water quality model for only one of the PCB homologs and use it to develop a set of TMDLs from which TMDLs for total PCBs could be extrapolated. This process became known as Stage 1 of an iterative approach to establishing the TMDLs for PCBs in the estuary. Since pentachlorobiphenyls were the dominant homolog in fish tissue monitored in the estuary, and since ambient data indicated that throughout the estuary this homolog represents approximately 25 percent of the total PCBs present, the pentachlorobiphenyls (penta-PCBs) were selected. Based on these recommendations and a review of the available data, EPA adopted this approach. Thus, based on the best scientific estimates and analysis as discussed further below, the Stage 1 TMDLs, WLAs and LAs for total PCBs were extrapolated, using a factor of 4 to 1, from TMDLs and allocations developed for penta-PCBs. EPA, the Commission and the States expect that the Stage 2 TMDLs, WLAs and LAs will be based on the summation of the PCB homolog groups, without the use of extrapolation. The partners intend that the Stage 2 TMDLs will be developed using all additional data collected and modeling performed after the establishment of these TMDLs. It is anticipated that the Stage 2 WLAs will be based upon an enhanced allocation methodology. When they are developed and established, the partners expect that the Stage 2 TMDLs will replace the Stage 1 TMDLs.

The TMDLs were calculated using both a conservative chemical model and a penta-PCB water quality model run until equilibrium was observed. This procedure was used because hydrophobic contaminants like PCBs sorb to particulates and interact significantly with the sediments of the estuary. Sediments respond more slowly than the water column to changes in PCB concentrations in either medium, and allowing the water column and sediments to come into equilibrium is necessary to ensure that water quality criteria are met. A modified version of the TOXI5 water quality model was used (DRBC 2003a and 2003b). Both models utilized outputs from a DYNHYD5 hydrodynamic model that was extended from the head of the Delaware Bay to the mouth of the bay (DRBC 2003a). The models cycled inputs from the period February 1, 2002 until January 31, 2003. This one-year period was considered to be representative of long-term hydrological conditions for two important reasons. First, during this period flows of the two main tributaries to the estuary – the main stem Delaware River and the Schuylkill River – reasonably represent the flows during the approximately 90- and 70-year periods of record, respectively, for the two tributaries (see Figures 5 and 6). Precipitation data during the one-year period also is in good agreement with the long-term precipitation record with respect to the number and percentage of days with and without precipitation. Upon the recommendation of the expert panel, in order to maintain hydrological and meteorological relationships between the various inputs to the model, effluent flows were based upon data for the same one-year period, rather than on design flows. The same approach was used for inputs such as air temperature, water temperature and wind speed.

Penta-PCB TMDLs were calculated in a four step procedure. The procedure initially utilized the conservative chemical model to establish contribution factors for two of the major tributaries to the estuary – the Delaware River at Trenton and the Schuylkill River – and each of the four estuary zones. The contribution factor reflects the influence of the loading attributable to each tributary or zone on the PCB concentration at the critical location in Zone 5 where the water quality criterion for PCBs drops from 44.4 picograms per liter to 7.9 picograms per liter. If the criterion at this location is met, then the water quality criteria are met throughout the estuary. Once the contribution factors were established, the TMDLs were calculated over a one-year period to determine an annual median loading. The annual median was used in order to be consistent with the model simulations and the 70-year exposure for human health criteria. A description of the four steps follows:

1. Calculate the contribution factor (CF) for each of the estuary zones and two of the tributary model boundaries to that critical location in Zone 5 where the criterion of 7.9 picograms per liter (approximately 2.0 picograms per liter of penta-PCBs) is controlling.

2. Calculate the allowable loadings from each of these sources that will still ensure that the water quality target is met at the critical location utilizing the CF and the proportion of the assimilative capacity at the critical location allocated to each source. Iteratively determine the amount of assimilative capacity (in picograms per liter) provided by the sediments, and add this concentration to the penta-PCB water quality target. Recalculate the allowable loadings from each of the six sources using this revised water quality target.

3. Utilize the water quality model for penta-PCBs with these allowable loadings to confirm that the sediment concentrations have reached pseudo-steady state, and confirm that the penta-PCB water quality target is met in Zones 2 through 5.

4. Estimate the gas phase concentrations that would be in equilibrium with the penta-PCB water concentrations when the water quality targets are met, include these in the water quality model, and then iteratively adjust the gas phase concentration of penta-PCBs in the air until the water quality target is reached.

For purposes of calculating the TMDLs, EPA notes that the model assumes that PCB loads from the ocean, the C&D Canal, the major tributaries and the air are at levels that ensure that the water quality standards are achieved, rather than at the actual levels, which in every case are higher. Thus, in developing the TMDLs, both the ocean boundary and the C&D Canal boundary were set to an equivalent penta-PCB criterion of 2.0 picograms per liter, corresponding to a total PCB water quality criterion of 7.9 picograms per liter, the criterion in lower Zone 5 where each of these water bodies meets the estuary. Other programs and factors beyond the scope of these TMDLs will be necessary to reduce PCB loads from these sources. The actual concentration at the mouth of the Bay exceeds the water quality criterion by one to two orders of magnitude, while the current concentration at the C&D Canal boundary exceeds this value by almost three orders of magnitude. Similarly, the Schuylkill and Delaware River boundary conditions were set to 9.68 picograms per liter and 10.72 picograms per liter respectively, although the actual concentrations in the two water bodies at the point where they enter the estuary are 1800 and 1600 picograms per liter respectively. The air concentration of PCBs also is considered by the model. When water quality standards are achieved, however, there will be no significant net exchange between dissolved PCBs in water and gas phase PCBs in the air. Because gas phase PCBs do not provide a load to the estuary when the water quality standards are met, they are not allocated any portion of the TMDLs. Actual air concentrations in the estuary region, however, currently exceed the levels required for equilibrium by two orders of magnitude.

The TMDLs for penta-PCBs calculated with the four-step procedure were 64.34 milligrams per day for Zone 2, 4.46 milligrams per day for Zone 3, 14.18 milligrams per day for Zone 4, and 12.02 milligrams per day for Zone 5. The higher TMDLs in Zones 2 and 4 are the result of the assimilative capacity provided by the flows from the main stem Delaware River in Zone 2 and the Schuylkill River in Zone 4.

Each of the zone TMDLs was then apportioned into three components: the WLA, LA and MOS. EPA has based these allocations upon recommendations of the Commission's TAC. The committee recommended that an explicit MOS of 5% be allocated in each estuary zone, and further recommended that for the Stage 1 TMDLs, the proportion of the TMDLs allocated to WLAs and LAs should be based upon the current proportion of loadings from the various PCB source categories to each of the zones during the one-year cycling period of February 1, 2002 to January 31, 2003.

Stage 1 TMDLs were then calculated using the ratio of penta-PCBs to total PCBs observed in ambient water samples collected during five surveys that encompass the range of hydrological conditions typically observed in the estuary. Median penta- to total PCB ratios of 0.23, 0.25, 0.25 and 0.23 were observed in Zones 2 to 5, respectively. For these TMDLs, a fixed value of 0.25 was used for all zones to scale up the zone-specific TMDLs, WLAs, LAs and MOSs. The following table summarizes the TMDLs for each estuary zone for total PCBs as well as the allocations to WLAs, LAs and the MOSs.

Stage 1 TMDLs for Total PCBs

Estuary Zone	TMDL	WLA	LA	MOS
	mg/day	mg/day	mg/day	mg/day
Zone 2	257.36	11.03	233.46	12.87
Zone 3	17.82	5.67	11.26	0.89
Zone 4	56.71	6.54	47.34	2.84
Zone 5	48.06	15.62	30.04	2.40
Sum	379.96	38.86	322.10	19.00

In the proposed PCB TMDLs, the LAs contained the loadings from municipal separate storm sewer systems (MS4s), which are regulated as NPDES point sources. Loadings from MS4s are now identified and included as part of the WLAs with the LAs adjusted accordingly.

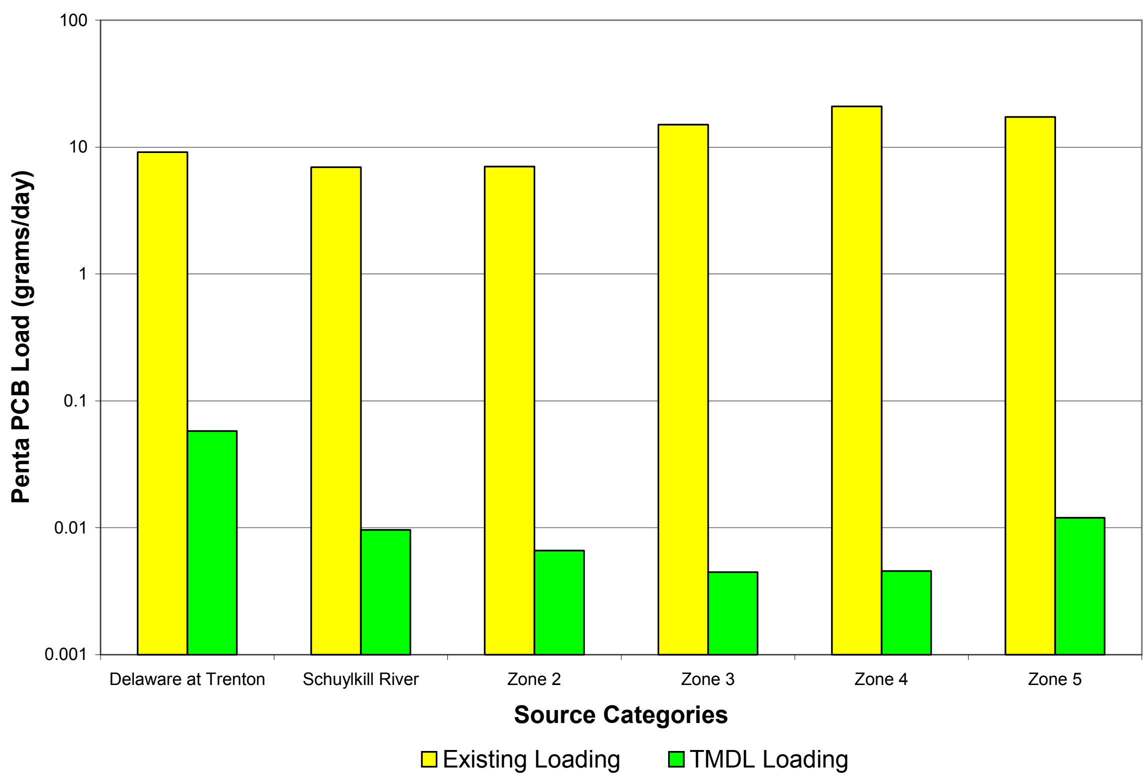
The portion of the TMDLs allocated to non-point sources is higher than the portion of the TMDLs allocated to point sources in all four estuary zones when the current loading proportions are used as the basis for allocating the zone TMDLs. This result is not unexpected. Nonpoint sources include, among other sources, contaminated sites, non-point source runoff, and the two main tributaries, which contribute greater loadings to the zones than the NPDES discharges (including stormwater discharges and combined sewer overflows) that comprise the point source contributions. The proportions vary between zones, with Zones 3 and 5 having the highest allocations to point sources (approximately 30%).

Implementing Load Reductions to Achieve the TMDLs

The following figure compares the current penta-PCB loadings for water quality management Zones 2 through 5 and the Delaware and Schuylkill Rivers to the Stage 1 TMDL penta-PCB loadings:

The chart illustrates that existing loadings are roughly two to three orders of magnitude higher than the TMDLs. Achieving the water quality standards for PCBs in the Delaware Estuary will require significant reductions from current loadings from both point and nonpoint sources. In addition to reducing PCB loads from sources discharging directly to the estuary, reductions from sources in the non-tidal portion of the river, local and regional air emissions, and sources contributing to elevated PCB concentrations in the Atlantic Ocean will be necessary to achieve and maintain the applicable PCB standards and adequately protect human health.

These TMDLs focus on the instream conditions which need to be met to protect human health and establish individual wasteload allocations (WLAs) for 142 point sources that are deemed to be potential sources of penta-PCBs (see Appendix 2). In order to begin to implement these TMDLs, the NPDES permitting authorities believe that it is appropriate for these discharges to receive non-numeric water quality-based effluent limits (WQBELs) consistent with their



respective individual WLAs when their NPDES permits are reissued or otherwise modified.[1] The Delaware River Basin Commission may also separately require actions to implement these TMDLs. On December 3, 2003, the DRBC passed Resolution 2003-27 authorizing and directing the Executive Director to require dischargers and other responsible parties to conduct monitoring and/or other data collection and analyses to further characterize point and non-point loadings of toxic contaminants, including PCBs, to the Delaware Estuary for purposes of developing and implementing TMDLs or actions under the DRBC Water Quality Regulations. Requirements in NPDES permits or through DRBC regulations may include: (1) the use of Method 1668A, a highly sensitive analytical method capable of detecting very small amounts of PCBs, for any monitoring of influent and effluent to better quantify individual PCB congeners; (2) the development of a PCB minimization plan; and (3) implementation of appropriate PCB minimization measures identified through PCB minimization planning. The respective NPDES permitting authorities will determine the discharge-specific effluent controls consistent with the WLAs, and may consider the following factors: the relative loading of penta-PCBs, the type of discharge, the type of analytical method used to measure the 19 penta-PCB congeners, the number of the penta-PCB congeners that were detected, and the proportion of the zone WLA that is represented by the discharge loading. When Stage 2 TMDLs are issued, it is expected that all NPDES permits issued, reissued or modified will include numeric or non-numeric requirements consistent with the Stage 2 WLAs for each zone. The implementation strategy for the development of NPDES permit effluent limits consistent with the WLAs is discussed at greater length in Appendix 3 of this report.

Reducing point source discharges alone will not be sufficient to achieve the estuary water quality standards. Runoff from contaminated sites is a significant source of PCBs. For these TMDLs, EPA and the states evaluated forty-nine contaminated sites within the estuary watershed (see Appendix 4). The combined loads from these sites are estimated to comprise 57.09% of the loading to Zone 3; 38.04% of the loading to Zone 4 and 46% of the loading to Zone 5 (see Table 7). Contaminated sites make up a much smaller proportion of the loading in Zone 2 – only 0.42% – because of the lack of contaminated sites and the significant influence in this zone of the main stem Delaware River. In order to achieve the reductions required by the TMDLs, EPA and the States would need to undertake a concerted effort using the authorities under CERCLA, RCRA and the related state statutes.

Significant reductions will be required in point and nonpoint sources to the major tributaries. Currently, concentrations of PCBs in the Schuylkill and Delaware Rivers where they discharge to the estuary are approximately 1800 and 1600 picograms per liter, respectively. Even if all the TMDLs are achieved, the water quality criteria in the estuary will not be attained until the

[1]The States have indicated that a typical permit will include, among other requirements, the requirement to monitor the discharge using Method 1668A and to implement a PCB pollutant minimization program. The regulation at 40 CFR 122.44(k) allows the use of non-numeric, BMP-based WQBELs where a BMP is determined to be an appropriate means to control pollutants under specified circumstances. Where a permit uses such BMP WQBELs, compliance may be achieved by implementing such requirements.

concentration in the Schuylkill is reduced to 9.68 picograms per liter and the concentration in the main stem Delaware River falls to 10.72 picograms per liter.

Although the ocean boundary has a less significant influence on Zone 5 than does the main stem Delaware River, sources contributing to elevated PCB concentrations in the Atlantic Ocean also must be reduced. The concentration of PCBs in ocean water at the estuary boundary currently exceeds the water quality criterion for Delaware Bay by one to two orders of magnitude.

Finally, air concentrations of PCBs in the region currently are two orders of magnitude above the concentration required to achieve equilibrium and halt contributions of PCBs from the air to the water. Air monitoring data collected at several sites in New Jersey, Delaware and Pennsylvania suggest that PCB air concentrations primarily result from local sources. Thus, source reductions must focus on PCBs in the local and regional airshed.

These reductions cannot be achieved overnight. The Commission has created a TMDL Implementation Advisory Committee (IAC), with members from each of the estuary states, the major municipal dischargers and two of the smaller ones, industrial dischargers, and fishery, wildlife and environmental organizations. EPA Regions II and III also will participate, in an advisory role. The IAC will meet over a two-year period to develop creative and cost-effective strategies for achieving load reductions in the short term and attaining water quality standards in the longer term. Notably, some large dischargers already have undertaken studies to track down PCBs on a voluntary basis. However, due to the scope and complexity of the problem that has been defined through development of these TMDLs, achieving the estuary water quality standards for PCBs will take decades.

Additional Information

A notice about the proposed TMDLs for PCBs in the Delaware Estuary was published in the *Federal Register* and in each of the estuary states' registers on September 2, 2003. Additional notices were published in regional newspapers. The notices contained details about the comment period which closed on October 21, 2003, informational meetings and the public hearing for these TMDLs. Details about these events were also provided on the Commission's web site, at http://www.drbc.net. EPA received oral testimony from 8 groups or individuals and written comments from 30 groups or individuals from various sectors. After consideration of all data and information contained in the public comments, a document providing responses to these public comments has been prepared and appropriate revisions made to these final TMDLs.

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1. INTRODUCTION

1.1 Regulatory Background

Total Maximum Daily Loads or TMDLs are one of the approaches defined in the Clean Water Act (CWA) for addressing water pollution. The first approach of the CWA that was implemented by the U.S. EPA was the technology-based approach to controlling pollutants (Section 301). This approach was implemented in the mid-1970s through the issuance of permits authorized under Section 402 of the Act. The approach specified minimum levels of treatment for sanitary sewage and for various categories of industries. The other water quality-based approach was implemented in the 1980s. This approach includes water quality-based permitting and planning to ensure that standards of water quality established by States are achieved and maintained.

Section 303(d) of the Act establishes TMDLs as one of the tools to address those situations where the technology-based controls are not sufficient to meet applicable water quality standards for a water body (U.S. EPA, 1991). They are defined as the maximum amount of a pollutant that can be assimilated by a water body without causing the applicable water quality standard to be exceeded. The basis of a TMDLs is thus the water quality standard. This standard may be established for the protection of aquatic life, human health through ingestion of drinking water or resident fish, or wildlife. Under Section 303(d), States are required to identify, establish a priority ranking, and to develop TMDLs for those waters that do not achieve or are not expected to achieve water quality standards approved by the U.S. EPA. Federal regulations implementing Section 303(d) of the Clean Water Act provide that a TMDL must be expressed as the sum of the individual wasteload allocations for point sources (WLA) plus the load allocation for nonpoint sources (LA) plus a margin of safety (MOS). This definition may be expressed as the equation:

$$TMDL = WLA + LA + MOS$$

1.2 Study Area

Zones 2 through 5 of the Delaware River (Figure 1) have been designated by the Delaware River Basin Commission as that section of the mainstem of the Delaware River and the tidal portions of the tributaries thereto, between the head of Delaware Bay (River Mile 48.2) and the head of the tide at Trenton, New Jersey (River Mile 133.4). Zones 2 to 4 are bordered by the State of New Jersey and the Commonwealth of Pennsylvania. Zone 5 is bordered by the States of Delaware and New Jersey. Zone 2 encompasses the area from the head of the tide at Trenton to River Mile 108.4. Zone 3 encompasses the area from River Mile 108.4 to River Mile 95.0. Zone 4 encompasses the area from River Mile 95.0 to River Mile78.8, and Zone 5 encompasses the area from River Mile 78.8 to the head of Delaware Bay.

In 1989, the Delaware River Basin Commission created the Estuary Toxics Management Program to address the impact of toxic pollutants in the tidal Delaware River (also called the Delaware Estuary. The mission of this program was to develop policies and procedures to control the discharge of substances toxic to humans and aquatic biota from point sources discharging to this water body. In 1993, Commission staff identified several classes of pollutants and specific chemicals that were likely to exceed water quality criteria currently being developed under the program. These included polychlorinated biphenyls (PCBs), volatile organics, metals, chlorinated pesticides, chronic toxicity and acute toxicity. This list was subsequently included in the Delaware Estuary Programs's Comprehensive Conservation and Management Plan in 1996.

Beginning in the late 1980's, concern regarding the possible contamination of fish populations that were rebounding as dissolved oxygen levels improved resulted in a number of investigations of contaminant levels in resident and anadromous fish species. These species included the white perch, channel catfish and striped bass. The studies subsequently identified PCBs and several chlorinated organics at elevated levels (DRBC, 1988; Greene and Miller, 1994; Hauge et al, 1990; U.S. F&WS, 1991 and 1992). These studies and other data collected by DRBC and the states resulted in fish consumption advisories being issued by all three states bordering the Estuary beginning in 1989. These advisories were principally based upon PCB contamination; and to a lesser degree, chlorinated pesticides such as DDT and its metabolites DDE and DDD, and chlordane.

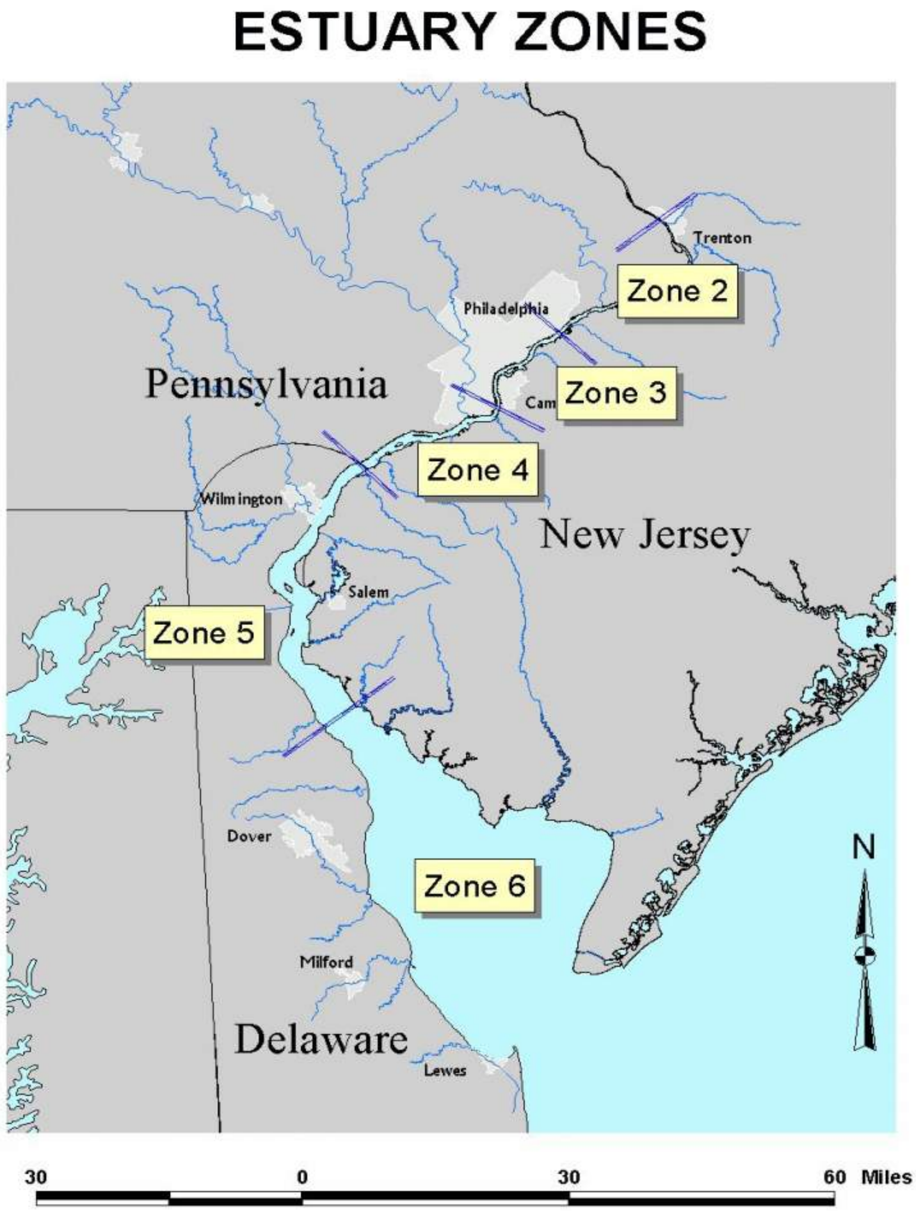
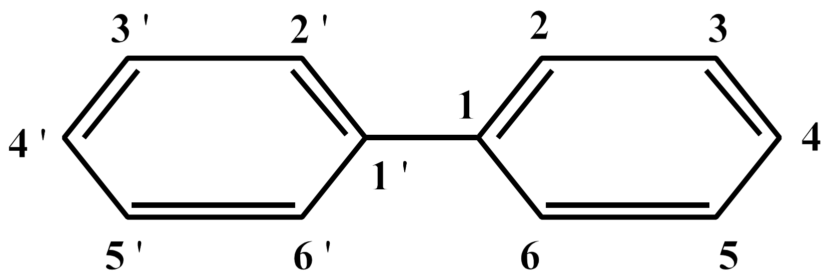


Figure1: Water Quality Zones of the Delaware River.

1.3 Polychlorinated biphenyls (PCBs)

Polychlorinated biphenyls (PCBs) are a class of man-made compounds that were manufactured and used extensively in electrical equipment such as transformers and capacitors, paints, printing inks, pesticides, hydraulic fluids and lubricants. Individual PCB compounds called congeners can have up to 10 chlorine atoms on a basic structure consisting of two connected rings of carbon atoms. There are 209 possible patterns where chlorine atoms can occur resulting in 209 possible PCB compounds. PCB compounds can be grouped by the number of chlorine atoms attached to the carbon rings. These groups are called homologs. PCB compounds containing five chlorine atoms, for example, are referred to as the pentachlorobiphenyls or penta-PCBs.



Although their manufacture and use were generally banned by federal regulations in the late 1970s, existing uses in electrical equipment and certain exceptions to the ban were allowed. In addition, PCBs may also be created as a by-product in certain manufacturing processes such as dye and pigment production. PCBs are hydrophobic, sorbing to organic particles such as soils and sediments and concentrating in the tissues of aquatic biota either directly or indirectly through the food chain.

1.4 Applicable Water Quality Standards and Numerical Target for TMDLs

Water quality criteria for toxic pollutants including Total PCBs were adopted on October 23, 1996 by the Commission and are included in Section 3.30 of Article 3 of the Commission's water quality regulations. The criteria do, however, differ between the zones of the estuary depending on the designated uses of the zone. In Zones 2 and 3, use of the water for public water supply after reasonable treatment is a designated use. In these two zones, human health criteria are based upon exposure to PCBs through ingestion of water and fish taken from these estuary zones. In Zone 4 and upper Zone 5 (above River Mile 68.75), use of the water for public water supply is not a designated use. In these two zones, human health criteria are based solely upon exposure to PCBs through ingestion of fish taken from these estuary zones. Current DRBC criteria assume a consumption rate of 6.5 grams per day (~½ pound meal every 35 days) is used in Zones 2, 3, 4, and the upper portion of Zone 5. This rate was the default national rate for freshwater fish consumption utilized in EPA's 1980 methodology for deriving human health criteria, and was used by the States in developing their freshwater water quality criteria. A consumption rate of 37.0 grams per day (~½ pound meal every 6 days) is used in the lower portion of Zone 5. This consumption rate is consistent with the rate utilized by the State of Delaware following a recent evaluation of available information on consumption rates.

Although criteria to protect aquatic life from acute and chronic effects of PCBs and criteria to protect human health from the carcinogenic and non-carcinogenic of PCBs were adopted, the most stringent standards adopted were based upon protecting human health from the carcinogenic effect of PCBs through ingestion of water and fish taken from these estuary zones (Table 1). The applicable DRBC water quality criteria are therefore:

Table 1: DRBC Water Qaulity Criteria for Zones 2 to 5 of the Delaware Estuary

Estuary Zone	**Exposure Route**	
	Water & Fish Consumption	Fish Consumption Only
Zone 2 & 3	44.4 picograms per liter	
Zone 4 and upper Zone 5		44.8 picograms per liter
Lower Zone 5		7.9 picograms per liter

These criteria are currently the same as criteria adopted by State of New Jersey and the Commonwealth of Pennsylvania. The DRBC criteria for the lower portion of Zone 5 is also the same as the water quality criteria adopted by the State of Delaware; however, a slightly higher and therefore less stringent criteria was adopted for the upper portion of Zone 5.

As part of the effort to establish TMDLs for total PCBs and to update adopted water quality standards based upon new information, the Commission's Toxic Advisory Committee did consider adopting wildlife criteria for total PCBs and revising the human health criteria for carcinogens. The latter was necessitated by two actions by the U.S. Environmental Protection Agency: the updating of the cancer potency factor (i.e., slope factor), one of the key elements used to calculate the criterion, in December 1998 (U.S. EPA, 1998); and the issuance of revised guidance on developing human health water quality criteria in October 2000 (U.S. EPA, 2000). In February 2003, the Toxics Advisory Committee recommended adoption of a revised human health criterion for carcinogens Zones 2 through 5, and that the NJ state-wide water quality criterion for total PCBs for the Delaware Estuary (Zones 2 though 6) for the protection of wildlife be adopted following the impending adoption by the New Jersey Department of Environmental Protection. Refinement of the wildlife criterion based upon site-specific data could then proceed. The Committee also recommended that the Commission consider alternatives to the current risk level of 10^{-6} (another element in the calculation of the human health criterion for carcinogens). On March 19, 2003, the Commission passed a resolution authorizing public participation of the revised human health criteria for carcinogens and directing the Toxics Advisory Committee to initiate development of site-specific wildlife criteria for Zones 2 through 6 of the Delaware River. Since the basis for the TMDLs could be affected by criteria adoption by either the NJDEP or the DRBC, and the TMDLs must be based on the water quality criteria in force when the TMDL is approved, the Commission further directed that the Commission's Executive Director request U.S. Environmental Protection Agency Regions II and II to identify which criteria should be the basis for the TMDLs at this time. In a letter dated April 16, 2003, both U.S. EPA regional offices indicated that the current and applicable DRBC water quality criteria should be the basis for the TMDLs being developed by Commission staff for December 2003.

1.5 Listing under Section 303(d)

Until recently, the attainment of water quality standards for total PCBs could not be measured directly in samples of ambient water so States relied on measurements of contaminants in fish fillet samples collected from the estuary. This is possible since the amount in fish tissue is related to the water concentration by a factor known as the bioaccumulation factor or BAF. This factor accounts for the uptake and concentration of a contaminant in the tissue either directly from the water or through the target species' food chain. Current and historical concentrations of total PCBs in filet samples collected from channel catfish in Zones 2 through 5 and white perch collected in Zones 2 through 6 are shown in Figures 2 and 3. While tissue concentrations have declined since the banning in the late 1970s, current levels in both species are approximately 800 to 1000 parts per billion (ppb), two to three orders of magnitude above the level expected to occur when estuary waters are at the water quality standards for total PCBs.

New Jersey was the first state to issue an advisory recommending no consumption of channel catfish in 1989. This was followed in 1990 by Pennsylvania who recommended no consumption of white perch, channel catfish and American eel caught between Yardley, PA above Trenton to the Pennsylvania/Delaware border.

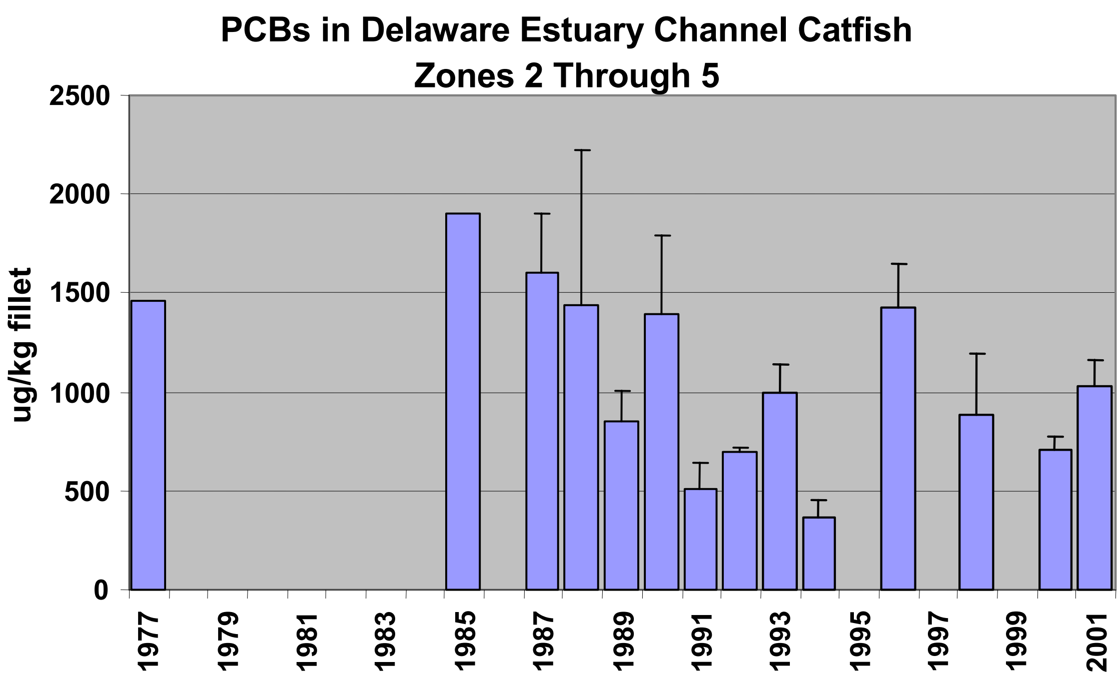


Figure 2: PCB concentrations in fillet samples of channel catfish collected from Zones 2 through 5 of the Delaware Estuary from 1977 to 2001. Units are in micrograms per kilogram or parts per billion (ppb). Graphs provided by Richard Greene, Delaware DNREC.

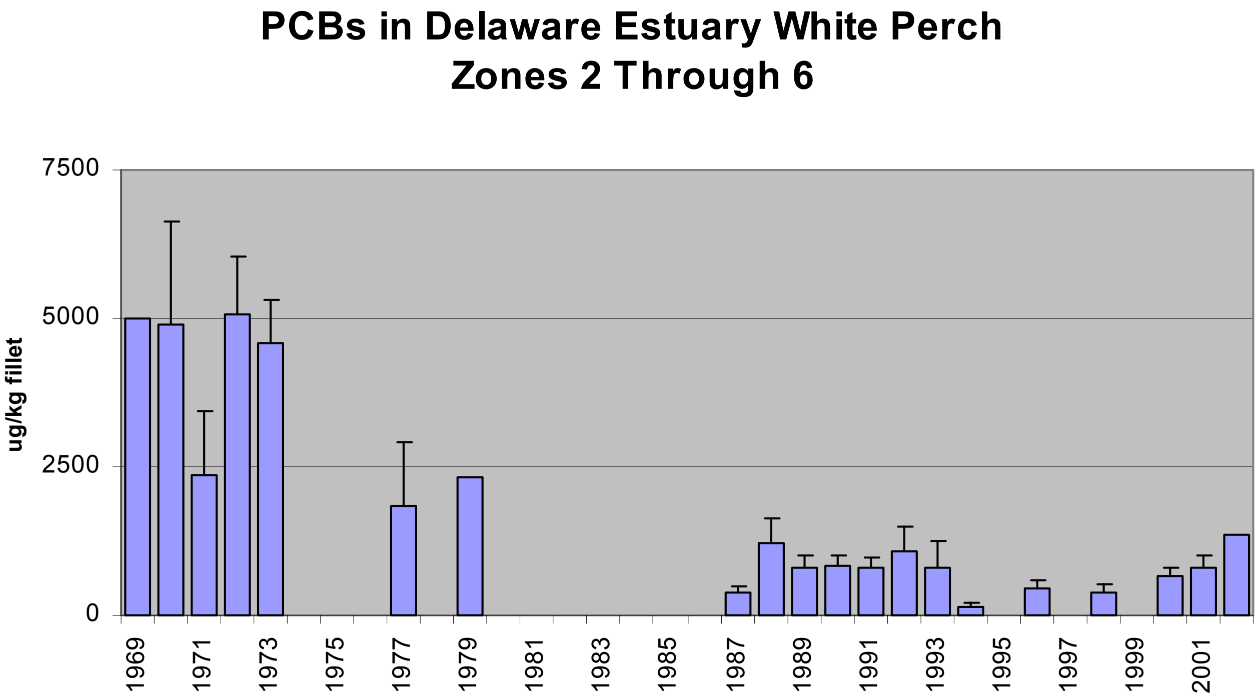


Figure 3: PCB concentrations in fillet samples of white perch collected from Zones 2 through 6 of the Delaware Estuary from 1977 to 2001. Units are in micrograms per kilogram or parts per billion (ppb). Graphs provided by Richard Greene, Delaware DNREC.

After conducting additional sampling in the lower tidal river, Delaware issued an advisory in 1994 recommending no consumption of striped bass, white perch, channel catfish and white catfish caught between the Pennsylvania/Delaware border and the Chesapeake and Delaware Canal (C&D Canal). These advisories remained essentially unchanged until 1999, when Pennsylvania recommended limited consumption (one meal per month) of white perch and striped bass, and one meal every two months for channel catfish in the same advisory area. Delaware meanwhile, increased the restrictions on consuming fish caught between the Pennsylvania/Delaware border and the C&D Canal to all fish species, and reduced the recommended consumption of striped bass, white perch, white catfish, channel catfish and American eel to one meal per year. In January 2003, New Jersey issued updated state-wide and water body-specific advisories due to PCB contamination that included Zones 2 through 5. These advisories contained recommended meal frequencies for two levels of lifetime cancer risk (10^{-5} and 10^{-6}), and for high risk individuals (children, infants, pregnant or nursing women, and women of child-bearing age). Recommended consumption (at a risk level of 10^{-6}) of channel catfish in Zones 2 to 4 is 6 meals per year while no consumption of striped bass in Zone 4 and all finfish in Zone 5 is recommended.

The New Jersey Department of Environmental Protection subsequently included Zones 2 through 5 of the Delaware River for PCBs in a report entitled "1998 Identification and Setting of Priorities for Section 303(d) Water Quality Limited Waters in New Jersey", September 15, 1998. By Memorandum of Agreement between U.S. Environmental Protection Agency, Region II and the New Jersey Department of Environmental Protection dated May 12, 1999, the NJDEP agreed to develop, public notice, respond to comments and submit to EPA, Total Maximum Daily Loads (TMDLs) for PCBs in the Delaware Estuary by September 15, 2003. This date was subsequently extended to December 31, 2003 in a revised Memorandum of Agreement dated September 16, 2002.

The Delaware Department of Natural Resources & Environmental Control (DNREC) first listed Zone 5 of the Delaware River for toxics in 1996. In 1998, DNREC again listed Zone 5 of the Delaware River, but specifically listed PCBs as a pollutant contributing to the impairment. In Attachment B to a Memorandum of Agreement between the Delaware Department of Natural Resources & Environmental Control and the U.S. Environmental Protection Agency, Region III dated July 25, 1997, DNREC agreed to complete the TMDLs for Zone 5 by December 31, 2002 provided that funding and certain other conditions were met. The MOA also provided that EPA Region III establish the TMDLs if DNREC was unable to complete the TMDLs by the date set forth in Attachment B. In a Consent Decree between the American Littoral Society, the Sierra Club, and the U.S. Environmental Protection Agency dated July 31, 1997, the U.S. EPA agreed to establish TMDLs by December 15, 2003 of the year following the state's deadline.

In a Consent Decree between the American Littoral Society and Public Interest Group of Pennsylvania, dated April 9, 1997, EPA agreed to approve or establish TMDLs for all water quality-limited segments listed on the 1996 303(d) list as impaired by sources other than acid mine drainage by April 9, 2007. PADEP listed Zones 2 to 5 of the Delaware River (included in areas E and G of the Pennsylvania State Water Plan) for priority organics including PCBs in both 1996 and 1998. No date has been set by PADEP for completion of the TMDLs for these water quality segments. The TMDLs currently being proposed will satisfy the commitments that resulted from these listings for each respective state.

1.6 Pollutant sources, loadings and ambient data

The basis for the inclusion of Zones 2 through 5 on the Section 303(d) lists of the estuary states was the levels of PCBs observed in fish tissue collected from the estuary. This was necessary since the common analytical method used for ambient water and wastewater had detection limits for total PCBs in the 500 nanogram per liter range. New Jersey was the first state to issue an advisory recommending no consumption of channel catfish in 1989. This was followed in 1990 by Pennsylvania who recommended no consumption of white perch, channel catfish and American eel caught between Yardley, PA above Trenton to the Pennsylvania/Delaware border. After conducting additional sampling in the lower tidal river, Delaware issued an advisory in 1994 recommending no consumption of striped bass, white perch, channel catfish and white catfish caught between the Pennsylvania/Delaware border and the Chesapeake and Delaware Canal C&D Canal.

Loadings of PCBs to the estuary from point sources were first investigated by the Delaware River Basin Commission in 1996 and 1997 (DRBC, 1998a). This study utilized a new analytical methodology (high resolution gas chromatography/high resolution mass spectrometry or HRGC/HRMS) and focused on discharges from five large sewage treatment plants and one industrial facility. The results of the study found effluent concentrations ranging from 1,430 to 45,140 picograms/L during dry weather, and 2,020 to 20,240 pg/L during wet weather. The dry weather sample from the effluent of the industrial facility had a concentration of 10,270 pg/L. In the spring of 2000, the Commission required 94 NPDES permittees to conduct monitoring of their continuous and stormwater discharges for 81 PCB congeners utilizing analytical methods that could achieve picogram per liter detection limits. The results of this monitoring were submitted to the Commission over the next two years, and indicated that loadings to the estuary zones from point sources were significant and of such magnitude to cause the water quality standards to be exceeded. Figures 4 and 5 present the cumulative loadings of total PCBs from continuous point source discharges during dry weather and wet weather, respectively.

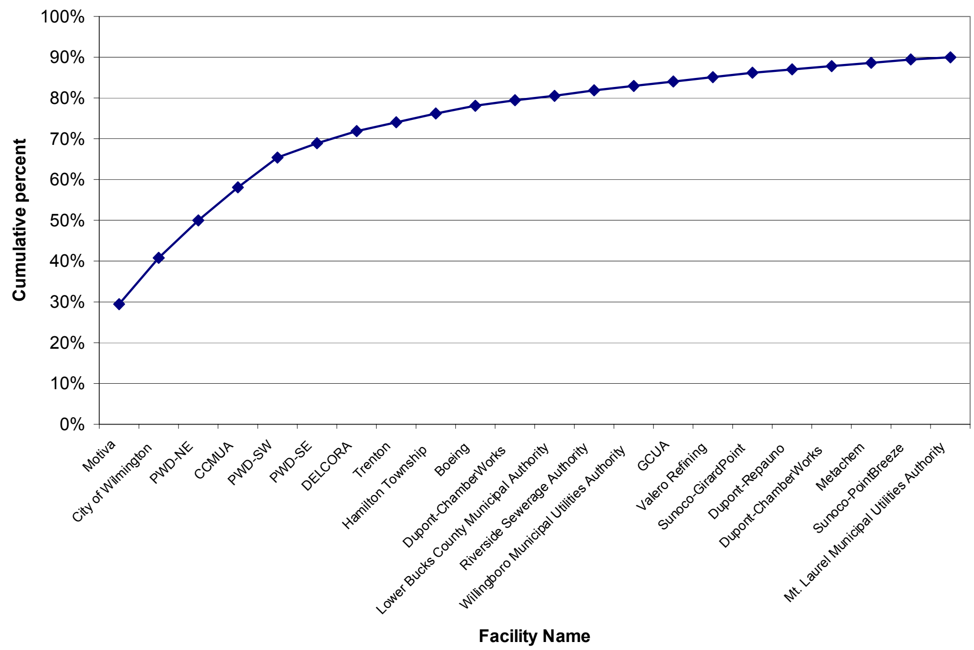


Figure 4: Cumulative loadings from continuous point source dischargers when the discharge was not influenced by precipitation (dry weather loadings).

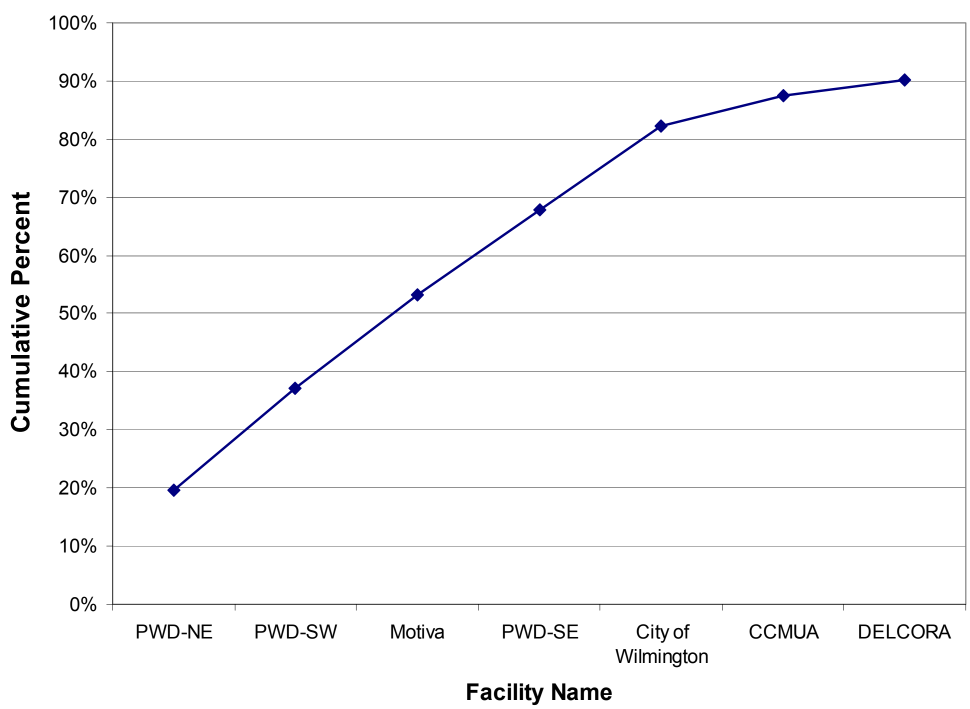


Figure 5: Loadings from continuous point source dischargers when the discharge was influenced by precipitation (wet weather loadings).

Beginning in September 2001, the Commission initiated surveys of the ambient waters of Zones 2 through 5 using the more sensitive HRGC/HRMS method (Method 1668A) and larger sample volumes to obtain data on PCBs adsorbed to particulate matter, PCBs adsorbed to dissolved organic matter and truly dissolved PCBs. Each survey involves sampling on a transect across the river at 15 locations between the C&D Canal and Trenton. A total of nine surveys have been completed to date with a focus on periods of intermediate and high inflows to the estuary. Figure 6 presents the results from surveys conducted in September 2001, May 2002, October 2002 and March 2003. Low flow conditions occurred during the September and October surveys (~3,300 cfs). Intermediate flow conditions (~16,000 cfs) occurred during the May survey, and high flow conditions (36,100 cfs) occurred during the March survey. As indicated in this graph, ambient concentrations of total PCBs based upon the sum of 124 congeners analyzed ranges between 443 and 10,136 pg/L with the highest values generally occurring during lower river inflows.

1.7 Other Required Elements for Establishing TMDLs

1.7.1 Seasonal variation

TMDL regulations at Section 130.32(b)(9) require the consideration of seasonal variation in environmental factors that affect the relationship between pollutant loadings and water quality impacts. Although seasonal variation is usually not as important for TMDLs based upon human health criteria for carcinogens since the duration for this type of criteria is a 70 year exposure, the Stage 1 TMDLs for total PCBs do include seasonal variation in several ways. Due to the interaction of PCBs with the sediments of the estuary, long-term model
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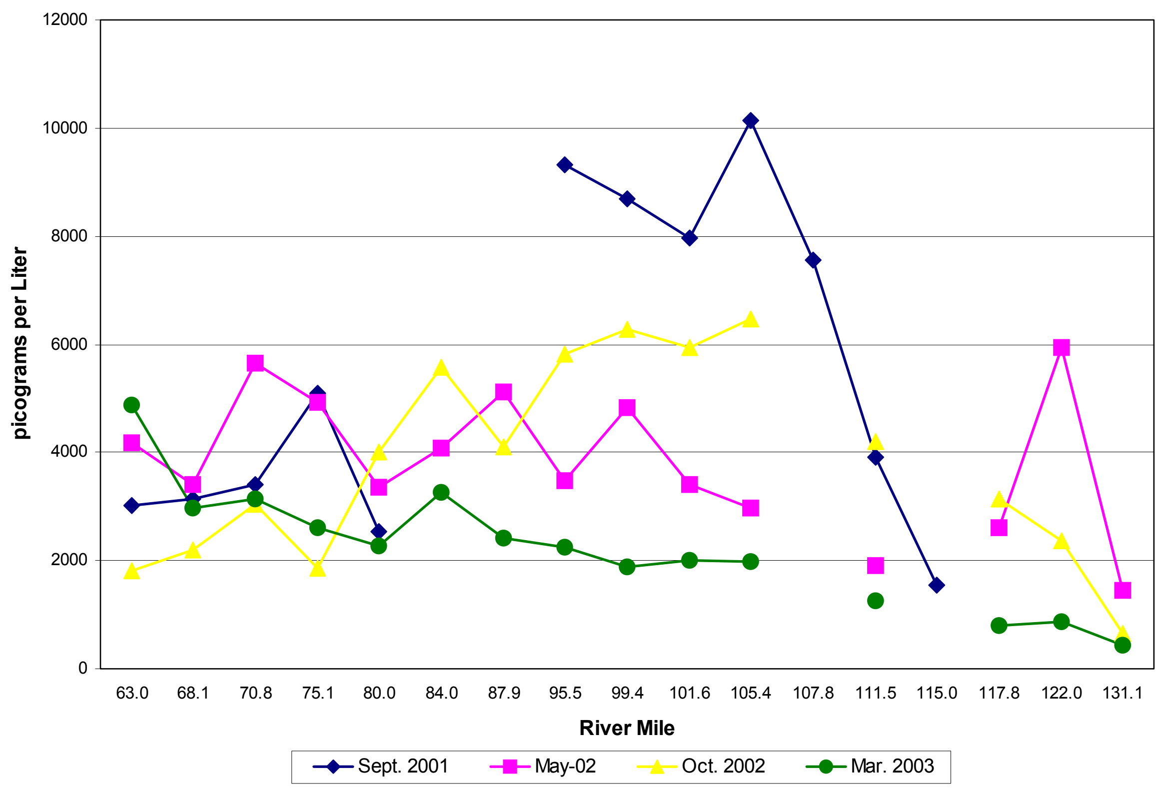

Figure 6: Concentrations of 124 PCB congeners at 15 locations in Zones 2 to 5 of the Delaware Estuary during varying flow conditions.

simulations were necessary to both confirm the model parameters established during the short-term calibration, and evaluate the time required for the sediments to reach pseudo steady-state with the overlying water column as loadings of PCBs were reduced.

The model will cycle model inputs from the period February 1, 2002 until January 31, 2003. This one year period is considered to be representative of long-term conditions (see Section 3.2.3.1), and is the same period utilized for long-term, decadal scale model simulations. Use of this one year cycling period, allowed consideration of seasonal variation in model input parameters such as tributary flows, tidal forcing functions, air and water temperature, wind velocity and loadings of penta-PCBs.

1.7.2 Monitoring Plan

The Delaware River Basin Commission has conducted nine surveys of the ambient waters of the Delaware Estuary between September 2001 and April 2003 to provide data for calibrating the water quality model for penta-PCBs that was used to establish the Stage 1 TMDLs. Samples collected during these surveys were analyzed using a more sensitive HRGC/HRMS method (Method 1668A) and larger sample volumes to obtain data at picogram per liter levels. The Commission plans to conduct additional surveys in both Zones 2 to 5 and in Delaware Bay (Zone 6) as part of the effort to calibrate water quality models for the other PCB homologs, and to establish and refine the TMDLs and associated WLAs and LAs for Stage 2. Contingent on available funding, the Commission plans to continue the ambient water surveys on a yearly basis to track the progress in achieving the load reductions and applicable water quality standards for PCBs.

In the spring of 2000, the Commission required 94 NPDES permittees to conduct monitoring of their continuous and stormwater discharges for 81 PCB congeners utilizing analytical methods that could achieve picogram per liter detection limits. The results of this monitoring indicated that loadings to the estuary zones from point sources were significant and of such magnitude to cause the water quality standards to be exceeded. These results have also be used to determine the need for and the frequency of additional monitoring in NPDES permits have been reissued in the last few years. Following approval of the Stage 1 TMDLs, most of the NPDES permittees included in the 2000 monitoring requirements will be required to conduct some additional monitoring using Method 1668A. These monitoring requirements will provided data in future years to assess the progress in achieving the TMDLs.

The Commission is also planning, contingent on available funding, to work cooperatively with the NJDEP and Rutgers University to continue air monitoring at Lums Pond near the western end of the C&D Canal and at a site in the NJ Pinelands which are located east of the estuary. Monitoring data at these sites and at a long-term site at Rutgers University will provided data to assess the long-term trends in regional background concentrations of PCBs (Lums Pond) and in regional concentrations in the estuary airshed.

1.7.3 Implementation Plan

Current EPA regulations do not require an implementation plan to be included with TMDLs. EPA NPDES regulations do require that effluent limitations must be consistent with approved WLAs [40 CFR Part 122.44(d)(1)(vii)(B)]. EPA regulations allow the use of non-numeric effluent limits in certain circumstances [40 CFR Part 122.44(K)]. In addition to EPA regulations, the Commission and its signatory parties currently have in place an implementation procedure for utilizing wasteload allocations and other effluent requirements formally issued by the Commission's Executive Director. This procedure has been in use for over 25 years with wasteload allocations for carbonaceous oxygen demand and other pollutants that were developed for discharges to the estuary. Section 4.30.7B.2.c.6). of the Commission regulations requires that WLAs developed by the Commission shall be referred to the appropriate state agency for use, as appropriate, in developing effluent limitations, schedules of compliance and other effluent requirements in NPDES permits.

As part of the implementation strategy, the NPDES permitting authorities believe that it is appropriate for 142 NPDES point source discharges to receive non-numeric WQBELs consistent with the WLAs. It is expected that the non-numeric WQBELs resulting from the Stage 1 WLAs require PCB minimization and reduction programs and additional monitoring using Method 1668A consistent with state and federal NPDES regulations. See Appendix 3 for details on the permit implications of this TMDL. These permit requirements are intended to expedite the reduction in PCB loadings to the estuary while Stage 2 TMDLs and WLAs are being completed.

A unique aspect of the implementation of these TMDLs is the establishment of a TMDL Implementation Advisory Committee (IAC)by the DRBC, which shall be asked to develop creative and cost-effective strategies for reducing PCB loadings and achieving the TMDLs for PCBs in the Delaware Estuary. The IAC will be encouraged to engage in creative, collaborative problem-solving. Its recommendations will be submitted to the Commission, which will consider them in consultation with all regulatory agencies whose approval is required to implement them. Each regulatory agency also will be represented on the IAC. The committee is expected to convene six times a year for two years.

1.7.4 Reasonable Assurance that the TMDLs will be Achieved

Data available to assess whether the TMDLs will be achieved include ambient water quality data collected by the Commission during routine surveys of Zones 2 through 6 of the Delaware River. Effluent quality data and source minimization plans required through NPDES permits issued by state permitting authorities will provide the basis for assessments regarding consistency with the WLAs developed or issued in Stage 1 and Stage 2. Commission regulations also require that the WLAs be reviewed and, if required, revised every five years, or as directed by the Commission. This will ensure that additional discharges of the pollutant or increased non-point source loadings in the future will be considered.

Achieving the reductions in the load allocations for tributaries will require the listing of the tributary on future Section 303(d) lists submitted by the estuary states for those tributaries that are not currently listed for impairment by PCBs, and completion and implementation of TMDLs for PCBs for those tributaries that are already listed as impaired by PCBs. Achieving the load reductions required for contaminated sites will require close coordination with the federal CERCLA programs and state programs overseeing the assessment and cleanup of these sites. In addition, the Commission has broad powers under Article 5 of the Delaware River Basin Compact (Public Law 87-328) to control future pollution and abate existing pollution in the waters of the basin including Section 2.3.5B of the Commission's Rules of Practice and Procedure (DRBC, 2002).

2. TWO STAGE APPROACH TO ESTABLISHING AND ALLOCATING TMDLs FOR PCBs

2.1 Background

Developing TMDLs for a complex pollutant in a complex estuarine ecosystem with numerous point and non-point sources is an enormous task requiring substantial levels of effort, funding and time. As discussed above, the deadlines contained in the Section 303(d) lists prepared by the States and approved by the U.S. EPA, Memoranda of Understanding, and Consent Decrees discussed above allocated five years for developing the TMDLs. A coordinated effort to develop the TMDLs was initiated in 2000 when Carol R. Collier, Executive Director of the Delaware River Basin Commission in a letter dated May 25, 2000 requested that U.S. EPA Regions II and III endorse the Commission as the lead agency in developing the TMDLs for PCBs in the Delaware Estuary. In a letter dated August 7, 2000, Region II endorsed the Commission's role as the lead agency to develop the TMDLs. An August 11, 2000 letter from Region III also acknowledge the important role of the Commission while identifying the legal constraints on the date for establishing the TMDLs. On July 26, 2000, the Commission passed Resolution 2000-13 stating that the Commission would continue its ongoing program to control the discharge of toxic substances, including PCBs, to the Delaware Estuary, and would work cooperatively with the signatory parties to the Delaware River Basin Compact and their agencies and affected parties in this effort.

2.2 Staged Approach

The complexity of a TMDL for a class of compounds such as PCBs, the limited time and data available, and the benefits of refining it through time with more data led to a decision to develop the TMDLs for PCBs in two stages consistent with EPA TMDL guidance. A staged approach provides for adaptive implementation through execution of load reduction strategies while additional monitoring and modeling efforts proceed. The approach recognizes that additional monitoring data and modeling results will be available following issuance of the Stage 1 TMDLs to enable a more refined analysis to form the basis of the Stage 2 TMDLs.

In the first stage, TMDLs and individual wasteload allocations were developed for each zone. Stage 1 WLAs were based upon a simplified methodology, while still meeting all of the regulatory requirements for establishing a TMDL. Consistent with the recommendations of an expert panel of scientists experienced with PCB modeling, these TMDLs were extrapolated from penta homolog data using the observed ratio in the Delaware Estuary of the penta homolog to total PCBs (see Section 3.4).

Stage 2 TMDLs, individual WLAs and LAs are targeted for development by December 31, 2005. Once the Stage 2 TMDLs are finalized, EPA expects the WLAs developed in Stage 2 to replace the Stage 1 WLAs. EPA expects the Stage 2 WLAs and LAs to be based on all of the monitoring data obtained through the development of the Stage 2 TMDLs, and the additional modeling that will be performed following the establishment of the Stage 1 TMDLs. Stage 2 TMDLs will also be based on the summation of the PCB homolog groups, without the use of extrapolation. It is anticipated that the Stage 2 WLAs will be based upon a more sophisticated allocation methodology than the Stage 1 WLAs, and will likely reflect application of the procedures set forth in the DRBC Water Quality Regulations.

As described in the documents released in April 2003 (Appendix 1) and following establishment of these TMDLs, the water quality-based effluent limitations (WQBELs) in NPDES permits that are issued, reissued or modified after the approval date must be consistent with the WLAs. The NPDES permitting authorities believe that these WQBELs will include non-numeric controls in the form of a best management practices (BMP) approach as the most appropriate way to identify and control discharges of PCBs consistent with the Stage 1 WLAs. Federal regulations (40 CFR Part 122.44(k)(4)) allow the use of non-numeric, BMP-based WQBELs in permits.

Guidelines describing appropriate NPDES permitting actions resulting from individual WLAs that may result following the establishment of the Stage 1 TMDLs by the U.S. Environmental Protection Agency are presented in Appendix 3. The guidelines include 1) the use of Method 1668A for any monitoring of the wastewater influent and effluent at a facility, 2) development of a PCB minimization plan, and 3) implementation of appropriate, cost-effective PCB minimization measures identified through the plan.

The identification of point source dischargers that are potentially significant sources of total PCBs is a dynamic process that depends on several factors including the availability and extent of PCB congener data for each discharge, the detection limit of the method used to analyze for PCB congeners, the flows used for each discharge, the procedure used to calculate the loadings, the location of the discharge in the estuary, and the proximity and loading of other sources of PCBs. EPA specifically requested comment on the list of significant point source dischargers, and has incorporated those comments, where appropriate, into this document (see Section 3.5). Expectations as to how the NPDES permits may appropriately address these specific WLAs can be found in Appendix 3.

An important component of the staged approach is the assessment and evaluation of options to control non-point sources of PCBs. These sources include contaminated sites (sites covered under CERCLA or RCRA), non-NPDES regulated stormwater discharges, tributaries to the estuary, air deposition, and contaminated sediments (see Section 1.4 and Appendix Tables 4-1). Addressing these sources is particularly important since contaminated sites and non-point stormwater discharges have been identified as the two largest categories of PCB loadings in this TMDL based upon current data and assessment procedures.

3. STAGE 1 APPROACH TO ESTABLISHING TMDLs

3.1 Background

TMDLs for total PCBs are estimates of the loading of the sum of all the PCB homologs that can enter the estuary and still meet the current water quality criteria. TMDLs are, by nature, abstract. They are the *projected*, not the current, loadings from all sources that should result in the achievement of water quality standards at all points in the estuary. Since current concentrations of PCB homologs are 500 times higher than the water quality criteria, the TMDLs and associated individual WLAs and LAs will be proportionately less.

In order to meet standards at all points in the estuary, some parts of the estuary will have to be less than the standard for that portion of the estuary. This is particularly true for these TMDLs in the Delaware Estuary since the water quality standards vary between the zones, and the standard in lower Zone 5 below the Delaware Memorial Bridges is approximately 5 times lower than the standards in Zones 2 to upper Zone 5 (see Section 1.4).

While simplistic approaches can be used to estimate TMDLs, significant effort has been devoted to developing and calibrating a hydrodynamic and water quality model for the Delaware Estuary to be used in establishing PCB TMDLs for this water body (DRBC, 2003a; DRBC, 2003b; DRBC, 2003c). There are several reasons why a more sophisticated approach is appropriate. These reasons include:

1. Zones 2 – 5 of the Delaware River are significantly influenced by tidal forces producing a 6 foot tidal range at Trenton, NJ and tidal excursions of up to 12 miles. The model incorporates this tidal movement in the hydrodynamic model (DRBC, 2003a).
2. PCBs are hydrophobic, sorb to dissolved, colloidal and particulate carbon, and are transported with carbon molecules and particulates associated with carbon. The model incorporates these

characteristics, partitions PCBs to each of these phases, and simulates the concentrations of the 3 phases in the estuary (DRBC, 2003b).

3. PCBs are a class of chemicals; each having different physical-chemical properties such as volatilization rate and partitioning rate. The model can incorporate these properties for each of the ten homolog groups (DRBC, 2003b).
4. There are many sources of PCBs enter the estuary at different locations in different amounts and at different times. The model can simulate the spatial and temporal nature of these sources (DRBC, 2003c).
5. A model can simulate the additional assimilative capacity provided by the burial of PCBs into the deeper layers of the estuary sediments, and the exchange of PCBs in the gas phase in the estuary airshed with the dissolved phase of PCBs in the ambient waters of the estuary (DRBC, 2003b).

3.2 Conceptual Approach

3.2.1 Guiding Principles

The TMDLs require that each source of PCBs including the sediment, air deposition meets water quality criteria by itself and in conjunction with all other sources. The procedure used to establish the TMDLs incorporates these principles by initially determining the concentration or loading from each source category followed by an assessment of the attainment of the water quality standards when loadings from all source categories are considered.

Another principle is that, when the water quality standards are met, additional loading of PCBs to the estuary is dependent on dilution by flows from other sources into the estuary, and the loss of PCBs through fate processes occurring in the estuary. Two of the source categories do not explicitly provide additional flows to the estuary and therefore do not provide assimilation capacity. The two sources are atmospheric dry deposition and gas phase transfer of PCBs, and contaminated sites. Ground and surface water flow from contaminated sites do occur, but these flows have not been adequately characterized and are not included in the current version of the penta-PCB model. As a result, the assimilative capacity for these sources must be obtained from other source categories.

All source categories and sources within categories are not created equally. Reductions in PCB loads in any source category will provide different amounts of assimilative capacity in different areas of the estuary. Figure7 illustrates this principle for the four boundaries of the penta-PCB model. In this example, each of the boundaries is set at a concentration of 100 milligrams per liter with the resulting model predicting ambient conservative chemical concentrations throughout the estuary. Of the four boundaries, the C&D Canal and the Schuylkill River have the smallest influence on conservative chemical concentrations in the estuary. This influence is also localized to the area where the source enters the estuary. The influence of the ocean boundary at the mouth of Delaware Bay appears to be limited to the Bay and the lower portions of Zone 5 (up to approximately River Mile 65). The Delaware River at Trenton, however, has a significant influence on the estuary conservative chemical concentrations from Zone 2 through Zone 5. Reductions in PCB loadings from the Delaware River at Trenton will therefore provide substantially more assimilative capacity in a larger area of the estuary.

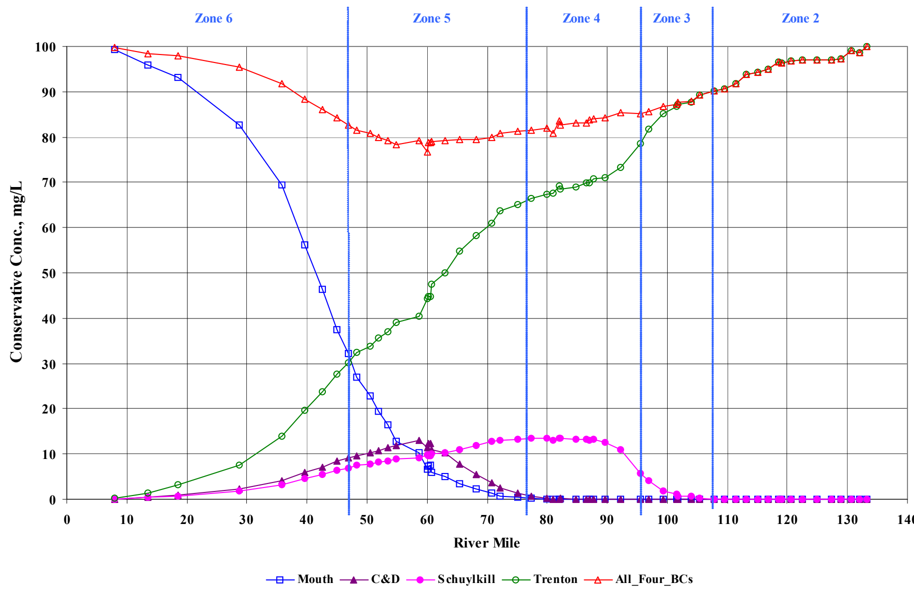

Figure 7: Relative impact of the four boundaries when the conservative chemical concentrations are set at 100 milligrams per liter.

Estuary sediments function as a sink or loss mechanism for PCBs through burial of PCBs that settle to the bottom of the estuary. This small (<1 cm/year) net deposition of particulates provides additional assimilation capacity in the estuary, and is incorporated in the calculation of the TMDLs for each of the zones.

Recent monitoring of air concentrations in the regional airshed surrounding the Delaware Estuary indicate that PCB concentrations are particularly high in the Philadelphia-Camden area, and contribute PCBs to the estuary through dry and wet deposition, and exchange of PCBs in the gas phase (Van Ry et al, 2002 and Figure 8). While the proportional loading of PCBs from dry and wet deposition is explicitly included in the load allocation portion of the TMDLs, the transfer of PCBs in the gas phase with dissolved PCBs in the estuarine waters is not since there will be no significant net exchange between dissolved PCBs in water and gas phase PCBs in the air (i.e., they will reach equilibrium) when water quality standards are achieved. The modeling approach used to develop the TMDLs takes this into account by setting the gas phase air concentrations at the equilibrium concentrations (see Section 3.3.1 and 3.3.5).

The difference between the current gas phase concentrations and the gas phase concentrations when the estuary meets standards, is a significant TMDL implementation issue since water quality standards will not be achieved without reducing the gas phase concentrations to a level where they are in equilibrium with the dissolved PCB concentrations at the water quality standard. Figure 8 illustrates the relative difference between the current gas phase air concentration of penta-PCBs in Zone 3 and the gas phase concentration at equilibrium with the dissolved penta-PCB concentrations when the TMDL is achieved.

Finally, the boundaries of the model which include the head of tide of the tributaries, the C&D Canal, and the mouth of Delaware Bay were assigned concentrations of penta-PCBs in determining the TMDLs and establishing WLAs. Section 4.20.4B.1 of the Commission's Water Quality Regulations specify that in establishing WLAs, the concentrations at the boundaries of the area of interest shall be set at the lower of actual data or the applicable water quality criteria (DRBC, 1996). Thus for modeling purposes, tributaries or other boundaries cannot exceed the water quality criteria for the zone of the estuary that they enter or border. In developing these TMDLs, both the C&D Canal boundary and the mouth of Delaware Bay boundary were set to 7.9 pg/L. This is the criterion for Zone 5 where the canal enters the mainstem of the Delaware River, and is the current criterion for Zone 6 (Delaware Bay). The current concentrations of PCBs at the mouth of the Bay exceed this value by 2 orders of magnitude, while current concentrations at the C&D Canal boundary exceed this value by almost 3 orders of magnitude. Thus like the gas phase concentrations of PCBs in the air, PCB concentrations at both the C&D Canal and the ocean boundary must also be reduced in order to achieve the water quality standards. The relative influence of these boundaries at the critical compliance location must also be considered in determining the relative importance of the required reductions (see Figure 7).

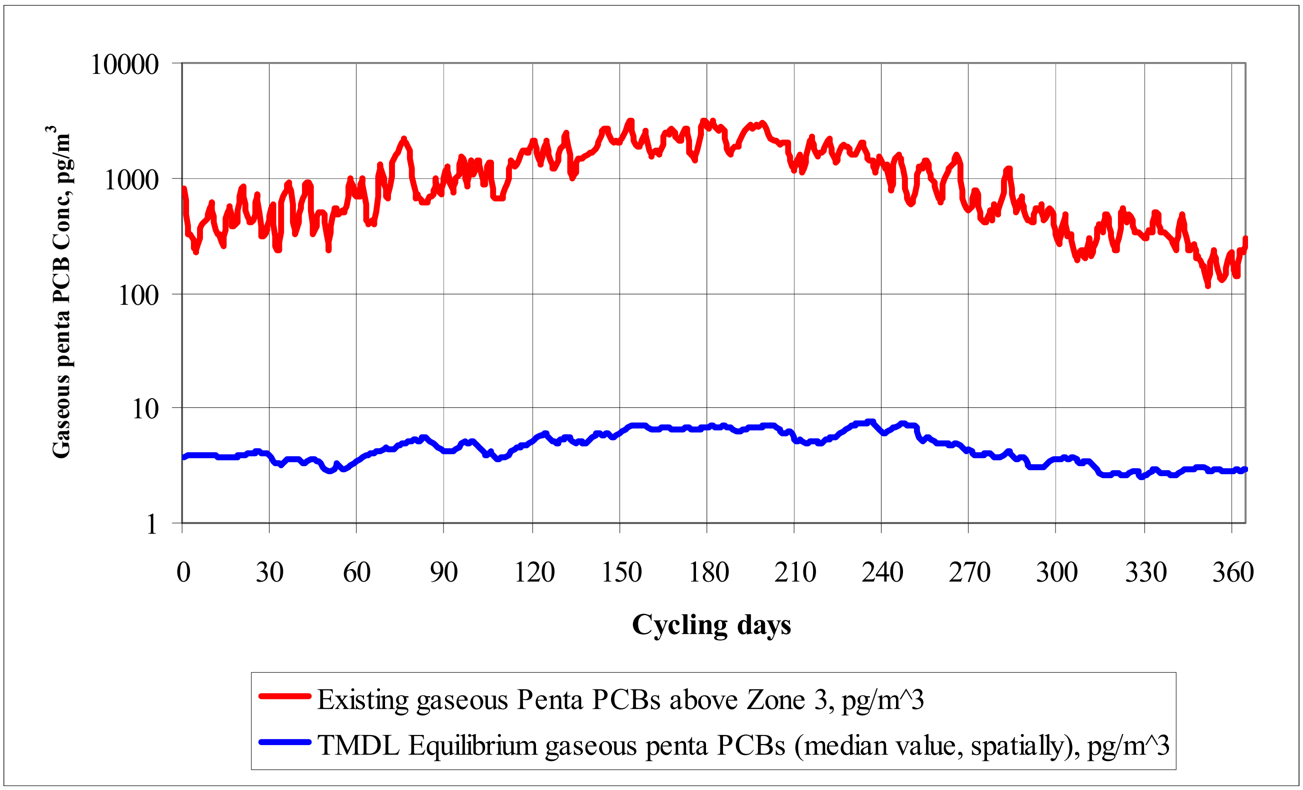

Figure 8: Atmospheric gas phase penta-PCB concentrations during the one year model cycling period based upon current data and the expected penta-PCB concentrations when the TMDLs are achieved.

3.2.2 Modeling Approach

Several mathematical models are used to develop the TMDLs for PCBs. The first is a hydrodynamic model that was extended to included Delaware Bay (Zone 6). The hydrodynamic model is discussed in Section 3.2.4.1 and fully described in the report entitled "DYNHYD5 Hydrodynamic Model (Version 2.0) and Chloride Water Quality Model for the Delaware River Estuary" (DRBC, 2003a). The water quality models used in this effort included an updated TOXI5 model for chlorides, and a new model for pentachlorobiphenyls (penta-PCBs)(DRBC, 2003b). The hydrodynamic and chloride models are discussed in Section 3.2.4.1 and

3.2.4.1, respectively and described in detail in the report on the hydrodynamic model (DRBC, 2003a). The organic carbon and penta-PCB models are discussed in Section 3.2.4.3 and fully described in the report entitled “PCB Water Quality Model for the Delaware Estuary (DELPCB)” (DRBC, 2003b).

TMDLs are calculated using both the conservative chemical model, and the penta-PCB water quality model run until equilibrium is observed. The model cycles model inputs from the period February 1, 2002 until January 31, 2003. This one year period is considered to be representative of long-term conditions (see Section 3.2.3.1), and is the same period utilized for the decadal scale (74 year) model simulations by HydroQual, Inc.

3.2.3 TMDL Approach

Although the water quality standards are expressed as total PCBs and the TMDLs must be expressed as Total PCBs, the current water quality model only addresses penta-PCBs. As discussed in Section 2.2, the TMDLs for total PCBs are extrapolated from TMDLs for penta-PCBs using the observed ratio in the Delaware River/Estuary of the penta homolog to total PCBs. Therefore, a water quality target for penta-PCBs must be established for use in the TMDL procedures. This target is determined by assuming that the ratio of penta-PCBs to total PCBs is approximately 0.25.

TMDLs for total PCBs for Zones 2 through 5 of the Delaware Estuary are established using a four step procedure. TMDLs are calculated over a one year period (annual median) to be consistent with both the model simulations and the 70 year exposure used for human health criteria. The procedure initially utilizes the conservative chemical model to establish contribution factors (Cfs) for two of the major tributaries to the estuary (the Delaware River at Trenton and the Schuylkill River), and each of the estuary zones. Allowable loadings are then calculated for each of these sources utilizing the CF and the proportion of the water quality target at the critical location allocated to each source. These loadings are used in the conservative chemical and penta-PCB models to establish the assimilative capacity provided by burial of PCBs into the estuary sediments. The gas phase concentrations that would be in equilibrium with the penta-PCB water concentrations when the water quality targets are met are then included in the water quality model. The model is then run to confirm that the water quality targets are still being met.

Following establishment of the TMDLs for each zone, each of the zone TMDLs are apportioned using the current percentage contribution for each of the source categories excluding loads from the Delaware River, Schuylkill River and contaminated sites based upon the respective loadings during the period Feb. 1, 2002 to Jan. 31, 2003 (Table 2, Figure 9)

Table 2: Apportionment of Zone TMDLs to Wasteload and Load Allocations excluding loads from the Delaware River, Schuylkill River and contaminated sites.

ZONE	WASTELOAD ALLOCATION	LOAD ALLOCATION
2	44.1%	55.9 %
3	78.1%	21.9 %
4	60.8%	39.2 %
5	63.4 %	36.6 %

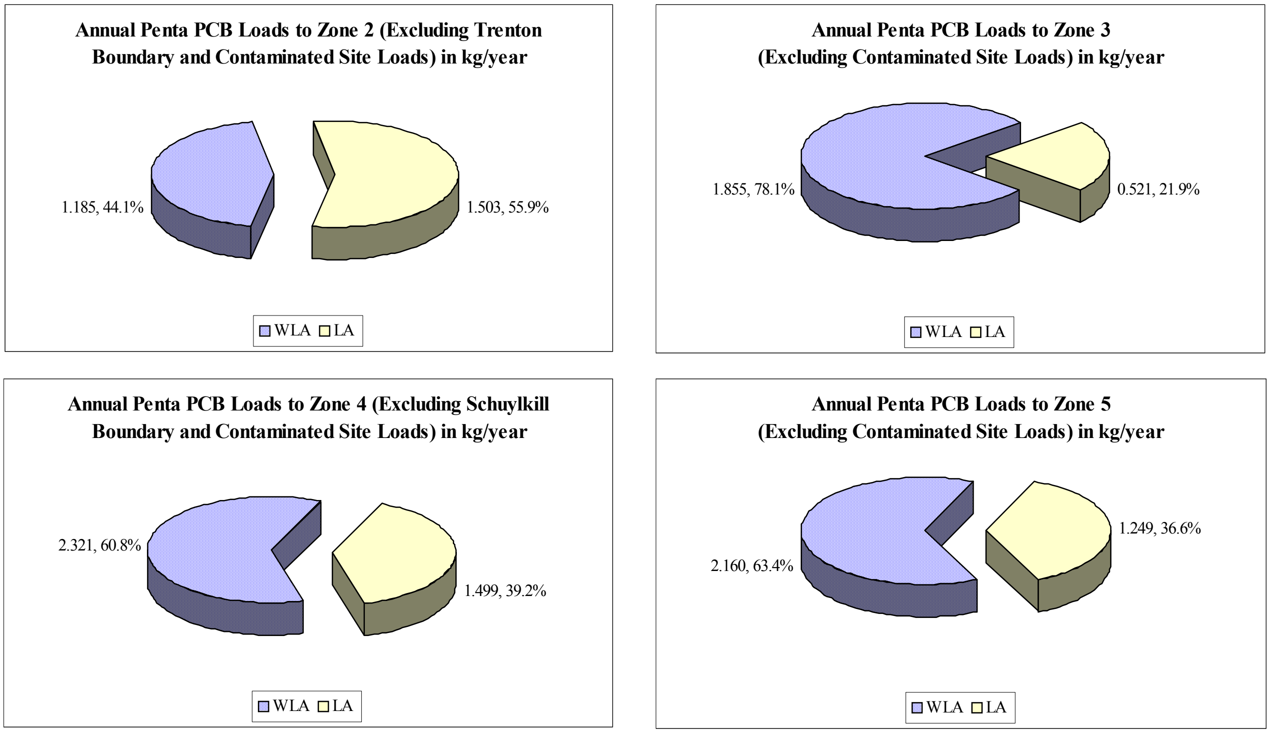

Figure 9: Apportionment of Zone TMDLs in kilograms per year (kg/year) to Wasteload and Load Allocations excluding loads from the Delaware River, Schuylkill River and contaminated sites.

The wasteload allocation portion of the TMDL represents those source categories that are regulated under the NPDES program (point sources, combined sewer overflows or CSOs, and municipal separate storm sewer systems or MS4s). The load allocation portion of the TMDL represents the remaining categories including contaminated sites, non-NPDES regulated stormwater discharges, tributaries and air deposition).

In accordance with the TMDL regulations, a portion of each zone TMDL must be allocated to a margin of safety. The margin of safety (MOS) is intended to account for any lack of knowledge concerning the relationships between pollutant loadings and receiving water quality. Commission regulations also require that a portion of the TMDL be set aside as a margin of safety, with the proportion reflecting the degree of uncertainty in the data and resulting water quality-based controls. The MOS can be incorporated into the TMDL either implicitly in the design conditions under which the TMDL is calculated or explicitly by assigning a fixed proportion of the TMDL. Since the conditions under which the TMDL is determined like tributary flows are related to the long-term conditions and not to design conditions associated with human health water quality standard for carcinogens (such as the harmonic mean flow of tributaries), expression of the MOS as an explicit percentage of each zone TMDL was considered the more appropriate approach. An explicit percentage of 5% was then utilized in the apportionment of the zone TMDLs. Both the apportionment of the zone TMDLs using the current percentage contribution and use of a margin of safety of 5% were recommended by the Commission's Toxic Advisory Committee.

3.2.4 Model Descriptions and Inputs

3.2.4.1 Hydrodynamic Model

Inputs to the hydrodynamic, conservative chemical and PCB models included daily tributary flows at the two major tributary boundary conditions, the Delaware River at Trenton and the Schuylkill River, and at 20 minor tributaries for the period February 1, 2002 to January 31, 2003. A comparison of the cumulative distribution curve for this one year period to the curve for the period of record for the Delaware River at Trenton (1912 to March 2003) and the Schuylkill River (1934 to March 2003) is presented in Figures 10 and 11, respectively. The figures indicate that the flows occurring during the one year cycling period are a reasonable representation of the flows during the period of record for these two tributaries.

The hydrodynamic model also includes precipitation induced flows for both point and non-point sources. The precipitation pattern occurring during the one year cycling period was compared to historical precipitation records (1872 to March 2003) maintained by the Franklin Institute (2003) to determine the degree to which the precipitation pattern for the one year cycling period was representative of the long term record. This comparison indicated good agreement for both the number and percentage of days when precipitation exceeded 0.01 inches, and the number and percentage of days when precipitation was less than 0.01 inches (Figures 12 and 13). This precipitation data was used to both calculate the flow of each discharge during precipitation events and determine when data collected during precipitation events would be used in loading calculations.

The tidal forcing function in the hydrodynamic model was based upon actual tide data for the one year cycling period. Since the major component of the tidal function has a periodicity of 12.42 hours and minor components with lunar and annual periodicity, this data set was considered representative of long-term tidal conditions. In addition, the expert panel recommended that alternative model inputs based upon design conditions not be used in TMDL simulations in order to maintain any hydrological relationships between the various inputs. For this reason, actual discharge flows for the point sources included in this TMDL determination during the one year cycling period were used rather than design effluent flows such as those specified in Section 4.30.7A.8. of the Commission's Water Quality Regulations or federal NPDES regulations. This is particularly important in the establishment of PCB TMDLs for the Delaware Estuary since the flow from a number of the point sources is significantly influenced by precipitation. For example, design effluent flows for the City of Philadelphia's wastewater treatment plants are approximately 200 million gallons per day, but can double during precipitation events. In addition, procedures have not been developed nor does the Commission's regulations specify procedures to establish design effluent flows for those discharges that are solely driven by precipitation (i.e., stormwater discharges). Such procedures and regulations will be developed for application in the Stage 2 TMDLs for PCBs, if necessary. The similarity of the precipitation pattern observed during the one year cycling period to the long term precipitation record suggests that the precipitation induced flows for both continuous and stormwater discharges used to develop the Stage 1 TMDLs may ultimately serve as design flows for these discharges.

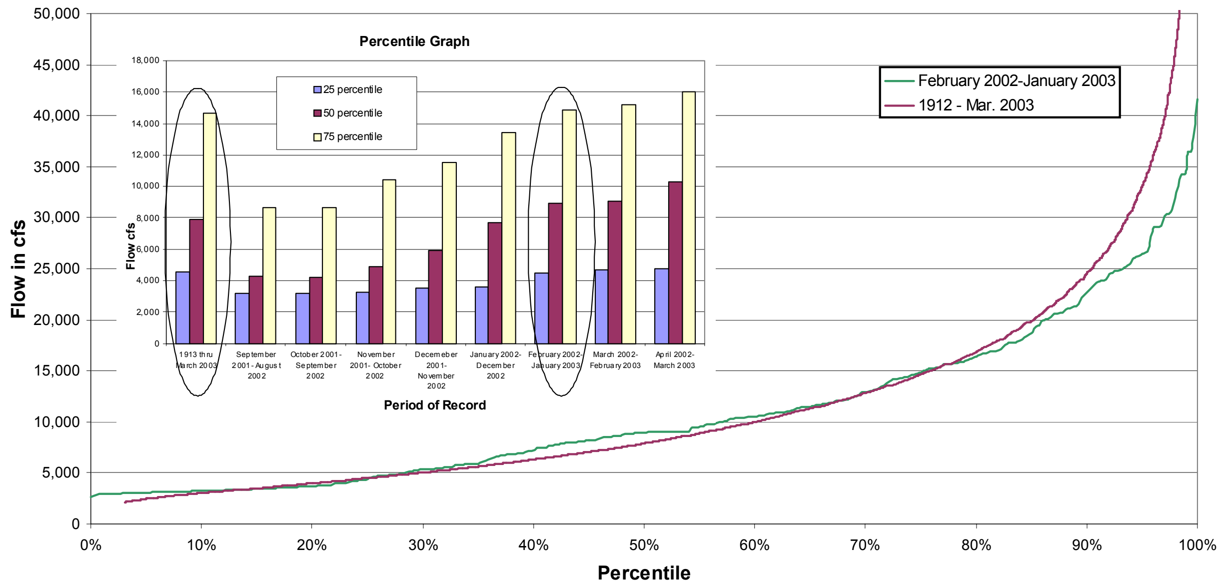

Figure 10: Cumulative distribution curve for the period of record for the Delaware River at Trenton (1912 to March 2003) compared to the period February 1, 2002 to January 31, 2003.

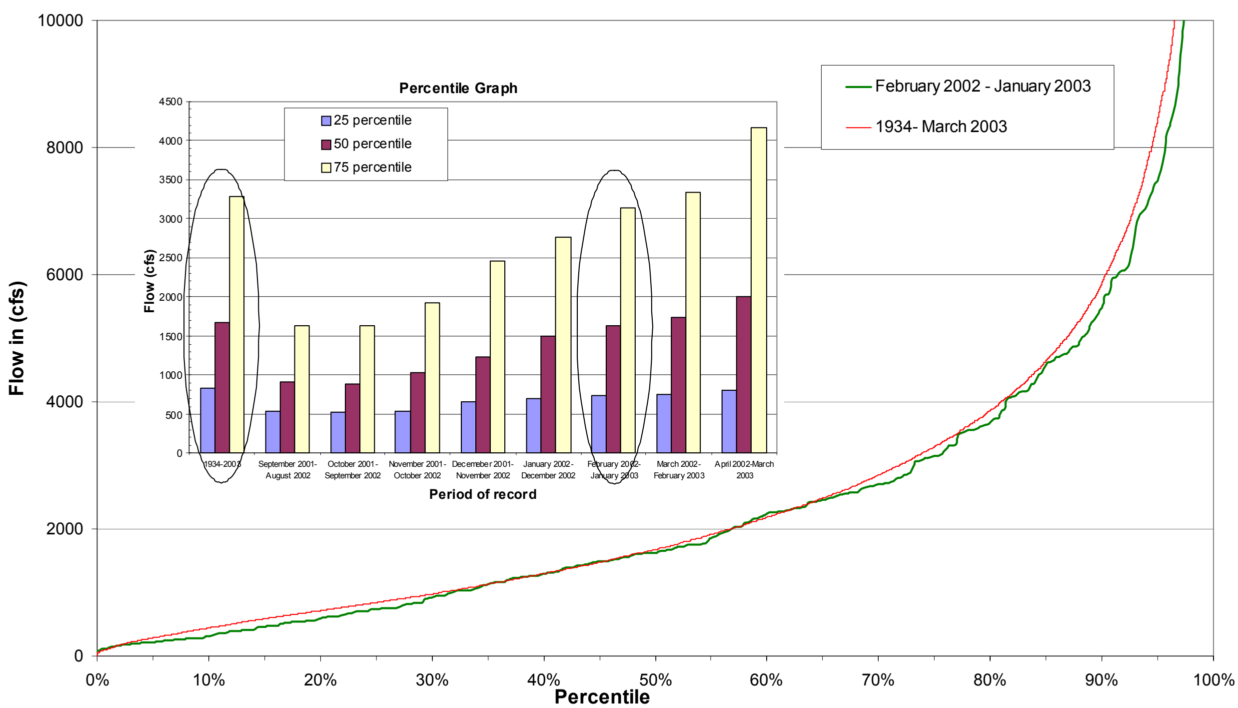

Figure 11: Cumulative distribution curve for the period of record for the Schuylkill River (1934 to March 2003) compared to the period February 1, 2002 to January 31, 2003.

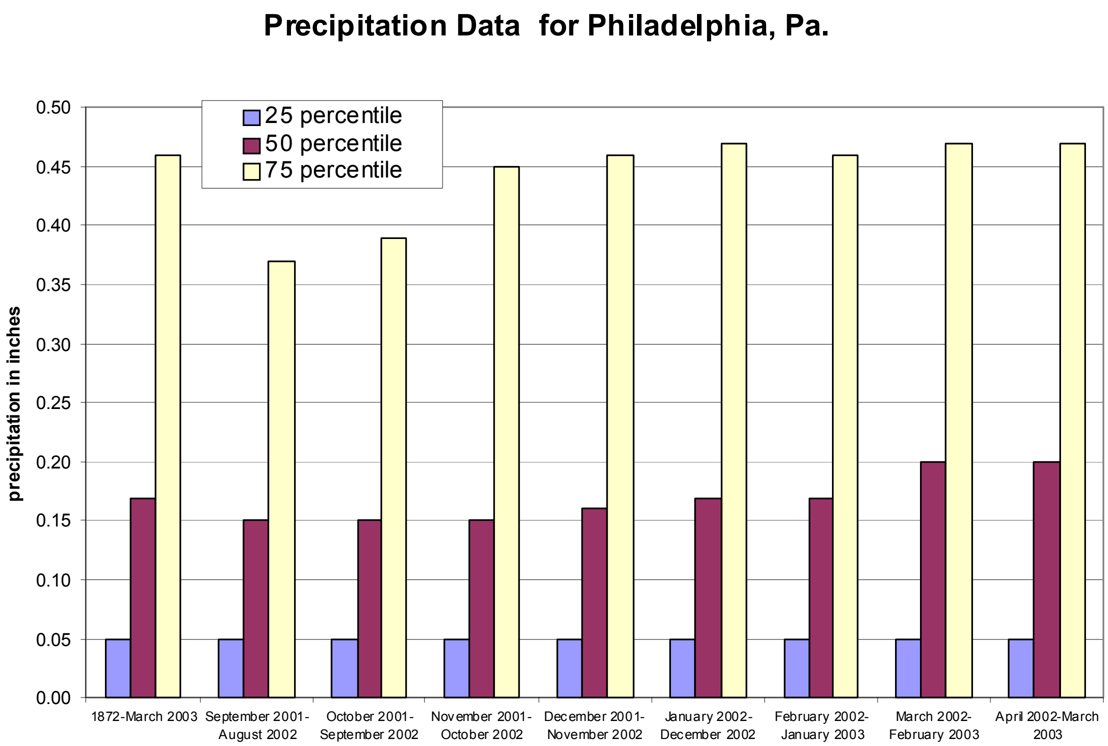

Figure 12: Percentile curves for precipitation data (events > 0.01 inches) for Philadelphia, PA from 1872 to March 2003 compared to the period February 1, 2002 to January 31, 2003.

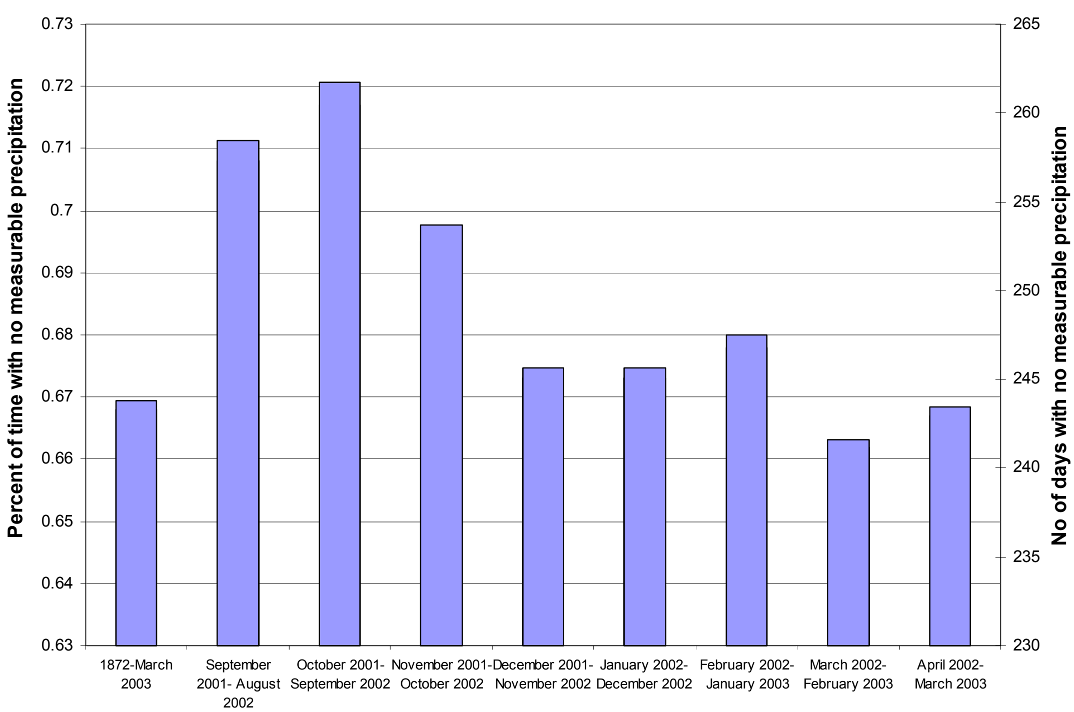

Figure 13: Percentile curves for precipitation data (days with precipitation < 0.01 inches) for Philadelphia, PA from 1872 to March 2003 compared to the period February 1, 2002 to January 31, 2003.

3.2.4.2 Conservative Chemical Water Quality Model

A TOXI5 (water quality) model consisting of 87 water column segments was then linked with the outputs from the calibrated DYNHYD5 hydrodynamic model and calibrated against the chloride concentrations. This model is based upon the U.S. EPA's Water Quality Simulation Program (WASP) Version 5.12., and does not include any fate processes for chlorides or any interaction of the chlorides with the sediment. The main objective in this calibration process was the determination of an advection factor and a set of dispersion coefficients for the water quality model to correctly simulate the dispersive mixing within the Estuary. Review of comparison plots and the results of regression analyses indicated that the model was able to reproduce the temporal and spatial trends, and the magnitude of the chloride concentrations, within a reasonable range throughout the tidal portion of the Delaware River.

3.2.4.3 Penta-PCB and Organic Carbon Water Quality Models

The calibrated hydrodynamic and conservative chemical model are used to drive mass balance models of organic carbon and penta-PCBs (DELPCB). DELPCB is a simulation program enhanced from the U.S. EPA's Water Quality Simulation Program (WASP) Version 5.12, and is fully described in DRBC (2003c). The organic carbon model has two organic carbon state variables and one inorganic solid (IS) as a control state variable. These variables are integrated with the one-dimensional hydrodynamic DYNHYD5 model to dynamically simulate these sorbent variables. The two carbon variables are biotic carbon (BIC), carbon generated internally by phytoplankton, and particulate detrital carbon (PDC) which consists of detritus and other forms of non-living carbon. The model treats the two organic carbon sorbents as non-conservative state variables that are advected and dispersed among water segments, that settle to and erode from benthic segments, and that move between benthic layer segments through net sedimentation.

The model also partitions penta-PCBs into particulate- PCB, truly dissolved-PCB, and dissolved organic carbon (DOC) bound phases treated as individual state variables. The real time model simulates tide-induced flows, and the spatial and temporal distributions of the organic carbon and penta-PCB variables. During the modeling process, using data generated by the hydrodynamic model, DELPCB simulates the spatial and temporal distributions of water quality parameters including BIC, PDC, total penta-PCB, particulate penta-PCB, and truly dissolved PCB, and DOC-bound PCB. The sum of the latter two is total dissolved penta-PCB.

3.2.4.4 Model Inputs

Additional inputs to the models include air and water temperature, wind data and the loadings of penta-PCBs from various source categories for the period February 1, 2002 to January 31, 2003. Water temperature data were obtained from three automatic water quality monitoring stations operated cooperatively by the DRBC and the U.S. Geological Survey at the Ben Franklin Bridge, Chester, PA and Reedy Island. Air temperature and wind speed data were obtained from the National Weather Service at the Philadelphia International Airport station.

Daily loadings of organic carbon and penta -PCBs were estimated for relevant source categories, including contaminated sites, non-point sources, point discharges, atmospheric deposition, and model boundaries, for each day of the one year cycling period. Detailed discussion of load development for each source category is described in Section 2 of the report entitled "Calibration of the PCB Water Quality Model for the Delaware Estuary for Carbon and Penta-PCBs" (DRBC, 2003c).

3.3 Procedure for Establishing TMDLs

3.3.1 Summary

TMDLs for total PCBs for Zones 2 through 5 of the Delaware Estuary are established using a multi-step procedure that incorporated the guiding principles discussed in Section 3.2.1. As discussed in Section 1.4, the existing DRBC water quality standards are used as the basis for the Stage 1 TMDLs. The selection of these standards establishes the transition from a standard of 44.8 pg/L in upper Zone 5 to a standard of 7.9 pg/L in lower Zone 5 as the critical location for ensuring that standards are met throughout the estuary. Standards that are lower than upstream water quality standards typically require ambient water concentrations in upstream waters to be lower than the applicable standards for those waters. In tidal waters such as the Delaware Estuary, downstream waters with less stringent water quality standards can have the same effect on upstream waters depending on the extent of upstream movement during flooding tides. With the use of the existing DRBC water quality standards as the basis for the TMDLs in Stage 1, the critical location occurs where the 7.9 pg/L standard becomes effective (River Mile 68.75, the site of the Delaware Memorial Bridges).

The procedure initially utilizes the conservative chemical model to establish contribution factors for two of the major tributaries to the estuary (the Delaware River at Trenton and the Schuylkill River), and each of the estuary zones. The reasons for utilizing the contribution factor approach and the conservative model are 1) TMDLs are controlled by the value of the standard at the critical location, and 2) computer simulation time is minimized permitting the numerous iterations necessary to perform the procedure (approximately five hours for a 50 year simulation with the penta-PCB water quality model). The factors represent the contribution of each of the six sources in picograms per liter to the concentration of penta-PCBs at the critical compliance location. The loading into each zone is assigned as distributed loadings by utilizing a weighting factor calculated using the surface area of the model segments within the zone. For each of the estuary zones, the contribution factor has the units of pg/L per unit of loading. The unit of loading is relative to magnitude of the water quality standard. For example, conventional pollutants with standards in units of milligrams per liter (parts per million) and toxic pollutants with standards in micrograms per liter (parts per billion), loading is often expressed in kilograms per day. With the standard for PCBs in the picograms per liter range, however, loading is more appropriately expressed in terms of milligrams per day. Different units are used for the two major tributaries since the model calculates the loading of PCBs from these tributaries using the daily flows and the concentration of penta-PCBs. Therefore, the contribution factor for these two sources are expressed in units of pg/L per pg/L of penta-PCBs at the tributary boundary compared to pg/L per 100 mg/day for the loadings from the zones.

TMDLs are calculated in a four step procedure (Figure 14). The four steps are:

1. Calculate the contribution factor for each of the estuary zones and two of the tributary model boundaries to the critical compliance point with the penta-PCB water quality target.
2. Determine the proportion of the water quality target allocated to each of these six sources utilizing the median daily flow contributed by each during the one year model cycling period. Calculate the allowable loadings from each of these sources utilizing the CF and the proportion of the water quality target at the critical location allocated to each source. Then utilize these loadings in the conservative chemical and penta-PCB models to establish the assimilative capacity provided by burial of PCBs into the estuary sediments. Iteratively determine the amount of assimilative capacity (in pg/L) provided by the sediments, and add this concentration to the penta-PCB water quality target. Recalculate the allowable loadings from each of the six sources using this revised water quality target.
3. Utilize the water quality model for penta-PCBs with these allowable loadings to confirm that the sediment concentrations have reached pseudo-steady state, and confirm that the penta-PCB water quality target is met in Zones 2 through 5. Initial

penta-PCB conditions in the water and sediments are updated to shorten the simulation time to reach peudo steady-state in Step 4.

4. Estimate the gas phase concentrations that would be in equilibrium with the penta-PCB water concentrations when the water quality targets are met, include these in the water quality model and then confirm that the water quality targets are still being met. Iteratively adjust the gas phase concentration of penta-PCBs in the air until the water quality target is reached. The air will neither be a source or sink for penta-PCBs when the estuary meets the water quality standard and gas phase concentrations are reduced to the equilibrium concentration.

3.3.2 Step 1

In determining the contribution factor for the two tributary boundaries and the four estuary zones, the boundary of interest is set to 1 pg/L and all other model boundaries except the one of interest are set to zero pg/L. Model simulations are then run for 10 years to ensure that equilibrium conditions are achieved, and the annual median value is then calculated for each model segment in the main stem of the river. Figures 15 through 17 illustrate how the contribution factor is determined for the four model boundaries. These figures indicate the concentration of penta-PCBs at the critical point when a concentration of 1 pg/L is set at the model boundary.

Table 3 lists the contribution factors determined by this analysis for all of the model boundaries and each of the estuary zones.

Table 3: Summary of the contribution factors from the model boundaries and the estuary zones at the criteria critical point (Model segment 24 - River Mile 68.1).

Estuary Zone/Boundary	**Contribution Factor [pg/L] per [100 mg/day]**	**Contribution Factor [pg/L] per [pg/L]**
Zone 2	1.9668	-
Zone 3	2.1428	-
Zone 4	2.2813	-
Zone 5	0.96704	-
Delaware River @ Trenton	-	0.5815
Schuylkill River	-	0.11839
Ocean & C&D Canal	-	-

3.3.3 Step 2

Once the contribution factors are determined, the next step is to determine the allowable loadings from each of these sources that will still ensure that the water quality target is met at the critical location. The following assumptions are made in determining these loadings:

a. The assimilative capacity at the critical location controls the allowable loadings from each source. In concentration units, this assimilative capacity is equal to one-quarter of the applicable water quality standard or 1.975 pg/L of penta-PCBs.
b. The influence from ocean (the mouth of Delaware Bay) and the C&D Canal are treated as background. This is based in part upon their minimal influence at the critical location..
c. Net burial of PCBs into the sediment results in a loss of PCBs from the system. This removal of PCBs provides assimilative capacity that can be utilized by other sources. At the critical location, this additional assimilative capacity is approximately 0.5 pg/L of penta-PCBs.
d. When the concentration of penta-PCBs meets the water quality targets throughout the estuary, the concentration of penta-PCBs in the gas phase will be at equilibrium with the truly dissolved penta-PCBs in the water column, and the net flux of penta-PCBs will be zero. Thus, the air will neither be a source or sink for penta-PCBs when the estuary meets the water quality standard and gas phase are concentrations are reduced to the equilibrium concentration.

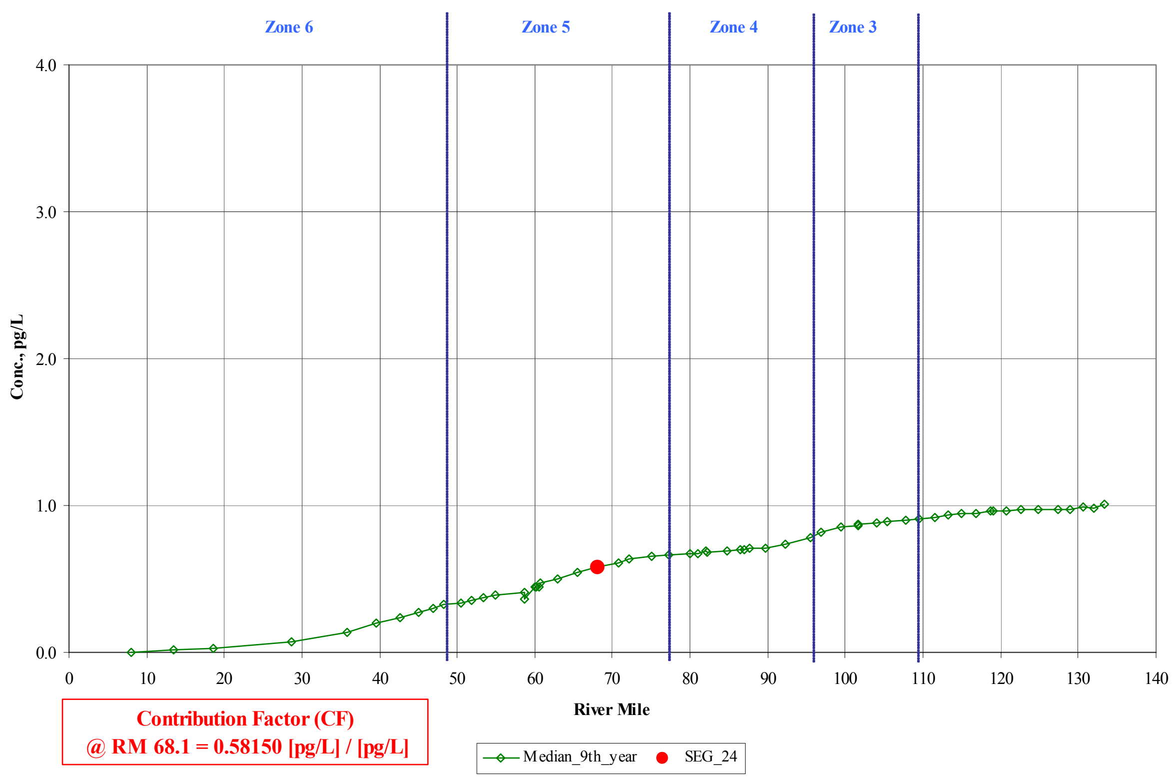

Figure 15: Simulated penta-PCB concentrations in the water column when the concentration of the Delaware River at Trenton, NJ is set to 1 picogram per liter.

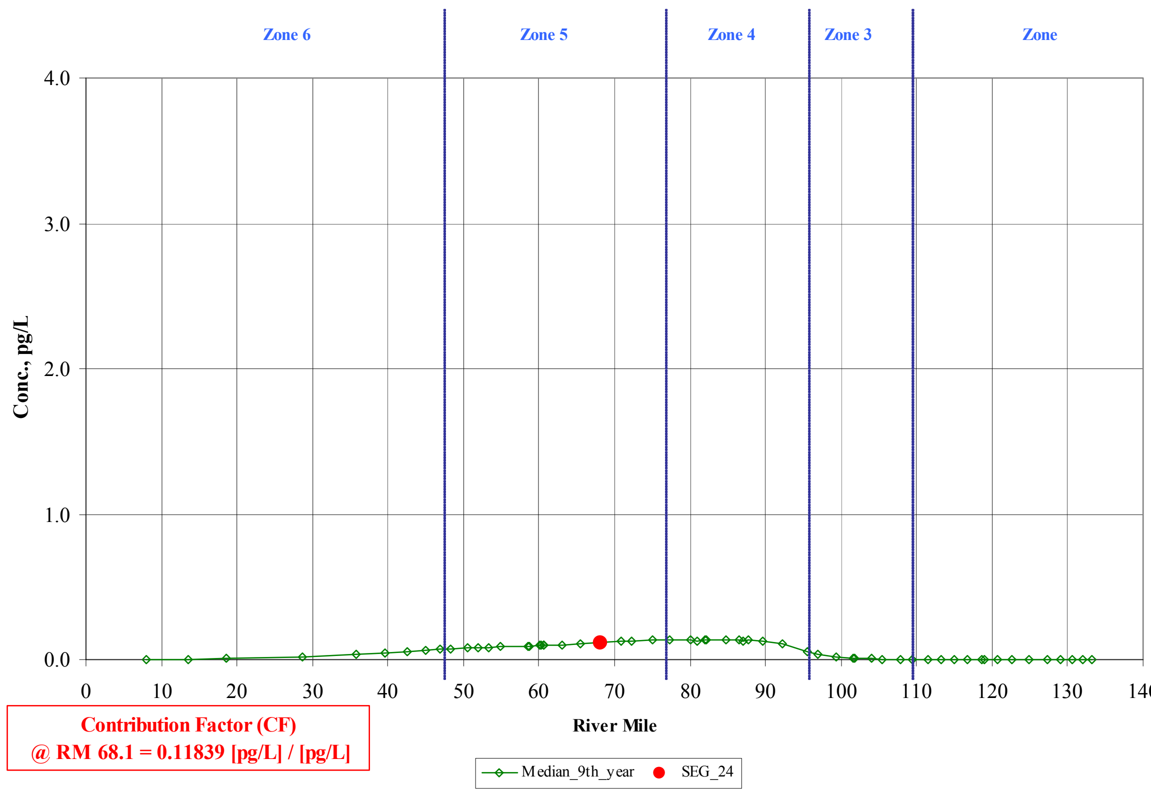

Figure 16: Simulated penta-PCB concentrations in the water column when the concentration of the Schuylkill River is set to 1 picogram per liter.

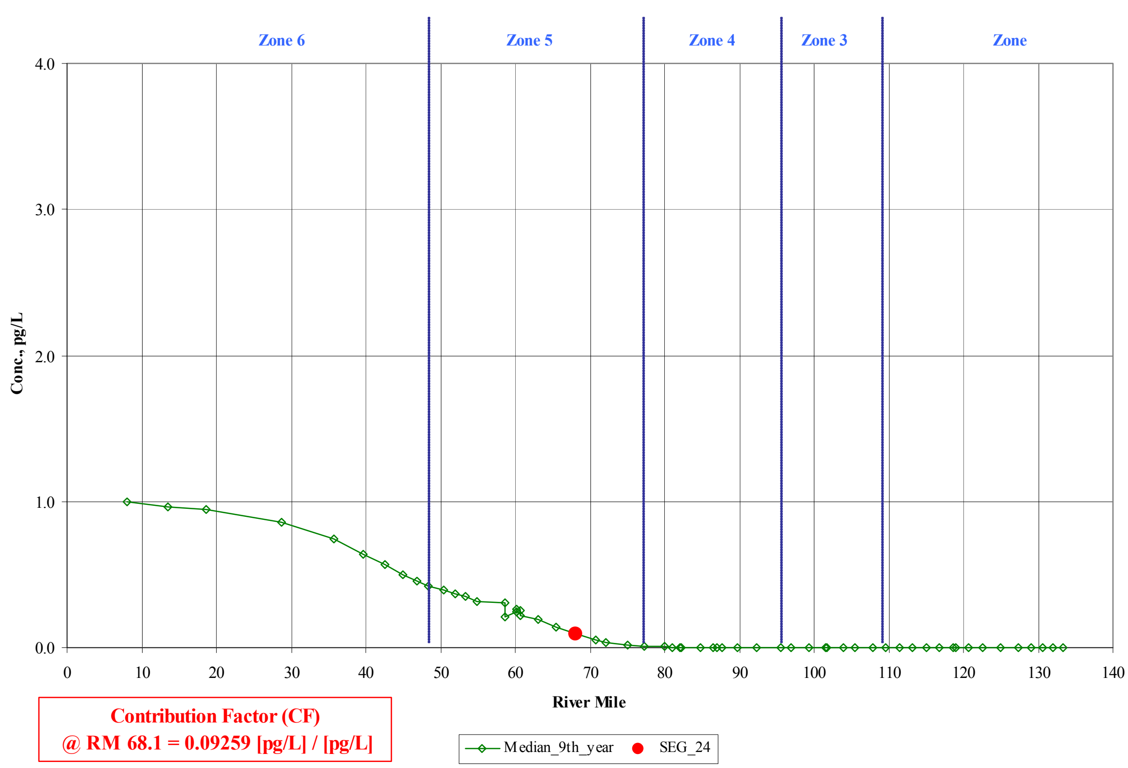

Figure 17: Simulated penta-PCB concentrations in the water column when the concentration at the mouth of Delaware Bay and the C&D Canal is set to 1 picogram per liter.

Using the principle that the assimilative capacity of the two tributary boundaries and each of the zones is based upon the inflow provided by each source, the percentage distribution of the assimilative capacity for each of these sources is established. Table 4 presents the flows for each of the sources during the one year model cycling period and the percentage distribution of the assimilative capacity based upon these flows. This distribution percentage is then applied to the penta-PCB water quality target of 1.975 pg/L to establish the contribution of each of the sources in picograms/liter to the target (Table 4). The influence of the mouth of Delaware Bay and the C&D Canal is first removed since this influence is considered background based in part on their minimal influence at the critical location. The additional assimilative capacity provided by the burial of PCBs into the estuary sediments was then estimated by inserting these loads in the conservative chemical and penta-PCB models. The results of this process was that the additional assimilative capacity was estimated to be 0.5 pg/L. This increased the assimilative capacity to 2.2921 pg/L (1.975 pg/L minus 0.183 pg/L for the background influences, plus 0.500 pg/L additional for burial by sediments) at the critical location. The contribution of each of the sources in picograms/liter to the target was then recalculated and used with the contribution factor to establish the allowable concentration or loadings for each of the tributary boundaries and estuary zones, respectively (Table 4).

At this point, a total allowable loading or assimilative capacity of 94.99 mg/day of penta-PCBs for all six sources was calculated. The majority of this loading was assigned to the two tributary boundaries, the Delaware River at Trenton and the Schuylkill River. Figure 18 graphically presents the available assimilative capacity at the critical location and the apportionment to each of the sources and estuary zones. Figure 19 presents the results of simulations using the conservative chemical model demonstrating that the calculated loadings result in attainment of the revised water quality target of 2.475 pg/L.

Table 4: Summary of Steps 1 and 2 of the Procedure for Establishing TMDLs

Sources of Loadings	Contribution Factor (CF)	Mean Daily Flow During 1 Year Cycling Period	Distribution Percentage	Concentration at the Critical Location	Allowable Concentrations or Loadings.	Allowable Loadings (TMDL)
Units	[pg/L] / [pg/L] or [pg/L] / [100mg/day]		%	pg/L	pg/L or mg/day	mg/day
Trenton	0.581500*	249.19	68.0	1.559	2.68*	57.727
Schuylkill	0.118390*	45.87	12.5	0.287	2.42*	9.609
Zone 2	1.966800	20.79	5.7	0.130	6.61	6.613
Zone 3	2.142800	15.26	4.2	0.095	4.46	4.455
Zone 4	2.281300	16.66	4.5	0.104	4.57	4.569
Zone 5	0.967040	18.57	5.1	0.116	12.02	12.016
Sum		366.3	100	2.2921	-	94.99

* - Units are either [pg/L] / [pg/L] or pg/L.

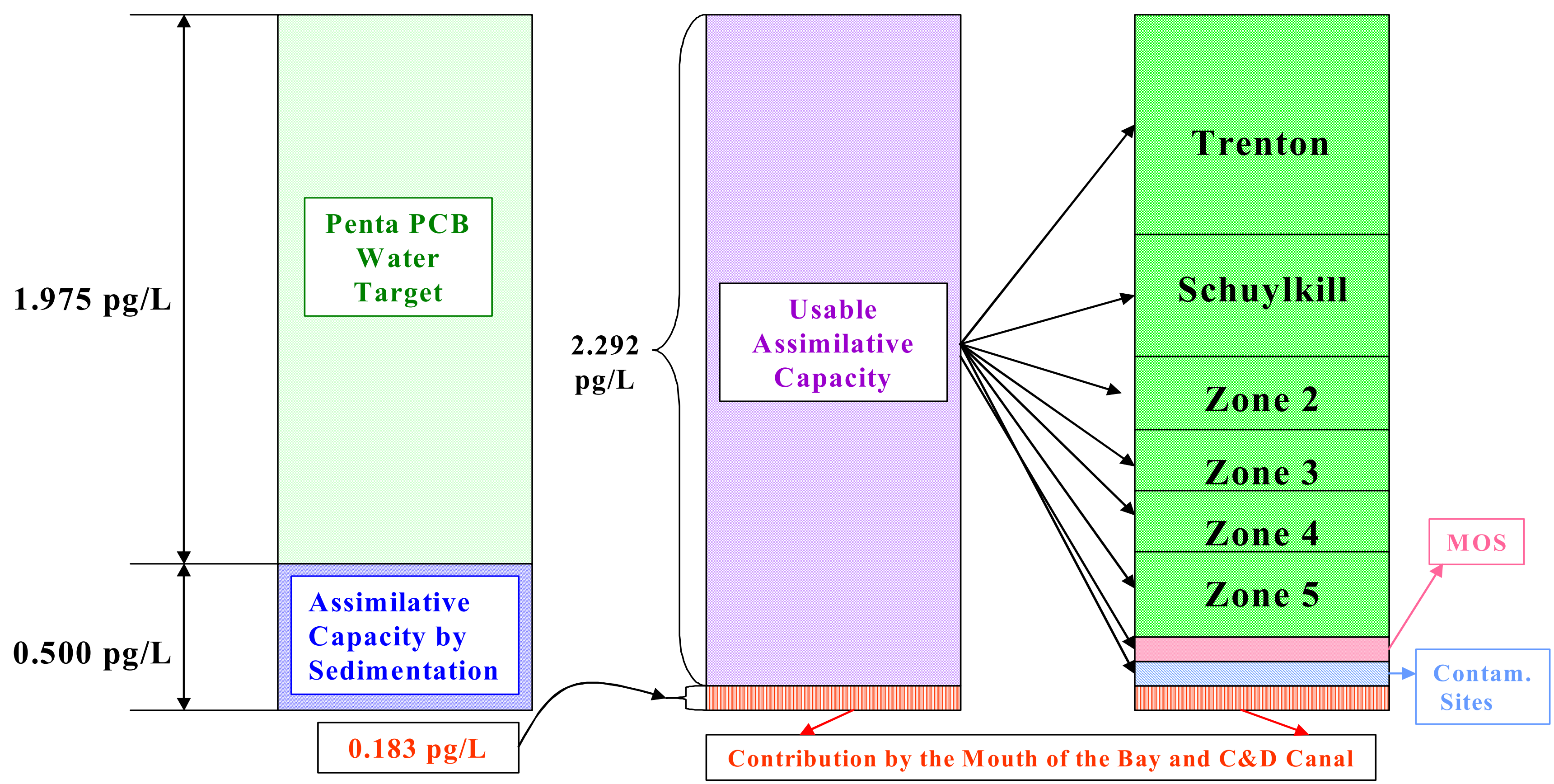

Figure 18: Graphical presentation of the allocation of the assimilative capacity at the critical location.

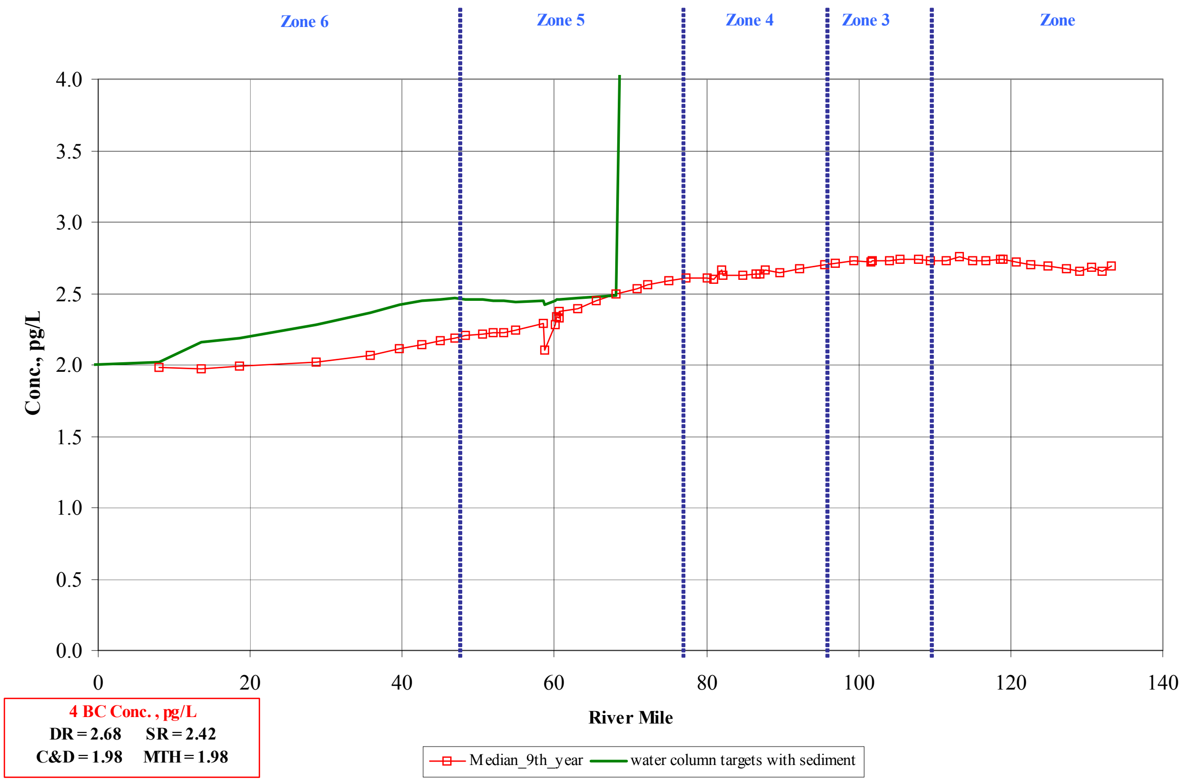

Figure 19: Simulated penta-PCB concentrations in the water column when loadings established in Step1 are used in the conservative chemical model.

3.3.4 Step 3

The next two steps will utilize the water quality model for penta-PCBs to confirm the assimilative capacity that was added due to the loss of PCBs by burial by the sediment, to confirm that sediment concentrations have reached steady-state, and to make final adjustments to account for the exchange of penta-PCBs in the truly dissolved phase with penta-PCBs in the gaseous phase in the estuary airshed.

In this step, the PCB water quality model is run with the initial water column concentrations set to the concentrations described by the final simulation with the conservative chemical model (Figure 19), the loadings from the model boundaries and to each estuary zone that were determined in Step 2, initial penta-PCB concentrations in the sediment, and no air-water exchange of gaseous penta-PCBs. The purpose of this simulation is to determine the sediment concentrations that are in equilibrium with the estuary concentrations that will meet the water quality target of 1.975 pg/L at the critical location. These simulations were run for 50 years to establish the point at which equilibrium was reach between the water column and the sediments. Figure 20 indicates the sediment concentration of penta-PCBs at six locations in the estuary corresponding to a model segment in each of the estuary zones and Delaware Bay. Note that sediment concentrations in all segments reach equilibrium after 20 to 30 years from the assigned initial conditions. The simulated median sediment concentrations at each of the model segments is presented in Figure 21. The amount of assimilative capacity provided by the loss of penta-PCBs to the sediment is illustrated in Figure 22. The figure indicates that the amount of assimilative capacity provided by the sediments varies along the estuary due to the varying burial rates computed by the model. The assimilation capacity provided is about 0.5 pg/L at the critical location.

The penta-PCB model was then rerun for ten years with the initial sediment conditions set to these values along with the loadings from the model boundaries and to each of the estuary zones to confirm that the water quality target at the critical location was being met. Figure 23 presents a plot of the annual median values during the ninth year of the simulation, confirming that the water quality target is being met. Figure 24 demonstrates that the sediments are in equilibrium during the simulation period.

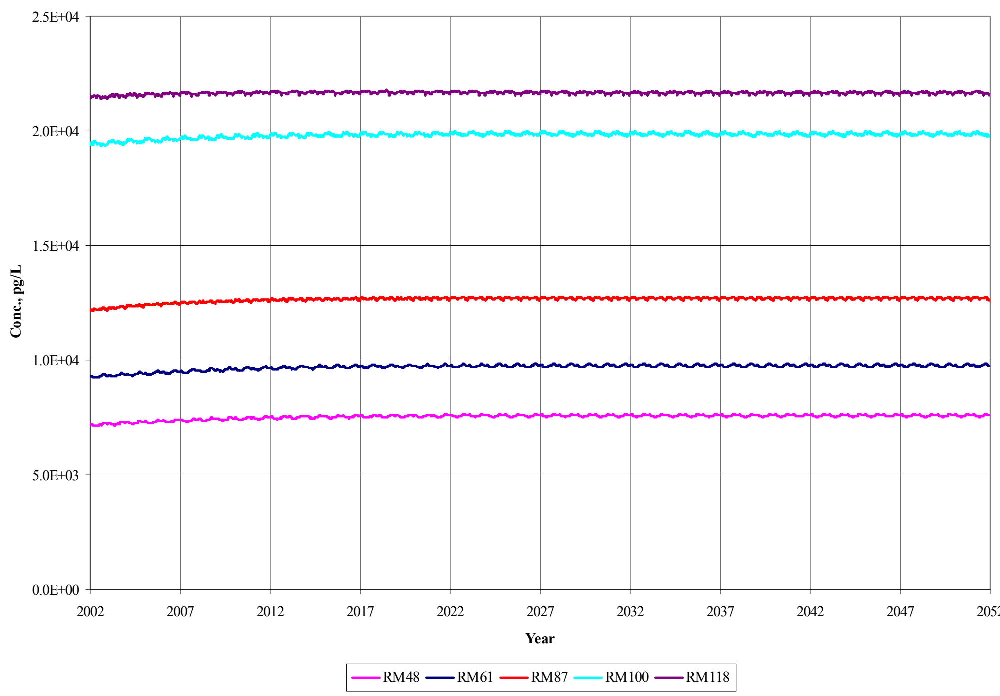

Figure 20: Temporal plot of penta-PCB concentrations in surface sediment layer during a 100 year simulation using the loads established in Step 2.

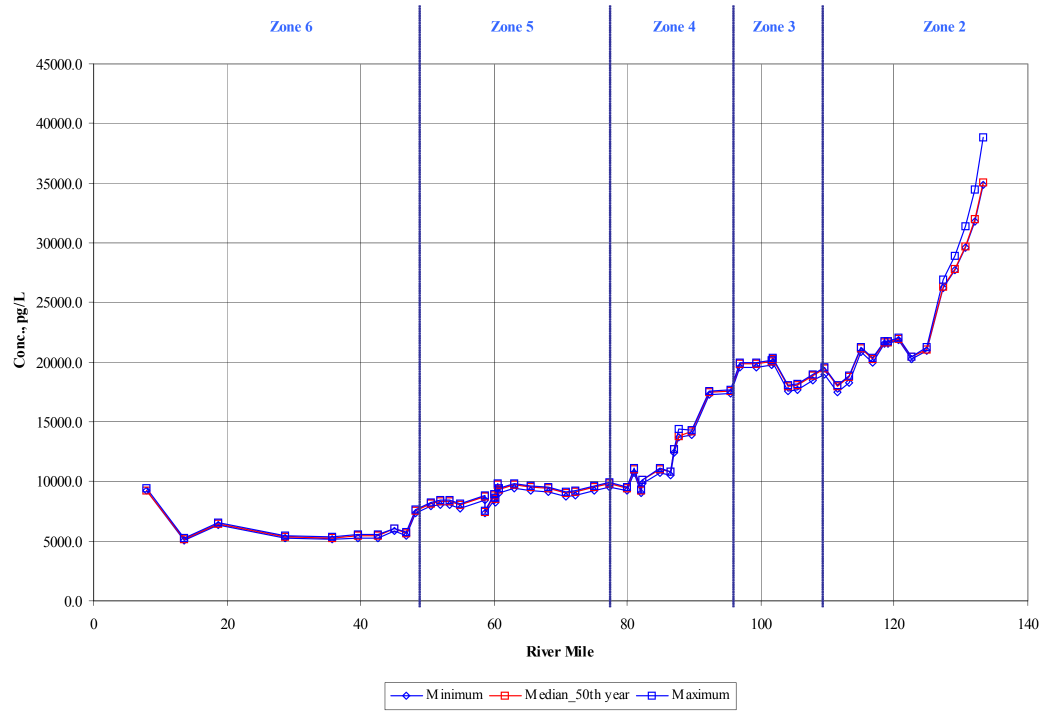

Figure 21: Spatial plot of simulated surface sediment concentrations of penta-PCBs in surface sediment layer during a 50 year simulation using the loads established in Step 2.

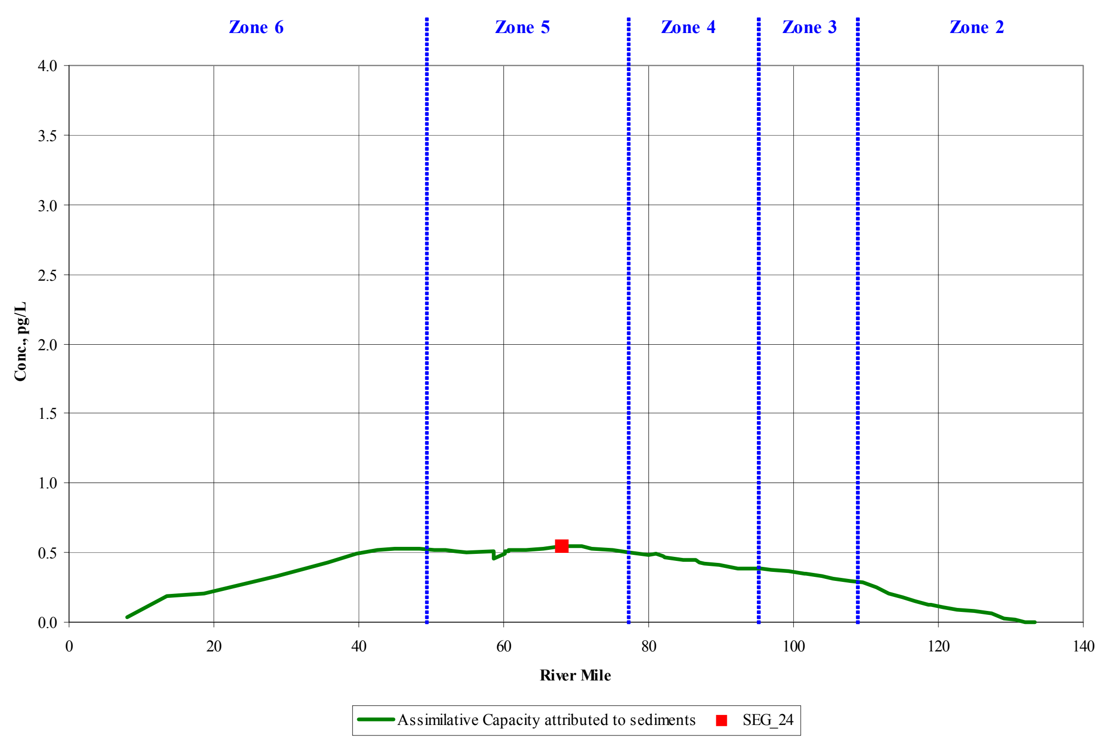

Figure 22: Spatial plot of the assimilative capacity in pg/L provided by the sediment layer.

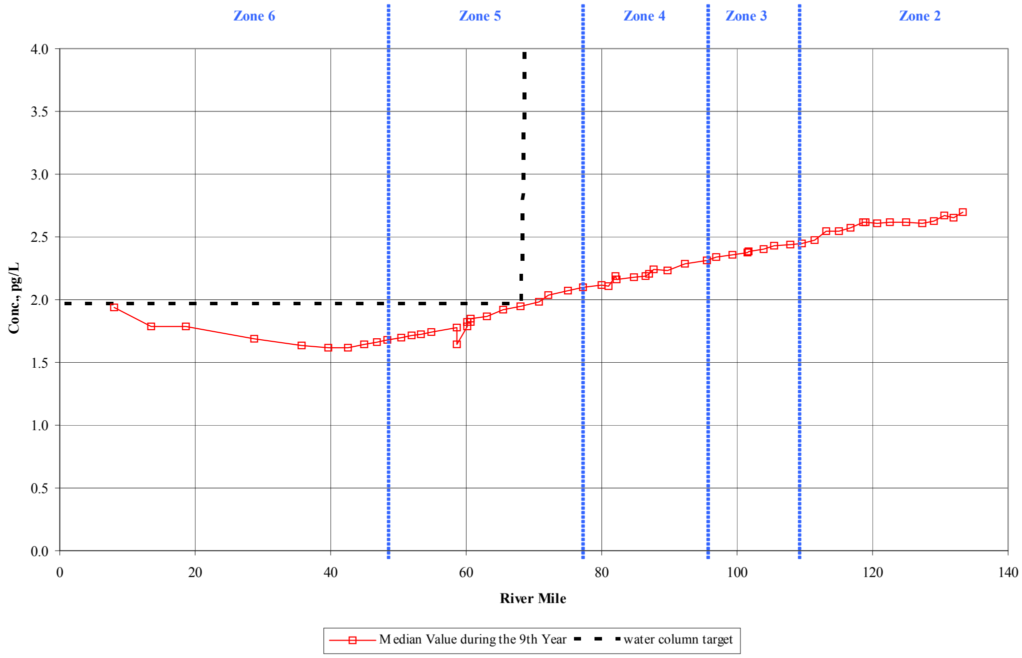

Figure 23: Spatial plot of the penta-PCBs in the water column during a 10 year simulation using the loads established in Step 2 and with new sediment initial conditions.

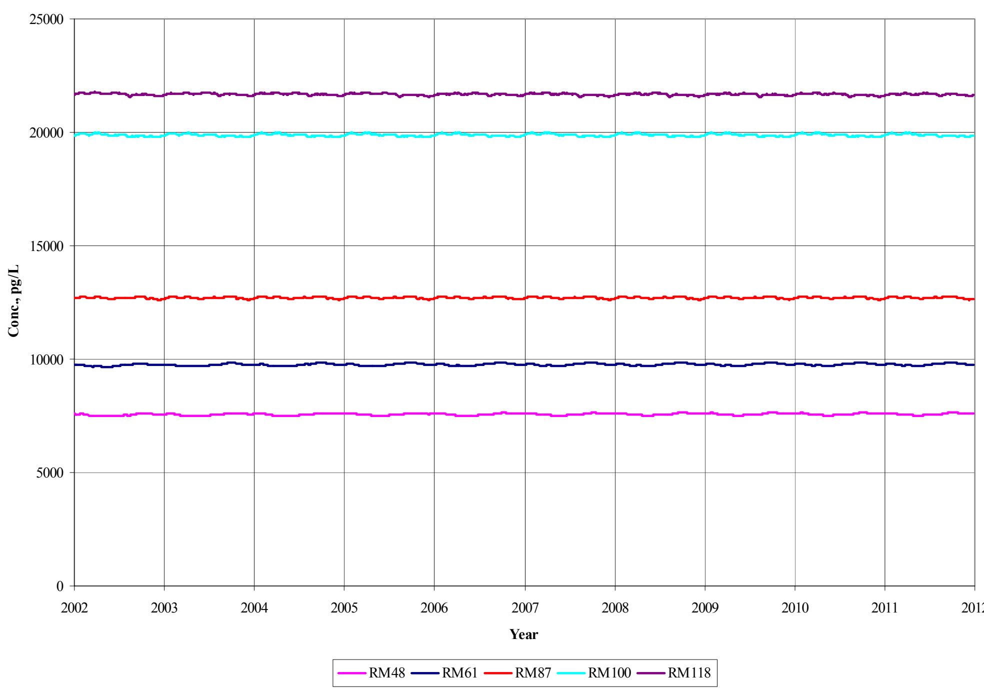

Figure 24: Temporal plot of the concentration of penta-PCBs in the surface sediment layer during a 10 year simulation using the loads established in Step 2 and with new sediment initial conditions.

3.3.5 Step 4

The final step in developing TMDLs for penta-PCBs for Zones 2 through 5 of the Delaware Estuary is to include the exchange of penta-PCBs between the gas phase in the atmosphere and truly dissolved penta-PCBs in the water. In the current model framework, the gas phase air concentrations are assigned, and are not dynamically simulated by the model. However, when the TMDL is achieved there should be close to zero net exchange between the water and air. It was therefore necessary to estimate the gas phase concentration that would be in equilibrium with the water quality targets (Figure 8) and then confirm that the water quality targets are still being met.

The penta-PCB water quality model utilizes the following formula to determine the volatilization rate of a chemical:

$$\frac{\partial C}{\partial t} = \frac{K_V}{D}\left[C_W - \frac{C_A}{H/RT_K}\right]$$

where: K_V = the transfer rate, meters per day
D = model segment depth in meters
C_W = truly dissolved fraction of the chemical in water, mg/L
C_A = atmospheric gas phase concentration, mg/L
H = Henry's Law Constant, atm-m^3/day
R = universal gas constant
T_K = water temperature in degrees Kelvin

At equilibrium, the volatilization rate will be zero. Therefore:

$$\left[C_W - \frac{C_A}{H/RT_K}\right] = 0$$

Rearranging this formula to calculate the atmospheric gas phase concentration for penta-PCBs:

$$C_W \times H/RT_K = C_A$$

Figure 25 presents the truly dissolved penta-PCB water concentrations predicted by the model from Step 4 and the corresponding equilibrium air concentrations of gaseous phase penta-PCBs for the one year cycling period.

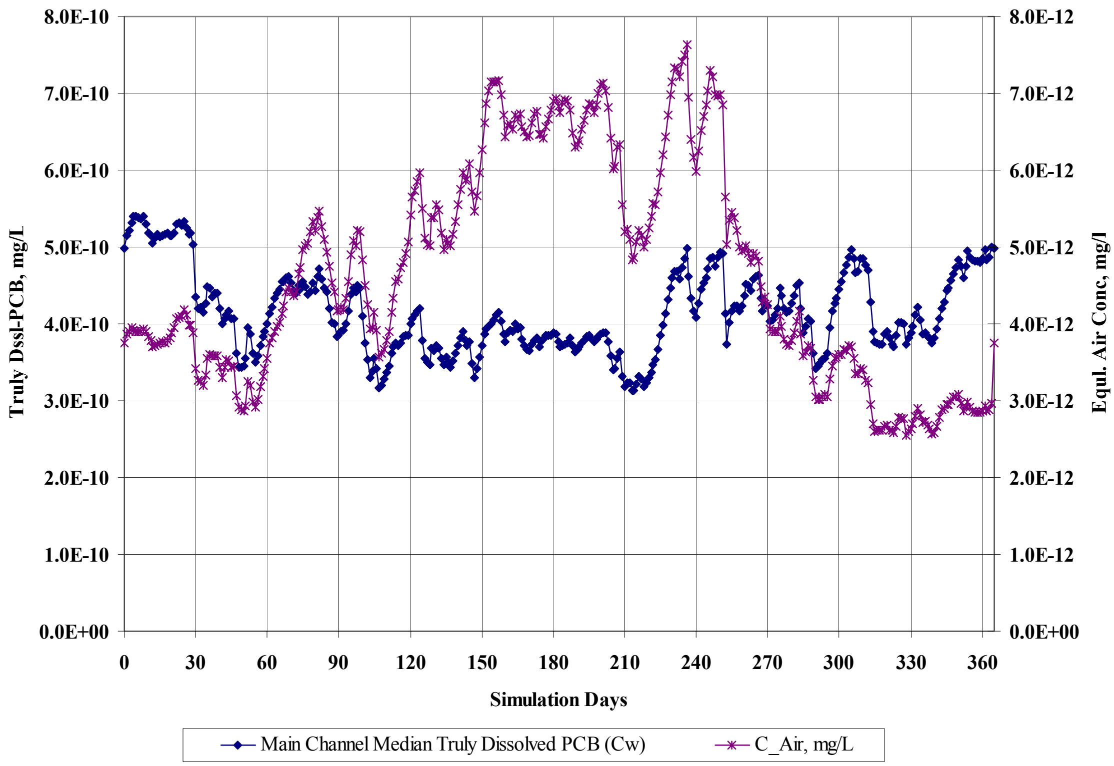

Figure 25: Back-calculated, equilibrium, median, gas phase penta-PCB concentrations during the one year model cycling period.

The penta-PCB water quality model is then run with the conditions obtained from Step 2 and 3 including the loadings from the model boundaries and to each estuary zone, initial penta-PCB concentrations in the sediment (Figure 24), and with back-calculated, equilibrium, median, gas phase penta-PCB concentrations during the one year model cycling period (Figure 25). The purpose of this simulation is to confirm that the penta-PCB concentrations in the sediments and the penta-PCB gas phase air concentrations are in equilibrium with the estuary concentrations that will meet the water quality target of 1.975 pg/L at the critical location when all fate processes are enabled in the model. These simulations were also run for 100 years to establish the point at which equilibrium was reached between the water column and the sediments. Figure 26 indicates the sediment concentration of penta-PCBs at five locations in the estuary corresponding to a model segment in each of the estuary zones and Delaware Bay. Note that sediment concentrations in all segments reach equilibrium after approximately 20 years. The simulated sediment concentrations at each of the model segments is presented in Figure 27. Figure 28 presents a plot of the annual median values during the 99th and 100th year of the simulation, confirming that the water quality target is being met.

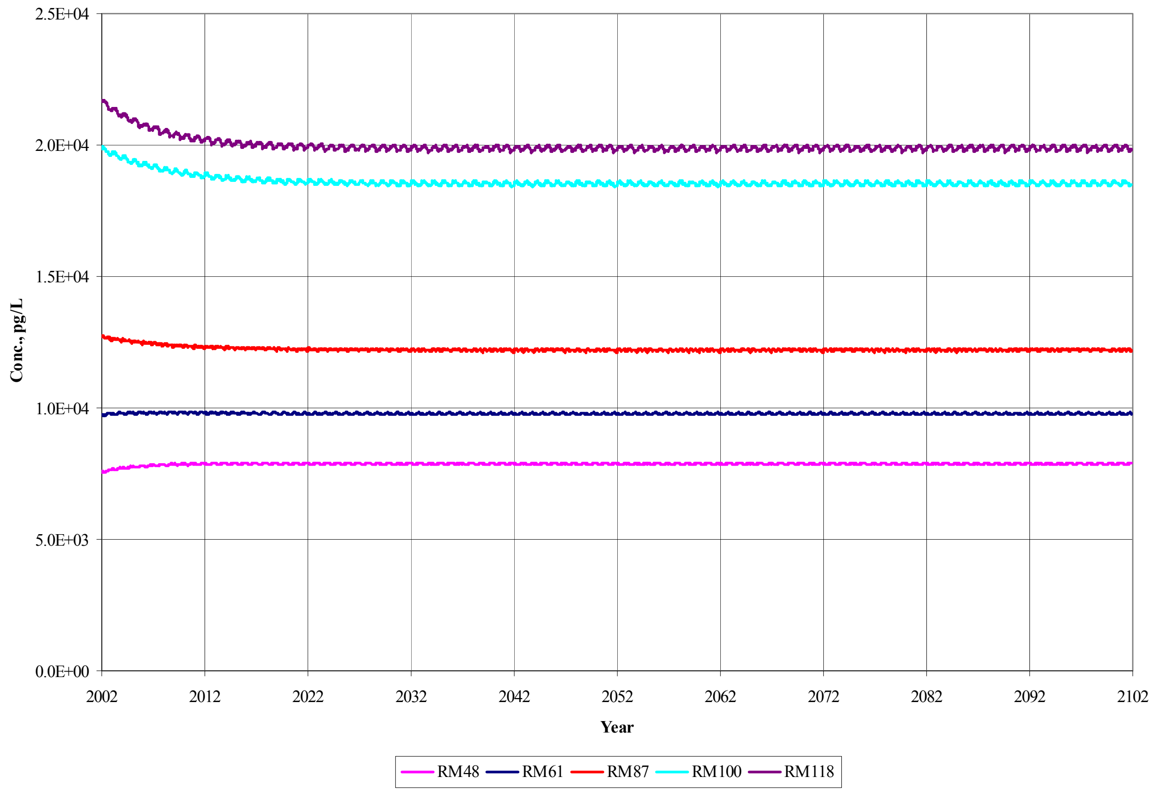

Figure 26: Temporal plot of penta-PCB concentrations in the surface sediment layer during a 100 year simulation with air-water exchange processes enabled.

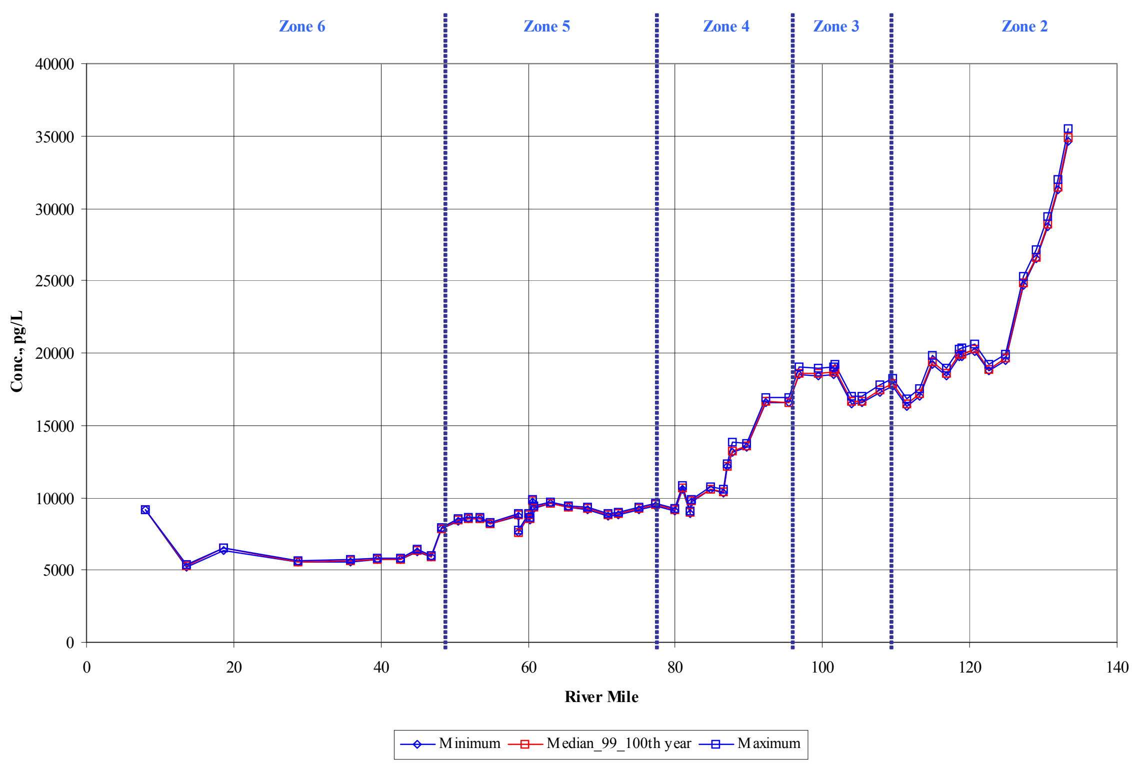

Figure 27: Spatial plot of penta-PCB concentrations in the surface sediment layer during a 100 year simulation with air-water exchange processes.

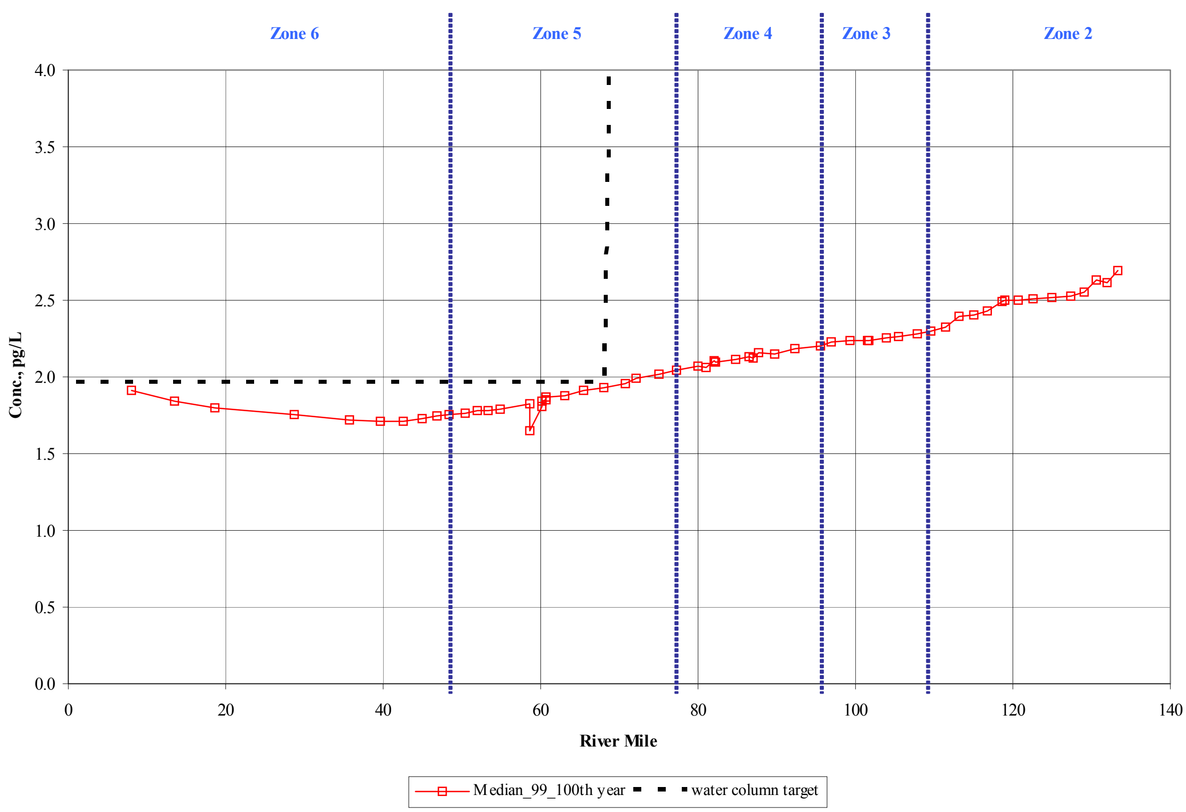

Figure 28: Spatial plot of the penta-PCBs in the water column during a 100 year simulation using the loads established in Step 2, new sediment initial conditions, and with air-water exchange processes enabled

4. TMDLs, WLAs and LAs for Total PCBs for Zones 2 to 5

4.1 TMDLs, WLAs and LAs for Penta- PCBs

Table 5 summarizes the calculated TMDLs (allowable loadings) for penta-PCBs for Zones 2 to 5 of the Delaware Estuary that were derived in Section 3.3.5. The loadings from the Delaware River at Trenton and the Schuylkill River are included in the Zone 2 and 4 TMDLs, respectively. The next step is to allocate the zone-specific TMDLs to a wasteload allocation portion or WLA, a load allocation portion or LA, and a margin of safety.

Table 5: TMDLs for penta-PCBs for Zones 2 through 5 of the Delaware Estuary

Estuary Zone	TMDL (milligrams / day)
Zone 2	64.3400
Zone 3	4.4555
Zone 4	14.1779
Zone 5	12.0157
Sum	94.9891

The Commission's Toxics Advisory Committee has made several recommendations on the policies and procedures to be used to establish these allocations. Federal regulations at 40 CFR Part 130.7(c)(1) require a margin of safety or MOS to be included in a TMDL to account for any lack of knowledge concerning the relationships between pollutant loadings and receiving water quality. Commission regulations also require that a portion of the TMDL be set aside as a margin of safety, with the proportion reflecting the degree of uncertainty in the data and resulting water quality-based controls. The margin of safety can be incorporated either implicitly in the design conditions used in establishing the TMDLs or explicitly by assigning a proportion of each TMDL. Both of these approaches were considered by the Toxics Advisory Committee who recommended that an explicit margin of safety of 5% be assigned in allocating the zone-specific TMDLs. This recommendation was based upon the use of a one year cycling period for the hydrodynamic and water quality model that mimics the period of record for the two major tributaries to the estuary rather than design tributary flows; and the use of tide data, precipitation data and the actual effluent flows that occurred during the one year cycling period. EPA finds these recommendations reasonable and supported by the evidence, and adopted them in these TMDLs. Table 6 presents the MOS allocation for each of the zones as well as the two tributary boundaries. This is necessary since the loadings from these tributaries are part of the PCB loadings to Zones 2 and 4

Table 6: Allocation of the Zone TMDLs to the 5% Margin of Safety

Sources of Loadings	Contribution Factor (CF)	TMDL	MOS	TMDL - MOS
	[pg/L] / [pg/L] or [pg/L] / [100mg/day]	mg/day	mg/day	mg/day
Delaware River	0.581500	57.727	2.886	54.841
Schuylkill River	0.118390	9.609	0.48	9.129
Zone 2	1.966800	6.613	0.331	6.282
Zone 3	2.142800	4.455	0.223	4.232
Zone 4	2.281300	4.569	0.228	4.341
Zone 5	0.967040	12.016	0.601	11.415
Sum		**94.989**	**4.749**	**90.24**

The committee recommended that for the Stage 1 TMDLs, the proportion of the TMDLS that are allocated to WLAs and LAs should be based upon the current loadings from the various PCB source categories to each of the zones during the one year cycling period (February 1, 2002 to January 31, 2003) used in the TMDL model simulations. EPA finds these recommendations reasonable and adopted them in these TMDLs.

Prior to allocation of the remaining portion of the TMDL between WLA and LA, the portion of the assimilative capacity allocated to contaminated sites was determined since the assimilative capacity for this source must also be shared between the estuary zones and the two boundary tributaries (see Section 3.2.1). Table 7 presents the load allocated to the contaminated sites by source and the remaining assimilative capacity that must still be allocated.

Table 7: Allocation of the Zone TMDLs to Contaminated Sites

Sources of Loadings	TMDL - MOS	% of Total Loading to Zone	Contaminated Site Allocation	TMDL - MOS - CS
	mg/day		mg/day	
Delaware River	54.841	-	0.229	54.612
Schuylkill River	9.129	-	3.473	5.656
Zone 2	6.282	0.42	0.026	6.256
Zone 3	4.233	57.09	2.416	1.816
Zone 4	4.340	38.04	1.651	2.689
Zone 5	11.415	46	5.251	6.164
	94.989	**-**	**13.046**	**77.193**

The remaining assimilative capacity can now be apportioned to WLAs and the rest of the sources that contribute to the LAs (Table 8). The WLA source categories include the continuous point source NPDES discharges, stormwater discharges permitted under the NPDES program, and combined sewer overflows (CSOs), and municipal separate storm sewer systems (MS4s).

EPA's regulations require NPDES-regulated storm water discharges to be addressed by the WLA component of a TMDL. Assessing the estimated loading from such discharges is relatively difficult compared to traditional point source discharges, as storm water discharge is typically calculated by quantifying the area of urban and residential land uses in a basin. For this reason, it is important to have updated land use data and runoff coefficients.

In developing the Stage 1 TMDLs, the existing WLAs were calculated for traditional point source discharges based on effluent concentrations and the actual effluent flows during the one year model cycling period (see Section 3.2.4.1). A November 22, 2002 EPA Memorandum entitled, "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm water Source and NPDES Permit Requirements Based on Those WLAs" clarified existing regulatory requirements for municipal separate storm sewer systems (MS4s) connected with TMDLs. Where a TMDL has been developed, the MS4 community must receive a WLA rather than a LA. The Stage 1 TMDL explicitly assigns a portion of each of the zone WLAs to storm water discharges that do not have an individual NPDES permit. Appendix 6 presents the procedure used to develop each of these zone allocations to MS4s and the resulting MS4 loading in milligrams per day (mg/day).

The LA source categories also include the other smaller tributaries, non-point source loads not permitted under the NPDES program, dry and wet atmospheric deposition. Tables 9 and 10 summarize the categories included in the aggregate allocations to WLAs and LAs in each zone, respectively. Table 11 summarizes the allocations to WLAs, LAs and the MOS. Figures 29 to 32 graphically illustrate the proportion allocated.

Table 8: Summary of Zone TMDLs for penta-PCBs and the allocation to the major source categories for PCBs.
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Sources of Loadings	Contribution Factor (CF)	TMDL	MOS	Contaminated Site Allocation	Remaining Allocation	Allocation to Continuous Point Sources	Allocation to CSOs	Allocation to MS4s	Remaining Portion to the rest of LAs
	[pg/L] / [pg/L] or [pg/L] / [100mg/day]	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day
Trenton	0.581500	57.727	2.886	0.229	54.611	0.000			
Schuylkill	0.118390	9.609	0.480	3.473	5.656	0.000			
Zone 2	1.966800	6.613	0.331	0.026	6.256	1.241	0.006	1.511	3.498
Zone 3	2.142800	4.455	0.223	2.416	1.816	0.771	0.462	0.185	0.398
Zone 4	2.281300	4.569	0.228	1.651	2.689	0.614	0.677	0.342	1.055
Zone 5	0.967040	12.016	0.601	5.250	6.165	3.132	0.182	0.592	2.259
Sum		94.989	4.749	13.046	77.193	5.758	1.327	2.630	7.211

Table 9: Summary of the Zone WLAs for penta-PCBs and their allocation to source categories.

Estuary Zone	WLA	NPDES continuous discharging point sources	CSOs	Municipal separate stormwater sewer service
	mg/day	mg/day	mg/day	mg/day
Zone 2	2.7574	1.2408	0.0059	1.5107
Zone 3	1.4180	0.7713	0.4620	0.1847
Zone 4	1.6338	0.6143	0.6772	0.3423
Zone 5	3.9062	3.1319	0.1822	0.5922
Sum	9.7155	5.7583	1.3272	2.6300

Table 10: Summary of the Zone LAs for penta-PCBs and their allocation to source categories.

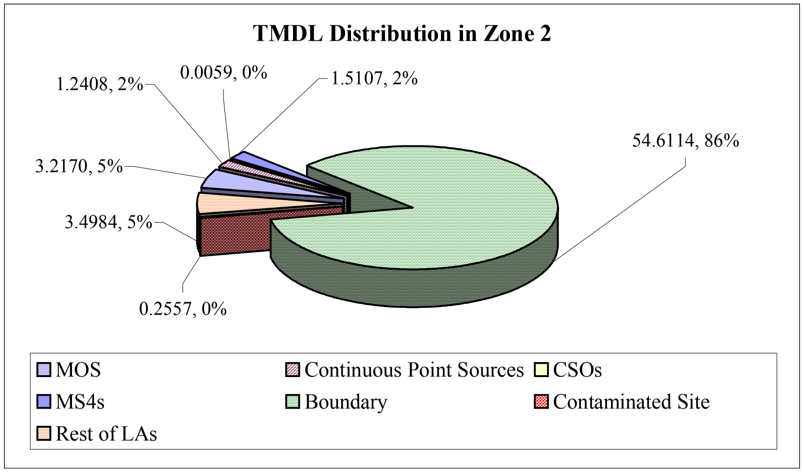
Estuary Zone	**LAs**	**Boundary ***	**Contaminated Site**	**Others**
	mg/day	mg/day	mg/day	mg/day
Zone 2	58.3656	54.6114	0.2557	3.4984
Zone 3	2.8147	0.0000	2.4164	0.3983
Zone 4	11.8351	5.6558	5.1240	1.0554
Zone 5	7.5087	0.0000	5.2501	2.2586
Sum	80.5242	60.2672	13.0462	7.2107

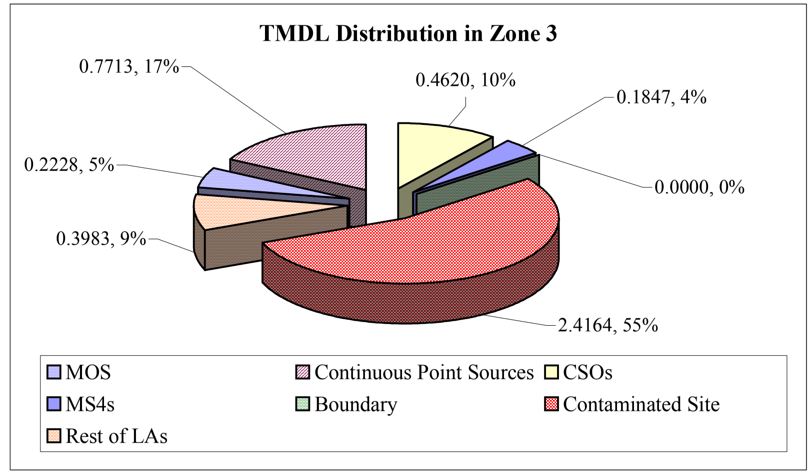
* - The boundary in Zone 2 is the Delaware River at Trenton, and the boundary in Zone 4 is the Schuylkill River.

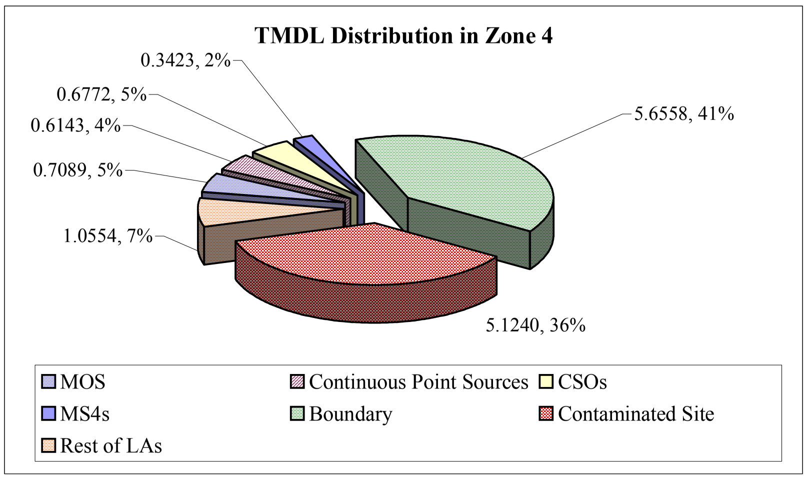
Table 11: Summary of the Zone TMDLs for penta-PCBs and their allocation to WLAs, LAs and a MOS.

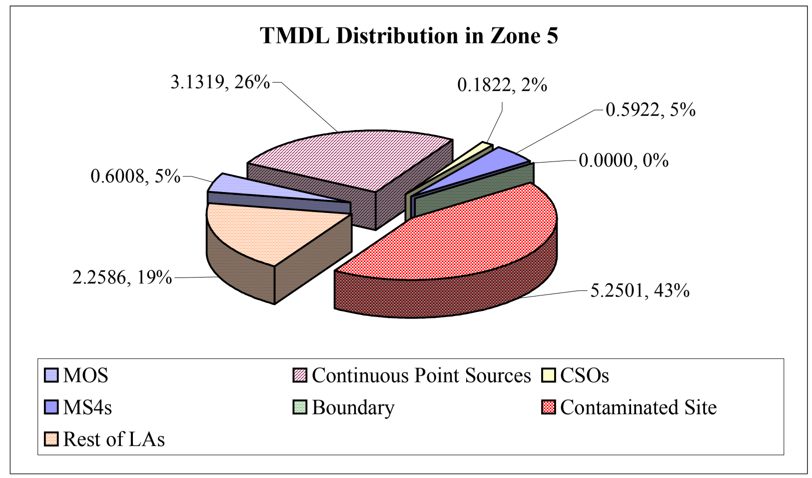
Estuary Zone	**TMDL**	**WLA**	**LA**	**MOS**
	mg/day	mg/day	mg/day	mg/day
Zone 2	64.3400	2.7574	58.3656	3.2170
Zone 3	4.4555	1.4180	2.8147	0.2228
Zone 4	14.1779	1.6338	11.8351	0.7089
Zone 5	12.0157	3.9062	7.5087	0.6008
Sum	94.9891	9.7155	80.5242	4.7495

Figures 29 - 32: Distribution of Zone TMDLs to Point sources and CSOs, and the Remainder of the Non-Point Sources (tributary boundary loads, the MOS and the Contaminated Site loading excluded).









4.2 TMDLs, WLAs and LAs for Total PCBs

4.2.1 Extrapolation from Penta to Total PCBs

As discussed in Sections 2.2 and 3.2.2, TMDLs for Total PCBs will be extrapolated from penta homolog data using the observed ratio in the Delaware Estuary of the penta homolog to total PCBs. This approach was recommended by the expert panel established by the Commission due to time limitations and the technical difficulty in developing and calibrating a PCB model for each of the ten PCB homologs. Data available to the panel at that time indicated that the proportion of penta-PCBs to Total PCBs at 15 locations sampled in the estuary ranged between 0.2 and 0.3 (20 to 30% of Total PCBs). Figure 33 presents the ratio of penta-PCBs to Total PCBs for each zone based upon data currently available. EPA finds this extrapolation to be reasonable and supported by the best available data.

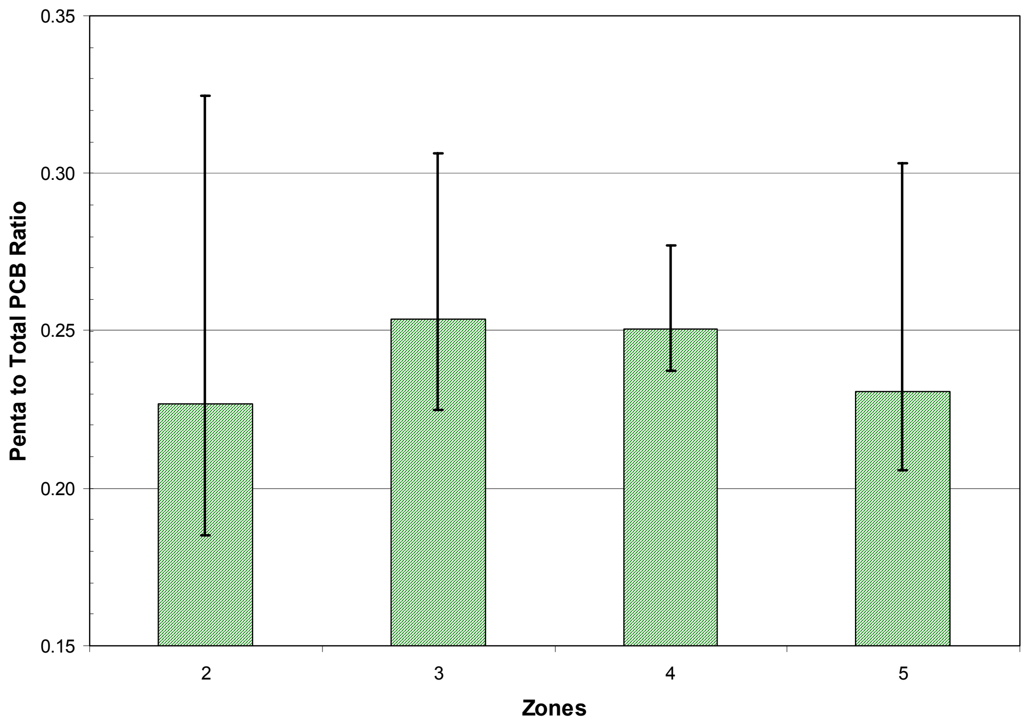


Figure 33: Ratio of Penta-PCBs to Total PCBs in ambient water samples collected from 15 sites in the Delaware Estuary during surveys conducted on September 18, 2001, March 15, 2002, April 11, 2002, October 8, 2002 and March19, 2003. Error bars indicate the minimum and maximum ratios observed at any sampling site during all five surveys.

This data supports the original data and indicates median penta- to total PCB ratios of 0.23, 0.25, 0.25 and 0.23 for Zones 2 to 5, respectively. For Stage 1 TMDLs, a fixed value of 0.25 was used for all zones to scale up the zone-specific TMDLs, WLAs, LAs and MOSs.

4.2.2 TMDLs, WLAs and LAs for Total PCBs

Table 12 summarizes the TMDLs for each estuary zone for total PCBs as well as the allocations to WLAs, LAs and the MOSs.

Table 12: TMDLs, WLAs, LAs and MOSs for Total PCBs for Zones 2 to 5 of the Delaware Estuary.

Estuary Zone	TMDL	WLA	LA	MOS
	mg/day	mg/day	mg/day	mg/day
Zone 2	257.36	11.03	233.46	12.87
Zone 3	17.82	5.67	11.26	0.89
Zone 4	56.71	6.54	47.34	2.84
Zone 5	48.06	15.63	30.04	2.40
Sum	379.96	38.86	322.10	19.00

4.2.3 Uncertainty Analysis for TMDLs, WLAs and LAs for Total PCBs

Uncertainty is associated with three elements of the Stage 1 TMDLs: 1) the use of annual median values for determining compliance with the penta-PCB water quality target, 2) the loading of penta-PCBs for each of the source categories that is used to apportion the TMDLs, and 3) the extrapolation of the penta-PCB TMDLs, aggregate and individual WLAs, and LAs to total PCBs.

As discussed in Section 3.2.1, TMDLs are calculated over a one year period (annual median) to be consistent with both the model simulations and the 70 year exposure used for human health criteria. The estuary, however, is dynamic with ambient PCB concentrations being affected by the amount of inflow from the tributaries, the variation in the tides over lunar and annual time scales, changes in both continuous and precipitation-induced wastewater flows, and the prevailing air and water temperature. Thus, ambient PCB concentrations will vary on both a daily and monthly basis about the annual median. The magnitude of this variation can be seen by plotting the annual minimum and annual maximum values that occur during long-term model simulations like those used to check whether a given set of loading assumptions results in compliance with the penta-PCB water quality target at the critical location (see Figure 28). Figure 34 illustrates the uncertainty associated with the use of annual median values by comparing annual minimum and maximum plots of water column concentrations of penta-PCBs during a 100 year simulation. The figure indicates that the annual variation is approximately +15% to -25%.

The uncertainty in the loading estimates for each of the source categories is discussed in Section 2.7 of the model calibration report (DRBC, 2003c). A Monte Carlo analysis was performed to examine and compare the uncertainty for the loading estimates for each PCB source category that were used in the 577 day model calibration period. This analysis indicated that the greatest uncertainty was associated with the tidal non-point source loads (90^{th} and 10^{th} percentiles of loading were 44.82 and 2.28 kilograms, respectively) followed by the contaminated site loads (90^{th} and 10^{th} percentiles of loading were 24.94 and 4.23 kilograms, respectively). Less uncertainty was associated with the loading from point sources (90^{th} and 10^{th} percentiles of loading were 8.53 and 5.16 kilograms, respectively)

The uncertainty in the extrapolation from penta-PCBs to total PCBs is illustrated in Figure 33. This figure indicates that while the zone ratios of penta-PCBs to total PCBs is close to 0.25, the uncertainty associated with the ratios varies between zones with the largest uncertainty occurring in Zone 2 (0.19 to 0.32) and the smallest occurring in Zone 4 (0.24 to 0.28).

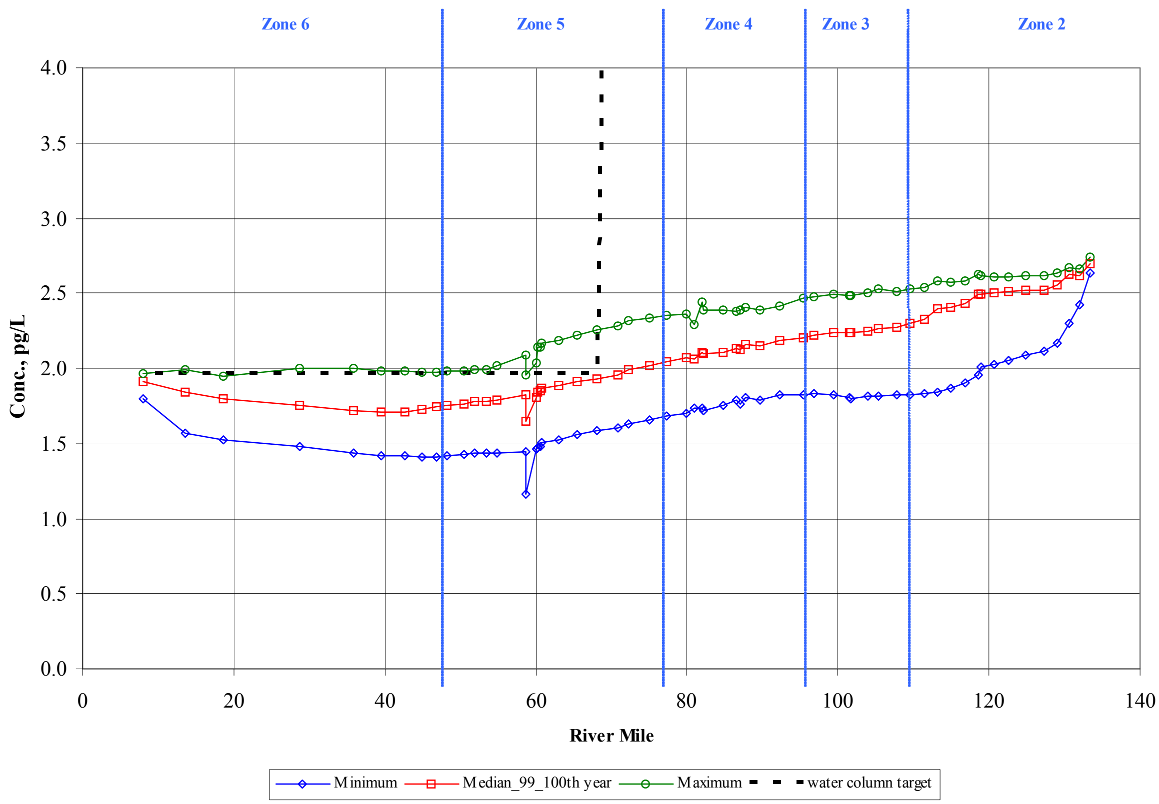


Figure 34: Spatial plots of the annual median, annual minimum and annual maximum values of water column penta-PCB concentrations during a 100 year simulation using the TMDL loads.

5. REFERENCES

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Appendix 1

REDUCING PCB LOADINGS TO THE DELAWARE ESTUARY:
A Staged Approach to Establishing TMDLs

Documents distributed at the April 29, 2003 meeting convened by the

U.S. Environmental Protection Agency, Regions II and III

Delaware River Basin Commission

Delaware Department of Natural Resources & Environmental Control

New Jersey Department of Environmental Protection

Pennsylvania Department of Environmental Protection

Appendix 2

Individual Wasteload Allocations for NPDES Discharges: Stage 1 TMDLs for Total PCBs for Zones 2 to 5 of the Delaware Estuary

Appendix Table 2-1: Individual wasteload allocations for the point source discharges except CSOs and MS4s.

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
1	1	Morrisville WWTP	PA0026701	001	2	132.9	76	2	65.566	0.057280	0.229120
2	2	Trenton	NJ0020923	001	2	132.2	75	1	243.612	0.212825	0.851301
3	3	PSEG-Mercer	NJ0004995	441A	2	130.4	74	2	0.000	0.000000	0.000000
4	4	PSEG-Mercer	NJ0004995	441C	2	130.4	74	1	5.010	0.004377	0.017508
5	5	MSC Pre Finish Metals	PA0045021	001	2	130.1	74	2	0.646	0.000564	0.002256
6	6	Hamilton Township	NJ0026301	001	2	128.0	73	2	220.791	0.192889	0.771555
7	7	Yates Foil	NJ0004332	001B	2	128.0	73	2	0.070	0.000061	0.000244
8	8	Yates Foil	NJ0004332	002A	2	128.0	73	2	0.000	0.000000	0.000000
9	9	Bordentown Sewerage Authority	NJ0024678	001	2	128.0	71	2	26.292	0.022969	0.091877
10	10	U.S. Steel	PA0013463	002	2	127.4	71	1	61.390	0.053632	0.214527
11	11	U.S. Steel	PA0013463	103	2	127.0	71	1	10.056	0.008785	0.035141
12	12	U.S. Steel	PA0013463	203	2	127.0	71	1	3.787	0.003308	0.013234
13	13	Exelon-Fairless	PA0057088	001	2	126.6	71	2	0.000	0.000000	0.000000
14	14	Waste Management Grows Landfill	PA0043818	001	2	125.5	70	2	1.182	0.001033	0.004131
15	15	Lower Bucks County Municipal Authority	PA0026468	001	2	121.9	69	2	129.179	0.112854	0.451417
16	16	Florence Township	NJ0023701	001	2	121.4	68	2	15.682	0.013700	0.054802
17	17	GEON Company (Burlington) Polyone	NJ0004235	001A	2	120.3	68	2	15.051	0.013149	0.052595
18	18	Bristol Borough	PA0027294	001	2	118.7	66	2	29.383	0.025669	0.102677
19	19	US Pipe & Foundry	NJ0005266	002A	2	118.1	66	1	0.807	0.000705	0.002821
20	20	City of Burlington	NJ0024660	002	2	117.6	64	2	46.336	0.040480	0.161921
21	21	PSEG-Burlington	NJ0005002	WTPA	2	117.4	64	1	0.929	0.000812	0.003246
22	22	Rohm&Haas-Bristol	PA0012769	009	2	117.1	64	1	5.710	0.004988	0.019952

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
23	23	Burlington Township	NJ0021709	001	2	117.0	64	2	34.901	0.030490	0.121961
24	24	Colorite Polymers	NJ0004391	002A	2	117.0	64	2	0.008	0.000007	0.000030
25	25	Colorite Polymers	NJ0004391	003A	2	117.0	64	2	0.740	0.000646	0.002585
26	26	Bristol Township	PA0026450	001	2	116.8	64	2	34.732	0.030342	0.121370
27	27	Beverly Sewerage Authority	NJ0027481	001	2	114.7	63	1	18.890	0.016503	0.066010
28	28	Delran Sewerage Authority	NJ0023507	001	2	110.8	60	2	37.419	0.032691	0.130762
29	29	Mt. Holly Municipal Utilities Authority	NJ0024015	001	2	110.8	61	2	54.904	0.047965	0.191862
30	30	Mt. Laurel Municipal Utilities Authority	NJ0025178	001A	2	110.8	60	2	67.433	0.058911	0.235646
31	31	Riverton Borough	NJ0021610	001	2	110.8	61	1	3.853	0.003366	0.013464
32	32	Willingboro Municipal Utilities Authority	NJ0023361	001	2	110.8	61	2	123.392	0.107798	0.431194
33	33	AFG Industries	NJ0033022	001A	2	109.6	59	1	10.258	0.008962	0.035848
34	34	AFG Industries	NJ0033022	002	2	109.4	59	2	0.092	0.000080	0.000321
35	35	Hoeganaes Corp.	NJ0004375	001A	2	109.4	59	2	0.330	0.000288	0.001151
36	36	Hoeganaes Corp.	NJ0004375	003A	2	109.4	59	2	0.000	0.000000	0.000000
37	37	Cinnaminson Sewerage Authority	NJ0024007	001	2	108.9	59	1	27.980	0.024444	0.097778
38	38	Riverside Sewerage Authority	NJ0022519	001	2	108.8	59	1	124.107	0.108423	0.433693
39	1	Palmyra Borough	NJ0024449	001	3	107.7	58	2	19.235	0.005384	0.021536
40	2	Rohm&Haas-Philadelphia	PA0012777	001	3	106.1	56	2	15.974	0.004471	0.017885
41	3	Rohm&Haas-Philadelphia	PA0012777	003	3	106.1	56	1	2.175	0.000609	0.002435
42	4	Rohm&Haas-Philadelphia	PA0012777	007	3	106.1	56	2	0.003	0.000001	0.000003
43	5	NGC Industries	NJ0004669	001A	3	104.4	55	2	1.528	0.000428	0.001710
44	6	PWD-NE	PA0026689	001	3	104.1	55	1	1238.662	0.346711	1.386845
45	7	Citgo Petroleum	NJ0131342	001A	3	103.4	55	2	0.012	0.000003	0.000014
46	8	Exelon-Delaware	PA0011622	001	3	101.2	52	2	0.044	0.000012	0.000049

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
47	9	Exelon-Delaware	PA0011622	002	3	101.2	52	1	0.655	0.000183	0.000733
48	10	Exelon-Delaware	PA0011622	004	3	101.2	52	2	0.011	0.000003	0.000013
49	11	Exelon-Delaware	PA0011622	006	3	101.1	52	2	0.000	0.000000	0.000000
50	12	CCMUA	NJ0026182	001	3	98.0	49	1	818.459	0.229093	0.916372
51	13	PWD-SE	PA0026662	001	3	96.8	49	1	657.721	0.184101	0.736405
52	1	Coastal Mart / Coastal Eagle Point Oil	NJ0005401	003A	4	94.7	48	2	0.006	0.000002	0.000007
53	2	Coastal Mart / Coastal Eagle Point Oil	NJ0005401	001A	4	94.3	48	2	55.368	0.014863	0.059451
54	3	Metro Machine	PA0057479	DD2	4	93.2	44	1	49.040	0.013164	0.052656
55	4	Metro Machine	PA0057479	DD3	4	93.1	44	2	17.845	0.004790	0.019161
56	5	Kvaerner	PA0057690	019	4	92.8	44	1	0.100	0.000027	0.000108
57	6	Kvaerner	PA0057690	021	4	92.8	44	1	0.100	0.000027	0.000108
58	7	Kvaerner	PA0057690	012	4	92.7	44	1	22.608	0.006069	0.024275
59	8	Kvaerner	PA0057690	047	4	92.5	45	2	0.005	0.000001	0.000005
60	9	Sunoco-GirardPoint	PA0011533	015	4	92.5	45	2	99.167	0.026620	0.106481
61	10	Sunoco-PointBreeze	PA0012629	002	4	92.5	46	2	75.899	0.020374	0.081496
62	11	PWD-SW	PA0026671	001	4	90.7	43	1	1020.466	0.273932	1.095729
63	12	Ausimont	NJ0005185	001A	4	90.7	43	1	0.840	0.000225	0.000902
64	13	Ausimont	NJ0005185	002A	4	90.7	43	1	0.077	0.000021	0.000082
65	14	Chevron	NJ0064696	001A	4	90.5	43	2	0.157	0.000042	0.000169
66	15	Colonial Pipeline	NJ0033952	001A	4	90.5	43	2	0.087	0.000023	0.000094
67	16	BP Paulsboro	NJ0005584	002A	4	89.6	43	2	0.352	0.000095	0.000378
68	17	BP Paulsboro	NJ0005584	003A	4	89.4	43	2	7.006	0.001881	0.007522
69	18	GCUA	NJ0024686	001	4	88.4	43	1	113.497	0.030467	0.121868
70	19	Air Products	NJ0004278	001A	4	88.2	42	2	10.041	0.002695	0.010782

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
71	20	Valero Refining	NJ0005029	001A	4	87.7	42	1	99.473	0.026702	0.106809
72	21	Hercules	NJ0005134	001A	4	87.5	42	1	4.120	0.001106	0.004424
73	22	Greenwich Township	NJ0030333	001	4	87.0	42	2	12.110	0.003251	0.013003
74	23	Dupont-Repauno	NJ0004219	007	4	86.6	42	1	1.433	0.000385	0.001538
75	24	Dupont-Repauno	NJ0004219	001A	4	85.6	38	1	80.773	0.021682	0.086730
76	25	Boeing	PA0013323	002	4	85.4	38	1	158.353	0.042508	0.170032
77	26	Boeing	PA0013323	016	4	85.4	38	1	0.149	0.000040	0.000160
78	27	Tinicum Township	PA0028380	001	4	85.4	40	1	15.450	0.004147	0.016590
79	28	Boeing	PA0013323	001	4	85.2	38	1	29.068	0.007803	0.031212
80	29	Boeing	PA0013323	003	4	85.2	38	1	0.404	0.000108	0.000433
81	30	Boeing	PA0013323	007	4	85.2	38	1	0.235	0.000063	0.000252
82	31	Boeing	PA0013323	008	4	85.2	38	2	0.018	0.000005	0.000019
83	32	Exelon-Eddystone	PA0013716	001	4	85.2	38	1	0.064	0.000017	0.000069
84	33	Exelon-Eddystone	PA0013716	005	4	85.2	38	1	0.509	0.000137	0.000546
85	34	Exelon-Eddystone	PA0013716	007	4	85.2	38	2	0.000	0.000000	0.000000
86	35	Exelon-Eddystone	PA0013716	008	4	85.2	38	2	0.000	0.000000	0.000000
87	36	Kimberly Clark	PA0013081	029	4	83.2	36	1	0.086	0.000023	0.000092
88	37	DeGuessa-Huls Corp.	PA0051713	001	4	82.2	36	2	9.063	0.002433	0.009731
89	38	DELCORA	PA0027103	001	4	80.6	34	1	309.423	0.083061	0.332244
90	39	ConocoPhillips	PA0012637	002	4	80.2	34	2	0.000	0.000000	0.000000
91	40	ConocoPhillips	PA0012637	006	4	80.2	34	2	0.029	0.000008	0.000032
92	41	ConocoPhillips	PA0012637	007	4	80.2	34	1	0.511	0.000137	0.000549
93	42	ConocoPhillips	PA0012637	008	4	80.2	34	1	0.111	0.000030	0.000119
94	43	Harrison Township-Mullica Hill	NJ0020532	001	4	79.8	79	2	6.093	0.001636	0.006543

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
95	44	Safety Kleen	NJ0005240	001A	4	79.8	79	2	7.440	0.001997	0.007989
96	45	Safety Kleen	NJ0005240	002A	4	79.8	79	1	3.512	0.000943	0.003772
97	46	Swedesboro	NJ0022021	001	4	79.8	79	2	3.296	0.000885	0.003539
98	47	ConocoPhillips	PA0012637	101	4	79.6	34	2	0.000	0.000000	0.000000
99	48	ConocoPhillips	PA0012637	201	4	79.6	34	2	48.580	0.013041	0.052163
100	49	Logan Township	NJ0027545	001	4	79.5	34	2	12.114	0.003252	0.013007
101	50	Solutia	NJ0005045	001	4	79.2	34	2	12.228	0.003282	0.013130
102	1	General Chemical	DE0000655	001	5	77.9	33	2	0.000	0.000000	0.000000
103	2	Geon Company (Pedricktown) Polyone	NJ0004286	003	5	75.9	32	2	0.011	0.000007	0.000030
104	3	Geon Company (Pedricktown) Polyone	NJ0004286	001A	5	74.9	32	2	1.690	0.001135	0.004542
105	4	Dupont-Edgemoor	DE0000051	001	5	73.2	31	1	32.214	0.021641	0.086564
106	5	Dupont-Edgemoor	DE0000051	004	5	72.2	31	1	0.153	0.000103	0.000412
107	6	Conectiv-Edgemoor	DE0000558	041	5	71.8	31	2	0.008	0.000005	0.000020
108	7	City of Wilmington	DE0020320	001	5	71.6	31	2	1297.745	0.871802	3.487207
109	8	Carney's Point	NJ0021601	001	5	71.3	25	2	10.265	0.006896	0.027584
110	9	AMTRAK	DE0050962	003	5	70.7	30	1	2.002	0.001345	0.005378
111	10	AMTRAK	DE0050962	004	5	70.7	30	1	35.822	0.024065	0.096259
112	11	Penns Grove Sewer Authority	NJ0024023	001	5	70.7	28	1	23.206	0.015589	0.062357
113	12	Dupont-ChamberWorks	NJ0005100	001A	5	69.8	25	1	138.476	0.093026	0.372103
114	13	Dupont-ChamberWorks	NJ0005100	662A	5	69.8	25	1	102.854	0.069096	0.276383
115	14	Conectiv-Deepwater	NJ0005363	003A	5	69.1	24	2	0.000	0.000000	0.000000
116	15	Conectiv-Deepwater	NJ0005363	005	5	69.1	24	2	0.035	0.000024	0.000094
117	16	Conectiv-Deepwater	NJ0005363	006	5	69.1	24	2	0.006	0.000004	0.000017
118	17	Conectiv-Deepwater	NJ0005363	017	5	69.1	24	1	0.284	0.000191	0.000763

Serial No.	Serial No. per Zone	Facility Name	NPDES	DSN	ZONE	RM	Model Segment	Potential Group (category)	Current Loadings (Sept. 2003) mg/day	Pent-PCBs WLA mg/day	Total PCBs WLA mg/day
119	18	Dupont-ChamberWorks	NJ0005100	011A	5	68.9	24	2	0.004	0.000003	0.000010
120	19	Dupont-ChamberWorks	NJ0005100	013A	5	68.9	24	2	0.000	0.000000	0.000000
121	20	Pennsville Sewerage Authority	NJ0021598	001	5	65.1	23	1	63.353	0.042559	0.170237
122	21	OxyChem	DE0050911	001	5	62.2	81	1	1.798	0.001208	0.004831
123	22	OxyChem	DE0050911	002	5	62.2	81	1	0.168	0.000113	0.000453
124	23	Conectiv-DelawareCity	DE0050601	016	5	61.9	22	2	0.123	0.000082	0.000330
125	24	Conectiv-DelawareCity	DE0050601	033	5	61.9	22	2	0.005	0.000003	0.000012
126	25	Conectiv-DelawareCity	DE0050601	034	5	61.9	22	2	0.015	0.000010	0.000040
127	26	Metachem	DE0020001	002	5	61.9	22	1	1.713	0.001151	0.004604
128	27	Metachem	DE0020001	003	5	61.9	22	1	2.176	0.001462	0.005848
129	28	Metachem	DE0020001	001	5	61.5	21	2	81.182	0.054537	0.218147
130	29	Motiva	DE0000256	001	5	61.5	21	2	0.000	0.000000	0.000000
131	30	Motiva	DE0000256	601	5	61.5	21	1	0.000	0.000000	0.000000
132	31	Kaneka Delaware Corp.	DE0000647	001	5	61.4	21	2	2.266	0.001522	0.006089
133	32	Formosa Plastics	DE0000612	001	5	61.3	21	2	4.885	0.003281	0.013126
134	33	Motiva	DE0000256	101	5	61.0	21	1	2843.225	1.910027	7.640108
135	34	Delaware City STP (New Castle Co.)	DE0021555	001	5	60.1	18	2	4.085	0.002744	0.010976
136	35	City of Salem	NJ0024856	001	5	58.8	15	2	10.062	0.006760	0.027038
137	36	Port Penn STP (New Castle Co.)	DE0021539	001	5	54.8	12	2	0.487	0.000327	0.001308
138	37	PSEG-HopeCreek	NJ0025411	461A	5	52.0	11	2	0.000	0.000000	0.000000
139	38	PSEG-HopeCreek	NJ0025411	461C	5	52.0	11	1	0.915	0.000614	0.002457
140	39	PSEG-HopeCreek	NJ0025413	462A	5	52.0	11	2	0.011	0.000007	0.000029
141	40	PSEG-Salem	NJ0005622	485	5	51.0	77	2	0.000	0.000000	0.000000
142	41	PSEG-Salem	NJ0005622	489	5	51.0	77	1	0.984	0.000661	0.002644

Appendix 3

Permit Implications for NPDES Dischargers
resulting from Stage 1 TMDLs for PCBs

The staged approach to establishing TMDLs for PCBs for Zones 2 to 5 of the Delaware Estuary that was presented to interested parties in April 2003 by the regulatory agencies described appropriate NPDES permitting actions that would result following the establishment of the Stage 1 TMDLs by the U.S. Environmental Protection Agency. The criteria that were presented at that time utilized a cumulative loading approach to identify those discharges with the largest loading of penta-PCBs. The criteria have been expanded and refined since that time to include the quality of the penta-PCB data used to develop the loading estimates for the NPDES dischargers.

Approach:

NPDES dischargers (excluding CSOs and MS4s) were divided into two groups based upon the type of analytical method used to measure the 19 penta-PCB congeners, and the number of the penta-PCB congeners that were detected. Five criteria are considered in classifying NPDES point discharges into two groups.

The criteria for grouping the discharges is as follows:

1. Method used:
   a. 1668A
   b. 8082A

2. Discharge consists principally of non-contact cooling water.

3. If Method 1668A was used, the data was submitted at the detection limits specified in the method:
   a. Yes
   b. No

4. Average number of detected penta congeners per sampling event:
   a. 4 or greater
   b. Less than 4

5. Calculated loadings
   a. A discharge using Method 1668A with lower detection limits which is one of a group of discharges whose total cumulative loading is less than 10% of the zone waste load allocation.

<u>Group 1</u>

1. All discharges, except non-contact cooling water discharges, which have detected 4 or more penta PCB congeners per sampling event regardless of the method used and detection limits achieved, with the exception of those discharges using Method 1668A at the method specified detection limits whose cumulative loadings are less than the 10 percent of zone WLAs.

<u>Group 2</u>

1. All discharges with less than 4 congener detected per sampling event.
2. All discharges which have detected 4 or more penta PCB congeners per sampling event using Method 1668A at the method specified detection limits whose cumulative loadings are less than the 10 percent of zone WLAs.
3. All non-contact cooling water, regardless of the number of penta congeners detected, method used, or detection limits.

Permit Requirements:

Federal regulations implementing the NPDES program at 40 CFR Part 122.44(k)(4) allow the use of non-numeric, Best Management Practices-based WQBELs where a BMP approach is the reasonably necessary means to control pollutants to achieve the goals of the Clean Water Act. The uncertainty associated with several elements of the current TMDL development process including the PCB loadings calculations, the model inputs, and the extrapolation from penta-PCBs to total PCBs support this approach for Stage 1. EPA recommends that the groups receive the following permit requirements consisten with state and federal NPDES permit regulations.

Group 1 - Permit requirements will include waste minimization and reduction programs and additional monitoring with Method 1668A. Both requirements will be performed concurrently, and will be imposed when permit is reissued or modified. DRBC may also impose the requirements.

Group 2 - Permit requirements will include waste minimization and reduction programs (WMRP) and additional monitoring with Method 1668A. Monitoring will be performed in the first two years to confirm the presence and concentration of PCB congeners followed by the WMRP in the third year if the monitoring results confirm the concentrations and associated loading estimates for penta-PCBs, or result in loading estimates for other PCB homologs that exceed the individual WLAs for total PCBs for the discharge.

It is recommended that both requirements will be imposed when permit is reissued or modified. DRBC may also impose the requirements for selected discharges (i.e., non-contact cooling water discharges).

Note: Dischargers in both Groups are receiving individual WLAs. Therefore, the sum of all individual WLAs plus the aggregate WLA for CSOs will equal the proportion of the TMDL for each zone that is allocated to WLAs (Zone WLA).

EPA specifically requested comment and additional information during the public comment period regarding the assignment of discharges to each group. Based upon the comments received, no changes to the group assignments were necessary. The draft TMDL document utilizes data from point discharges that were submitted by April 2003. Some dischargers utilized method 1668A for analysis, however the data reported did not adhere to method detection limits specified by the method. Therefore all dischargers which utilized method 1668A were required to re-submit data at the detection limits specified by the method. As of the April date, some dischargers had resubmitted the data , however, there remained a group of dischargers who did not provide the data by April 2003. Many of these dischargers have provided data since April and the resubmitted data has been used to generate revised loadings and number of penta congeners detected (Appendix Tables 3-2 to 3-5). The resubmitted data had essentially two effects. It typically increased the number of detected congeners and changed the loadings estimates for the discharges.

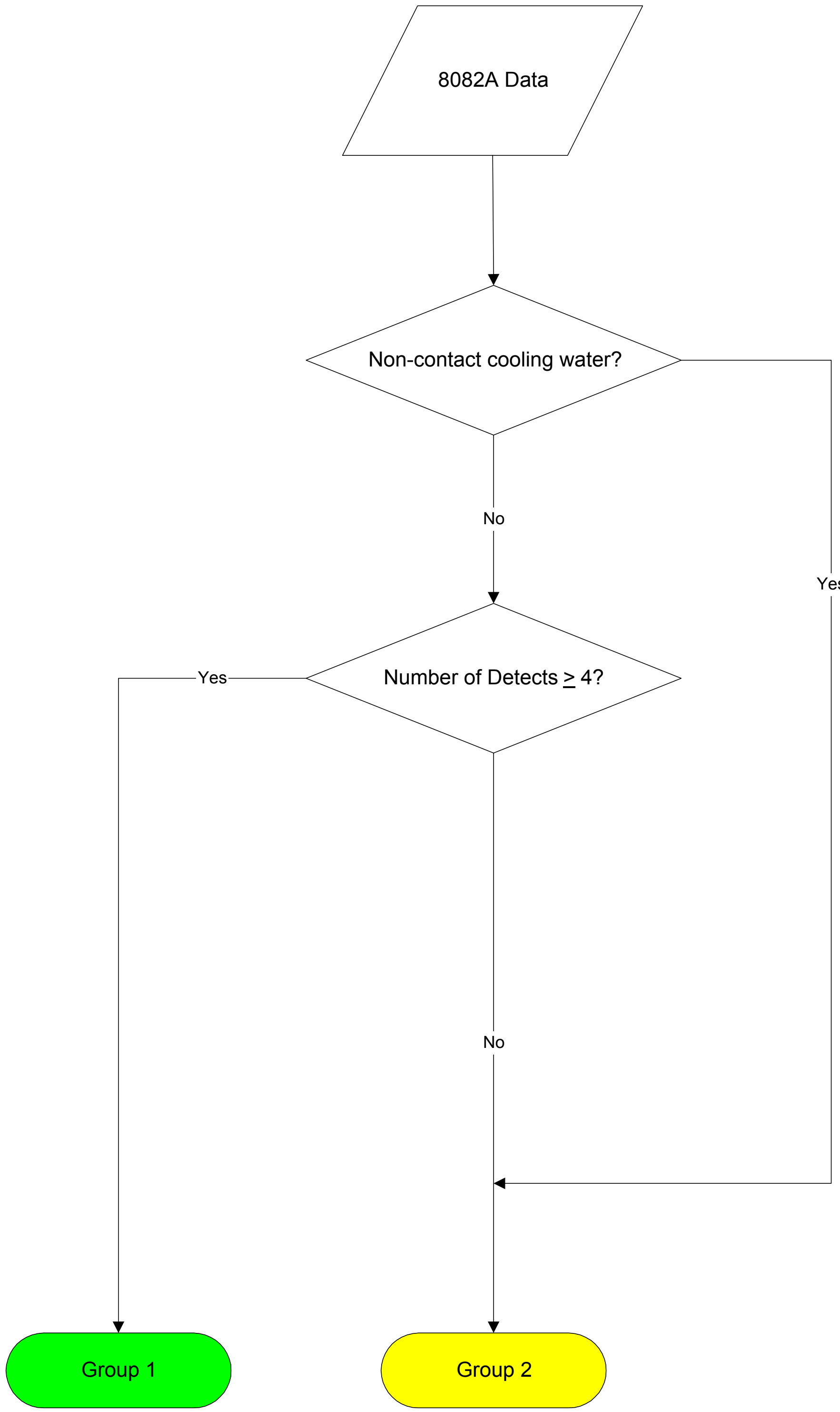
There are however, a small number of dischargers which utilized method 1668A for which we have not received resubmitted data as of September 11, 2003.

As indicated at that time, the identification of significant point source dischargers is a dynamic process that depends on several factors including the availability and extent of PCB congener data for each discharge, the flows used for each discharge, the procedure used to calculate the loadings, the location of the discharge in the estuary, and the proximity and loading of other sources of PCBs. As a result, the list of point source dischargers is subject to change both prior to December 2003 and during the development of the Stage 2 TMDLs.

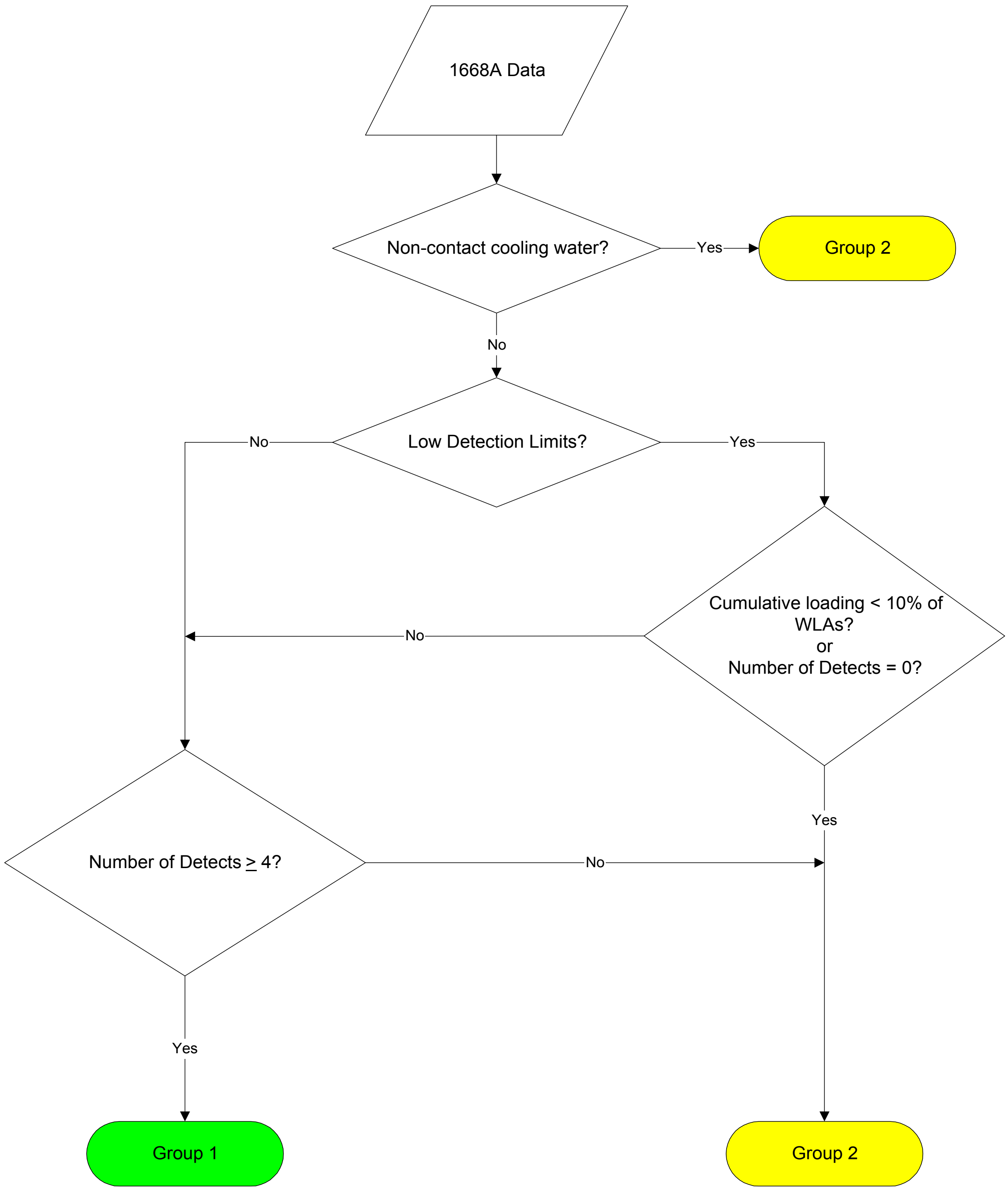
Appendix Tables 3-2 to 3-5 list the discharges assigned to each group as of September 11, 2003. Individual discharges from combined sewer overflows (CSOs) and municipal separate storm sewer systems (MS4s) have not been included in the tables. Table 9 lists the categorical allocation by zone to these two sources. Individual wasteload allocations for the point source dischargers included in the Stage 1 TMDLs are also listed in each table.

Appendix Table 3-1: Distribution of NPDES Discharges to each group in each zone of the Delaware Estuary.

	Number of Discharges				
	Zone 2	Zone 3	Zone 4	Zone 5	Total
Group 1	13	5	25	17	60
Group 2	25	8	25	24	82
Total	38	13	50	41	142



Appendix Figure 3-1: Selection process for permit requirements for NPDES discharges using Method 8082A.



Appendix Figure 3-2: Selection process for permit requirements for NPDES discharges using Method 1668A.

Appendix Table 3-2: Data used to assign the permit requirements for NPDES discharges in Zone 2.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	Trenton	NJ0020923-001	132.2	3	3	Yes	Yes	11.2	No	243.612	*	1
2	PSEG-Burlington	NJ0005002-WTPA	117.4	3	1	Yes	Yes	10.3	No	0.929	*	1
3	U.S. Steel	PA0013463-103	127.0	5	1	Yes	Yes	9.7	No	10.056	*	1
4	U.S. Steel	PA0013463-002	127.4	3	1	Yes	Yes	9.5	No	61.390	*	1
5	U.S. Steel	PA0013463-203	127.0	2	1	Yes	Yes	9.3	No	3.787	*	1
6	Rohm&Haas-Bristol	PA0012769-009	117.1	3	0	Yes	Yes	9.0	No	5.710	*	1
7	Riverside Sewerage Authority	NJ0022519-001	108.8	2	0	No	N/A	7.0	No	124.107	*	1
8	Beverly Sewerage Authority	NJ0027481-001	114.7	1	0	No	N/A	7.0	No	18.890	*	1
9	PSEG-Mercer	NJ0004995-441C	130.4	1	0	Yes	Yes	7.0	No	5.010	*	1
10	AFG Industries	NJ0033022-001A	109.6	1	0	No	N/A	6.0	No	10.258	*	1
11	US Pipe & Foundry	NJ0005266-002A	118.1	0	2	No	N/A	5.0	No	0.807	*	1
12	Cinnaminson Sewerage Authority	NJ0024007-001	108.9	3	3	No	N/A	4.0	No	27.980	*	1
13	Riverton Borough	NJ0021610-001	110.8	1	0	No	N/A	4.0	No	3.853	*	1
1	GEON Company (Burlington) Polyone	NJ0004235-001A	120.3	1	1	No	N/A	3.5	No	15.051	*	2
2	Willingboro Municipal Utilities Authority	NJ0023361-001	110.8	3	0	No	N/A	3.0	No	123.392	*	2
3	Hamilton Township	NJ0026301-001	128.0	3	0	No	N/A	2.7	No	220.791	*	2
4	Bristol Borough	PA0027294-001	118.7	3	3	No	N/A	2.3	No	29.383	*	2
5	City of Burlington	NJ0024660-002	117.6	3	0	No	N/A	2.0	No	46.336	*	2
6	Bristol Township	PA0026450-001	116.8	3	3	No	N/A	1.5	No	34.732	*	2
7	AFG Industries	NJ0033022-002	109.4	0	1	No	N/A	1.0	No	0.092	*	2
8	Mt. Holly Municipal Utilities Authority	NJ0024015-001	110.8	3	0	No	N/A	0.7	No	54.904	*	2
9	Delran Sewerage Authority	NJ0023507-001	110.8	3	0	No	N/A	0.3	No	37.419	*	2
10	Burlington Township	NJ0021709-001	117.0	3	0	No	N/A	0.3	No	34.901	*	2
11	Florence Township	NJ0023701-001	121.4	3	0	No	N/A	0.3	No	15.682	*	2
12	Lower Bucks County Municipal Authority	PA0026468-001	121.9	3	3	No	N/A	0.2	No	129.179	*	2

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
13	Bordentown Sewerage Authority	NJ0024678-001	128.0	3	3	No	N/A	0.2	No	26.292	*	2
14	Mt. Laurel Municipal Utilities Authority	NJ0025178-001A	110.8	3	0	No	N/A	0.0	No	67.433	*	2
15	Morrisville WWTP	PA0026701-001	132.9	3	0	No	N/A	0.0	No	65.566	*	2
16	Waste Management Grows Landfill	PA0043818-001	125.5	1	0	No	N/A	0.0	No	1.182	*	2
17	MSC Pre Finish Metals	PA0045021-001	130.1	1	0	No	N/A	0.0	No	0.646	*	2
18	Hoeganaes Corp.	NJ0004375-001A	109.4	1	1	No	N/A	0.0	No	0.330	*	2
19	Hoeganaes Corp.	NJ0004375-003A	109.4	0	1	No	N/A	0.0	No	0.000	*	2
20	Exelon-Fairless	PA0057088-001	126.6	3	0	Yes	Yes	9.0	Yes	0.000	*	2
21	PSEG-Mercer	NJ0004995-441A	130.4	3	0	Yes	Yes	6.3	Yes	0.000	*	2
22	Colorite Polymers	NJ0004391-003A	117.0	1	0	Yes	Yes	2.0	No	0.740	65.9	2
23	Colorite Polymers	NJ0004391-002A	117.0	1	1	Yes	Yes	4.0	No	0.008	0.7	2
24	Yates Foil	NJ0004332-002A	128.0	0	1	Yes	Yes	2.0	No	0.000	0.0	2
25	Yates Foil	NJ0004332-001B	128.0	1	0	Yes	Yes	0.0	No	0.070	6.3	2

RM: River Mile
DW: Dry Weather
WW: Wet Weather
* Cumulative loading percentages to Zone WLA (minus portions to CSOs and MS4) are shown up to 100 percent.

Appendix Table 3-3: Data used to assign the permit requirements for NPDES discharges in Zone 3.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	PWD-NE	PA0026689-001	104.1	3	3	Yes	Yes	10.5	No	1238.662	*	1
2	CCMUA	NJ0026182-001	98.0	3	3	Yes	Yes	10.0	No	818.459	*	1
3	Exelon-Delaware	PA0011622-002	101.2	3	0	Yes	Yes	9.7	No	0.655	92.5	1
4	PWD-SE	PA0026662-001	96.8	3	3	Yes	Yes	9.7	No	657.721	*	1
5	Rohm&Haas-Philadelphia	PA0012777-003	106.1	1	0	Yes	Yes	7.0	No	2.175	*	1
1	NGC Industries	NJ0004669-001A	104.4	1	1	No	N/A	0.0	No	1.528	*	2
2	Palmyra Borough	NJ0024449-001	107.7	1	0	No	N/A	0.0	No	19.235	*	2
3	Exelon-Delaware	PA0011622-006	101.1	3	0	Yes	Yes	9.3	Yes	0.000	*	2
4	Rohm&Haas-Philadelphia	PA0012777-001	106.1	3	1	Yes	Yes	3.8	No	15.974	*	2
5	Citgo Petroleum	NJ0131342-001A	103.4	1	0	Yes	No	0.0	No	0.012	*	2
6	Rohm&Haas-Philadelphia	PA0012777-007	106.1	1	0	Yes	Yes	6.0	No	0.003	0.4	2
7	Exelon-Delaware	PA0011622-004	101.2	0	1	Yes	Yes	11.0	No	0.011	1.8	2
8	Exelon-Delaware	PA0011622-001	101.2	0	1	Yes	Yes	12.0	No	0.044	7.5	2

RM: River Mile
DW: Dry Weather
WW: Wet Weather
* Cumulative loading percentages to Zone WLA (minus portions to CSOs and MS4) are shown up to 100 percent.

Appendix Table 3-4: Data used to assign the permit requirements for NPDES discharges in Zone 4.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	Dupont-Repauno	NJ0004219-007	86.6	0	1	No	N/A	12.0	No	1.433	*	1
2	Exelon-Eddystone	PA0013716-001	85.2	0	1	Yes	Yes	12.0	No	0.064	14.2	1
3	Dupont-Repauno	NJ0004219-001A	85.6	3	1	Yes	Yes	11.5	No	80.773	*	1
4	Boeing	PA0013323-002	85.4	1	1	Yes	Yes	11.5	No	158.353	*	1
5	Kvaerner	PA0057690-019	92.8	0	1	Yes	Yes	11.0	No	0.100	57.0	1
6	Kvaerner	PA0057690-021	92.8	0	1	Yes	Yes	11.0	No	0.100	73.3	1
7	Boeing	PA0013323-001	85.2	1	0	Yes	Yes	11.0	No	29.068	*	1
8	PWD-SW	PA0026671-001	90.7	3	3	Yes	Yes	10.8	No	1020.466	*	1
9	Valero Refining	NJ0005029-001A	87.7	4	1	Yes	Yes	10.6	No	99.473	*	1
10	Exelon-Eddystone	PA0013716-005	85.2	0	1	Yes	Yes	10.0	No	0.509	*	1
11	Ausimont	NJ0005185-001A	90.7	0	1	Yes	Yes	10.0	No	0.840	*	1
12	Boeing	PA0013323-003	85.2	0	1	Yes	Yes	9.0	No	0.404	*	1
13	Boeing	PA0013323-016	85.4	0	1	Yes	Yes	8.0	No	0.149	97.5	1
14	Boeing	PA0013323-007	85.2	0	1	Yes	Yes	8.0	No	0.235	*	1
15	Tinicum Township	PA0028380-001	85.4	3	3	Yes	Yes	8.0	No	15.450	*	1
16	Safety Kleen	NJ0005240-002A	79.8	0	1	No	N/A	7.0	No	3.512	*	1
17	Kvaerner	PA0057690-012	92.7	3	0	Yes	Yes	7.0	No	22.608	*	1
18	DELCORA	PA0027103-001	80.6	3	3	Yes	Yes	6.7	No	309.423	*	1
19	GCUA	NJ0024686-001	88.4	5	0	Yes	Yes	6.4	No	113.497	*	1
20	ConocoPhillips	PA0012637-008	80.2	0	1	No	N/A	6.0	No	0.111	*	1
21	Metro Machine	PA0057479-DD2	93.2	4	0	No	N/A	6.0	No	49.040	*	1
22	Hercules	NJ0005134-001A	87.5	1	1	Yes	Yes	6.0	No	4.120	*	1
23	Kimberly Clark	PA0013081-029	83.2	0	2	Yes	Yes	5.5	No	0.086	40.6	1
24	ConocoPhillips	PA0012637-007	80.2	0	1	No	N/A	5.0	No	0.511	*	1
25	Ausimont	NJ0005185-002A	90.7	1	0	Yes	Yes	5.0	No	0.077	26.7	1

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	ConocoPhillips	PA0012637-006	80.2	0	1	No	N/A	3.0	No	0.029	*	2
2	Coastal Mart / Coastal Eagle Point Oil	NJ0005401-003A	94.7	0	1	No	N/A	2.0	No	0.006	*	2
3	ConocoPhillips	PA0012637-002	80.2	3	1	No	N/A	1.5	Yes	0.000	*	2
4	ConocoPhillips	PA0012637-101	79.6	3	1	No	N/A	1.0	Yes	0.000	*	2
5	Swedesboro	NJ0022021-001	79.8	1	0	No	N/A	1.0	No	3.296	*	2
6	Logan Township	NJ0027545-001	79.5	1	1	No	N/A	1.0	No	12.114	*	2
7	Safety Kleen	NJ0005240-001A	79.8	3	0	No	N/A	0.7	No	7.440	*	2
8	Metro Machine	PA0057479-DD3	93.1	3	0	No	N/A	0.7	No	17.845	*	2
9	Chevron	NJ0064696-001A	90.5	1	0	No	N/A	0.0	No	0.157	*	2
10	Harrison Township-Mullica Hill	NJ0020532-001	79.8	1	0	No	N/A	0.0	No	6.093	*	2
11	DeGuessa-Huls Corp.	PA0051713-001	82.2	1	0	No	N/A	0.0	No	9.063	*	2
12	Air Products	NJ0004278-001A	88.2	1	0	No	N/A	0.0	No	10.041	*	2
13	Greenwich Township	NJ0030333-001	87.0	1	0	No	N/A	0.0	No	12.110	*	2
14	ConocoPhillips	PA0012637-201	79.6	3	0	No	N/A	0.0	No	48.580	*	2
15	Coastal Mart / Coastal Eagle Point Oil	NJ0005401-001A	94.3	3	0	No	N/A	0.0	No	55.368	*	2
16	Exelon-Eddystone	PA0013716-008	85.2	4	0	Yes	Yes	11.8	Yes	0.000	*	2
17	Exelon-Eddystone	PA0013716-007	85.2	3	0	Yes	Yes	11.7	Yes	0.000	*	2
18	Solutia	NJ0005045-001	79.2	3	0	Yes	No	1.3	No	12.228	*	2
19	Colonial Pipeline	NJ0033952-001A	90.5	0	1	Yes	No	0.0	No	0.087	*	2
20	BP Paulsboro	NJ0005584-002A	89.6	0	1	Yes	No	0.0	No	0.352	*	2
21	BP Paulsboro	NJ0005584-003A	89.4	1	0	Yes	No	0.0	No	7.006	*	2
22	Sunoco-PointBreeze	PA0012629-002	92.5	3	3	Yes	No	0.0	No	75.899	*	2
23	Sunoco-GirardPoint	PA0011533-015	92.5	3	3	Yes	No	0.0	No	99.167	*	2
24	Kvaerner	PA0057690-047	92.5	0	1	Yes	Yes	10.0	No	0.005	0.8	2
25	Boeing	PA0013323-008	85.2	0	1	Yes	Yes	13.0	No	0.018	3.7	2

Appendix Table 3-5: Data used to assign the permit requirements for NPDES discharges in Zone 5.

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
1	AMTRAK	DE0050962-003	70.7	0	3	Yes	Yes	12.3	No	2.002	*	1
2	AMTRAK	DE0050962-004	70.7	0	3	Yes	Yes	12.0	No	35.822	*	1
3	OxyChem	DE0050911-002	62.2	0	3	Yes	Yes	11.0	No	0.168	16.8	1
4	Conectiv-Deepwater	NJ0005363-017	69.1	0	1	Yes	Yes	11.0	No	0.284	25.9	1
5	PSEG-Salem	NJ0005622-489	51.0	1	0	Yes	Yes	11.0	No	0.984	86.5	1
6	Metachem	DE0020001-003	61.9	0	4	No	N/A	9.5	No	2.176	*	1
7	Metachem	DE0020001-002	61.9	0	3	No	N/A	9.3	No	1.713	*	1
8	Dupont-Edgemoor	DE0000051-004	72.2	0	3	Yes	Yes	9.0	No	0.153	11.5	1
9	Dupont-Edgemoor	DE0000051-001	73.2	3	0	Yes	Yes	8.7	No	32.214	*	1
10	Dupont-ChamberWorks	NJ0005100-662	69.8	3	0	Yes	Yes	8.7	No	102.854	*	1
11	Dupont-ChamberWorks	NJ0005100-001	69.8	3	0	Yes	Yes	8.0	No	138.476	*	1
12	Motiva	DE0000256-101	61.0	3	3	Yes	Yes	7.5	No	2843.225	*	1
13	OxyChem	DE0050911-001	62.2	3	0	Yes	Yes	7.0	No	1.798	*	1
14	Penns Grove Sewer Authority	NJ0024023-001	70.7	1	0	No	N/A	7.0	No	23.206	*	1
15	PSEG-HopeCreek	NJ0025411-461C	52.0	1	0	Yes	Yes	5.0	No	0.915	55.1	1
16	Motiva	DE0000256-601	61.5	3	0	Yes	Yes	5.0	No	0.000 **	*	1
17	Pennsville Sewerage Authority	NJ0021598-001	65.1	3	0	No	N/A	4.7	No	63.353	*	1
1	Carney's Point	NJ0021601-001	71.3	3	0	No	N/A	2.7	No	10.265	*	2
2	General Chemical	DE0000655-001	77.9	3	3	No	N/A	2.2	Yes	0.000	*	2
3	Port Penn STP (New Castle Co.)	DE0021539-001	54.8	1	0	No	N/A	1.0	No	0.487	*	2
4	Metachem	DE0020001-001	61.5	3	3	No	N/A	1.0	No	81.182	*	2
5	City of Wilmington	DE0020320-001	71.6	3	3	No	N/A	0.8	No	1297.745	*	2
6	Geon Company (Pedricktown) Polyone	NJ0004286-003	75.9	0	1	No	N/A	0.0	No	0.011	*	2
7	Geon Company (Pedricktown) Polyone	NJ0004286-001A	74.9	1	0	No	N/A	0.0	No	1.690	*	2
8	Kaneka Delaware Corp.	DE0000647-001	61.4	1	1	No	N/A	0.0	No	2.266	*	2
9	Delaware City STP (New Castle Co.)	DE0021555-001	60.1	1	0	No	N/A	0.0	No	4.085	*	2

Serial No.	Facility Name	DRBC ID	RM	# of DW SAMPLES	# of WW SAMPLES	Analytical Method 1668a	Submitted data at Method 1668A detection limits	Avg. # of congeners per sampling event (Sept 2003)	Non-Contact Cooling water	Current Loadings (Sept. 2003) mg/day	Cumulative loading percentage to WLA	Potential Group (category)
10	Formosa Plastics	DE0000612-001	61.3	1	0	No	N/A	0.0	No	4.885	*	2
11	City of Salem	NJ0024856-001	58.8	3	0	No	N/A	0.0	No	10.062	*	2
12	PSEG-HopeCreek	NJ0025411-461A	52.0	3	0	Yes	Yes	9.7	Yes	0.000	*	2
13	Dupont-ChamberWorks	NJ0005100-013	68.9	3	0	Yes	Yes	9.3	Yes	0.000	*	2
14	PSEG-Salem	NJ0005622-485	51.0	3	0	Yes	Yes	9.0	Yes	0.000	*	2
15	Motiva	DE0000256-001	61.5	3	0	Yes	Yes	8.7	Yes	0.000	*	2
16	Conectiv-Deepwater	NJ0005363-003A	69.1	1	0	Yes	Yes	8.0	Yes	0.000	*	2
17	Dupont-ChamberWorks	NJ0005100-011	68.9	1	1	Yes	Yes	11.0	No	0.004	0.1	2
18	Conectiv-DelawareCity	DE0050601-033	61.9	0	3	Yes	Yes	11.7	No	0.005	0.3	2
19	Conectiv-Deepwater	NJ0005363-006	69.1	0	1	Yes	Yes	12.0	No	0.006	0.5	2
20	Conectiv-Edgemoor	DE0000558-041	71.8	0	3	Yes	Yes	10.7	No	0.008	0.7	2
21	PSEG-HopeCreek	NJ0025411-462A	52.0	0	1	Yes	Yes	0.0	No	0.011	1.0	2
22	Conectiv-DelawareCity	DE0050601-034	61.9	0	4	Yes	Yes	11.5	No	0.015	1.5	2
23	Conectiv-Deepwater	NJ0005363-005	69.1	0	1	Yes	Yes	10.0	No	0.035	2.6	2
24	Conectiv-DelawareCity	DE0050601-016	61.9	0	3	Yes	Yes	11.7	No	0.123	6.6	2

RM: River Mile
DW: Dry Weather
WW: Wet Weather
* Cumulative loading percentages to Zone WLA (minus portions to CSOs and MS4) are shown up to 100 percent.
** Flow is set to zero in the loading calculation because DSN 601 is an upstream monitoring point of DSN 101.

Appendix 4

Contaminated Sites and Municipalities with Combined Sewer Overflows (CSOs) that were evaluated as part of the Stage 1 TMDLs

Appendix Table 4-1: Contaminated Sites evaluated as part of the Stage 1 TMDLs and their estimated Penta-PCB Load.

Facility	Daily penta-PCB Load (kg/day)	Estimate Prepared by
Castle Ford - DE-192	1.4374E-06	EPA
Forbes Steel & Wire Corp. - DE-165	5.1989E-06	EPA
Rogers Corner Dump - DE-246	1.0465E-04	EPA
Industrial Products - DE-030	5.1129E-05	EPA
Chicago Bridge and Iron - DE-038	3.2768E-03	EPA
ABM-Wade, 58th Street Dump - PA-0179	1.9739E-06	EPA
O'Donnell Steel Drum - PA-0305	3.4939E-07	EPA
Conrail-Wayne Junction - PA-215	2.3043E-03	EPA
CONRAIL, Morrisville Lagoons - PA-441*	5.4056E-06	EPA
Pennwalt Corp. - Cornwells Heights - PA-0031*	3.1227E-07	EPA
Front Street Tanker - PA-2298	1.9914E-06	EPA
8th Street Drum - PA-3272	8.9655E-07	EPA
East 10th Street Site - PA-2869	1.0076E-02	EPA
Metal Bank - PA-2119	9.9092E-05	EPA
Lower Darby Creek Area Site - PA-3424	1.8481E-04	EPA
Roebling Steel Co.	4.9609E-05	EPA
Bridgeport Rental & Oil Services (BROS)	5.8140E-04	EPA
Dana Transport Inc.	3.8523E-08	EPA
Harrison Avenue Landfill	6.2542E-03	EPA
Metal Bank groundwater pathway	9.8312E-07	DRBC
AMTRAK Former Refueling Facility	1.3182E-03	DNREC
Gates Engineering	6.8226E-10	DNREC
AMTRAK Wilmington Railyard	1.6238E-03	DNREC
Diamond State Salvage	0.0000E+00	DNREC
NeCastro Auto Salvage	1.2867E-05	DNREC
Hercules Research Center	4.6121E-06	DNREC
Dravo Ship Yard	5.3216E-05	DNREC
DP&L/Congo Marsh	2.7290E-07	DNREC
American Scrap & Waste	7.4230E-04	DNREC
Pusey & Jones Shipyard	1.6033E-06	DNREC
Delaware Car Company	0.0000E+00	DNREC
Bafundo Roofing	1.5692E-04	DNREC
Kreiger Finger Property	1.5828E-04	DNREC
Clayville Dump	0.0000E+00	DNREC
Electric Hose & Rubber	8.8694E-05	DNREC
Penn Del Metal Recycling	1.1407E-04	DNREC
E. 7th Street North & South	5.7992E-05	DNREC
Delaware Compressed Steel	6.2877E-06	DNREC
Newport City Landfill	0.0000E+00	DNREC
DuPont Louviers – MBNA	9.5516E-08	DNREC
North American Smelting Co.	1.2821E-05	DNREC
RSC Realty	3.4113E-05	DNREC
AMTRAK CNOC	0.0000E+00	DNREC
Wilmington Coal Gas – N	2.2378E-06	DNREC

Facility	Daily penta-PCB Load (kg/day)	Estimate Prepared by
Del Chapel Place	2.2515E-06	DNREC
Kruse Playground	1.0643E-06	DNREC
Budd Metal	6.3450E-06	DNREC
Fox Point Park Phase II	1.1708E-04	DNREC
Bensalem Redev LP (Elf Atochem)	1.7561E-05	PADEP

Appendix Table 4-2: Municipalities or Regional Authorities with Combined Sewer Overflows (CSOs) that were evaluated as part of the Stage 1 TMDLs

Municipality/Regional Authority	NPDES Nos.	Zone
City of Philadelphia Water Department	PA0026662 PA0026671 PA0026689	2, 3 and 4
Camden County Municipal Utilities Authority	NJ0108812 NJ0026182	3 and 4
Delaware County Regional Authority (DELCORA)	PA0027103	4
City of Wilmington	DE0020320	5

Appendix 5

Municipalities in Delaware, New Jersey, and Pennsylvania,
designated as Phase II Separate Stormwater Sewer Systems (MS4s)
within urbanized areas in the Delaware River Watershed

Appendix Table 5-1: Municipalities with Separate Stormwater Sewer Systems that have the potential to be included in the waste load allocation (LA) for PCBs for Zones 2 to 5 of the Delaware Estuary.

State	County Name	Municipality Name
DE	KENT	CAMDEN TOWN
DE	KENT	DOVER CITY
DE	KENT	KENT COUNTY
DE	NEW CASTLE	NEWARK CITY
DE	NEW CASTLE/DE DOT	ARDEN
DE	NEW CASTLE/DE DOT	ARDENTOWN
DE	NEW CASTLE/DE DOT	ARDENCROFT
DE	NEW CASTLE/DE DOT	BELLEFONTE
DE	NEW CASTLE/DE DOT	DELAWARE CITY
DE	NEW CASTLE/DE DOT	ELSMERE
DE	NEW CASTLE/DE DOT	MIDDLETOWN
DE	NEW CASTLE/DE DOT	NEWPORT
DE	NEW CASTLE/DE DOT	NEW CASTLE
DE	NEW CASTLE/DE DOT	ODDESSA
DE	NEW CASTLE/DE DOT	TOWNSEND
DE	NEW CASTLE/DE DOT	CITY OF WILMINGTON
DE	KENT	WYOMING TOWN

State	County Name	Municipality Name
NJ	ATLANTIC	BUENA BORO
NJ	ATLANTIC	BUENA VISTA TWP
NJ	BURLINGTON	BEVERLY CITY
NJ	BURLINGTON	BORDENTOWN CITY
NJ	BURLINGTON	BORDENTOWN TWP
NJ	BURLINGTON	BURLINGTON CITY
NJ	BURLINGTON	BURLINGTON TWP
NJ	BURLINGTON	CHESTERFIELD TWP
NJ	BURLINGTON	CINNAMINSON TWP
NJ	BURLINGTON	CINNAMINSON TWP
NJ	BURLINGTON	DELANCO TWP
NJ	BURLINGTON	DELRAN TWP
NJ	BURLINGTON	EASTAMPTON TWP
NJ	BURLINGTON	EDGEWATER PARK TWP
NJ	BURLINGTON	EVESHAM TWP
NJ	BURLINGTON	EVESHAM TWP
NJ	BURLINGTON	FIELDSBORO BORO
NJ	BURLINGTON	FLORENCE TWP
NJ	BURLINGTON	HAINESPORT TWP
NJ	BURLINGTON	LUMBERTON TWP
NJ	BURLINGTON	MANSFIELD TWP
NJ	BURLINGTON	MAPLE SHADE TWP
NJ	BURLINGTON	MEDFORD LAKES BORO
NJ	BURLINGTON	MEDFORD TWP
NJ	BURLINGTON	MOORESTOWN TWP
NJ	BURLINGTON	MOORESTOWN TWP
NJ	BURLINGTON	MOUNT HOLLY TWP

State	County Name	Municipality Name
NJ	BURLINGTON	MOUNT LAUREL TWP
NJ	BURLINGTON	MOUNT LAUREL TWP
NJ	BURLINGTON	NEW HANOVER TWP
NJ	BURLINGTON	NORTH HANOVER TWP
NJ	BURLINGTON	PALMYRA BORO
NJ	BURLINGTON	PALMYRA BORO
NJ	BURLINGTON	PEMBERTON BORO
NJ	BURLINGTON	PEMBERTON TWP
NJ	BURLINGTON	RIVERSIDE TWP
NJ	BURLINGTON	RIVERTON BORO
NJ	BURLINGTON	SHAMONG TWP
NJ	BURLINGTON	SOUTHAMPTON TWP
NJ	BURLINGTON	SPRINGFIELD TWP
NJ	BURLINGTON	TABERNACLE TWP
NJ	BURLINGTON	TABERNACLE TWP
NJ	BURLINGTON	WESTAMPTON TWP
NJ	BURLINGTON	WILLINGBORO TWP
NJ	BURLINGTON	WOODLAND TWP
NJ	BURLINGTON	WRIGHTSTOWN BORO
NJ	CAMDEN	AUDUBON BORO
NJ	CAMDEN	AUDUBON PARK BORO
NJ	CAMDEN	BARRINGTON BORO
NJ	CAMDEN	BELLMAWR BORO
NJ	CAMDEN	BERLIN BORO
NJ	CAMDEN	BERLIN TWP
NJ	CAMDEN	BERLIN TWP
NJ	CAMDEN	BROOKLAWN BORO
NJ	CAMDEN	CAMDEN CITY
NJ	CAMDEN	CHERRY HILL TWP
NJ	CAMDEN	CLEMENTON BORO
NJ	CAMDEN	COLLINGSWOOD BORO

State	County Name	Municipality Name
NJ	CAMDEN	GIBBSBORO BORO
NJ	CAMDEN	GIBBSBORO BORO
NJ	CAMDEN	GIBBSBORO BORO
NJ	CAMDEN	GLOUCESTER CITY
NJ	CAMDEN	GLOUCESTER CITY
NJ	CAMDEN	GLOUCESTER TWP
NJ	CAMDEN	GLOUCESTER TWP
NJ	CAMDEN	HADDON HEIGHTS BORO
NJ	CAMDEN	HADDON TWP (EAST)
NJ	CAMDEN	HADDON TWP (NORTH)
NJ	CAMDEN	HADDON TWP (SOUTH)
NJ	CAMDEN	HADDONFIELD BORO
NJ	CAMDEN	HI-NELLA BORO
NJ	CAMDEN	LAUREL SPRINGS BORO
NJ	CAMDEN	LAWNSIDE BORO
NJ	CAMDEN	LINDENWOLD BORO
NJ	CAMDEN	MAGNOLIA BORO
NJ	CAMDEN	MERCHANTVILLE BORO
NJ	CAMDEN	MOUNT EPHRAIM BORO
NJ	CAMDEN	OAKLYN BORO
NJ	CAMDEN	PENNSAUKEN TWP
NJ	CAMDEN	PINE HILL BORO
NJ	CAMDEN	PINE HILL BORO
NJ	CAMDEN	PINE VALLEY BORO
NJ	CAMDEN	RUNNEMEDE BORO
NJ	CAMDEN	SOMERDALE BORO
NJ	CAMDEN	STRATFORD BORO
NJ	CAMDEN	TAVISTOCK BORO
NJ	CAMDEN	VOORHEES TWP
NJ	CAMDEN	VOORHEES TWP

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	CAMDEN	VOORHEES TWP
NJ	CAMDEN	VOORHEES TWP
NJ	CAMDEN	WINSLOW TWP
NJ	CAMDEN	WINSLOW TWP
NJ	CAMDEN	WINSLOW TWP
NJ	CAMDEN	WOODLYNNE BORO
NJ	CAPE_MAY	CAPE MAY POINT BORO
NJ	CAPE_MAY	DENNIS TWP
NJ	CAPE_MAY	LOWER TWP
NJ	CAPE_MAY	LOWER TWP
NJ	CAPE_MAY	MIDDLE TWP
NJ	CAPE_MAY	WEST CAPE MAY BORO
NJ	CAPE_MAY	WOODBINE BORO
NJ	CUMBERLAND	BRIDGETON CITY
NJ	CUMBERLAND	COMMERCIAL TWP
NJ	CUMBERLAND	DEERFIELD TWP
NJ	CUMBERLAND	DOWNE TWP
NJ	CUMBERLAND	FAIRFIELD TWP
NJ	CUMBERLAND	GREENWICH TWP
NJ	CUMBERLAND	HOPEWELL TWP
NJ	CUMBERLAND	LAWRENCE TWP
NJ	CUMBERLAND	MAURICE RIVER TWP
NJ	CUMBERLAND	MILLVILLE CITY
NJ	CUMBERLAND	SHILOH BORO
NJ	CUMBERLAND	STOW CREEK TWP
NJ	CUMBERLAND	UPPER DEERFIELD TWP
NJ	CUMBERLAND	VINELAND CITY
NJ	GLOUCESTER	CLAYTON BORO
NJ	GLOUCESTER	DEPTFORD TWP
NJ	GLOUCESTER	DEPTFORD TWP

STATE	COUNTY NAME	MUNICIPALITY NAME
NJ	GLOUCESTER	DEPTFORD TWP
NJ	GLOUCESTER	EAST GREENWICH TWP
NJ	GLOUCESTER	ELK TWP
NJ	GLOUCESTER	ELK TWP
NJ	GLOUCESTER	ELK TWP
NJ	GLOUCESTER	FRANKLIN TWP
NJ	GLOUCESTER	GLASSBORO BORO
NJ	GLOUCESTER	GLASSBORO BORO
NJ	GLOUCESTER	GREENWICH TWP
NJ	GLOUCESTER	HARRISON TWP
NJ	GLOUCESTER	LOGAN TWP
NJ	GLOUCESTER	LOGAN TWP
NJ	GLOUCESTER	MANTUA TWP
NJ	GLOUCESTER	MONROE TWP
NJ	GLOUCESTER	MONROE TWP
NJ	GLOUCESTER	MONROE TWP
NJ	GLOUCESTER	NATIONAL PARK BORO
NJ	GLOUCESTER	NEWFIELD BORO
NJ	GLOUCESTER	PAULSBORO BORO
NJ	GLOUCESTER	PITMAN BORO
NJ	GLOUCESTER	SOUTH HARRISON TWP
NJ	GLOUCESTER	SOUTH HARRISON TWP
NJ	GLOUCESTER	SWEDESBORO BORO
NJ	GLOUCESTER	WASHINGTON TWP
NJ	GLOUCESTER	WASHINGTON TWP
NJ	GLOUCESTER	WASHINGTON TWP
NJ	GLOUCESTER	WENONAH BORO
NJ	GLOUCESTER	WEST DEPTFORD TWP
NJ	GLOUCESTER	WEST DEPTFORD TWP
NJ	GLOUCESTER	WESTVILLE BORO

State	County Name	Municipality Name
NJ	GLOUCESTER	WOODBURY CITY
NJ	GLOUCESTER	WOODBURY CITY
NJ	GLOUCESTER	WOODBURY HEIGHTS BORO
NJ	GLOUCESTER	WOOLWICH TWP
NJ	GLOUCESTER	WOOLWICH TWP
NJ	MERCER	HAMILTON TWP
NJ	MERCER	TRENTON CITY
NJ	MERCER	TRENTON CITY
NJ	MERCER	WASHINGTON TWP
NJ	MONMOUTH	ALLENTOWN BORO
NJ	MONMOUTH	MILLSTONE TWP
NJ	MONMOUTH	UPPER FREEHOLD TWP
NJ	OCEAN	JACKSON TWP
NJ	OCEAN	JACKSON TWP
NJ	OCEAN	JACKSON TWP
NJ	OCEAN	LACEY TWP
NJ	OCEAN	MANCHESTER TWP
NJ	OCEAN	PLUMSTED TWP
NJ	SALEM	ALLOWAY TWP
NJ	SALEM	ALLOWAY TWP
NJ	SALEM	CARNEYS POINT TWP
NJ	SALEM	ELMER BORO
NJ	SALEM	ELSINBORO TWP
NJ	SALEM	LOWER ALLOWAYS CREEK TWP
NJ	SALEM	LOWER ALLOWAYS CREEK TWP
NJ	SALEM	LOWER ALLOWAYS CREEK TWP
NJ	SALEM	MANNINGTON TWP
NJ	SALEM	OLDMANS TWP
NJ	SALEM	PENNS GROVE BORO
NJ	SALEM	PENNSVILLE TWP
NJ	SALEM	PILESGROVE TWP
NJ	SALEM	PITTSGROVE TWP
NJ	SALEM	QUINTON TWP
NJ	SALEM	QUINTON TWP
NJ	SALEM	SALEM CITY
NJ	SALEM	UPPER PITTSGROVE TWP
NJ	SALEM	UPPER PITTSGROVE TWP
NJ	SALEM	WOODSTOWN BORO

State	County Name	Municipality Name
PA	Bucks	Bensalem Twp.
PA	Bucks	Bristol Boro
PA	Bucks	Bristol Twp.
PA	Bucks	Buckingham Twp.
PA	Bucks	Bucks County
PA	Bucks	Chalfont Boro
PA	Bucks	Doylestown Boro
PA	Bucks	Doylestown Twp.
PA	Bucks	East Rockhill Twp.
PA	Bucks	Falls Twp.
PA	Bucks	Hilltown Twp.
PA	Bucks	Hulmeville Boro
PA	Bucks	Ivyland Boro
PA	Bucks	Langhorne Boro
PA	Bucks	Langhorne Manor Boro
PA	Bucks	Lower Makefield Twp.
PA	Bucks	Lower Southampton Twp.
PA	Bucks	Middletown Twp.
PA	Bucks	Morrisville Boro
PA	Bucks	New Britain Boro
PA	Bucks	New Britain Twp.
PA	Bucks	Newtown Boro
PA	Bucks	Newtown Twp.
PA	Bucks	Northampton Twp.
PA	Bucks	Penndel Boro
PA	Bucks	Perkasie Boro
PA	Bucks	Plumstead Twp.
PA	Bucks	Sellersville Boro
PA	Bucks	Silverdale Boro
PA	Bucks	Solebury Twp.
PA	Bucks	Tullytown Boro

State	County Name	Municipality Name
PA	Bucks	Upper Makefield Twp.
PA	Bucks	Upper Southampton Twp.
PA	Bucks	Warminster Twp.
PA	Bucks	Warrington Twp.
PA	Bucks	Warwick Twp.
PA	Bucks	West Rockhill Twp.
PA	Bucks	Wrightstown Twp.
PA	Bucks	Yardley Boro
PA	Chester	Avondale Boro
PA	Chester	Birmingham Twp.
PA	Chester	Caln Twp.
PA	Chester	Charlestown Twp.
PA	Chester	Chester County
PA	Chester	Coatesville City
PA	Chester	Downingtown Boro
PA	Chester	East Bradford Twp.
PA	Chester	East Brandywine Twp.
PA	Chester	East Caln Twp.
PA	Chester	East Fallowfield Twp.
PA	Chester	East Goshen Twp.
PA	Chester	East Marlborough Twp.
PA	Chester	East Pikeland Twp.
PA	Chester	East Vincent Twp.
PA	Chester	East Whiteland Twp.
PA	Chester	Easttown Twp.
PA	Chester	Franklin Twp.
PA	Chester	Honeybrook Twp.
PA	Chester	Kennett Square Boro
PA	Chester	Kennett Twp.
PA	Chester	London Britain Twp.
PA	Chester	London Grove Twp.

State	County Name	Municipality Name
PA	Chester	Malvern Boro
PA	Chester	Modena Boro
PA	Chester	New Garden Twp.
PA	Chester	New London Twp.
PA	Chester	Newlin Twp.
PA	Chester	Parkesburg Boro
PA	Chester	Penn Twp.
PA	Chester	Pennsbury Twp.
PA	Chester	Phoenixville Boro
PA	Chester	Pocopson Twp.
PA	Chester	Sadsbury Twp.
PA	Chester	Schuylkill Twp.
PA	Chester	South Coatesville Boro
PA	Chester	Spring City Boro
PA	Chester	Thornbury Twp.
PA	Chester	Tredyffrin Twp.
PA	Chester	Upper Oxford Twp.
PA	Chester	Upper Uwchlan Twp.
PA	Chester	Uwchlan Twp.
PA	Chester	Valley Twp.
PA	Chester	Wallace Twp.
PA	Chester	West Bradford Twp.
PA	Chester	West Brandywine Twp.
PA	Chester	West Caln Twp.
PA	Chester	West Chester Boro
PA	Chester	West Goshen Twp.
PA	Chester	West Grove Boro
PA	Chester	West Pikeland Twp.
PA	Chester	West Sadsbury Twp.
PA	Chester	West Vincent Twp.
PA	Chester	West Whiteland Twp.

State	County Name	Municipality Name
PA	Chester	Westtown Twp.
PA	Chester	Willistown Twp.
PA	Delaware	Aldan Boro
PA	Delaware	Aston Twp.
PA	Delaware	Bethel Twp.
PA	Delaware	Brookhaven Boro
PA	Delaware	Chadds Ford Twp.
PA	Delaware	Chester City
PA	Delaware	Chester Heights Boro
PA	Delaware	Chester Twp.
PA	Delaware	Clifton Heights Boro
PA	Delaware	Collingdale Boro
PA	Delaware	Colwyn Boro
PA	Delaware	Concord Twp.
PA	Delaware	Darby Boro
PA	Delaware	Darby Twp.
PA	Delaware	Delaware County
PA	Delaware	East Lansdowne Boro
PA	Delaware	Eddystone Boro
PA	Delaware	Edgemont Twp.
PA	Delaware	Folcroft Boro
PA	Delaware	Glenolden Boro
PA	Delaware	Haverford Twp.
PA	Delaware	Lansdowne Boro
PA	Delaware	Lower Chichester Twp.
PA	Delaware	Marcus Hook Boro
PA	Delaware	Marple Twp.
PA	Delaware	Media Boro
PA	Delaware	Middletown Twp.
PA	Delaware	Millbourne Boro
PA	Delaware	Morton Boro

State	County Name	Municipality Name
PA	Delaware	Nether Providence Twp.
PA	Delaware	Newtown Twp.
PA	Delaware	Norwood Boro
PA	Delaware	Parkside Boro
PA	Delaware	Prospect Park Boro
PA	Delaware	Radnor Twp.
PA	Delaware	Ridley Park Boro
PA	Delaware	Ridley Twp.
PA	Delaware	Rose Valley Boro
PA	Delaware	Rutledge Boro
PA	Delaware	Sharon Hill Boro
PA	Delaware	Springfield Twp.
PA	Delaware	Swarthmore Boro
PA	Delaware	Thornbury Twp.
PA	Delaware	Tinicum Twp.
PA	Delaware	Trainer Boro
PA	Delaware	Upland Boro
PA	Delaware	Upper Chichester Twp.
PA	Delaware	Upper Darby Twp.
PA	Delaware	Upper Providence Twp.
PA	Delaware	Yeadon Boro
PA	Montgomery	Abington Twp.
PA	Montgomery	Ambler Boro
PA	Montgomery	Bridgeport Boro
PA	Montgomery	Bryn Athyn Boro
PA	Montgomery	Cheltenham Twp.
PA	Montgomery	Collegeville Boro
PA	Montgomery	Conshohocken Boro
PA	Montgomery	East Greenville Boro
PA	Montgomery	East Norriton Twp.
PA	Montgomery	Franconia Twp.

State	County Name	Municipality Name
PA	Montgomery	Green Lane Boro
PA	Montgomery	Hatboro Boro
PA	Montgomery	Hatfield Boro
PA	Montgomery	Hatfield Twp.
PA	Montgomery	Horsham Twp.
PA	Montgomery	Jenkintown Boro
PA	Montgomery	Lansdale Boro
PA	Montgomery	Limerick Twp.
PA	Montgomery	Lower Frederick Twp.
PA	Montgomery	Lower Gwynedd Twp.
PA	Montgomery	Lower Merion Twp.
PA	Montgomery	Lower Moreland Twp.
PA	Montgomery	Lower Pottsgrove Twp.
PA	Montgomery	Lower Providence Twp.
PA	Montgomery	Lower Salford Twp.
PA	Montgomery	Marlborough Twp.
PA	Montgomery	Montgomery Twp.
PA	Montgomery	Narberth Boro
PA	Montgomery	Norristown Boro
PA	Montgomery	North Wales Boro
PA	Montgomery	Pennsburg Boro
PA	Montgomery	Perkiomen Twp.
PA	Montgomery	Plymouth Twp.
PA	Montgomery	Red Hill Boro
PA	Montgomery	Rockledge Boro
PA	Montgomery	Royersford Boro
PA	Montgomery	Salford Twp.
PA	Montgomery	Schwenksville Boro
PA	Montgomery	Skippack Twp.
PA	Montgomery	Souderton Boro
PA	Montgomery	Springfield Twp.

State	County Name	Municipality Name
PA	Montgomery	Telford Boro
PA	Montgomery	Towamencin Twp.
PA	Montgomery	Trappe Boro
PA	Montgomery	Upper Dublin Twp.
PA	Montgomery	Upper Frederick Twp.
PA	Montgomery	Upper Gwynedd Twp.
PA	Montgomery	Upper Hanover Twp.
PA	Montgomery	Upper Merion Twp.
PA	Montgomery	Upper Moreland Twp.
PA	Montgomery	Upper Providence Twp.
PA	Montgomery	Upper Salford Twp.
PA	Montgomery	West Conshohocken Boro.
PA	Montgomery	West Norriton Twp.
PA	Montgomery	Whitemarsh Twp.
PA	Montgomery	Whitpain Twp.
PA	Montgomery	Worcester Twp.
PA	Philadelphia	Philadelphia City
PA	Philadelphia	Philadelphia County

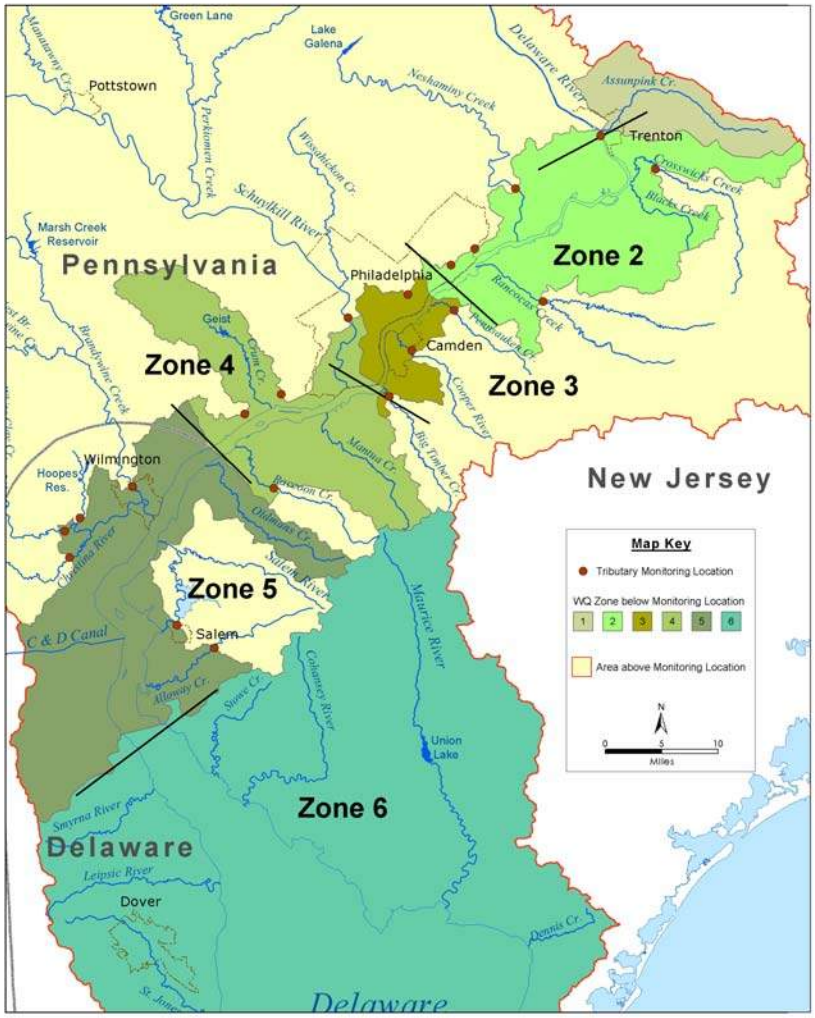
Appendix 6

Wasteload Allocation Estimates for Municipal Separate Storm Sewer Systems (MS4s)

A November 22, 2002 EPA Memorandum entitled, “Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm water Source and NPDES Permit Requirements Based on Those WLAs” clarified existing regulatory requirements for municipal separate storm sewer systems (MS4s) connected with TMDLs, i.e. that where a TMDL has been developed, the MS4 community must receive a WLA rather than a LA. In the draft TMDL document, EPA identified two options for assigning MS4 WLAs. This Appendix outlines the method used to assign each zone with a single categorical WLA for multiple point sources of storm water discharges.

EPA’s regulations require NPDES-regulated storm water discharges to be addressed by the WLA component of a TMDL. In order to estimate the portion of the Load Allocation (LA) that corresponds to separate storm sewer systems (MS4) so that these MS4 allocations could be converted to Wasteload Allocations (WLAs) we considered the land uses within each zone, downstream of the tributary monitoring locations. In order to be consistent with the WLAs, we only considered MS4’s likely to discharge to the mainstem Delaware or tidal portions of tributaries. Since delineated MS4 service areas have not been identified for many communities, we assumed that approximately 90% of areas categorized as *High Intensity Residential* area, and 70% of areas categorized as either *Low Intensity Residential* or *Commercial / Industrial / Transportation* are served by MS4 systems. We assumed that the entire PCB load associated with MS4s would correspond to the Non-Point Source Runoff category previously defined. Appendix Figure 6-1 below shows the Non-Point Source area contributing to each Zone. Zone 6 is not included in this analysis, since no Zone 6 WLAs are being developed as part of this TMDL.

Appendix Figure 6-1. Non-point Source Areas by Zone.



In order to determine what portion of Non-Point Source Runoff volume corresponds to MS4 service areas, we computed both MS4 and non-MS4 runoff volumes for the 19 month continuous simulation period using the methodologies contained in *Urban Hydrology for Small Watersheds, Technical Release 55,* Soil Conservation Service (currently, Natural Resources Conservation Service), June 1986. Appendix Table 6-1 below shows the computation of the composite Curve Number (CN) for both the MS4 and non-MS4 areas by zone. Land use categories corresponding to wetlands and open water were not included in the calculation of composite CNs.

Appendix Table 6-1. Computation of Composite Curve Numbers for MS4 and Non-MS4 Areas by Zone.

	Land Use Value	Land Use Category	area (m^2)	CN	% MS4	MS4 Area (m^2)	Non-MS4 Area (M2)	CN x MS4 Area	Composite MS4 CN	CN x Non-MS4 Area	Composite Non-MS4 CN
zone 2	21	Low Intensity Residential	149,942,000	80	70.00%	104,959,400	44,982,600	8,396,752,000		3,598,608,000	
	22	High Intensity Residential	35,470,900	90	90.00%	31,923,810	3,547,090	2,873,142,900		319,238,100	
	23	Commercial/Industrial/Transportation	51,066,300	94	70.00%	35,746,410	15,319,890	3,360,162,540		1,440,069,660	
	32	Quarries/Strip Mines/Gravel Pits	13,057,200	95	0.00%	0	13,057,200	0		1,240,434,000	
	33	Transitional	3,193,340	91	0.00%	0	3,193,340	0		290,593,940	
	41	Deciduous Forest	110,273,000	76	0.00%	0	110,273,000	0		8,380,748,000	
	42	Evergreen Forest	3,564,690	76	0.00%	0	3,564,690	0		270,916,440	
	43	Mixed Forest	52,161,800	76	0.00%	0	52,161,800	0		3,964,296,800	
	81	Pasture/Hay	180,362,000	79	0.00%	0	180,362,000	0		14,248,598,000	
	82	Row Crops	54,280,000	82	0.00%	0	54,280,000	0		4,450,960,000	
	85	Urban/Recreational Grasses	8,976,360	79	0.00%	0	8,976,360	0		709,132,440	
			662,347,590			172,629,620	489,717,970	14,630,057,440	84.75	38,913,595,380	79.46
zone3	21	Low Intensity Residential	43,022,200	80	70.00%	30,115,540	12,906,660	2,409,243,200		1,032,532,800	
	22	High Intensity Residential	52,358,200	90	90.00%	47,122,380	5,235,820	4,241,014,200		471,223,800	
	23	Commercial/Industrial/Transportation	37,042,800	94	70.00%	25,929,960	11,112,840	2,437,416,240		1,044,606,960	
	32	Quarries/Strip Mines/Gravel Pits	104,987	95	0.00%	0	104,987	0		9,973,765	
	33	Transitional	8,749	91	0.00%	0	8,749	0		796,149	
	41	Deciduous Forest	8,324,080	76	0.00%	0	8,324,080	0		632,630,080	
	42	Evergreen Forest	67,075	76	0.00%	0	67,075	0		5,097,685	
	43	Mixed Forest	2,448,720	76	0.00%	0	2,448,720	0		186,102,720	
	81	Pasture/Hay	1,076,110	79	0.00%	0	1,076,110	0		85,012,690	
	82	Row Crops	1,238,450	82	0.00%	0	1,238,450	0		101,552,900	
	85	Urban/Recreational Grasses	2,780,200	79	0.00%	0	2,780,200	0		219,635,800	
			148,471,571			103,167,880	45,303,691	9,087,673,640	88.09	3,789,165,349	83.64
zone4	21	Low Intensity Residential	118,875,000	80	70.00%	83,212,500	35,662,500	6,657,000,000		2,853,000,000	
	22	High Intensity Residential	30,808,700	90	90.00%	27,727,830	3,080,870	2,495,504,700		277,278,300	
	23	Commercial/Industrial/Transportation	65,573,900	94	70.00%	45,901,730	19,672,170	4,314,762,620		1,849,183,980	
	32	Quarries/Strip Mines/Gravel Pits	1,148,050	95	0.00%	0	1,148,050	0		109,064,750	
	33	Transitional	4,413,330	91	0.00%	0	4,413,330	0		401,613,030	
	41	Deciduous Forest	143,833,000	76	0.00%	0	143,833,000	0		10,931,308,000	
	42	Evergreen Forest	4,900,350	76	0.00%	0	4,900,350	0		372,426,600	
	43	Mixed Forest	46,163,000	76	0.00%	0	46,163,000	0		3,508,388,000	
	81	Pasture/Hay	98,138,200	79	0.00%	0	98,138,200	0		7,752,917,800	
	82	Row Crops	37,478,300	82	0.00%	0	37,478,300	0		3,073,220,600	
	85	Urban/Recreational Grasses	15,321,200	79	0.00%	0	15,321,200	0		1,210,374,800	
			566,653,030			156,842,060	409,810,970	13,467,267,320	85.87	32,338,775,860	78.91
zone5	21	Low Intensity Residential	86,418,600	80	70.00%	60,493,020	25,925,580	4,839,441,600		2,074,046,400	
	22	High Intensity Residential	12,247,500	90	90.00%	11,022,750	1,224,750	992,047,500		110,227,500	
	23	Commercial/Industrial/Transportation	48,787,700	94	70.00%	34,151,390	14,636,310	3,210,230,660		1,375,813,140	
	32	Quarries/Strip Mines/Gravel Pits	5,088,940	95	0.00%	0	5,088,940	0		483,449,300	
	33	Transitional	1,818,800	91	0.00%	0	1,818,800	0		165,510,800	
	41	Deciduous Forest	151,311,000	76	0.00%	0	151,311,000	0		11,499,636,000	
	42	Evergreen Forest	8,114,110	76	0.00%	0	8,114,110	0		616,672,360	
	43	Mixed Forest	62,097,600	76	0.00%	0	62,097,600	0		4,719,417,600	
	81	Pasture/Hay	141,668,000	79	0.00%	0	141,668,000	0		11,191,772,000	
	82	Row Crops	198,928,000	82	0.00%	0	198,928,000	0		16,312,096,000	
	85	Urban/Recreational Grasses	18,823,700	79	0.00%	0	18,823,700	0		1,487,072,300	
			735,303,950			105,667,160	629,636,790	9,041,719,760	85.57	50,035,713,400	79.47

Using the composite CNs for MS4 and Non-MS4 areas and daily 24-hour precipitation totals, we computed daily runoff volumes. The daily 24-hour precipitation totals are daily means of the recorded totals from the Wilmington, Philadelphia, and Neshaminy precipitation gages. As indicated in Appendix Table 6-2 below, only storm events exceeding the computed initial abstraction (Ia) for each area result in runoff. Similarly, only days with measurable precipitation are included in Appendix Table 6-2. We summed the total runoff depth for the 19-month continuous simulation period and multiplied by the area to compute a total runoff volume. We computed the percentage of the total volume associated with the MS4 areas by dividing the MS4 runoff volume by the total of the MS4 and Non-MS4 runoff volumes. The percentage of the MS4 runoff volume is shown at the bottom of Appendix Table 6-2 below.

Appendix Table 6-2. Computation of Runoff Volume Generated by MS4s.

		Zone 2		Zone 3		Zone 4		Zone 5	
		MS4	Non-MS4	MS4	Non-MS4	MS4	Non-MS4	MS4	Non-MS4
	CN	84.75	79.46	88.09	79.46	88.09	83.64	85.87	79.47
	Area (m^2)	172,629,620	489,717,970	103,167,880	45,303,691	156,842,060	409,810,970	105,667,160	629,636,790
	Area (ft^2)	1,858,169,693	5,271,280,154	1,110,489,775	487,644,849	1,688,233,818	4,411,168,398	1,137,391,800	6,777,353,740
	S	1.80	2.58	1.35	2.58	1.35	1.96	1.65	2.58
	Ia	0.36	0.52	0.27	0.52	0.27	0.39	0.33	0.52
Date	Precip. (in)	Runoff (in)							
9/4/2001	0.72	0.060	0.015	0.112	0.015	0.112	0.047	0.075	0.015
9/10/2001	0.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/14/2001	0.63	0.036	0.005	0.077	0.005	0.077	0.027	0.047	0.005
9/20/2001	0.31	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
9/21/2001	0.13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/24/2001	0.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
9/25/2001	0.22	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
…	…	…	…	…	…	…	…	…	…
2/21/2003	0.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2/22/2003	1.96	0.751	0.515	0.936	0.515	0.936	0.696	0.809	0.515
2/23/2003	0.30	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000
2/27/2003	0.02	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2/28/2003	0.05	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/2/2003	0.83	0.099	0.035	0.165	0.035	0.165	0.082	0.118	0.035
3/5/2003	0.34	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000
3/6/2003	0.60	0.029	0.003	0.066	0.003	0.066	0.021	0.039	0.003
3/13/2003	0.04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/16/2003	0.04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/17/2003	0.04	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/20/2003	1.55	0.472	0.293	0.620	0.293	0.620	0.429	0.518	0.294
3/21/2003	0.08	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/26/2003	0.27	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/28/2003	0.03	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3/29/2003	0.34	0.000	0.000	0.003	0.000	0.003	0.000	0.000	0.000
3/30/2003	0.20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Runoff (in)	4.997	2.397	7.866	2.397	7.866	4.293	5.818	2.399
	Runoff (ft)	0.416447206	0.199708498	0.655529917	0.199708498	0.655529917	0.357726343	0.484831079	0.199887138
	Runoff (ft3)	773,829,578	1,052,719,443	727,959,270	97,386,821	1,106,687,774	1,577,991,140	551,442,894	1,354,705,843
	% of Runoff from MS4	**42%**		**88%**		**41%**		**29%**	

The current MS4 loads for the cycling one year period are calculated using the runoff volume ratio as shown in Appendix Table 6-2 and non-point source runoff loads. Then, proportions of MS4 loads to total loads are calculated. Note that the total loads are defined as sum of point and non-point source loads excluding Trenton and Schuylkill boundary and contaminated site loads for this calculation. The existing MS4 load proportions are summarized in Appendix Table 6-3.

Appendix Table 6-3. Existing loads and proportions of MS4 loads by Zone for the cycling one year period.

Estuary Zone	NPS plus MS4 Loads	MS4 Loads	Total Loads* (Point plus Non-Point sources)	Proportion of MS4 loads to Total Loads*
	kg/365days	kg/365days	kg/365days	%
2	1.545	1.545 x 42 % = 0.649	2.688	24.15
3	0.275	0.275 x 88 % = 0.242	2.376	10.17
4	1.186	1.186 x 41 % = 0.486	3.820	12.73
5	1.129	1.129 x 29 % = 0.327	3.409	9.61

** Total loads, indicated here, are defined excluding Trenton and Schuylkill boundary and contaminated sites loads.*

Appendix Table 6-4 shows the Zone TMDLs excluding Trenton and Schuylkill boundary loads. In addition, the Table contains Zone specific MOS, allocations to contaminated site loads and allocatable portion to the rest of point and non-point source categories. The allocations to MS4s are calculated by proportion of MS4 loads to Total Loads shown in Appendix Table 6-3 and Allocatable portion to the rest of categories shown in Appendix Table 6-4. Summary of categorical WLAs and LAs are presented in Table 9 and Table 10 of the main text.

Appendix Table 6-4. Summary of the Zone TMDLs for penta-PCBs excluding Trenton and Schuylkill boundaries.

Estuary Zone	TMDL	MOS	Contaminated Site	Allocatable portion to the rest of categories	Allocations to MS4s
	mg/day	mg/day	mg/day	mg/day	mg/day
Zone 2	6.613	0.331	0.026	6.256	1.511
Zone 3	4.455	0.223	2.416	1.816	0.185
Zone 4	4.569	0.228	1.651	2.689	0.342
Zone 5	12.016	0.601	5.250	6.165	0.592

New Jersey Department of Environmental Protection
Report on the Establishment of
Total Maximum Daily Load (TMDL)
For Phosphorus in Strawbridge Lake,
Moorestown Township, Burlington County, NJ
Amendment to the Tri-County Water Quality Management Plan

Proposed: July 3, 2000
Established: September 9, 2000
Approved: December 8, 2000
Adopted: June 22, 2003

Introduction

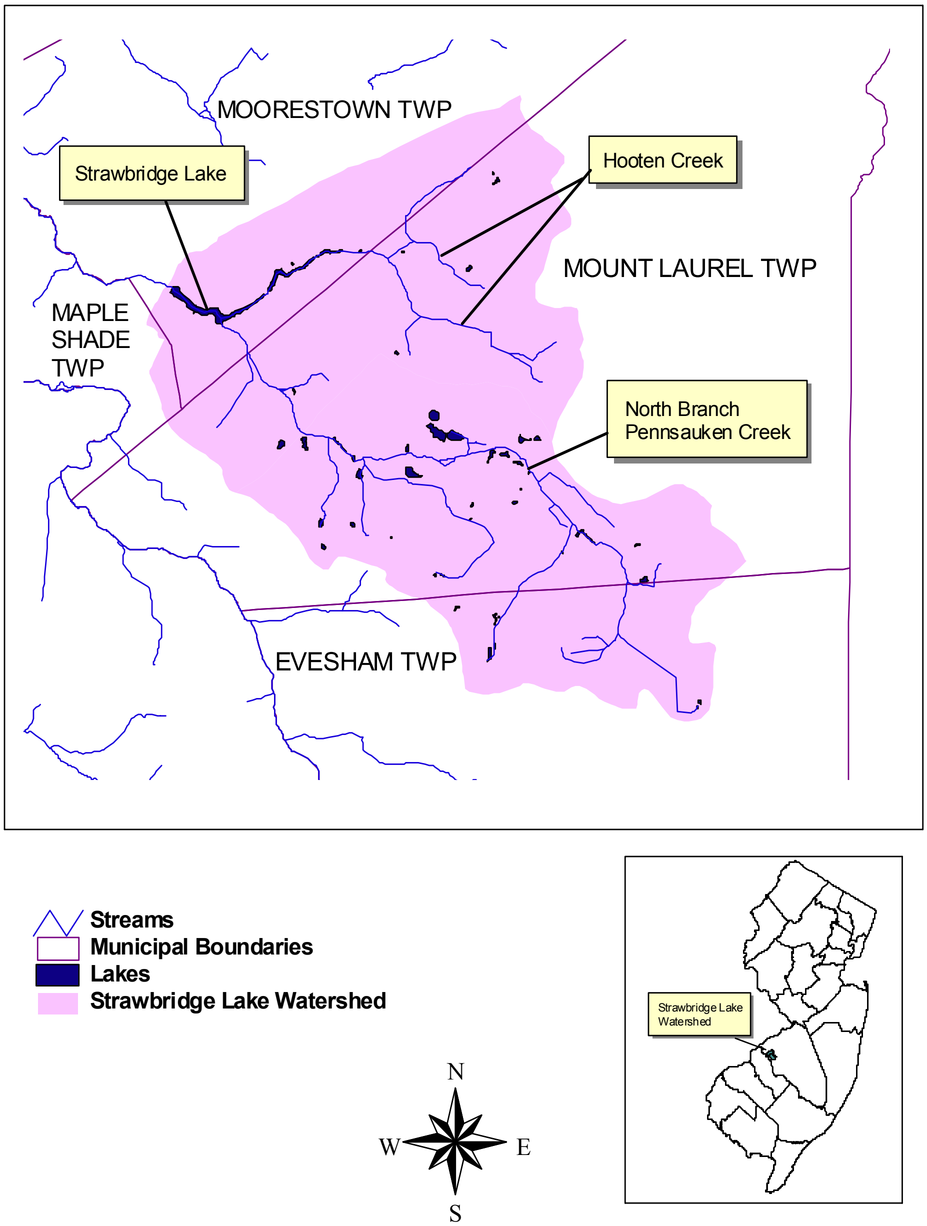
A Total Maximum Daily Load (TMDL) represents the assimilative or loading capacity of the receiving water taking into consideration point and nonpoint sources of pollution, natural background, as well as surface water withdrawals. A TMDL is developed as a mechanism for identifying all the contributions to surface water quality impacts and setting goals for load reduction for specific pollutants as necessary to meet surface water quality standards. TMDLs are required, under section 303(d) of the federal Clean Water Act, to be developed for waterbodies that do not meet water quality standards after the implementation of technology-based effluent limitations. TMDLs may also be established to help maintain or improve water quality in waters that are not impaired. Regulations concerning TMDLs are contained in EPA's Water Quality Planning and Management Regulation (40 CFR § 130.7(c)).

Where TMDLs are required to address documented surface water quality impairments, allocations are made to the varying sources contributing to the water quality problem in order to reduce the total pollutant load received by the waterbody. Load reduction goals established through TMDLs are achieved through the issuance of wasteload allocations for point sources and load allocations for nonpoint source discharges. Since nonpoint source pollution, by definition, does not come from discrete, identifiable sources, load allocations would consist of the identification of categories of nonpoint sources that contribute to the parameters of concern. The load allocation would also include specific load reduction measures for the categories of sources, to be implemented through best management practices (BMPs) including local ordinances for stormwater management and nonpoint source pollution control, headwater protection practices, or other mechanisms or addressing the priority issues of concern. There are no point sources of pollution to the Strawbridge Lake, therefore only load allocations have been developed.

In May 1999, the New Jersey Department of Environmental Protection (NJDEP) and USEPA Region II entered into a Memorandum of Agreement (MOA) that included an 8-year schedule. Using this schedule, they agreed to produce TMDLs for all water quality limited segments on the 1998 Section 303(d) list of Water Quality Limited Waterbodies in New Jersey, or provide information necessary to remove waterbodies from the list.

Originally, a basic TMDL for Strawbridge Lake was to be established by the Department by December 31, 2000 under this MOA. However, in order to accommodate EPA's request to accelerate this TMDL schedule, the current deadline for the establishment of the Strawbridge Lake TMDL has been revised to August 15, 2000.
Since the watershed of Strawbridge Lake takes up the majority of the watershed of the North Branch of the Pennsauken Creek, this TMDL will be also be incorporated within the TMDL for the whole Pennsauken Creek, which is due to EPA by June 30, 2002.

Strawbridge Lake Watershed
Figure 1



Background

Strawbridge Lake is located in Moorestown Township in Burlington County, New Jersey (see Figure 1), although its 12.6 square mile watershed extends into portions of Mount Laurel and Evesham Townships in addition to Moorestown. The majority of the watershed of Hooten Creek and North Branch Pennsauken is contained in Mt. Laurel Township, while the headwaters of the North Branch are in Evesham Township. This long, tri-basin lake is a result of the impoundment of the confluence of Hooten Creek and the North Branch of the Pennsauken Creek that started in the late 1920's and was completed between 1931 to 1937. The lake receives surface runoff through Hooten Creek to the Upper and Middle Basins and the Lower Basin receives runoff from the headwaters of the North Branch of Pennsauken Creek. The discharge from the lake retains the name of the North Branch Pennsauken Creek that flows into the Delaware River approximately ten miles below the dam of the Lower Basin.

Strawbridge Lake is a 32.9-acre (13.3 hectares) lake with an average pre-dredged depth of 2.4 feet (0.74 meters) and a maximum depth of 8.0 feet (2.4 meters). Each basin has been dredged at least once since impoundment: the Upper Basin was dredged in 1959, the Middle Basin in 1962 and the Lower Basin in 1968 (USACOE, 1970). The most recent dredging of the lake basins started in the late 1990's: the Upper Basin was dredged in 1997, the Middle in 1999, and the first half of the Lower Basin began in the spring of 2000.

The watershed area that drains into the Strawbridge Lake is a complex mix of land uses including agriculture, mature residential subdivisions, new residential subdivisions, office parks, major transportation routes (I-295, NJ Turnpike, Rte. 38), shopping malls and large industrial complexes. The lake and its park around the perimeter are heavily used for passive recreational activities such as picnicking and bird watching. The lake is used for fishing, although the lake is no longer stocked. There are no swimming beaches on the lake, and before dredging, no canoes or shallow boats could be used.

The sub-watersheds that are delineated in this report are: Lake Basins, the land that drains directly into the three Lake basins; Hooten Creek; and the North Branch of the Pennsauken Creek.

Section 303(d) Listing and Applicable Surface Water Quality Standards

Applicable Surface Water Quality Standards (SWQS)

Strawbridge Lake is classified as FW-2 non-trout (N.J.A.C. 7:9B). Designated uses are primary contact recreation (i.e., swimming); secondary contact recreation (i.e., wading, boating); fishing (recreational and consumption) and the provision of a natural, scenic area. Criteria that are relevant to the 303(d) Listings for the Strawbridge Lake follow:

<u>Phosphorus</u>
Lakes: Phosphorus as total P shall not exceed 0.05 in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies of water, except where site-specific criteria are developed. Note: Presently, no site-specific criteria apply to the Strawbridge Lake.

<u>Sedimentation</u>

There is no quantitative State criterion for sedimentation. The applicable suspended solids criterion is 40mg/l; however, Strawbridge Lake is not listed as impaired for suspended solids. There is, however, a narrative criterion for floating, colloidal, color and settleable solids (N.J.A.C. 7:9B-1.14(c)3I) that reads:

> None noticeable in the water or deposited along the shore or on the aquatic substrate in quantities detrimental to the natural biota. None which would render the waters unsuitable for the designated uses.

Chlordane in Fish Tissue:

There are no SWQS for chlordane in surface waters in New Jersey. However, the United States Food and Drug Administration has established a Maximum Permissible Level (MPL) for chlordane in foodstuffs (e.g., edible fillets of food fish) at 0.3 parts per million (ppm).

Heavy Macrophyte Growth

There is no State criterion for heavy macrophyte growth.

1998 Impaired Waterbodies List (303(d) List)

Strawbridge Lake has been included on 1996 and 1998 Impaired Waterbodies Lists due to water quality issues associated with eutrophication, specifically sedimentation, heavy macrophyte growth, and elevated phosphorus and chlordane contamination in fish tissue. These listings apply to all three basins of Strawbridge Lake.

Data sources for the inclusion of Strawbridge Lake on Impaired Waterbodies Lists for eutrophication issues are F.X. Browne, Associates (1993), and the Department's Clean Lakes Program. The Clean Lakes Program reviewed these data and reported this information to the 303(d) Program. The chlordane contamination in finfish tissue listing is based upon information supplied through NJDEP (1990) and Moser and others (1984).

Sedimentation: F.X. Browne (1993) has identified sedimentation as the primary problem in Strawbridge Lake. Sedimentation has reduced the mean lake depth from 4.9 to 2.4 feet thereby reducing the lake's aesthetic appeal. Sediment has also limited the lake's recreational value by impairing the fishery, contributing to eutrophication and preventing the use of small boats. F.X. Browne stated that sediment occupied over 50 percent of the lake's estimated total volume of 52 million gallons. The average sediment thickness as measured in 1992 was 2.5 feet.

Although there are no violations of the State's SWQS for suspended solids, in-lake levels were considered very high, progressively increasing from the Upper to the Lower Basin. In concert, Secchi disk transparency was poor, with the Lower Basin exhibiting the lowest transparency. The implementation plan developed for the phosphorus TMDL is expected to address the sedimentation issue as well.

Phosphorus: In-lake data for total phosphorus collected from Strawbridge Lake during the summer of 1992 and discussed in F.X. Browne (1993) show levels to be marginal in the Upper and Middle Basins when compared to the applicable SWQS criterion; and unacceptable in the Lower Basin. Average total phosphorus levels in the summer were 0.052, 0.055 and 0.188 mg/l at the lake surfaces of the Upper, Middle and Lower Basins respectively. Year-around data taken from June, 1992 through April, 1993 at the outlet of the Lower Basin (Omni, 2000, Appendix A) show mean phosphorus concentrations in the summer and winter of 0.202 and 0.127 mg/l, respectively, the year-around mean being 0.165 mg/l. Based on the ratio between year-around mean and summer mean, the year-around means in the Upper, Middle and Lower Basins can be estimated based on the summer 1992 data to be 0.043, 0.045 and 0.154 mg/l, respectively.

Chlordane: Chlordane became a contaminant of concern for the North Branch of Pennsauken Creek and Strawbridge Lake in April of 1978. Due to concern about the levels of pesticides found in fish tissue, a ban of fishing, swimming and boating was announced in a News Release (NJDEP, 1978) after consultation with both State and County Health Departments. Fish sampling showed very high levels of the pesticide chlordane in the edible portions of the fish caught in these waters (i.e., 100 samples of over 13 different fish species). The US Food and Drug Administration have established a maximum permissible level (MPL) of 0.3 parts per million (ppm) for chlordane in food products. Thirty percent of the fish samples had levels in excess of 1.0 ppm and several exceeded 3.5 ppm.

Although the exact nature and source of the contamination remained unclear, NJDEP funded studies of sediment transport in these drainage areas. Moser (1985) indicated that possible improper use of chlordane as a termaticide (i.e., aerial spraying for termites instead of subterranean insertion near foundations) could have resulted in significant runoff and transport to the waters from the residential housing surrounding Strawbridge Lake. Subsequent fish sampling in 1981-1982, Belton et. al. (1983) indicated that the levels of chlordane had decreased since 1978 but were still in excess of the FDA maximum permissible level. Strawbridge Lake was again sampled in 1986 and still showed concentrations in edible tissue of fish in excess of 2 ppm (NJDEP, 1990).

In 1988, levels in all samples collected in Strawbridge Lake had dropped below the FDA permissible level of 0.3 ppm (NJDEP,1993). However, due to State-wide budget cutbacks in the mid-1990s, the Toxics in Biota Monitoring Program budget was severely reduced, and only three fish were collected from Strawbridge Lake at that time. This made it somewhat problematic as to whether the ban at Strawbridge Lake should be lifted.

Subsequently, funding levels for the Toxics in Biota Monitoring Program were restored in 1998 and samples collected in 1999 included 12 fish from Strawbridge Lake, which are currently being analyzed. Once assessed, DEP will evaluate 1) if the downward trend in chlordane contamination since the 1970s has continued, 2) whether regulatory amendments are indicated concerning the fishing, swimming and boating bans; and 3) the impairment status of the water quality in Strawbridge Lake (i.e., 303(d) Listed Impaired Waters under Clean Water Act).

Intended Future 303(d) Actions

Constituent of Concern:	Intended Actions:
Elevated Phosphorus	Establish TMDL
Sedimentation	Address through Phosphorous TMDL such that the impairment will be resolved by the next listing cycle (2002)
Chlordane (in Fish Tissue)	If continued sampling confirms <0.3 ppm (MPL), Pursue 1) removal of the fish consumption advisories and 2) delisting;
Heavy macrophyte growth	Dredging; and if necessary, weed harvesting

Strawbridge Lake Monitoring Plan

1. Trophic Status: Strawbridge Lake should be monitored to determine post-dredging trophic status using an approved Quality Assurance Project Plan, which includes analysis of field QA samples. The Clean Lakes Program must approve monitoring design and methods. Sampling should be conducted at the Hooten Creek and Pennsauken Creek lake inlets, within each of the 3 lake basins and at the lake outlet. Since the Upper and Middle basins have been dredged and the material removed from the site, the monitoring could start there. After the Lower Basin is completed, monitoring should take place 1 year after all dredge materials are removed from the site. The monitoring should consider seasonality and include sampling during critical spring and summer seasons. Water column parameters of interest include:

Total Phosphorus (TP)	Chlorophyll a (Chl a)
Ortho- phosphate (PO4)	Phytoplankton
Total Kjeldahl Nitrogen (TKN)	Dissolved Oxygen Profiles (DO)
Nitrate + nitrite (NO3+NO2)	Dissolved Oxygen – Percent Saturation
Ammonia nitrogen (NH4-N)	Alkalinity
Total Suspended Sediments (TSS)	Ph
Temperature (T)	Fecal Coliform (FC)

In addition, bottom sediments should be collected for nutrients (TP, TN) to evaluate nutrient cycling.

Results will be used to evaluate trophic status and compliance with SWQS. If com-pliance with SWQS is demonstrated, delisting will be proposed. If SWQS are exceeded, delisting will not be pursued, and as appropriate, additional management measures will be implemented.

2. Chlordane in Fish Tissue: NJDEP collected 12 fish from Strawbridge Lake to evaluate current concentrations of chlordane. Results will be used in conjunction with previous studies to evaluate current fish consumption advisories and make any appropriate amendments to those advisories. Delisting will be pursued if fish consumption advisories are lifted.

Summary of Intended Actions

Phosphorus: The Department intends to establish a TMDL for this constituent of concern; see below.

Sedimentation: The Department intends to address the sedimentation issue by the following actions: 1) by the establishment of the TMDL for phosphorus which includes implementation measures which will address sedimentation. These include dredging the three basins of unconsolidated sediments; 2) continuing to implement BMPs throughout the watershed to decrease the amount of unconsolidated sediments entering the lake basins; and 3) monitoring the effects of implementation on the sedimentation rate. If the sedimentation rate is determined to be acceptable, then delisting will be pursued for this constituent of concern. Otherwise, additional solutions will be pursued, such as construction of a forebay to capture sediments and facilitate maintenance dredging in a confined area.

Chlordane in Fish Tissue: In 1988, fish tissue samples indicated that the levels of chlordane had dropped below the FDA permissible level of 0.3 ppm (NJDEP, 1993). Continued sampling of fish tissue from this lake has occurred but sufficient samples have not been collected to make a final determination. Twelve additional samples of fish tissue were taken in 1999. Very preliminary results from these data indicate that levels may be below the 0.3 ppm MPL, however, the full data set has not been fully assessed. In addition, the Department intends to take another set of fish tissue samples during the monitoring phase of this TMDL. If results from both of the data sets confirm the 1988 data, that the tissue from the fish have dropped below the FDA permissible level of 0.3 ppm, then the Department will pursue lifting the fish consumption advisories and delisting from the 303(d) list. Lifting of advisories would allow consumption of fish from these lake basins again, and thus restore the fishing and fish consumption designated uses.

Heavy Macrophyte Growth: As mentioned above and in the rest of this document, the Upper and Middle Basins of Strawbridge Lake have been dredged of their unconsolidated sediments. At the writing of this document, dredging has begun on the first half of the Lower Basin. Where completed, the dredging has deepened the lake basins noticeably and eliminated the growth that was present because of the shallowness of the basins, thus restoring one measure of aesthetic value to the lake. As the lake basins return to equilibrium, it is possible that macrophyte growth may return. As outlined in the Implementation Plan, it is possible that the Township may need to consider a program of weed harvesting if macrophyte growth becomes a problem. The Department will monitor the lake and work with the Township and the PAC on future implementation initiatives that may be needed.

TMDL for Phosphorus in Strawbridge Lake, Burlington County, NJ

Water Quality Modeling

The Diagnostic-Feasibility Study of Strawbridge Lake (F.X. Browne, 1993) was approved by EPA through the Clean Lakes Program and forms the technical basis for the TMDL calculations. Hereafter in this document it will be referred to as the Clean Lakes Report. The analysis has been modified to correct errors in data presentation and manipulation and to take into account more recent land use information and New Jersey's adopted standard of 0.05 mg/l for total phosphorus. NJDEP's 1995 land use data show 80% less cropland/pasture and 27% more urban land uses compared to the information on which the analysis in the Clean Lakes Report was based.

The empirical model developed by Dillon and Rigler (1975) was used in the Clean Lakes Report because after a survey of commonly used models, Dillon and Rigler gave the best predictive results for phosphorus concentration in the Lower Basin. Using land uses in 1990 as estimated in the Clean Lakes Report, the model calculates the total phosphorus concentration to be 0.154 mg/l in the Lower Basin. As discussed above, the year-around total phosphorus mean in the Lower Basin, based on data taken from 1992 to 1993, was estimated to be 0.154 mg/l in one study [1] and 0.165 mg/l in another (Omni, 2000, Appendix A). In addition, Strawbridge Lake's hydrologic and morphological characteristics fit the assumptions within the model. The Dillon and Rigler model is described in EPA's Clean Lakes Manual, Quantitative Techniques for the Assessment of Lake Quality. The model relates allochthonous TP load to steady state TP concentration.

Watershed loads for total phosphorus were estimated using the Unit Areal Loadings methodology which uses the land use patterns within the watershed and pollutant export coefficients obtained from literature sources, as described in EPA's Clean Lakes Program guidance manual (Reckhow,1979). Land use was determined using the NJDEP's GIS system using 1995-1996 data. The export coefficients used from the Clean Lakes Report are: 2.04 kg/ha/yr for cropland/pasture; 0.71 kg/ha/yr for residential; 0.75 kg/ha/yr for lakes and ponds; 0.77 kg/ha/yr for industrial/commercial; 0.06 kg/ha/yr for mixed forest; and 0.07 kg/ha/yr for forested wetland.

As shown in Figure 2, the Strawbridge Lake watershed was divided into 3 sub-watersheds: Hooten Creek, North Branch of the Pennsauken Creek, and the watershed of the lake basins themselves. Existing land uses and calculated allochthonous loading rates for the three sub-watersheds are shown in Table 1. Loading rate estimates for septic tanks and waterfowl, which are not included in the runoff export coefficients, were dev-

[1] The Clean Lakes Program report used the summer mean of 0.188 mg/l to compare with model results. When adjusted for seasonal differences, the year-around average is actually 0.154 mg/l.

eloped in the Clean Lakes Report and included in Table 1. The North Branch of the Pennsauken Creek contributes 57% of the load to the Lower Basin of Strawbridge Lake, the Hooten Creek delivers 25% and the sub-watershed of the Lake delivers 18%.

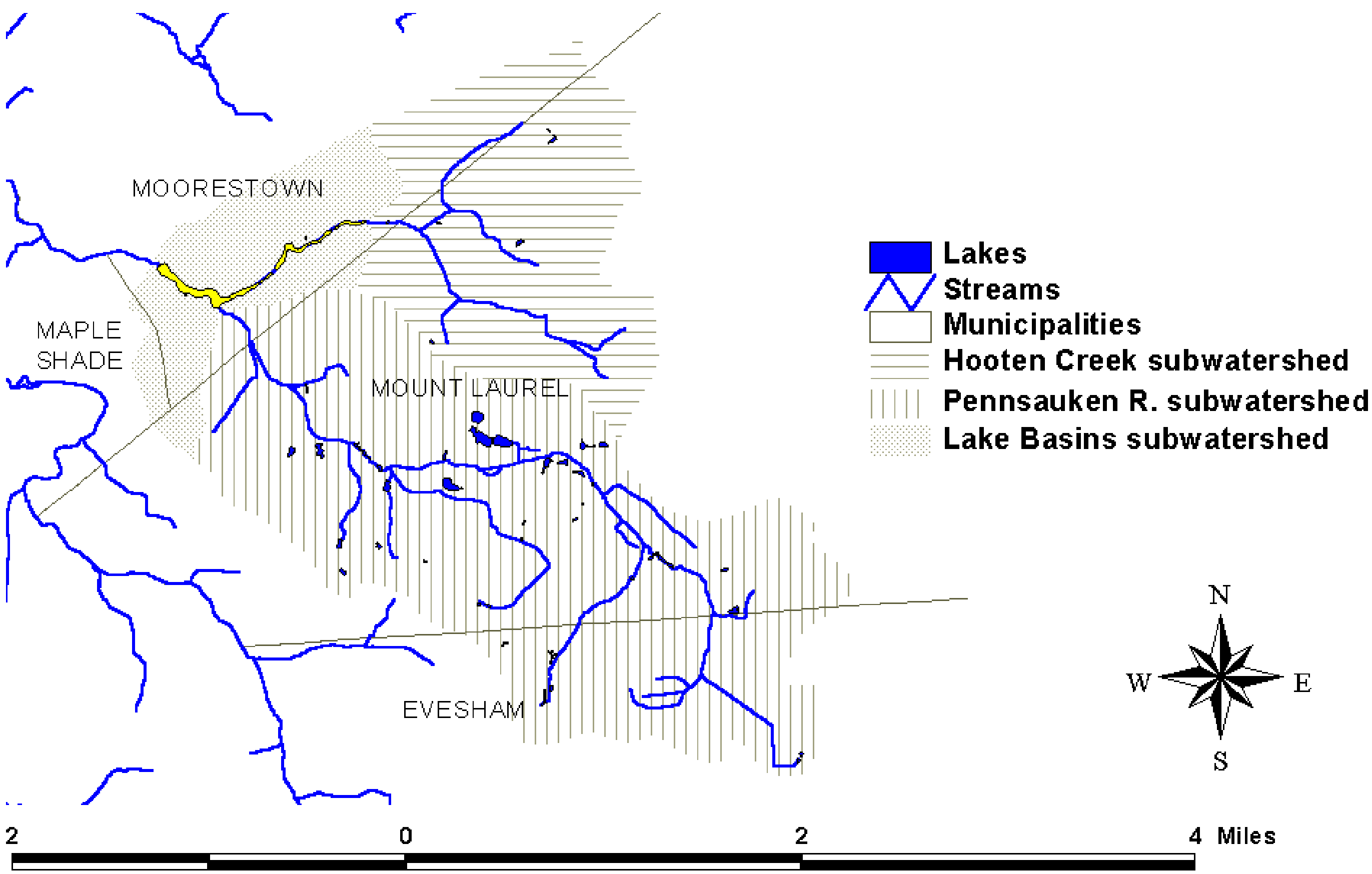
Table 1		Existing Land Use (hectares)			Current Loading Rate (kgTP/yr)		
LU/LC	kgTP/ ha/yr	Hooten Creek	Pennsauken Creek	Lake Basins	Hooten Creek	Pennsauken Creek	Lake Basins
Commercial / Industrial	0.77	159	536	182	122	413	140
Cropland / Pasture	2.04	125	113	2	256	230	5
Forest / Barren Land	0.06	166	173	22	10	10	1
Residential	0.71	190	743	211	135	527	150
Surface Water	0.75	5	26	13	3	19	10
Wetland	0.07	252	400	8	18	28	1
Septic Tank							13
Waterfowl							70
TOTAL		896	1,990	439	544	1,228	390
Percentage		27%	60%	13%	25%	57%	18%

The current allochthonous load is estimated to be 2,162 kg/yr total phosphorus (Table 1). Therefore, the predicted unit areal phosphorus loading for the Lower Basin is calculated to be 24.8 $g/m^2/yr$. The Lower basin receives flow (and load) from the entire watershed through the Upper and Middle Basins and the North Branch Pennsauken while the Upper/Middle Basins only receive discharge from Hooten Creek. Data taken in 1992 indicate that summer mean total phosphorous concentrations in the Upper and Middle Basins were 0.052 and 0.055 mg/l, respectively. While the model used for the Lower Basin over-predicts phosphorous concentrations in the Middle and Upper Basins[2] both the field data and the model confirm that the Lower Basin is the most sensitive component and therefore the one around which the TMDL calculations are based.

[2] Model calculations in the Clean Lakes Report do not reflect this over-prediction in the Middle and Upper basins because they are based on an incorrect flushing rate. The correct flushing rate is 220 times per year, not 720 as published in the Clean Lakes Report.

Figure 2

Strawbridge Lake Subwatersheds



The current condition is calculated as follows using the Dillon-Rigler (1975) formulation.

$$P = LT(1-R)/z$$
$$= 0.088 \text{ mgTP/l}$$

Where:

P = annual average total phosphorous concentration, mg/l
L = unit areal phosphorous loading, $g/m^2/yr$ = 24.8
T = detention time, yrs = $2.57e^{-3}$
R = phosphorus retention coefficient
= f(average depth, detention time) = 0.0447
z = average depth, m = 0.69

Dredging does not affect the phosphorus concentration using this formulation, since both detention time and average depth are increased by the same factor. The dredging will increase the mean depth from 0.69 meters to 1.32 meters and the detention time will also nearly double from $2.57e^{-3}$ years to $4.91e^{-3}$ years. The predicted steady-state phosphorus concentration using these estimated physical parameters and current allochthonous loads is 0.088mg/l.

Seasonal Variation/Critical Conditions

The target value for the phosphorus TMDL is adjusted to account for seasonal variation as follows: The Dillon-Rigler model predicts steady state phosphorus concentration. To account for seasonal variation, a peak to mean ratio was developed using data from the outlet of Strawbridge Lake. Two samples were taken twice a day on 20 occasions from June 1992 to April 1993 (Omni, 2000, Appendix B). Three values were not used because they were outliers and not consistent with the other sample taken on the same day. The 90^{th} percentile rank was used as the peak to account for data variability and to be consistent with the process used by the Department to define impaired water bodies. The seasonal variation was thereby determined to be 56%, resulting in a target phosphorus concentration of 0.032 mg/l.

<u>Target Condition</u>

The current steady state concentration of 0.088 mg/l of phosphorus must be reduced to a steady state of 0.032 mg/l to avoid exceeding the 0.05 mg/l phosphorus standard. To attain the target steady state concentration of 0.032mg/l total phosphorus, an overall reduction of 63.6% is necessary. The percent reduction was calculated by comparing the current condition of 0.088 mgTP/l to the target condition of 0.032 mgTP/l.

<u>Loading Capacity</u>

The Dillon-Rigler model was used to solve for loading rate given the target concentration of 0.032 mg/l. Reducing the current loading rate of 2,162 kgTP/yr by 63.6% yields the same result. The acceptable allochthonous loading capacity is 787 kgTP/yr.

Reserve Capacity

While developable land within the Strawbridge Lake watershed is limited, future growth is expected to convert some of the remaining farmland into commercial and residential land uses. Both of these land uses will result in less runoff loading of phosphorus than farmland. The implementation plan will emphasize, among others, forest preservation measures intended to preserve this important resource. Therefore, the reserve capacity is zero.

Margin of Safety

A margin of safety is required in order to account for uncertainty in the loading estimates, physical parameters and the model itself. The margin of safety, as described in EPA guidance, can be either explicit or implicit, (i.e., addressed through conservative assumptions used in establishing the TMDL). This TMDL contains an implicit margin of safety by using critical conditions, over-estimated loads, total phosphorus and dredging the lake. Each conservative assumption is further explained below.

Critical conditions are accounted for by comparing peak concentrations to mean concentrations and adjusting the target concentration accordingly (0.32 mg/TP/l instead of 0.05 mg/TP/l). In addition to the conservative approach used for critical conditions, the land use export methodology does not account for the distance between the land use and the lake, which will result in phosphorus reduction due to in-stream decay. Neither are any reductions assumed due to the addition of extensive lakeside vegetative buffer construction, biofilter wetlands or sedimentation chambers. Use of total phosphorus, as both the endpoint for the standard and in the loading estimates is a conservative assumption. Use of total phosphorous does not distinguish readily available phosphorus (e.g. dissolved ortho-phosphorus) which is available for algal growth from unavailable phosphorus (e.g. particulate).

Phosphorus load from sediment was never estimated in the Clean Lakes Report but is substantial based on the depth and high organic content of unconsolidated sediments. The sediments are as deep as the water column and rich in organic content. The removal of the unconsolidated sediment by dredging will convert the sediments from a substantial net source to a net sink of phosphorus due to settling.

Therefore, due to the multiple conservative assumptions built in to the calculation, an additional explicit margin of safety was not necessary.

Load Allocations

EPA regulations, 40 CFR § 130.2(i), state that “TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure.” For lake nutrient TMDLs it is appropriate to express the TMDL on a yearly basis. Long-term average pollutant loadings are typically more critical to overall lake water quality. Also, most available empirical lake models, such as the Dillon-Rigler model used in this analysis, use annual loads rather than daily loads to estimate in-lake concentrations.

The TMDL for total phosphorus is therefore calculated as follows (see Figure 3):

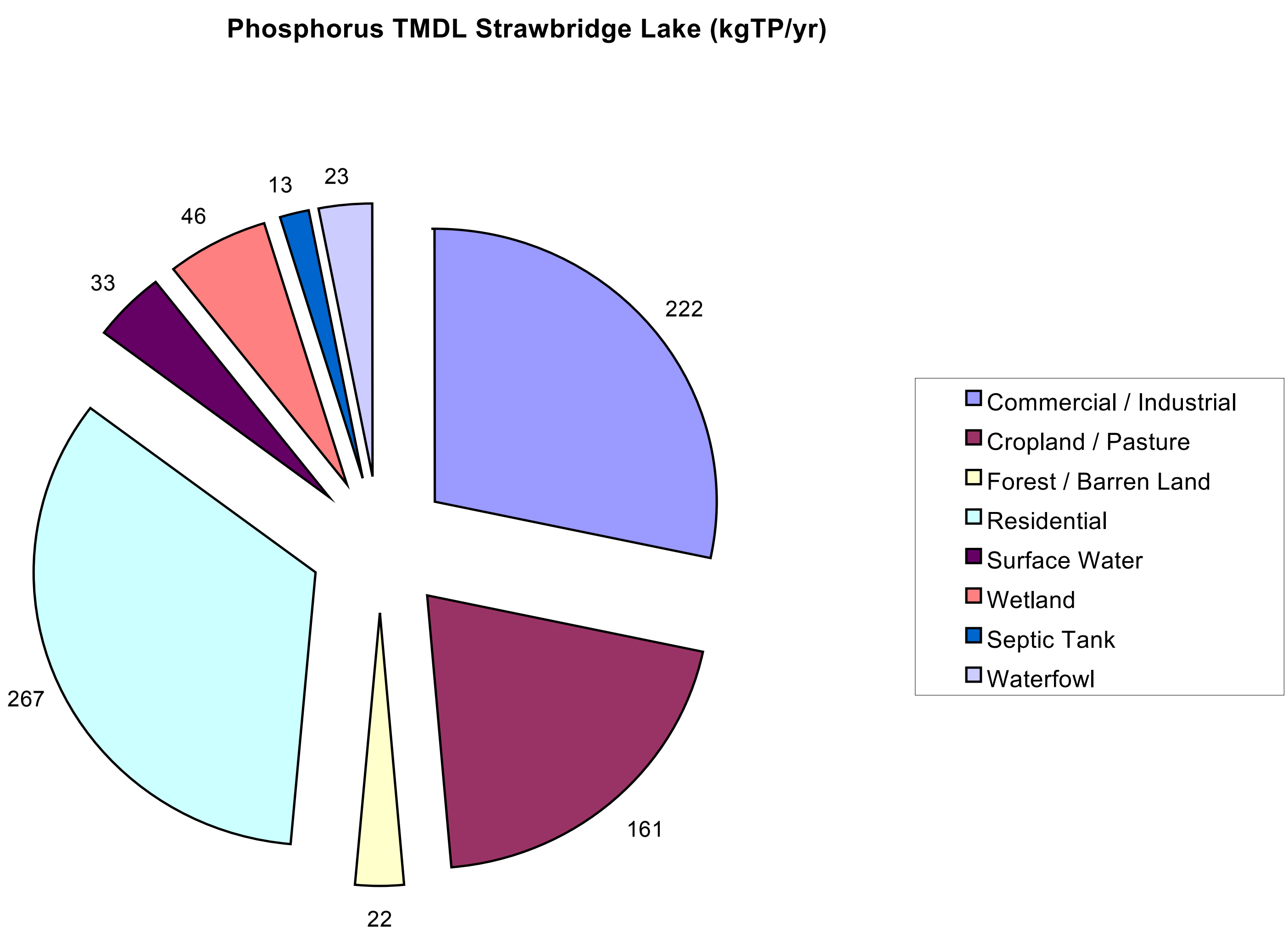
TMDL = loading capacity
= Sum of the load allocations + margin of safety + reserve capacity

where:

Loading capacity =		787 kg/yr
Sum of load allocations =		787 kg/yr
=		222 kg/yr commercial/industrial
	+	161 kg/yr cropland / pasture
	+	22 kg/yr forest / barren land
	+	267 kg/yr residential
	+	33 kg/yr surface water
	+	46 kg/yr wetland
	+	13 kg/yr septic tank
	+	23 kg/yr waterfowl
Margin of safety =		0
Reserve capacity =		0

In order to attain the TMDL, an overall load reduction of 63.6% must be achieved. Since loading rates have been defined for the three sub-watersheds and eight source categories, countless combinations of source reduction could be used to achieve the overall reduction target. To be successful, a reduction strategy must include substantial reductions in all three sub-watersheds. The selected scenario is to apply the reductions equally in all three sub-watersheds, and to focus on sources that can be affected by BMP implementation. Therefore, in order to attain the TMDL, the following sources must each be reduced by 67%: commercial/industrial, cropland/pasture, residential and waterfowl.

Figure 3


Phosphorus TMDL Strawbridge Lake (kgTP/yr)
222
161
22
267
33
46
13
23
Commercial / Industrial
Cropland / Pasture
Forest / Barren Land
Residential
Surface Water
Wetland
Septic Tank
Waterfowl

Implementation Plan for Strawbridge Lake

An implementation plan is not required at this time as part of the TMDL. However, for completeness, options for addressing the phosphorus exceedances and high levels of sedimentation are listed below. A schedule will be developed, working with the townships and county government and with the watershed community through the Watershed Management process as well as other aspects of a public process. Recently, a contract to assist in the preparation of a watershed management plan has been signed, and is within Watershed Management Area #18 which is a priority area for this year in the Unified Watershed Assessment Program directing approximately $412,000 toward "Action Now" implementation projects.

Pre-TMDL Implementation

Within the Diagnostic-Feasibility Study for Strawbridge Lake, a program was proposed to lower the phosphorus and other pollutants to acceptable levels (F.X. Browne, 1993). There were six components of the program:

1. Establishment of a Watershed Management Committee to evaluate and coordinate watershed management activities in the Strawbridge Lake Watershed.
2. Establishment of a "Watershed Watch" program to ensure that erosion and stormwater management controls are installed properly during construction activities and ensure those long-term stormwater controls are properly operated and maintained.
3. Implementation of Best Management Practices (BMPs) on agricultural lands within the watershed, with the goal that all farms should have an approved Conservation Plan.
4. Implementation of urban Best Management Practices throughout the watershed on areas that have severe erosion or stormwater runoff problems.
5. Installation of erosion protection measures on eroding areas of streams and on the shoreline of Strawbridge Lake.
6. Evaluation of the creation of biofilters and the enhancement of existing wetlands in the Strawbridge Lake watershed to reduce the silt and nutrients entering Strawbridge Lake.

Since the publication of the Diagnostic-Feasibility Study, the following actions have been accomplished, almost all under the direction of Moorestown Township in Moorestown:

- Moorestown Township has developed a working relationship with many cooperative entities in their quest to rehabilitate this Lake. Cooperating entities include Strawbridge Lake Watershed Committee, Strawbridge Lake Restoration Association, Delaware Riverkeeper Network, Americorps, Moorestown Environmental Advisory Committee, Save the Environment of Moorestown (STEM), and their consultant, Omni Environmental Corp., Princeton, NJ. They have been instrumental not only in developing projects but also funding them as listed below. These entities provide a diligent, willing group to obtain feedback and discussion as well as physical labor engaged in volunteer aspects of these projects.

- Dredging:
  a) the Upper Basin was dredged of 37,000 cu. yds. of sediment;
  b) the Middle Basin was dredged of 20,000 cu. yds. (1999); and
  c) dredging began on the Lower Basin in Spring, 2000 estimated to be one-half of the total proposed: 70,000 cu.yds.

- Shoreline stabilization: 4,020 linear feet of lake shore was stabilized and retrofitted with bio-engineering techniques to create a minimum of 10-20 feet vegetative buffer with tall grasses and shrubs to discourage Canada Geese, in particular. Because of the impending dredging, only 460 feet of rehabilitation was done on the Lower Basin, the remaining 3560 feet were constructed along the shorelines of the Upper and Middle Basins. An additional 2,400 feet of shoreline stabilization has started on a section of Strawbridge Lake Park along the Route 38 side between Pleasant Valley Ave, and the Route 38 bridge over the Pennsauken Creek (upper half of Lower Basin on south side).

- Public access sites: 240 feet of specially located public access sites interspersed

along the vegetative buffers as mentioned above. On the Lower Basin, 100 feet of public access sites were located; the rest were located along the Upper and Middle Basins. The public groups listed above provided important information in the location and design of these public access areas.

- Retrofitted stormwater outfalls/biofilter (pocket) wetlands: Four stormwater outfalls were retrofitted with two biofilter wetlands along the Lower Basin on the Haines Drive side of the lake (north side of lake in lake sub-drainage). Three stormwater discharges were retrofitted with sedimentation chambers and biofilter wetlands along the Upper Basin on the Route 38 side (south side of the lake in lake sub-drainage).

- Retrofit of commercial stormwater outfalls: Stormceptors (or their equal) were installed in the portion of the Moorestown Mall slated in the Mall's future expansion and reconstruction project. Stormwater from the Mall is piped directly into Pennsauken Creek, immediately upstream of the Lower Basin (inlake sub-drainage).

- Moorestown Township has passed (1999) a Stream Corridor ordinance for new development which stipulates the restoration and preservation of the vegetation in the 100-year flood plain and the development of a minimum 25 foot vegetative buffer.

Costs on the above restorative projects are: Current dredging of the 35,000 cu. yds. from the Lower Basin is $1.5 million and is being funded through a Bond by Moorestown Township. The Township estimates that an additional $1.5 million will be needed to dredge the remaining half of the unconsolidated sediments in the Lower Basin. Funding is being actively sought to pay for this second half of the dredging.

The rest of the above components have cost $2 million to date. Of the total expenditures of $3.5 million, Moorestown has provided 74% of the total; New Jersey (through various Departments and programs: 319(h) pass through from EPA, Wetlands Mitigation Council and Special appropriations), 16.3%; EPA, 6.7%; and private contributions, 3%.

Post-TMDL Implementation Plan

As a result of the calculations and loading estimates of the TMDL, the following additional components of the Implementation Plan are proposed:

1. Post-Dredging Water Monitoring of the Lake Basins: NJDEP will assume the water monitoring responsibility including phosphorous, starting first in the Upper and Middle Basins, using the recommendations as outlined above in the "Intended Future 303d Actions" part of the report (see pg. 6). Monitoring will be conducted in the Lower Basin when feasible, depending on the dredging schedule.

2. Retrofitting and rehabilitative BMPs: Each sub-basin has been assigned a load allocation corresponding to a 67% reduction. Modeling indicates that the Lower Basin receives the highest loadings from the North Branch of the Pennsauken Creek watershed (Table 1). Therefore, new rehabilitative and other retrofitting projects will need to be concentrated in the Pennsauken Creek. It is recommended that all stormwater basins originally constructed for flood control be systematically retrofitted to nonpoint source control basins throughout the watershed. The Department will work with the municipalities affecting the Lake, Moorestown, Maple Shade, Mt. Laurel and Evesham Townships, to enlist their support and cooperation with each of the components of this implementation plan, particularly in areas of acquiring financing, grants and permits (if any).

3. Farm conservation plans: According to the F.X. Browne program cited above, it was recommended that farm conservation plans be developed in order to reduce phosphorus loadings. The extent of application of this strategy must be assessed and remaining farms targeted for development of conservation management plans. Funding for implementing such plans is available through a federal program called EQIP (Environmental Quality Incentives Program) and the State's Conservation Cost Share Program.

4. Forest preservation/mitigation: As discussed above in the modeling section, any conversion of remaining forested areas of the watershed would negatively impact on the already very high loadings of phosphorous in this watershed. Efforts underway to acquire open space should be targeted at remaining forested tracts. Furthermore, the feasibility of actual large scale, forest mitigation (reforestation) should be investigated on suitable lands throughout the watershed, particularly in the North Branch of the Pennsauken Creek watershed. The Environmental Infrastructure Financing Program and the Garden State Trust, along with local open space programs, are sources of funds for this effort.

5. Land use in the Townships of Mt. Laurel, Evesham, Maple Shade and Moorestown: As part of the watershed management process, land use projection analyses will be prepared for the sub-watersheds to provide the basis to calculate NPS pollutant loading that can be expected with future land use. This will inform municipal officials regarding possible land use changes that should be considered along with the need to adopt site development ordinances that require use of BMPs. Use of BMPs integrated into new site development can reduce NPS pollutant loadings from phosphorus by 20 to 80% (NJDEP, 2000a).

One role of the recently formed Watershed Management Partnership in this Watershed Management Area #18 will be to educate the residents of the watershed on the necessity of specific ordinances and their enforcement. For example, forest preservation, stream corridor protection and advanced stormwater best management practices will be recommended, including detailed regular maintenance requirements. "No feed ordinances" for all waterfowl and wildlife and pet waste disposal ordinances will also be recommended, in addition to proper fertilization techniques for homes, corporate parks and golf courses. The latest drafts of the Department's *Best Management Practices for Control of Nonpoint Source Pollution from Stormwater* (NJDEP, 2000a) as well as the *Draft Guidance Manual: Best Management Practices for Golf Course Construction and Operation in New Jersey* (NJDEP, 2000b) are available to be used by all in the Watershed Management Area.

6. Four additional studies will be sponsored by the Department over the next two years, at a cost of approximately $100,000 in order to gather additional data and information necessary to attain the required reductions in loadings throughout the Lake's watershed, and further inform the model used to compute the TMDL for Pennsauken Creek:

a) Characterization of existing phosphorous and bacteria loadings from various land uses throughout the watershed, as well as long-term sedimentation rates in the lakes. A water quality sampling and sediment sampling program will be developed that will conform to the required QA/QC protocols. Samples will be collected during at least three storm events, and supplemental lake sampling will augment the Department's sampling. Sediment sampling will be conducted to determine the effect of sediment recycling on the in-lake pollutant concentration, and flow will also be measured during each sampling event in order to tie to loading.

b) A stormwater inventory and land use mapping for the watershed will be undertaken. Although stormwater is at the root of the pollution of this lake, very little data are available on the actual source of stormwater runoff, and further refinement of the land use data currently in the GIS will be obtained. This watershed is undergoing tremendous development and updated land use data will be critical to selection of NPS load reduction strategies.

c) A restoration master plan will be developed for this watershed. Using the US Department of Agriculture's Stream Visual Assessment Protocol, trained vol unteers will assess the feeder streams and tributaries of this watershed, identify potential restoration sites, the root cause of the problem for each site and recommend several best management practices that can be used to remedy the problem and restore each site.

d) An assessment of the effectiveness of the BMPs currently constructed in this watershed: biofilter wetlands, sedimentation chambers, detention basins and vegetative buffers. Since all of these BMPs have been constructed in this watershed, many around the Lake, these data will be tremendously important in determining the effectiveness of the non-point source reduction actions already undertaken and those planned.

7. Depending on the results of water quality monitoring and sedimentation rate estimation, additional techniques may be necessary, especially on the Lower Basin:

a) If the additional depth of the lake due to dredging increases the amount of macrophytic growth in the basins, Moorestown may consider properly timed weed harvesting of this growth in order to decrease phosphorous loading to the lake.
b) Once the Lower Basin is totally dredged, aeration could be considered, if the basin is deep enough. This technique has been a very effective in Upper Sylvan Lake where the oxygenated water acts to oxidize any metals in the water, which then binds to phosphorous, thus tying up excess phosphorous.
c) The monitoring plan will include the collection of data necessary to estimate long-term sedimentation rates in the lake. Additional management actions may be necessary if the rates are determined to be unacceptable. For instance, it may be necessary to add structures near the basin inlets designed to settle out the bulk of the solids in a defined area that can be dredged more frequently and easily.

The Department has reasonable assurance that implementation of these measures will achieve the necessary load reductions, particularly in the Upper and Middle Basins of Strawbridge Lake, which were only slightly above the SWQS in 1992. For the Lower Basin, all of these steps may be required to achieve SWQS. The ongoing and proposed monitoring programs will measure progress toward goals and inform the TMDL process which has begun for the Pennsauken Creek watershed.

References Cited

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F.X. Browne, 1993. *Diagnostic-Feasibility Study of Strawbridge Lake*. Prepared by F.X. Brown, Inc., 220 South Broad St, Lansdale, PA 19446. FXB Project No. NJ1246-01. Prepared for the Township of Moorestown, Burlington Co., NJ.

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NJDEP, 1990. *Polychlorinated Biphenyls (PCBs), Chlordane, and DDTs In Selected Fish And Shellfish From New Jersey Waters, 1986-1987: Results From New Jersey's Toxics In Biota Monitoring Program.* New Jersey Department Of Environmental Protection, Division of Science, Research and Technology, Trenton, NJ.

NJDEP, 1993*. Polychlorinated biphenyls (PCBs), chlordane, and DDTs in Selected Fish and Shellfish from New Jersey waters, 1986-1987: results from New Jersey's Toxics in Biota Monitoring Program*. NJDEP Technical Report.

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NJDEP, 2000b. *Draft Guidance Manual: Best Management Practices for Golf Course Construction and Operation in New Jersey.* New Jersey Department of Environmental Protection, Division of Watershed Management, Trenton, NJ. January, 2000, 43p.

NJDOH. 1978a. *Continuation of ban on fishing on North and South Branches of Pennsauken Creek and Strawbridge Lake* (NJDOH Release). October 18, 1978.

NJDOH. 1978b. *Continuing Public Health Actions regarding Chlordane Contamination of Freshwater Fishes in New Jersey;* Memorandum From Dr. Ronald Altman to Dr. Joanne E. Finley, State Commissioner of Health, December 21, 1978.

Omni Environmental Corp., 2000, Final Status Report for the Strawbridge Lake 319 (h) Restoration Project, for NJDEP and the Township of Moorestown, Princeton, NJ, January 21, 200, 28 p.

Reckhow, Kenneth H., 1979, Quantitative Techniques for the Assessment of Lake Quality, USEPA, Office of Water Planning and Standards, Washington D.C.; EPA-440/5-79-015 January 1979.

SPPP Form 15 – Optional Measures

All records must be available upon request by NJDEP.

1. Describe any Best Management Practice(s) the permittee has developed that extend beyond the requirements of the Tier A MS4 NJPDES permit that prevents or reduces water pollution.
2. Has the permittee adopted a Refuse Container/Dumpster Ordinance?

Stormwater Pollution Prevention Annual Report

MSRP ANNUAL REPORT - Tier A

You have completed the Annual Report submittal process. You may print or save a copy of this submittal report for your records.

Service ID:	809837
Facility Name:	MOORESTOWN TWP
Reporting Period:	January 1, 2017 through December 31, 2017
NJPDES Permit #:	NJG0150215
Activity ID:	DST170002

Contacts

Name:	Thomas Merchel
Title:	Township Manager
Contact Type:	Stormwater Coordinator
Organization Name:	MOORESTOWN TWP
Organization Type:	Municipal
E-Mail:	tmerchel@moorestown.nj.us
Phone:	(856) 914-3003 (Work Phone Number)
Contact Address:	111 W 2ND ST Moorestown, New Jersey 080572480

Uploaded Attachments

Attachment Name	Attachment Description	File Name
MS 2014 ms-4-tiera-supp-quest.	2017 Questionnaire	Tier_A_MS4_Annual_Supplemental_Questionnaire.pdf

Annual Report Details - Part A

Municipality Information

Team member responsible for completing the report:	William Long
Team member email address:	wlong@alaimogroup.com

Stormwater Pollution Prevention Plan

1. Has the municipality revised its Stormwater Pollution Prevention Plan during the last calendar year?	Yes
2. Date of the last revised SPPP:	04/20/2017

Public Notice

1. Is the municipality complying with applicable State and local public notice requirements when providing for public participation in the ongoing development and implementation of the stormwater program?	Yes

Report Details - Part B

Post-Construction Stormwater Management in New Development and Redevelopment

1. Is the municipality reviewing and approving major development residential projects in accordance with the Residential Site Improvement Standards (RSIS)?	Yes
2. Did the municipality adopt a municipal stormwater management plan?	Yes
3. Most recent date of adopted municipal stormwater management plan:	09/06/2007
4. Status of this plan (if not adopted):	
5. Did the municipality adopt the municipal stormwater control ordinance provided by NJDEP without change?	Yes
6. Most recent date the municipality adopted a municipal stormwater control ordinance:	09/14/2009
7. What is the current status of the ordinance?	
8. Did the municipality submit the adopted municipal stormwater management plan to the appropriate county review agency for approval?	Yes
9. Most recent date the adopted Municipal Stormwater Management Plan was submitted to the appropriate county review agency for approval:	03/18/2009
10. If yes, did the municipality send the adopted municipal stormwater control ordinance to the appropriate county review agency for approval?	Yes
11. Most recent date the adopted Municipal Stormwater Control Ordinance was submitted to the appropriate county review agency for approval:	09/14/2009
12. Status of county review:	Approved
13. Did the municipality adopt the review agency's required amendments and resubmit to the county review agency?	
14. Is the Stormwater Control Ordinance in effect?	Yes
15. Most recent effective date of Stormwater Control Ordinance:	09/14/2009
16. Ordinance Number(s):	24-2009
17. What is the current status of the adopted plan and ordinance?	
18. Are you reviewing projects as part of your site plan and sub-division approval process to ensure that they comply with your municipality's effective municipal stormwater control ordinance(s)?	Yes
19. How many projects that were subject to either the municipal stormwater control ordinance or the stormwater provisions of RSIS did the municipality review?	4
20. Does the municipal stormwater management plan contain a mitigation plan?	Yes

21. Has the municipality granted any variances or exemptions from the design and performance standards for stormwater management measures set forth in the approved municipal stormwater management plan and stormwater control ordinance(s)?	No
22. If yes, how many variances or exemptions from the design and performance standards has the municipality granted?	
23. If granted any variances or exemptions, did you submit a written report to the county review agency describing the variance or exemption and the required mitigation?	
24. Does the municipality's plan review evaluate storm drain inlet protection for solids and floatables in accordance with Attachment C of the permit?	Yes
25. Does the municipality require plans for long-term operation and maintenance for stormwater BMPs?	Yes
26. Are you ensuring that adequate long-term operation and maintenance of stormwater BMPs is being performed on property that you do not own or operate? **Please keep an inventory of stormwater BMPs indicating type, function and location in a format provided by the Department onsite and available for inspection or upon request.**	Yes
27. Briefly indicate how this is being accomplished (e.g., ordinance requiring operation and maintenance by private entity; operation and maintenance by you or other governmental entity):	Enforcement of Stormwater Ordinance
28. Is the municipality's stormwater management plan re-examined at each re-examination of the master plan in accordance with N.J.A.C. 7:8-4?	N/A - we did not re-examine our master plan this year
29. Date re-examination report was last adopted:	

Report Details - Part C

Local Public Education Program

1. Have you developed a Local Public Education Program?	Yes
2. Have you conducted educational activities that total a minimum of 10 points (between January 1, 2017 and December 31, 2017)?	Yes
3. School Presentations (1 point per visit / maximum of 5 points per year):	0
4. Website (1 point):	1
5. Stormwater Display (2 points):	2
6. Giveaway (2 points):	2
7. Citizen Stormwater Advisory Committee (2 points):	2
8. Utilize Department Materials (2 points each / maximum of 4 points per year):	2
9. Poster Contest (2 points):	0
10. Stormwater Training for Elected Municipal Officials (3 points):	0

11. Mural (3 points):	0
12. Mailing (3 points):	3
13. Partnership Agreement / Local Event (3 points):	0
14. Ordinance Education (5 points):	0

Storm Drain Inlet Labeling

1. Have you established a storm drain inlet labeling program?	Yes
2. Indicate the percentage or number of sectors labeled to date:	100%
3. Other Amount:	
4. Is your municipality maintaining the labels (i.e. replacing and/or repainting)?	Yes

Improper Disposal of Waste

Have you adopted and are you enforcing a regulatory mechanism for:

1. Pet Waste Ordinance:	Yes
2. Date adopted:	09/14/2009
3. Litter Ordinance/State Litter Statute:	Litter Ordinance
4. Date adopted:	02/25/1991
5. Improper Disposal of Waste Ordinance:	Yes
6. Date adopted:	09/14/2009
7. Wildlife Feeding Ordinance:	Yes
8. Date adopted:	09/14/2009
9. Containerized Yard Waste Ordinance / Yard Waste Collection Program Ordinance:	Yard Waste Collection Program Ordinance
10. Date adopted:	09/14/2009
11. Illicit Connection Ordinance:	Yes
12. Date adopted:	09/14/2009
13. Refuse Container/Dumpster Ordinance:	Yes
14. Date adopted:	09/14/2009
15. Private Storm Drain Inlet Retrofitting Ordinance:	Yes
16. Date adopted:	09/14/2009
17. Status of these ordinances (if not adopted):	
18. Method(s) of enforcement (e.g., summons, warnings, additional signs, etc.):	Warnings and Enforcement
19. Are you distributing the Pet Waste Information Sheets with pet licenses?	Yes

Report Details - Part D

MS4 Outfall Pipe Mapping

1. Has the municipality completed the mapping of the MS4 outfall pipes?	Yes
2. Date completed:	04/01/2008
3. Number of outfall pipes that you operate in the municipality:	216
4. How many MS4 outfall pipes are mapped?	172

Illicit Connection Elimination Program

1. Does the municipality have an ongoing program to detect and eliminate illicit connections to municipally owned or operated outfall pipes?	Yes
2. How many outfall pipes were inspected during the past calendar year?	42
3. Number of illicit connections detected during the past calendar year:	0
4. Number of illicit connections eliminated during the past calendar year: **Please attach, in a format provided by the Department, a list of all outfalls found to have an illicit connection since the inception of the program. The list must include the outfall location, receiving water body, source of illicit connection and the date the illicit connection was eliminated.**	0

Street Sweeping Program

1. In the past calendar year, were all required streets swept?	Yes
2. What was the total number of miles swept?	165

List the total amount of materials collected for each month since January 1, 2017, in tons.

3. Units:	Tons
4. January:	7.4
5. February:	3.7
6. March:	3.1
7. April:	3.1
8. May:	0
9. June:	0
10. July:	2.6
11. August:	5.2

12. September:	4.7
13. October:	6.3
14. November:	4.2
15. December:	315
16. Total (Note: 1.053 cubic yards = 1 ton):	355.3
17. Explain the reason if reporting zero (0) for a month above:	Street Sweeper down for repairs

Storm Drain Inlet Retrofitting

1. Has the municipality completed repaving, repairing, reconstruction, or alterations on any road surfaces in direct contact with municipally owned or operated storm drain inlets?	Yes
2. Approximately what percentage of storm drains within the municipality currently meet the standard?	92

Stormwater Facility Maintenance

Stormwater facilities include, but are not limited to, catch basins, extended detention basins, low flow bypasses, underground detention, dry wells, manufactured treatment devices, pervious paving buffers, infiltration basins/trenches, sand filters, constructed wetlands, wet ponds, bioretention, rooftop vegetated cover, vegetative filters, and stormwater conveyance systems. Stormwater facility inventories that indicate the type, function, and location of the facility must be kept onsite and available for inspection or upon request in a format provided by the Department. The format is available as SPPP Form 13 at: http://www.nj.gov/dep/dwq/pdf/Tier_A/A%20-%20pdf%206.pdf.

1. Have you developed a Stormwater Facility Maintenance Program?	Yes

Other Stormwater Facilities

1. Were all stormwater facilities that you operate inspected?	No
2. Were any found to be in need of cleaning or repair in order to function properly?	Yes
3. During the past calendar year, were any stormwater facilities (excluding catch basins) cleaned?	Yes
4. Were repairs made?	N/A - no repairs needed
5. Describe repair(s) or if repairs have not yet been made, provide a schedule for the repair(s):	

Catch Basins

1. Total number of catch basins that the municipality operates:	1642

2. Total number of catch basins inspected:	1642
3. Total number of catch basins cleaned:	160
4. Amount of materials removed from catch basins, in tons, during the past calendar year:	6
5. Units:	Tons

Report Details - Part E

Outfall Pipe Stream Scouring Remediation

For all outfall pipes undergoing remediation through a scour remediation program, attach additional page(s) as necessary indicating the location of the outfall pipe (including the alphanumeric identifier), the repair start date, and the repair completion date.

1. Has the municipality developed a prioritized list of outfall pipes requiring outfall pipe stream scouring remediation?	N/A - no outfalls meet the stream scouring requirement

De-icing Material and Sand Storage

1. Does the municipality have a permanent structure for all de-icing material storage?	Yes
2. If sand is being stored outside, is it set back 50 feet from storm sewer inlets, ditches or other stormwater conveyance channels, and surface water bodies?	Yes

Fueling Operations

1. Is the municipality implementing Standard Operating Procedures for vehicle fueling and receiving of bulk fuel deliveries at maintenance yard operations?	N/A - no fueling

Vehicle Maintenance

1. Is the municipality implementing Standard Operating Procedures for vehicle maintenance and repair activities at maintenance yard operations?	Yes

Good Housekeeping Practices

1. Is the municipality implementing Good Housekeeping Practices for all materials or machinery listed in the Inventory Requirements for Municipal Maintenance Yard Operations (including maintenance activities and ancillary operations)?	Yes

Equipment and Vehicle Washing

1. Has the municipality implemented measures to properly handle the discharge of equipment and vehicle wash wastewater from municipal maintenance yard operations?	Yes
2. Please indicate which option you implemented to eliminate the unpermitted discharge:	Connected to sanitary sewer
3. Date the management measure was implemented:	01/01/1977
4. What is the NJPDES permit number that authorizes the discharge of vehicle and equipment wash wastewater?	
5. Is the municipality maintaining records of vehicle and equipment washing?	

Annual Employee Training

1. Did the municipality conduct training for employees on stormwater related topics as required under the MS4 permit (e.g., police officers trained on ordinances)?	Yes
2. List date(s) of employee training:	Regular interval verbal training

Report Details - Part F

Sharing of Responsibilities

Does the municipality share services with another entity to satisfy a permit requirement?	Yes

For each of the following, indicate if you are relying on another entity to satisfy all or part of any permit requirements. Please provide additional information for any "Yes" answers in the provided Comments field.

1. Public notice:	No
2. Comments:	
3. Ensure compliance with RSIS for stormwater management:	No
4. Comments:	
5. Municipal stormwater management plan:	No
6. Comments:	
7. Municipal stormwater control ordinance:	No
8. Comments:	
9. Long term operation and maintenance of BMPs (post-construction):	No

10. Comments:	
11. Storm drain inlet design standard (post-construction):	No
12. Comments:	
13. Local public education program:	No
14. Comments:	
15. Storm Drain Inlet Labeling Program:	No
16. Comments:	
17. Illicit connection elimination program:	No
18. Comments:	
19. Street sweeping:	No
20. Comments:	
21. Storm drain inlet retrofitting:	No
22. Comments:	
23. Maintenance of municipally operated stormwater facilities:	No
24. Comments:	
25. Outfall pipe stream scouring:	No
26. Comments:	
27. De-icing and sand storage:	No
28. Comments:	
29. Fueling operations:	Yes
30. Comments:	Township vehicles fueled off-site
31. Vehicle maintenance:	No
32. Comments:	
33. Good Housekeeping:	No
34. Comments:	
35. Vehicle and Equipment Washing:	Yes
36. Comments:	Vehicles washed off-site
37. Employee Training:	No
38. Comments:	

Incidents of Non-compliance

Based on the answers you provided above, the Department has identified the following possible permit compliance issues. Please complete the Incidents of Non-compliance section and identify steps being taken to correct these deficiencies.

- Your municipality did not inspect all stormwater facilities which they operate.

1. Did your Public Complex have any incidents of non-compliance?	Yes

2. Identify the steps being taken to remedy the noncompliance and to prevent such incidents from recurring. **(If the text box is not large enough to complete this section, please provide your report as an attachment and upload it on the next screen. Please reference the attachment in the textbox.)**	Complete inspections

Certification

Certifier:	William Long
Certifier ID:	WILLIAMLONG
Challenge/Response Question:	What is your father's middle name?
Challenge/Response Answer:	******
Certification PIN:	******
Date/Time of Certification:	05/01/2018 07:28

"I certify under penalty of law that this Annual Report and Certification and all attached documents were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate this information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering this information, the information in this Annual Report and Certification and all attached documents is, to the best of my knowledge and belief, true, accurate and complete.

"I certify that the municipality is in compliance with its stormwater program, Stormwater Pollution Prevention Plan (SPPP) and the NJPDES Tier A Municipal Stormwater General Permit No. NJG0150215 except for any incidents of non-compliance which are identified herein. For any incidents of non-compliance, the Annual Report identifies the steps being taken to remedy the non-compliance and to prevent such incidents from recurring.

"I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information."

Please note, no changes will be allowed to be made to this report upon its certification. If you need to correct or modify the report after certification, please contact your case manager at (609) 633-7021 so they may enable that function.

William Long	05/01/2018
General	**Date**

2017 MS4 Tier A Permit Annual Report - Supplemental Questionnaire

General Information

A. Municipal Information

Municipality: Moorestown Township	County: Burlington
1. Has the municipality identified the stormwater team in the SPPP? (●) Yes ( ) No	
2. Municipal Population: 20726	3. Municipal Area (acres/sqm.): 15sqm

B. Sharing of Responsibilities – Permit Section D1

1. If the municipality shares services, what requirement do the shared services satisfy?

- [ ] Public Notice
- [ ] Post-Construction Stormwater Management in New Development and Redevelopment
- [ ] Local Public Education
- [ ] Improper Disposal of Waste
- [ ] Illicit Connection Elimination and MS4 Outfall Pipe Mapping
- [x] Solids and Floatable Controls
- [ ] Maintenance Yard Operations
- [ ] Employee Training
- [ ] N/A, there are no shared services

Permit Implementation - Ordinances

A. Ordinances - Permit Sections F5 and F6

1. *Pet Waste Ordinance*
Entity responsible for enforcement: Police Department and Local Board of Health

2. *Litter Ordinance/State Litter Statute*
Entity responsible for enforcement: Enforcement officers designated by the Municipal Manager

3. *Improper Disposal of Waste Ordinance*
Entity responsible for enforcement: Police Department and other Municipal Officials

4. *Wildlife Feeding Ordinance*
Entity responsible for enforcement: Police Department and other Municipal Officials

5. *Containerized Yard Waste Ordinance/Collection Program*
Entity responsible for enforcement: Public Works

6. *Illicit Connection Ordinance*
Entity responsible for enforcement: Public Works and other Municipal Officals

7. *Refuse Container/Dumpster Ordinance*
Entity responsible for enforcement: Police Department and other Municipal Officials

8. *Private Storm Drain Inlet Retrofitting Ordinance:*
Entity responsible for enforcement: Police Department and other Municipal Officials

9a. How many violations of these ordinances were enforced? 100

9b. Which of the above ordinances had the most violations? containerized yard waste/collection Program

B. Illicit Connection Elimination Program – Permit Section F6

1. During the past calendar year, has the municipality identified any pipes or discharges with unknown owners entering the MS4? ○ Yes ⊗ No
2. If yes, how many?

C. Storm Drain Inlet Retrofitting – Permit Section F7b

Existing storm drain inlets are required to be retrofitted to meet the design standard (contained in Attachment C of the permit) when such inlets are owned or operated by the Tier A Municipality and are in direct contact with repaving, repairing (excluding repair of individual potholes), reconstruction, resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen), or alterations of facilities owned or operated by the Tier A Municipality. For exemptions to this standard, refer to "Exemptions" in Attachment C.

1. At the completion of the above projects, did all of the storm drain inlets meet this standard? ⦿ Yes ○ No

Permit Implementation - Inventory

A. MS4 Outfall Pipe Mapping – Permit Section F6

1. Which map format is used:
○ Tax Map ○ SIIA ⦿ Electronic (e.g. AutoCAD, Micro Station, GIS) ○ USGS Quadrangle ○ Other
1a. If other, what is the format that the municipality uses?

2. Date of last revision: April 2014

3. Is the map updated annually? ○ Yes ⦿ No

4. Has the municipality investigated its MS4 for previously unmapped outfalls? ○ Yes ⦿ No
4a. How many outfalls were found?

5. What percentage of mapped outfalls in the municipality have been visually inspected during the last calendar year?
20%

6. Are the municipality's outfall pipes labelled in the field? ○ Yes ⦿ No
6a. If yes, do the labels match the alphanumeric code in the municipality's map? ○ Yes ○ No

7. Does the municipality's map identify outfalls that do not discharge to surface waters? ○ Yes ⦿ No

8. Does the municipality's map identify surface water body names? ⦿ Yes ○ No

9. Does the municipality's map identify streets? ⦿ Yes ○ No

10. Does the municipality's map identify blocks and lots? ○ Yes ⦿ No

11. Does the municipality's map identify MS4 conveyance systems (pipes, swales, ditches)? ○ Yes ⦿ No

12. Does the municipality's map identify other stormwater facilities? ○ Yes ⦿ No
12a. Please identify other stormwater facilities noted on the map (select as many as apply):

- ☐ Bioretention Systems
- ☐ Dry Wells
- ☐ Grass Swales
- ☐ Manufactured Treatment Devices (MTDs)
- ☐ Rooftop Vegetated Cover
- ☐ Vegetative Filters
- ☐ Retrofitted Storm Drain Inlets
- ☐ Constructed Stormwater Wetlands
- ☐ Extended Detention Basins
- ☐ Infiltration Basins
- ☐ Pervious Paving Systems
- ☐ Sand Filters
- ☐ Wet Ponds

13. Does the municipality's map identify areas with scour, erosion, and/or flooding and drainage control issues?
○ Yes ⦿ No

B. Storm Drain inlet Labeling – Permit Section F4b

1. How many labels have been replaced or repainted during the past calendar year to ensure legibility?

Permit Implementation - Inventory

A. Stormwater Facility inspection and Maintenance – Permit Section F7c

Stormwater facilities include, but are not limited to, catch basins, extended detention basins, low flow bypasses, underground detention, dry wells, manufactured treatment devices, pervious paving, riparian buffers, infiltration basins/ trenches, sand filters, constructed wetlands, wet ponds, bioretention, rooftop vegetated cover, vegetative filters, and stormwater conveyance systems. Stormwater facility inventories that indicate the type, function, and location of the facility must be kept onsite and available for inspection or upon request in a format provided by the Department. The format is available as SPPP Form 13 at: http://www.nj.gov/dep/dwq/pdf/Tier_A/A%20-%20pdf%206.pdf

1. Does the municipality's stormwater maintenance program include the following:

1a. An Inventory of facilities? (●) Yes ( ) No
1b. An Inspection schedule? (●) Yes ( ) No
1c. A maintenance schedule? (●) Yes ( ) No
1d. An inspection log noting when inspections were conducted? (●) Yes ( ) No
1e. A maintenance log noting any maintenance performed on Individual facilities? (●) Yes ( ) No

2. Does the municipality inspect stormwater facilities that are not owned by the municipality? ( ) Yes (●) No

2a. Does the municipality review maintenance logs for stormwater facilities that are not owned by the municipality?
( ) Yes (●) No

3. During the past calendar year, how many stormwater facilities (excluding catch basins) were repaired?

~~3~~ 0

4. During the past calendar year, how many stormwater facilities (excluding catch basins) were cleaned?

10

B. Stormwater Facility Inspection and Maintenance – Permit Section F7c

1. Does the municipality have a stormwater outfall pipe scouring detection, remediation, and maintenance program?
(●) Yes ( ) No

2. How many instances of scour has the municipality found during the past calendar year? 1

Permit Implementation - Inventory

A. De-icing Material and Sand Storage – Permit Section F8a

1. What type of de-icing material does the municipality use (select as many as appropriate)?

- [x] Sodium Chloride
- [ ] Calcium Chloride
- [ ] Potassium Acetate
- [ ] Brine Solution
- [ ] Unknown
- [x] Other (if other, please specify): Sand

B. Equipment and Vehicle Washing – Permit Section F8b

1. Does the municipality utilize an underground storage tank for managing vehicle wash wastewater? ( ) Yes (●) No

2. Which of the following options does the municipality use to manage vehicle wash wastewater? (select all that apply)

- [ ] Vehicle wash reclaim system
- [ ] Capture and haul system
- [ ] Discharge to sanitary sewer
- [ ] Discharge to groundwater
- [x] Washed off site
- [ ] Do not wash vehicles

Permit Implementation – Stormwater Management – Permit Section F3

Note: This portion of the annual report should be completed by a person knowledgeable in post-construction stormwater management project review and approvals.

1. Name of person completing this section: William Long, P.E.
2. Title of person completing this section: Township Engineer

A. Municipal Stormwater Management Plan (Plan)

1. Most recent date of re-examination of municipal master plan: June 26, 2008
2. Does the plan identify and address water bodies of concern (listed on Impaired Water Bodies List, TMDL, high quality water, existing erosion)? (●) Yes ( ) No
3. Does the plan identify and address areas of inadequate drainage? (●) Yes ( ) No
4. Does the plan include programs or BMPs and associated timeframes specifically addressing these impairments or pollutants? ( ) Yes (●) No
5. Does the plan identify how to incorporate future development pressures on the existing stormwater management infrastructure? ( ) Yes (●) No
6. Are mitigation projects listed in the municipality's mitigation plan? (●) Yes ( ) No ( ) No mitigation plan

B. Stormwater Control Ordinance

1. What is the ordinance's definition of major development?

~~All development and/or land development applications~~

Any development that provides for ultimately disturbing one or more acres of land or increasing an impervious surface by one-quarter acre or more. (See Area of Disturbance).

2. Has the municipality adopted a new stormwater control ordinance during the past year? ( ) ~~Yes~~ (●) No
3. If yes, did the municipality send the adopted municipal stormwater control ordinance to the appropriate county review agency for approval? ( ) Yes ( ) No

C. Review of Major Development for Stormwater Management

1. Did the municipality have any agricultural development projects that were granted exemptions under the Right to Farm Act? ( ) Yes (●) No
2. Do any municipal ordinances promote the use of nonstructural strategies? (●) Yes ( ) No ( ) Unknown
3. Does the municipality hold pre-application meetings to discuss incorporation of nonstructural strategies for individual projects? (●) Yes ( ) No
4. Does the municipality allow infiltration BMPs to infiltrate during the 2, 10, or 100 year storm events for quantity control? ( ) Yes (●) No
5. Does the municipality conduct municipal inspections of sites both during and after the construction is completed to ensure that BMPs function as designed? (●) Yes ( ) No

D. Inventory and Maintenance

Stormwater facility inventories that indicate the type, function, and location of the facility must be kept onsite and available for inspection or upon request in a format provided by the Department. The format is available as SPPP Form 13 at: http://www.nj.gov/dep/dwq/pdf/Tier_A/A%20-%20pdf%206.pdf.

1. Did the municipality update its map and inventory to include newly approved projects constructed within the last calendar year? ○ Yes ⦿ No

2. How many infiltration BMPs were approved during the past calendar year?

3. How many subsurface infiltration basins have been constructed during the past calendar year?

3a. How many of these subsurface infiltration basins were inspected during construction in the past calendar year?

3b. Did the final inspection include the following? Mark all that apply:

- ☐ Permeability test
- ☐ Visual inspection
- ☐ Check for drain down time
- ☐ Unknown

4. Select the methods the municipality uses to ensure that stormwater facilities that are not owned by the municipality will be properly maintained:

- ☐ Maintained by municipality
- ☐ Inspections
- ☑ Homeowners associations
- ☐ Shared services
- ☐ Fees
- ☐ Surety bonds
- ☐ Other

4a. If other, what are the methods for ensuring stormwater facilities are maintained?

5. In the past calendar year, has the municipality reviewed and approved any major residential developments that place an individual property owner as the responsible entity for the maintenance of any stormwater management facility(ies) that receive drainage from multiple parcels? ○ Yes ⦿ No

E. Stormwater Management Training

1. Have any of the current members of the planning or zoning board taken any NJDEP provided training for board members on the Stormwater Management rules? ○ Yes ○ No ⦿ Unknown

2. Have the municipality's inspector(s) for stormwater management taken any of the following classes:

2a. Stormwater Management and BMPs for Engineers through Rutgers University or NJDEP : ○ Yes ○ No ⦿ Unknown

2b. Municipal Engineering Construction Inspection Program, Part 1 through Rutgers University: ○ Yes ○ No ⦿ Unknown

2c. Municipal Engineering Construction Inspection Program, Part 2 through Rutgers University: ○ Yes ○ No ⦿ Unknown

2d. Soils & Site Evaluation for Septic Disposal Systems & Stormwater BMPs through Rutgers University: ○ Yes ○ No ⦿ Unknown

2e. Other stormwater training classes: Unknown

3. How many construction inspectors for stormwater management does the municipality have? 2

4.	How many operation and maintenance inspectors for stormwater management does the municipality have? 2
5.	How many plan reviewers for stormwater management does the municipality have? 2
6.	How many municipal engineers/stormwater plan reviewers have taken the NJDEP Stormwater Management and BMP Manual course offered through Rutgers University or NJDEP? 2

Education

A. Annual Employee Training – Permit Section F9

1. Is the municipality maintaining a record of the dates on which employees have received training? ◉ Yes ○ No
2. Type of training media on those dates: ☑ Video ☐ Mentoring ☐ Vendor Training

This Supplemental Questionnaire must be attached to your Annual Report to be considered complete. If you experience any difficulty in this process, please contact your municipal case manager at 609-633-7021.

1. Once you have completed the Questionnaire, use the "Save" function to save your answers to the Questionnaire to your computer. This can be done by going to FILE > then Save or Ctrl + S.
2. The completed and saved Questionnaire must then be uploaded as an attachment, in Part 7, to your Annual Report before the Annual Report is submitted to the Department.
3. To access the Annual Report, open the link to "NJDEP Online Portal" at http://www.nj.gov/dep/dwq/tier_a.htm. In Part 7, you will be asked to complete information regarding the file(s) to be uploaded. Navigate to your saved Questionnaire and then hit the "Upload" button in the lower right section of Part 7. The Annual Report will indicate if the Questionnaire was successfully uploaded. Then click on the "Continue" button and proceed with finalizing your Annual Report.

MSRP ANNUAL REPORT - Tier A

You have completed the Annual Report submittal process. You may print or save a copy of this submittal report for your records.

Service ID:	930399
Facility Name:	MOORESTOWN TWP
Reporting Period:	January 1, 2018 through December 31, 2018
NJPDES Permit #:	NJG0150215
Activity ID:	DST170002

Contacts

Name:	Thomas Merchel
Title:	Township Manager
Contact Type:	Stormwater Coordinator
Organization Name:	MOORESTOWN TWP
Organization Type:	Municipal
E-Mail:	tmerchel@moorestown.nj.us
Phone:	(856) 914-3003 (Work Phone Number)
Contact Address:	111 W 2ND ST Moorestown, New Jersey 080572480

Uploaded Attachments

Attachment Name	Attachment Description	File Name
Supplemental Questionnaire		Tier_A_MS4_Annual_Supplemental_Questionnaire_Moorestown.pdf
Authorization to Submit		Authorization to Submit Annual Report & Certification.pdf

Annual Report Details - Part A

Municipality Information

Team member responsible for completing the report:	Ken Shine
Team member email address:	kshine@pennoni.com

Stormwater Pollution Prevention Plan

1. Has the municipality revised its Stormwater Pollution Prevention Plan during the last calendar year?	Yes
2. Date of the last revised SPPP:	04/20/2017

Public Notice

1. Is the municipality complying with applicable State and local public notice requirements when providing for public participation in the ongoing development and implementation of the stormwater program?	Yes

Report Details - Part B

Post-Construction Stormwater Management in New Development and Redevelopment

1. Is the municipality reviewing and approving major development residential projects in accordance with the Residential Site Improvement Standards (RSIS)?	Yes
2. Did the municipality adopt a municipal stormwater management plan?	Yes
3. Most recent date of adopted municipal stormwater management plan:	09/06/2007
4. Status of this plan (if not adopted):	
5. Did the municipality adopt the municipal stormwater control ordinance provided by NJDEP without change?	Yes
6. Most recent date the municipality adopted a municipal stormwater control ordinance:	09/14/2009
7. What is the current status of the ordinance?	
8. Did the municipality submit the adopted municipal stormwater management plan to the appropriate county review agency for approval?	Yes
9. Most recent date the adopted Municipal Stormwater Management Plan was submitted to the appropriate county review agency for approval:	03/18/2009
10. If yes, did the municipality send the adopted municipal stormwater control ordinance to the appropriate county review agency for approval?	Yes
11. Most recent date the adopted Municipal Stormwater Control Ordinance was submitted to the appropriate county review agency for approval:	09/14/2009
12. Status of county review:	Approved
13. Did the municipality adopt the review agency's required amendments and resubmit to the county review agency?	
14. Is the Stormwater Control Ordinance in effect?	Yes
15. Most recent effective date of Stormwater Control Ordinance:	09/14/2009
16. Ordinance Number(s):	24-2009

17. What is the current status of the adopted plan and ordinance?	
18. Are you reviewing projects as part of your site plan and sub-division approval process to ensure that they comply with your municipality's effective municipal stormwater control ordinance(s)?	Yes
19. How many projects that were subject to either the municipal stormwater control ordinance or the stormwater provisions of RSIS did the municipality approve?	1
20. Does the municipal stormwater management plan contain a mitigation plan?	Yes
21. Has the municipality granted any variances or exemptions from the design and performance standards for stormwater management measures set forth in the approved municipal stormwater management plan and stormwater control ordinance(s)?	No
22. If yes, how many variances or exemptions from the design and performance standards has the municipality granted?	
23. If granted any variances or exemptions, did you submit a written report to the county review agency describing the variance or exemption and the required mitigation?	
24. Does the municipality's plan review evaluate storm drain inlet protection for solids and floatables in accordance with Attachment C of the permit?	Yes
25. Does the municipality require plans for long-term operation and maintenance for stormwater BMPs?	Yes
26. Are you ensuring that adequate long-term operation and maintenance of stormwater BMPs is being performed on property that you do not own or operate? **Please keep an inventory of stormwater BMPs indicating type, function and location in a format provided by the Department onsite and available for inspection or upon request.**	Yes
27. Briefly indicate how this is being accomplished (e.g., ordinance requiring operation and maintenance by private entity; operation and maintenance by you or other governmental entity):	Enforcement of Stormwater Ordinance. Written notification to private facility owners.
28. Is the municipality's stormwater management plan re-examined at each re-examination of the master plan in accordance with N.J.A.C. 7:8-4?	Yes
29. Date re-examination report was last adopted:	12/31/2018

Report Details - Part C

Local Public Education Program and Outreach

1. Has the municipality developed a Local Public Education Program?	Yes
	Yes

2. Has the municipality conducted educational activities that total the minimum number of points required by the permit?	

Storm Drain Inlet Labeling

1. Has the municipality established a storm drain inlet labeling program?	Yes
2. Indicate the percentage labeled to date:	100%
3. Other Amount:	
4. Is your municipality maintaining the labels (i.e. replacing and/or repainting)?	Yes

Community Wide Ordinances

Have you adopted and are you enforcing a regulatory mechanism for:

1. Pet Waste Ordinance:	Yes
2. Date adopted:	09/14/2009
3. Litter Ordinance/State Litter Statute:	Litter Ordinance
4. Date adopted:	02/25/1991
5. Improper Disposal of Waste Ordinance:	Yes
6. Date adopted:	09/14/2009
7. Wildlife Feeding Ordinance:	Yes
8. Date adopted:	09/14/2009
9. Containerized Yard Waste Ordinance / Yard Waste Collection Program Ordinance:	Yard Waste Collection Program Ordinance
10. Date adopted:	09/14/2009
11. Illicit Connection Ordinance:	Yes
12. Date adopted:	09/14/2009
13. Refuse Container/Dumpster Ordinance:	Yes
14. Date adopted:	09/14/2009
15. Private Storm Drain Inlet Retrofitting Ordinance:	Yes
16. Date adopted:	09/14/2009
17. Status of these ordinances (if not adopted):	
18. Method(s) of enforcement (e.g., summons, warnings, additional signs, etc.):	Warnings and Enforcement
19. Are you distributing the Pet Waste Information Sheets with pet licenses?	Yes

Report Details - Part D

MS4 Outfall Pipe Mapping

1. Has the municipality completed the mapping of the MS4 outfall pipes?	Yes, to be updated
2. Date completed:	04/01/2008
3. Number of outfall pipes that you operate in the municipality:	216
4. How many MS4 outfall pipes are mapped?	172

Illicit Connection Elimination Program

1. Does the municipality have an ongoing program to detect and eliminate illicit connections to municipally owned or operated outfall pipes?	Yes
2. How many outfall pipes were inspected during the past calendar year?	60
3. Number of illicit connections detected during the past calendar year:	0
4. Number of illicit connections eliminated during the past calendar year:	0

Street Sweeping Program

1. In the past calendar year, were all required streets swept?	Yes
2. What was the total number of miles swept?	168

List the amount of materials collected for each month in 2018.

3. Units:	Cubic yards
4. January:	8
5. February:	16
6. March:	0
7. April:	16
8. May:	8
9. June:	26
10. July:	12
11. August:	4
12. September:	8
13. October:	12

14. November:	0
15. December:	728
16. Total (Note: 1.053 cubic yards = 1 ton):	795.82
17. Explain the reason if reporting zero (0) for a month above:	Streets were not swept that month due to leaf pick up. Swept all streets in December.

Storm Drain Inlet Retrofitting

1. Has the municipality completed repaving, repairing, reconstruction, or alterations on any road surfaces in direct contact with municipally owned or operated storm drain inlets?	Yes
2. Approximately what percentage of storm drains within the municipality currently meet the standard?	93

Stormwater Facility Maintenance

Stormwater facilities include, but are not limited to, catch basins, extended detention basins, low flow bypasses, underground detention, dry wells, manufactured treatment devices, pervious paving buffers, infiltration basins/trenches, sand filters, constructed wetlands, wet ponds, bioretention, rooftop vegetated cover, vegetative filters, and stormwater conveyance systems. Stormwater facility inventories that indicate the type, function, and location of the facility must be kept onsite and available for inspection or upon request in a format provided by the Department. The format is available as SPPP Form 13 at: http://www.nj.gov/dep/dwq/pdf/Tier_A/A%20-%20pdf%206.pdf**.**

1. Have you developed a Stormwater Facility Maintenance Program?	Yes

Other Stormwater Facilities

1. Were all stormwater facilities that you operate inspected?	Yes
2. Were any found to be in need of cleaning or repair in order to function properly?	Yes
3. During the past calendar year, were any stormwater facilities (excluding catch basins) cleaned?	Yes
4. Were repairs made?	Yes
5. Describe repair(s) or if repairs have not yet been made, provide a schedule for the repair(s):	Sinkhole and broken pipe repairs, trees removed and new gabion stone installed

Catch Basins

1. Total number of catch basins that the municipality operates:	1642
2. Total number of catch basins inspected:	1642
3. Total number of catch basins cleaned:	691
4. Amount of materials removed from catch basins, in tons, during the past calendar year:	4
5. Units:	Tons

Report Details - Part E

Outfall Pipe Stream Scouring Remediation

For all outfall pipes undergoing remediation through a scour remediation program, attach additional page(s) as necessary indicating the location of the outfall pipe (including the alphanumeric identifier), the repair start date, and the repair completion date.

1. Has the municipality developed a prioritized list of outfall pipes requiring outfall pipe stream scouring remediation?	N/A - no outfalls meet the stream scouring requirement

De-icing Material and Sand Storage

1. Does the municipality have a permanent structure for all de-icing material storage?	Yes
2. If sand is being stored outside, is it set back 50 feet from storm sewer inlets, ditches or other stormwater conveyance channels, and surface water bodies?	Yes

Fueling Operations

1. Is the municipality implementing Best Management Practices for vehicle fueling and receiving of bulk fuel deliveries at maintenance yard operations in accordance with Attachment E of the permit?	N/A - no fueling

Vehicle Maintenance

1. Is the municipality implementing Best Management Practices for vehicle maintenance and repair activities at maintenance yard operations in accordance with Attachment E of the permit?	Yes

Good Housekeeping Practices

1. Is the municipality implementing Good Housekeeping Practices for all materials or machinery listed in the Inventory Requirements for Municipal Maintenance Yard Operations (including maintenance activities and ancillary operations) in accordance with Attachment E of the permit?	Yes

Equipment and Vehicle Washing

1. Has the municipality implemented measures to properly handle the discharge of equipment and vehicle wash wastewater from municipal maintenance yard operations?	Yes
2. Please indicate which option you implemented to eliminate the unpermitted discharge:	Connected to sanitary sewer
3. Date the management measure was implemented:	01/01/1977
4. What is the NJPDES permit number that authorizes the discharge of vehicle and equipment wash wastewater?	
5. Is the municipality maintaining records of vehicle and equipment washing?	

Annual Employee Training

1. Did the municipality conduct training for employees on stormwater related topics as required under the MS4 permit (e.g., police officers trained on ordinances)?	Yes
2. List date(s) of employee training:	Regular interval verbal training

Report Details - Part F

Sharing of Responsibilities

Does the municipality share services with another entity to satisfy a permit requirement?	Yes

For each of the following, indicate if you are relying on another entity to satisfy all or part of any permit requirements. Please provide additional information for any "Yes" answers in the provided Comments field.

1. Public notice:	No

2. Comments:	
3. Ensure compliance with RSIS for stormwater management:	No
4. Comments:	
5. Municipal stormwater management plan:	No
6. Comments:	
7. Municipal stormwater control ordinance:	No
8. Comments:	
9. Long term operation and maintenance of BMPs (post-construction):	No
10. Comments:	
11. Storm drain inlet design standard (post-construction):	No
12. Comments:	
13. Local public education program:	No
14. Comments:	
15. Storm Drain Inlet Labeling Program:	No
16. Comments:	
17. Illicit connection elimination program:	No
18. Comments:	
19. Street sweeping:	No
20. Comments:	
21. Storm drain inlet retrofitting:	No
22. Comments:	
23. Maintenance of municipally operated stormwater facilities:	No
24. Comments:	
25. Outfall pipe stream scouring:	No
26. Comments:	
27. De-icing and sand storage:	No
28. Comments:	
29. Fueling operations:	Yes
30. Comments:	Township vehicles fueled off-site.
31. Vehicle maintenance:	No
32. Comments:	
33. Good Housekeeping:	No
34. Comments:	
35. Vehicle and Equipment Washing:	Yes
36. Comments:	

	Vehicles washed off-site.
37. Employee Training:	No
38. Comments:	

Incidents of Non-compliance

Based on the answers you provided above, the Department has identified the following possible permit compliance issues. Please complete the Incidents of Non-compliance section and identify steps being taken to correct these deficiencies.

1. Did your municipality have any incidents of non-compliance?	No
2. Identify the steps being taken to remedy the noncompliance and to prevent such incidents from recurring. **(If the text box is not large enough to complete this section, please provide your report as an attachment and upload it on the next screen. Please reference the attachment in the textbox.)**	

Certification

Certifier:	Angelique Tucker
Certifier ID:	ATUCKER@PENNONI.COM
Challenge/Response Question:	What is your mother's middle name?
Challenge/Response Answer:	******
Certification PIN:	******
Date/Time of Certification:	05/01/2019 16:36

"I certify under penalty of law that this Annual Report and Certification and all attached documents were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate this information. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering this information, the information in this Annual Report and Certification and all attached documents is, to the best of my knowledge and belief, true, accurate and complete.

"I certify that the municipality is in compliance with its stormwater program, Stormwater Pollution Prevention Plan (SPPP) and the NJPDES Tier A Municipal Stormwater General Permit No. NJG0150215 except for any incidents of non-compliance which are identified herein. For any incidents of non-compliance, the Annual Report identifies the steps being taken to remedy the non-compliance and to prevent such incidents from recurring.

"I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for purposely, knowingly, recklessly, or negligently submitting false information."

Please note, no changes will be allowed to be made to this report upon its certification. If you need to correct or modify the report after certification, please contact your case manager at (609) 633-7021 so they may enable that function.

Angelique Tucker	05/01/2019
General	**Date**

Instructions for Saving and Submitting the

2018 MS4 Tier A Permit Annual Report - Supplemental Questionnaire

1. Once opened, please save the Questionnaire to your computer, using the "Save As" function. This can be done by going to FILE > then Save As... or Shift + Ctrl + S. Name the document Supplemental_Questionnaire_*TOWN NAME*
2. Complete the Questionnaire.
3. Once you have completed the Questionnaire, use the "Save" function to save your answers to the Questionnaire to your computer . This can be done by going to FILE > then Save or Ctrl + S.
4. The completed and saved Questionnaire must then be uploaded as an attachment, in Part 7, to your Annual Report before the Annual Report is submitted to the Department.
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Your Annual Report will be considered incomplete if the Supplemental Questionnaire is not attached. If you experience any difficulty in this process, please contact your municipal case manager at 609-633-7021.

Please note that use of Adobe Acrobat Reader DC is recommended. This free software is available for download at http://get.adobe.com/reader/ . If you have an earlier version of Adobe Reader, please go to the Adobe website at http://tv.adobe.com/watch/acrobat-x-tips-tricks/quick-tip-how-to-save-form-data-in-adobe-reader/ for detailed instructions on how to save your completed Questionnaire.

2018 MS4 Tier A Permit Annual Report - Supplemental Questionnaire

General Information

A. Municipal Information

Municipality: Township of Moorestown

County: Burlington

Stormwater Coordinator: Thomas Merchel

Phone: 856-235-3520

Email: TMerchel@moorestown.nj.us

Public Involvement and Participation

Provide a web address for each of the following:

Current Stormwater Pollution Prevention Plan (SPPP): http://www.moorestown.nj.us/DocumentCenter/View/2066/Stormwater-Pollution-Prevention-Plan---updated-4-20-17?bidId=

Municipal Stormwater Management Plan: https://www.ecode360.com/attachment/MO1116/MO1116-158l%20Mitigation%20Plan.pdf

Local Public Education and Outreach

Report the number of points obtained in each public education and outreach category:

General Public Outreach: 1

Watershed/Regional Collaboration: 6

Targeted Audiences Outreach: 6

Community Involvement Activities: 3

School/Youth Education and Activities: 5

Has the municipality advertised public education and outreach activities on the municipalities website?: (●) Yes ( ) No

Post Construction Stormwater Management

Note: This portion of the annual report should be completed by a person knowledgeable in post-construction stormwater management project review and approvals.

Name of person completing this section: Kenneth Shine, CFM

Affiliation of person completing this section: Project Manager

Please fill out the attached major development project list for all major developments approved in the last calendar year.

Community Wide Ordinances

Does the municipality maintain a database to track all instances of community wide ordinance violations?:

(●) Yes ( ) No

Provide the web address for each ordinance and report the entity responsible for the enforcement of each ordinance as well as the number of warnings and violations issued for each in the past calendar year:

Pet Waste Ordinance https://www.ecode360.com/13957478?highlight=pet,pet%20waste,waste,waste%20waste#13957478

Entity: Police Department and Local Board of Health — Warnings/Violations: data not readily available

Wildlife Feeding Ordinance https://www.ecode360.com/13957478?highlight=pet,pet%20waste,waste,waste%20waste#13957478

Entity: Police Department and other Municipal Officers — Warnings/Violations: data not readily available

Litter Control Ordinance https://www.ecode360.com/13957427?highlight=litter,littering#13957427

Entity: Enforcement Officers designated by the Municipal M — Warnings/Violations: data not readily available

Improper Disposal of Waste Ordinance https://www.ecode360.com/13957576

Entity: Police Department and other Municipal Officers — Warnings/Violations: data not readily available

Containerized Yard Waste/Yard Waste Collection Program Ordinance https://www.ecode360.com/13957497

Entity: Public Works — Warnings/Violations: data not readily available

Private Storm Drain Inlet Retrofitting Ordinance https://www.ecode360.com/13957547

Entity: Police Department and other Municipal Officers — Warnings/Violations: data not readily available

Illicit Connection Ordinance https://www.ecode360.com/13957509

Entity: Public Works and other Municipal Officers — Warnings/Violations: data not readily available

Stormwater Control Ordinance

Entity: Police Department and other Municipal Officers — Warnings/Violations: data not readily available

Municipal Maintenance Yard and Other Ancillary Operations

Does the municipality maintain a list of all materials and machinery located at each municipal maintenance yard and ancillary operation which could be a source of pollutants in a stormwater discharge?: (●) Yes ( ) No

Has the municipality implemented Best Management Practices as described in Attachment E for all applicable activities at each municipal maintenance yard and ancillary operation owned or operated by the municipality?: (●) Yes ( ) No

Does the municipality maintain an inspection log detailing conditions requiring attention and remedial actions taken at municipal maintenance yards and other ancillary operations?: (●) Yes ( ) No

Does the municipality have an underground vehicle wash water storage tank? ( ) Yes (●) No

Employee Training

Does the municipality maintain records of employee training including sign in sheets, dates of training, and training agendas?: (●) Yes ( ) No

Does the municipality maintain a list of the names and dates of the municipal board and governing body members that review and approve applications for development and redevelopment projects who have completed the "Asking the Right Questions in Stormwater Review" training tool?: (●) Yes ( ) No

Does the municipality maintain a list of the names and dates of individuals that review development and redevelopment projects for compliance with NJAC 7:8 on behalf of the municipality who have completed the Department approved stormwater management training once every 5 years?: (●) Yes ( ) No

Outfall Pipe Mapping

Check the box(es) for the components included on the municipality's outfall pipe map in addition to MS4 outfalls and surface water bodies:

- [ ] Conveyances (Pipes,Swales, Ditches)
- [ ] Culverts
- [ ] Block and Lots
- [ ] Green Infrastructure
- [ ] Manufactured Treatment Devices
- [ ] Stormwater Management Basins
- [ ] Storm Drain Inlets
- [x] Streets/Roadways
- [ ] Subsurface Infiltration/Detention Basins

Has the municipality included the outfall pipe map in the SPPP?: (●) Yes ( ) No

Does the municipality update the outfall pipe map annually?: ( ) Yes (●) No

Does the municipality's map identify outfalls that do not discharge to surface waters?: ( ) Yes (●) No

Stream Scouring

How many outfalls did the municipality inspect for stream scouring in the past calendar year?: 60

How many instances of stream scouring were found during those inspections?: 0

How many instances of stream scouring were remediated in the past calendar year?: 0

Stormwater Facilities Maintenance

Does the municipality keep up to date stormwater facility maintenance logs and inspection records for stormwater facilities owned or operated by the municipality?: ⦿ Yes ○ No

How does the municipality ensure adequate long-term cleaning, operation, and maintenance of stormwater facilities not owned or operated by the municipality?:

The Township is developing a list of private entities and notifying them of their obligation to inspect and maintain their facilities. The Township will require private entities to report on an annual basis to track their efforts.

Does the municipality keep up to date stormwater facility maintenance logs and inspection records for stormwater facilities not owned or operated by the municipality?: ○ Yes ⦿ No

Total Maximum Daily Load (TMDL)

Has the municipality reviewed TMDL reports to identify those which are relevant to the municipality's water bodies?: ⦿ Yes ○ No

How many TMDLs were found to be applicable to the municipality?: 4

How has the municipality used TMDL information to assist in the prioritization of stormwater facility maintenance?:

The Township will prioritize any stormwater facility maintenance that is required based on the area in which the facilities are located.

Has the municipality updated its SPPP to include TMDL information?: ○ Yes ⦿ No

Has the municipality incorporated any additional or optional measures? If so, please elaborate:

Major Development Project List

Provide the following information for each approved development or redevelopment project that is regulated by the Tier A MS4 NJPDES Permit, and not exempted under N.J.A.C. 7:8-1.6(b).

Tier A Municipality: Township of Moorestown		NJPDES#: NJG 0150215			PI ID#: 207630		Calendar Year: 2018
Project Name	Block(s) / Lot(s)	5G3 Construction Stormwater Permit Auth.#	NJDEP Land Use Permit Required? (Y/N)	Total Area of Disturbance (acres)	Increase of Impervious > ¼ acre? (Y/N)	Variance or Exemption Granted As Per Part IV.B.4.h of the Tier A MS4 Permit	Design Reviewer(s)
Moorestown Urban Renewal Associates	4801/12		Y ☐ N ☐	1.66	Y ☑ N ☐	Y ☐ N ☑	Christopher Noll
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	

Major Development Project List

Provide the following information for each approved development or redevelopment project that is regulated by the Tier A MS4 NJPDES Permit, and not exempted under N.J.A.C. 7:8-1.6(b).

Tier A Municipality: Township of Moorestown		NJPDES#: NJG0150215			PI ID#: 207630		Calendar Year: 2018
Project Name	Block(s) / Lot(s)	5G3 Construction Stormwater Permit Auth.#	NJDEP Land Use Permit Required? (Y/N)	Total Area of Disturbance (acres)	Increase of Impervious > ¼ acre? (Y/N)	Variance or Exemption Granted As Per Part IV.B.4.h of the Tier A MS4 Permit	Design Reviewer(s)
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
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			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
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			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	
			Y ☐ N ☐		Y ☐ N ☐	Y ☐ N ☐	

This Supplemental Questionnaire must be attached to your Annual Report to be considered complete. If you experience any difficulty in this process, please contact your municipal case manager at 609-633-7021.

1. Once you have completed the Questionnaire, use the "Save" function to save your answers to the Questionnaire to your computer. This can be done by going to FILE > then Save or Ctrl + S.
2. The completed and saved Questionnaire must then be uploaded as an attachment, in Part 7, to your Annual Report before the Annual Report is submitted to the Department.
3. To access the Annual Report, open the link to "NJDEP Online Portal" at http://www.nj.gov/dep/dwq/tier_a.htm. In Part 7, you will be asked to complete information regarding the file(s) to be uploaded. Navigate to your saved Questionnaire and then hit the "Upload" button in the lower right section of Part 7. The Annual Report will indicate if the Questionnaire was successfully uploaded. Then click on the "Continue" button and proceed with finalizing your Annual Report.

Municipal Stormwater Management Plan

March 2005

Revised **September, 2007**

Municipal Stormwater Management Plan

Prepared By

RV & A
REMINGTON VERNICK & ARANGO ENGINEERS

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Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the Township of Moorestown's strategy for addressing stormwater management and stormwater-related impacts related to land development. The creation of this plan is required by N.J.A.C. 7:14A-25 *Municipal Stormwater Regulations.*

This plan contains all of the required elements described in N.J.A.C.7:8 *Stormwater Management Rules*. The plan addresses impacts of land development on:

1. Groundwater recharge;
2. Stormwater quality; and
3. Stormwater quantity.

These above-referenced impacts are addressed by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land or projects that would result in 0.25 acres or more of additional impervious coverage.

These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A "build-out" analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include low impact development (LID) techniques including an emphasis on utilizing non structural stormwater management "best management practices" (BMPs), to the maximum extent practicable, in order to accomplish this plan's goals regarding stormwater recharge, water quality, and the control of stormwater rates of flow and flow volumes.

The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing development.

Goals

The goals of this MSWMP are to:

a. Reduce flood damage, including damage to life and property;
b. Minimize, to the extent practical, any increase in stormwater runoff from any new development;
c. Reduce soil erosion from any development or construction project;
d. Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
e. Maintain groundwater recharge (and improve in redevelopment areas if feasible);
f. Prevent, to the greatest extent feasible, an increase in non-point pollution;
g. Maintain the integrity of stream channels for their biological functions, as well as for drainage;
h. Minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
i. Protect public safety through the proper design and operation of stormwater basins.

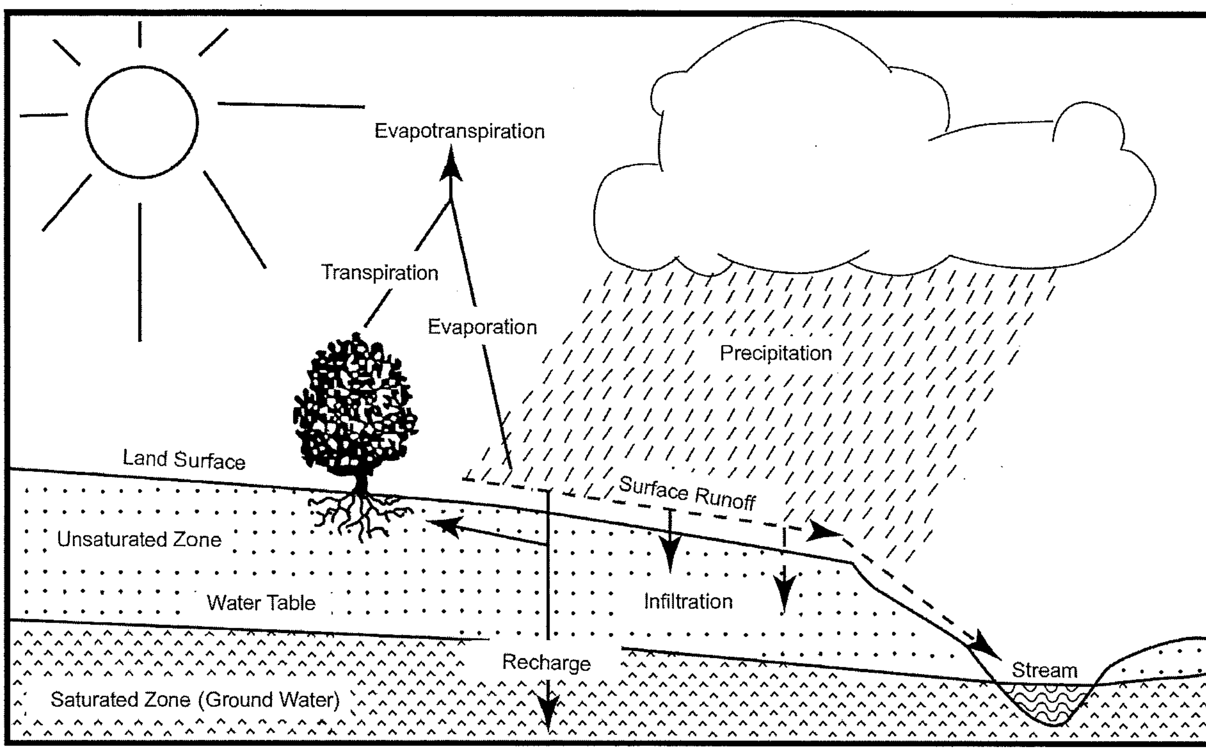
To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

Stormwater Discussion

The land development in Moorestown can dramatically alter the hydrologic cycle, which, ultimately, will affect entire watersheds (See Figure 1). Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration, which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Erosion and sedimentation can destroy habitat from which some species cannot adapt

In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways, such as in Strawbridge Lake or Swede Run. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.



Strategy to minimize the stormwater-related impacts of land development - The overall strategy to be employed in the Township of Moorestown to minimize stormwater-related impacts involves the following:

1. Low Impact Development Strategies - Incorporate the following nonstructural and structural low impact development (LID) stormwater management strategies to the maximum extent practicable:

   A. <u>Nonstructural LID Strategies:</u>

      1. <u>Protect areas that provide water quality benefits or areas particularly susceptible to erosion and and sediment loss</u>. Examples of areas that provide water quality benefits and/or can be susceptible to erosion and sediment loss include:

         a) Freshwater wetlands;
         b) Flood prone areas (areas within 100-year flood plains and/or within state-delineated Flood Hazard Areas);
         c) Floodway areas;
         d) Steeply sloping areas (areas with slopes of 10% or greater);
         e) Riparian corridors (in particular riparian corridors along Strawbridge Lake, North Branch Pennsauken Creek, Parkers Creek, Swede Run, Pompeston Creek, and Rancocas Creek and all other streams and tributaries shown on either the USGS quadrangle or the Burlington County Soil Survey;

f.) Forested areas;
g) Areas covered with native ground cover, native grasses, and native shrubs and trees;
h) Natural stormwater conveyance features (natural swales); and
i) Aquifer recharge areas.

2. Maximize the protection of natural drainage features and Vegetation.

Natural drainage features and vegetation include virtually the same areas as those listed immediately above in item No. 1A above.

3. Minimize land disturbance including clearing and grading.

This nonstructural stormwater management strategies calls for design engineers to "fit the development into the site" rather than changing the site's natural features to fit a pre-conceived development projects. For example:

a) Don't fill in flood plains to create dry land for building. Build on the non-flood prone lands.
b) Don't grade steeply sloping areas to create flat areas for building. Instead, locate development activities requiring flat slopes on the flat areas of the site.
c) Don't cover all of the site's best recharge areas with impervious coverage. Instead, leave much of the site's more pervious areas open to allow for the continuance of natural recharge and to provide areas suitable for manmade recharge facilities.
d) Don't relocate naturally existing drainage swales. Instead, protect those swales and utilize them in the project's design.
e) Don't develop within wetlands or wetland transition areas. Instead, preserve and realize these features as part of the project's overall stormwater management plan.
f) Don't clear existing vegetated areas to create large lawn areas. Instead utilize alternative landscaping that minimizes lawn development and maximizes the retention of natural, native grasses, shrubs, and woodlands.

4. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.

This strategy is related to the three (3) previously listed non structural stormwater management strategies in that it incorporates strategies to preserve natural areas and drainage features important to natural stormwater management.

In addition, where manmade landscaping is needed, this nonstructural BMP calls for maximizing the planting of low maintenance, native vegetation rather than development of large areas of high maintenance, non-native lawns and landscaping.

5. Minimize soil compaction

Soil compaction is minimized by not designing the project to require clearing and grading of large areas of the site so that the entire site becomes the "construction area." Site work should be phased and planned to minimize the extent to which the site is completely cleared and re-worked by construction equipment prior to building. Areas compacted during construction should be restored to preconstruction levels of perviousness or compaction.

This strategy is related to "minimizing land disturbance, including clearing and grading" discussed in item No. 1c, above.

6. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.

Some examples of strategies for minimizing impervious surface and disconnecting the flow of runoff over impervious surfaces include the following:

a) Utilize the minimum pavement or cartway width for roadways consistent with the traffic volumes, the need for roadside parking, and safety standards.
b) Sidewalks, when utilized, can be made of pervious materials or can be disconnected from the roadway's drainage system similarly, driveways can often be disconnected from the roadway's drainage system.
c) Rooftop runoff should be disconnected from the project's formal, engineered drainage system and directed to nearby infiltration recharge facilities such as bioretention systems.
d) Design the project's building with vegetated roofs when feasible.
e) Break-up sections of roadways and parking areas to drain, following natural drainage patterns to non-centralized stormwater storage, treatment and recharge facilities;
f.) Curbing should be constructed to permit runoff to be disconnected from the projects formal engineered drainage systems or curbs should be eliminated in favor of utilizing vegetated swales to convey the runoff.
g) Where possible, the impervious coverage from parking should be minimized by incorporating parking into, and under, the buildings proposed or by utilizing aesthetically designed parking structures.

The developer should select strategies appropriate to the proposed development, with the objective of minimizing the project's impervious coverage and maximizing the disconnection of runoff flows from that impervious coverage.

7. Minimize the decrease in the "time of concentration" from pre-construction to post-construction.

The "time of concentration" ("Tc") is defined as the time it takes for runoff to travel from the hydraulically most distant point of the drainage area to the point of interest within a watershed. Decreasing the "Tc" also decreases the peak discharge rate the velocity of flow. Thus, for purposes of stormwater management, we want the "Tc" to be maximized.

Strategies for maximizing the "Tc" for any given flow path include the following:

a) Maximize surface roughness for principal flow paths thus maximizing sheet flow and shallow concentrated flows through heavily vegetated areas and utilize vegetated conveyance channels wherever possible instead of stormwater piping systems.
b) Direct flows along slopes rather than down slopes to minimize the impact of slope on the time of concentration.
c) Utilize natural and manmade vegetated conveyance channels wherever possible instead of stormwater piping systems.
d) Don't collect and convey stormwater via traditional inlets and dipping systems only to discharge that runoff into a detention basin, the purpose of which is to slow down the rate of runoff.

8. Provide vegetated open channel conveyance systems discharging into and through stable vegetated areas.

This nonstructural strategy is directly related to "minimizing the time of concentration" discussed in item No. lg above and maximizing the protection of natural drainage features discussed in item No. lb above.

9. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site in order to prevent or minimize the release of those pollutants into stormwater runoff.

a) Design and/or maintenance features that help to prevent accumulation of trash and debris in drainage systems, such as street sweeping;
b) Design features that help to prevent the discharge of trash and debris from drainage systems;
c) Maintenance features aimed a minimizing utilization of deicing salts, pesticides, and herbicides. Integrated Pest Management (IPM) techniques shall be used.

B. Structural Low Impact Development –

1. Incorporate structural low impact development (LID) strategies to the maximum extent possible, including:

   In addition to emphasizing non structural LID BMPs to the maximum extent practicable, structural low impact development strategies (structural LID BMPs) should also be incorporated into the project's stormwater management plan to the maximum extent practicable prior to consideration of larger structural measures.

   Such low impact structural measures manage stormwater by storing, infiltrating and/or treating stormwater runoff close to its source, thus more closely mimicking the site's predevelopment hydrology than larger structural stormwater BMPs. They include smaller, decentralized structural measures such as rain gardens (small biofiltration basins), infiltration areas (small at-grade infiltration basins), small, below-grade infiltration facilities, and small, naturally landscaped stormwater detention areas.

   These small, LID structural BMPs tend to be unidentifiable as stormwater BMPs, being either out of sight, in the case of below-grade facilities, or resembling natural or manmade landscaping.

2. Structural Stormwater Management BMPs - Incorporate larger, structural stormwater management strategies, if and when necessary to fully meet the design and performance standards.

   In those situations where the project's runoff requires more than non structural and structural LID BMPs to meet the performance standards, the use of larger, structural BMPs should be utilized.

3. Mitigation - When one or more of the performance standards cannot be met, provide a suitable mitigation plan, acceptable to the Planning Board.

   Sometimes, despite all efforts, it may not be possible to fully meet one of more of the stormwater management performance standards. In those cases, mitigation must be provided. The Township would provide applicant's with guidance in this regard.

Background

Moorestown Township is located in northwestern Burlington County, New Jersey, approximately 10 miles east of Philadelphia. The township contains approximately 9,555 acres and 14.93 square miles.

The population has grown 18.0% in the ten-year period of 1990 to 2000. The year 2000 population was determined to be 19,017residents. The population growth from 1930 has been 162.41%. The period of the most rapid growth within the township occurred between 1950 and 1960. Estimates for Moorestown project a population of 24,344 residents in 2030. This is an increase of 14.8%. Figure 2 provides a graphic illustration of the township on the USGS quadrangle map.

Moorestown's eastern boundary is partially defined by the Rancocas Creek. The North Branch Pennsauken Creek flows northwest and forms part of the western boundary of the township. The Pompeston Creek, Swede Run, Parkers Creek and Kendles Run also flow through the township, and Strawbridge Lake is located in the southern portion of the township. A map of the township's waterways is provided as Figure 3.

The New Jersey Department of Environmental Protection (NJDEP) has established the Ambient Biomonitoring Network (AMNET) to monitor and document the health of the state waterways. Sites are classified as non-impaired, moderately impaired, or severely impaired based on biometrics related to benthic macroinvertebrate data. The New Jersey Integrated Water Quality Monitoring and Assessment Report, 305(b) and 303(d), is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants.

Some impaired waters are issued a Total Maximum Daily Load (TMDL) from NJDEP for the pollutant. A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody for one more of its designated uses. Implementation plans must be adopted to comply with a NJDEP TMDL.

According to these data, Pompeston Creek at New Albany Road, as well as Swede Run, have been classified as moderately impaired because of low levels of benthic macroinvertebrates. The Pennsauken Creek is classified as severely impaired due to low levels of macroinvertebrates, and high levels of phosphorus and arsenic. Strawbridge Lake has also been included on the 2004 Impaired Waterbodies List due to water quality issues related to eutrophication, specifically for sedimentation, heavy macrophyte growth and elevated phosphorus and chlordane contamination in fish.

There was a Total Maximum Daily Load (TMDL) established for the Strawbridge Lake for levels of phosphorus, as reported in the NJDEP's "Report on the Establishment of Total Maximum Daily Load (TMDL) for Phosphorous in Strawbridge Lake, Moorestown Township, Burlington County, New Jersey, September 2000". Proposed recommendations from the "Post-TMDL Implementation Plan" section of this document are incorporated into the "Design and Performance Standards" Section of this MSWMP.

In addition, TMDL's are being developed for the Rancocas and Pennsauken Creeks.

Moorestown does not experience any significant flooding problems. Principal flooding occurs in middle and late summer and in the fall. Summer floods are generally the result of thunderstorms.

As the impervious cover has increased in Moorestown, the peak and volumes of stream flows have also increased. The increased amount of water resulted in stream bank erosion along the township's waterways. The high imperviousness of the township has decreased the groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on instream habitat during the summer months.

A map of the groundwater recharge areas is presented as Figure 4. Wellhead Protection Areas, also a required aspect of the MSWMP, are shown in Figure 5. There are no wellhead protection areas in or infringing on Moorestown Township.

Design and Performance Standards

Moorestown has adopted the design and performance standards for stormwater management measures as presented in NJ.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The Stormwater Control Ordinance was submitted to the County for review and approval, and will be revised in accordance with the County's conditional approval of plan and ordinance.

In addition, Moorestown Township is participating in the development of a Regional Stormwater Management Plan for the Pompeston Creek, spearheaded by Rutgers University and the Pompeston Creek Watershed Association. The Township's MSWMP will be revised if necessary to comply with the forthcoming Regional Plan after its adoption.

Finally, as referenced previously, a Total Maximum Daily Load (TMDL) was established for phosphorous for Strawbridge Lake. The following information and recommendations were excerpted from NJDEP's September, 2000 report under the "Post-TMDL Implementation Plan":

Post-TMDL Implementation Plan

1. Post-Dredging Water Monitoring of the Lake Basins: NJDEP will assume the water monitoring responsibility including phosphorous, starting first in the Upper and Middle Basins, using the recommendations as outlined above in the "Intended Future 303d Actions" part of the report (see pg. 6). Monitoring will be conducted in the Lower Basin when feasible, depending on the dredging schedule.

2. Retrofitting and rehabilitative Best Management Practices (BMPs): Each sub-basin has been assigned a load allocation corresponding to a 67% reduction. Modeling indicates that the Lower Basin receives the highest loadings from the North Branch of the Pennsauken Creek watershed. Therefore, new rehabilitative and other retrofitting projects will need to be concentrated in the Pennsauken Creek. It is recommended that all stormwater basins originally constructed for flood control be systematically retrofitted to nonpoint source control basins throughout the watershed. The Department will work with the municipalities affecting the Lake, Moorestown, Maple Shade, Mt. Laurel and Evesham Townships, to enlist their support and cooperation with each of the components of this implementation plan, particularly in areas of acquiring financing, grants and permits (if any).

3. <u>Farm conservation plans</u>: According to the previous work by F.X. Browne, it was recommended that farm conservation plans be developed in order to reduce phosphorus loadings. The extent of application of this strategy must be assessed and remaining farms targeted for development of conservation management plans. Funding for implementing such plans is available through a federal program called EQIP (Environmental Quality Incentives Program) and the State's Conservation Cost Share Program.

4. <u>Forest preservation/mitigation</u>: Any conversion of remaining forested areas of the watershed would negatively impact on the already very high loadings of phosphorous in this watershed. Efforts underway to acquire open space should be targeted at remaining forested tracts. Furthermore, the feasibility of actual large scale, forest mitigation (reforestation) should be investigated on suitable lands throughout the watershed, particularly in the North Branch of the Pennsauken Creek watershed. The Environmental Infrastructure Financing Program and the Garden State Trust, along with local open space programs, are sources of funds for this effort.

5. <u>Land use in Mt. Laurel, Evesham, Maple Shade and Moorestown</u>: As part of the watershed management process, land use projection analyses will be prepared for the sub-watersheds to provide the basis to calculate NPS pollutant loading that can be expected with future land use. This will inform municipal officials regarding possible land use changes that should be considered along with the need to adopt site development ordinances that require use of BMPs. Use of BMPs integrated into new site development can reduce NPS pollutant loadings from phosphorus by 20 to 80% (NJDEP, 2000).

6. <u>Depending on the results of water quality monitoring and sedimentation rate estimation, additional techniques may be necessary, especially on the Lower Basin</u>:

a) If the additional depth of the lake due to dredging increases the amount of macrophytic growth in the basins, Moorestown may consider properly timed weed harvesting of this growth in order to decrease phosphorous loading to the lake.

b) Aeration could be considered, if the basin is deep enough. This technique has been a very effective in Upper Sylvan Lake where the oxygenated water acts to oxidize any metals in the water, which then binds to phosphorous, thus tying up excess phosphorous.

c) The monitoring plan will include the collection of data necessary to estimate long-term sedimentation rates in the lake. Additional management actions may be necessary if the rates are determined to be unacceptable. For instance, it may be necessary to add structures near the basin inlets designed to settle out the bulk of the solids in a defined area that can be dredged more frequently and easily.

This MSWMP endorses and incorporates these recommendations to be implemented as determined by Moorestown Township (and others) to the extent feasible and practicable.

Finally, this MSWMP shall be revised to incorporate applicable recommendations for any future TMDL's that are established within any contributing watershed areas within the Township.

Township inspectors will observe the construction of the projects to ensure that the stormwater management measures are constructed and function as designed.

Plan Consistency

Moorestown Township is not within a Regional Stormwater Management Planning Area so this plan does not need to be consistent to a regional stormwater management plan (RSWMP). If a RSWMP is developed, this MSWMP will be revised to be consistent. A TMDL has been issued for the Pennsauken Creek, and this plan is consistent with the TMDL response in that it incorporates a plan for the reduction of phosphorus.

The Moorestown MSWMP is consistent with the Residential Site Improvement Standards (RSIS) as specified in N.J.A.C. 5:21. Any review of residential sites for stormwater management compliance will follow the most recent RSIS and this plan will be revised to include any RSIS updates.

Moorestown already requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. Township inspectors will enforce these standards at all construction sites and report any violations or inconsistencies to the local Soil Conservation District.

Nonstructural Stormwater Management Strategies

Moorestown has reviewed the Master Plan, land use and zoning ordinances, and maps to determine what adjustments are needed for the implementation of the nonstructural stormwater management techniques. The ordinances that may be revised at a future date, at the discretion of the Township are listed below. Once an ordinance is revised, it will be submitted to the County and NJ Department of Environmental Protection.

Section 158-9. Off- Tract Improvements.
This section may be amended to require that any off-site and off-tract stormwater management and drainage improvements must conform to the "Design and Performance Standards" as described in this plan.

Section 158-18. Streets.
This section may be amended to discourage on-street parking, therefore lessening road widths. Also the minimum radius of a cul-de-sac may be reduced.

Section 158-20. Curbs.
This section may be amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

Section 158-22. Sidewalks.
This section may be amended to encourage developers to design sidewalks to drain runoff onto landscaped areas or to use permeable paving surfaces where appropriate.

Section 158-25. Storm Drainage Systems.
The section requires compliance with the Residential Site Improvement Standards promulgated at N.J.A.C 5:21-7.1 through N.J.A.C. 5:21-7.6, as amended. It may need to be amended to incorporate all requirements outlined in N.J.A.C. 7:8-5.

Section 158-26.E. Landscape buffers.
(Section 180-63.D. Landscape buffers, use of yards and pedestrian circulation.)
The sections may be amended to require the use of native vegetation, which will require less fertilization, and watering than non-native species. Also, the buffers may be used for stormwater management by disconnecting impervious surfaces and treating the runoff from surrounding impervious surfaces.

Section 158-39. Standards.
This section may be amended to prohibit materials or waste to be deposited upon a lot in such form or manner that they can be transferred off the lot, directly or indirectly, by natural forces such as precipitation, evaporation or wind. It may also be amended to require all materials and wastes that could create pollution to be enclosed in an appropriate container.

Section 158-18. Driveways.
The section on driveways may be amended to allow pervious paving materials to be used in driveway construction.

Section 158-26. Landscaping
This section may be amended to require a certain percentage preservation of forested areas.

Section 180-73. Parking Space Requirements.
This section may be amended to allow pervious paving in areas to provide overflow parking, vertical parking structures, smaller parking stalls, and shared parking. This section may also be amended to allow for flush curb with curb stop or curbing with curb cuts to encourage discharge of impervious areas into landscaped areas.

Section 180-82. Nonconforming structures, uses and lots.
This section requires a variance for structures or lots that do not conform to the standards. This section may need to be amended to reflect that the Township's Planning Board shall presume that nonstructural stormwater management BMPs have not been incorporated into the project's stormwater management plan to the maximum extent practicable, if variances or waivers are required that would result in a degree of development exceeding building coverage limits, impervious coverage limits, or lot disturbance limits.
In the event that a variance or waiver were granted by the Planning Board, the applicant would be required to fully mitigate the effect of the variance or waiver with regard to stormwater recharge, stormwater quality, and storm water runoff rates.

Building Coverage Limits.
Building coverage limits will be re-examined in each zoning district (during the next Master Plan reexamination) to determine if adjustments are necessary to better meet the stormwater management goals of this Municipal Stormwater Management Plan.

Impervious Coverage Limits.
Impervious coverage limits will be re-examined (during the next Master Plan reexamination) in each zoning district to determine if adjustments are necessary to better meet the stormwater management goals of this plan.

Maximum Site Disturbance Limits.
The Township's ordinances may be revised as necessary to specify maximum site disturbance limits for each zoning district.

Pollutant Source Control.

The Township's ordinances may be revised to require the following “source control" BMPs for all commercial, industrial and institutional uses and for all multifamily residential uses either under one management or having a homeowners association:

a. Pesticide and fertilizer use plans;
b. De-icing plans;
c. Trash receptacle and storage facilities;
d. Parking lot and internal roadway maintenance sweeping.

Land Use/ Build-Out Analysis

A detailed land use analysis for Moorestown was conducted. Figure 6 illustrates the HUC14s within the township. An existing land use plan is attached as Figure 7. The build-out calculations for impervious cover are shown in **Appendix B**, and were calculated using the Township zoning plan and zoning regulations. A zoning map appears as Figures 8. Figures 1 and 6 illustrate the HUC14 zones on the enclosed mapping. As expected, the buildout of much of the currently undeveloped land will result in a significant increase in the impervious cover within the Township.

Table 2 presents the pollutant loading coefficients by land cover. The pollutant loads at full build-out are presented in Table 3.

As per the enclosed data, the following is a summary of estimated pollutant build-outs by HUC-4 subwatershed:

Non-Point Source (NPS) Pollutant Loadings at Build-out

HUC14 Subwatershed	Total Phosphrous (lbs./yr.)	Total Nitrogen (lbs./yr.)	Total Suspended Solids (lbs./yr.)
North Branch Pennsauken Creek	2009	21,247	246,827
Pompeston Creek	1740	16,745	233,729
Strawbridge Lake	42	442	4,022
Swede Run	1790	17,205	245,249
Kendles Run	604	5,033	100,655
Rancocas Creek	775	7,390	104,322

The enclosed excerpts from the NJDEP for the Strawbridge Lake TMDL implementation provide several NPS reduction strategies that are applicable to some or all of these subwatersheds, including:

- Retrofitting & rehabilitation of existing BMP's (basins) – As feasible and practicable, existing stormwater basins originally constructed for flood control be systematically retrofitted to nonpoint source control basins throughout the watershed. Retrofits could be performed for key basins to improve Phosphorous, Nitrogen and Total Suspended Solids (TSS) removals.

- Farm Conservation Plans -- According to the previous work by F.X. Browne, it was recommended that farm conservation plans be developed in order to reduce Phosphorus loadings.

- Forest Preservation/Mitigation -- Efforts underway to acquire open space should be targeted at remaining forested tracts. Furthermore, the feasibility of actual large scale, forest mitigation (reforestation) should be investigated on suitable lands throughout the Township, particularly in the North Branch of the Pennsauken Creek watershed.

In addition to the above-referenced strategies, the following additional strategies should be considered:

- Use of BMP's for Nutrient Removal for Future Development – As a result of the NJ Stormwater Rule (N.J.A.C. 7:8), future major development projects must be designed to provide 80% Total Suspended Solids (TSS) reductions, via use of Best Management Practices (BMP's). In addition to TSS removals, certain BMP's (e.g, bioretention systems, enhanced swales, infiltration structures with filter strips) can provide significant Total Phosphorous, Nitrate and Ammonia Nitrogen removal efficiencies as well. Said BMP's should be incorporated into future stormwater designs where practicable.

- Implementation of Riparian Buffers for Future Development – Similar to forest preservation, preservation of Riparian Buffers can also provide excellent nutrient reductions. Buffers should be incorporated into future developments adjacent to waterways where practicable.

- Public Education – Use of Lawn fertilizer – As stated in the NJDEP Stormwater Best Management Practices Manual, there are basic application principles that apply to all fertilizer groups:

    - Use properly maintained and calibrated equipment.
    - Apply fertilizer evenly.
    - Keep fertilizer off of all paved and sidewalk areas.
    - Do not apply fertilizer up to a stream or pond edge. Keep a 'no apply' buffer of at least 15 feet, preferably 25 feet or more.
    - Apply nutrients in small amounts several times a year, at periods of maximum turf need.

  The Township and/or its environmental committee should participate in ongoing education efforts of homeowners' associations (HOA's) and landscape contractors as to the proper use of fertilizers.

Mitigation Plans

This mitigation plan is provided for any proposed development that is granted a variance or exemption from the stormwater management design and performance standards. Presented is a hierarchy of options.

Moorestown Township has opted to consider mitigation projects in accordance with the NJDEP's "Guidance for the Development of Municipal Mitigation Plans" document, dated February 2006.

As identified in NJDEP's Mitigation Plan Guidance Document, municipalities may:

1) Identify a pool of specific mitigation projects that could be selected by an applicant to offset the effect of a requested waiver/exemption or to address an existing stormwater problem; or

2) Choose to provide a process through which an applicant has the flexibility and responsibility to identify an appropriate mitigation project and a location to implement the mitigation project to offset the deficit that would be created by the grant of a waiver/exemption or to address a stormwater based impairment.

Moorestown has opted to provide a mitigation plan using BOTH (specific and applicant-identified mitigation project) options.

It must be stressed that requested exceptions will be granted only at the discretion of the Township. In addition, the issuance of a waiver(s) granted by NJDEP under a Land Use permit does not automatically waive the requirement for mitigation to be performed under a municipal review.

A. Specific (Township-identified) Mitigation Project Criteria

1. The mitigation project must be implemented within the same drainage area, as defined by the HUC14s, as the proposed development. The project must provide additional groundwater recharge benefits, or provide protection of previously developed property from stormwater runoff. The developer must also ensure long-term maintenance for the project, including those maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater Best Management Practices Manual.

    a. The applicant may select one project from the following list to compensate for not meeting the requirements of the performance standards. More detailed information can be obtained from the Township Engineer.

HUC 02040202100030
North Branch Pennsauken Creek

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202090020
Pompeston Creek

- Combat erosion caused by the Pompeston Creek on MEND property at 39/47 Beech Street.

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202090010

Swede Run

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202080040
Kendles Run

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202080020
Rancocas Creek

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202080010
Parkers Creek

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.

- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

HUC 02040202100020
Strawbridge Lake

Groundwater Recharge

- Retrofit existing detention basin to provide additional annual groundwater recharge.
- Replace impervious parking lot with permeable paving to provide additional groundwater recharge.

Water Quality

- Retrofit existing stormwater management facility to provide removal of 80% of total suspending solids from the parking lot runoff.
- Retrofit existing parking area to provide removal of total suspended solids. The retrofit BMP must be installed underground and may not reduce number of parking spaces.
- Enhance vegetative buffer within the "stream corridor".
- Purchase of easements along the "stream corridor".
- Removal of invasive plant species within riparian corridors, targeted wetland areas and stream corridors and replant with native species.

Water Quantity

- If an applicant cannot meet the water quantity reductions required on-site, the additional water quantity reduction should be provided within the same watershed or sub-watershed (HUC14) to meet the required total amount of the water quantity reduction. This can be done in several ways. The flood storage area along a waterway can be increased, new best management practices can be implemented to control previously uncontrolled runoff or an existing stormwater structure can be retrofitted to decrease the volume and peak of runoff.

2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Option 1, the mitigation project may provide mitigation that is not equivalent to the impacts for which the variance or exemption is sought, but addresses the same issue. For example, a variance given for meeting the 80 percent TSS requirement would result in an alternate project that addresses water quality impacts due to fecal impairment. A list of specific projects that can be used to address the mitigation option is below.

Water Quality

- Re-establish a vegetative buffer (minimum 50 foot wide) as a goose control measure and to filter stormwater runoff.
- Provide goose management measures, including public education at a local park.

In consideration of any mitigation project identified above, the Applicant shall provide the Township all necessary environmental information and data sufficient to address sensitive receptors associated with the project, as outlined in NJDEP regulations, and as outlined in the Applicant-Identified Mitigation Project requirements addressed below.

B. General (Applicant-Identified) Mitigation Project Criteria

In order to select an appropriate mitigation project to respond to a requested waiver/exemption requires, an assessment of the impact that would result from the requested deviation from full compliance with the standard(s) in the drainage area affected by the proposed project is required. For example, a waiver for stormwater quantity requirements must focus on the impacts of increased runoff on flooding, considering both quantity and location. Stormwater quality mitigation must aim to prevent an increase in pollutant load to the waterbodies that would be affected by the waiver/exemption. Ground water recharge mitigation must seek to maintain the baseflow and aquifer recharge in the area that would be affected by the waiver/exemption. For the purpose of this discussion, the term "sensitive receptor" is used to refer to a specific area or feature that would be sensitive to the impact assessed above.

Selection of an appropriate mitigation project for a requested waiver/exemption must adhere to the following requirements:

1. The project must be within the same area that would contribute to the receptor impacted by the project. Note that depending on the specific performance standard waived, the sensitive receptor and/or the contributory area to that receptor may be different. If there are no specific sensitive receptors that would be impacted as the result of the grant of the waiver/exemption, then the location of the mitigation project can be located anywhere within the municipality, and should be selected to provide the most benefit relative to an existing stormwater problem in the same category (quality, quantity or recharge).

2. Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project in the future.

3. The project should be close to the location of the original project, and if possible, be located upstream at a similar distance from the identified sensitive receptor.This distance should not be based on actual location, but on a similar hydraulic distance to the sensitive receptor. For example, if the project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch, it may be more beneficial to identify a location discharging to the same tributary.

4. For ease of administration, if sensitive receptors are addressed, it is preferable to have one location that addresses any and all of the performance standards waived, rather than one location for each performance standard.

5. It must be demonstrated that implementation of the mitigation project will result in no adverse impacts to other properties.

6. Mitigation projects that address stormwater runoff quantity can provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.

All necessary information to support a specific waiver request(s) must be provided by the Developer(s) for consideration by the Township, in accordance with applicable NJDEP and/or Township requirements, an as outlined in NJDEP's "Guidance for the Development of Municipal Mitigation Plans" document, dated February 2006.

At the Township's discretion, a developer may be permitted to fund analyses to identify potential mitigation projects that could be used to address deficits in complying with each of the performance standards. However, the funding option shall only be allowed where the project requesting the waiver will have no measurable impact with respect to flooding, erosion, water quality degradation, etc. The funding option may also be appropriate in situations where the size of an individual project requesting a waiver/exemption is small, or the degree of deficit in complying with the design and performance standard(s) is small. Or, where the project requiring mitigation is for one individual single family home, given authority constraints, a financial contribution may be a preferred option.

Finally, the following information will be obtained and provided by the Developer of an approved waiver for the Township to comply with its annual NJDEP MS4 permitting requirements (i.e., required for all Township-approved mitigation projects):

i. Impact from noncompliance. Provide a table quantifying what would be required for the project to achieve the standards, the extent to which this value will be achieved on site and the extent to which the value must be mitigated off site.

ii. Narrative and supporting information regarding the need for the waiver, including:

- The waiver cannot be due to a condition created by the applicant. If the applicant can comply with the Stormwater Management rules through a reduction in the scope of the project, the applicant has created the condition and a waiver cannot be issued. Demonstrate that the need for a waiver is not created by the applicant.

- Provide a discussion and supporting documentation of the site conditions peculiar to the subject property that prevent the construction of a stormwater management facility that would achieve full compliance with the design and performance standards. Site conditions may include soil type, the presence of karst geology, acid soils, a high groundwater table, unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, safety and welfare..

- Demonstration that the grant of the requested waiver/exemption would not result in an adverse impact that would not be compensated for by off site mitigation.

iii. Identify the sensitive receptor(s) related to the performance standard from which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor.

iv. Provide the design details of the mitigation project. This includes, but is not limited to, drawings, calculations, and other information needed to evaluate the mitigation project.

v. List the party or parties responsible for the construction and the maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to, and accepts the responsibility for construction and maintenance. Under no circumstance shall the responsible party be an individual single-family homeowner. Selection of a project location that is under municipal authority avoids the need to obtain authority from a third party for the construction and future maintenance of the project.

vi. Include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5.8. In addition, if the maintenance responsibility is being transferred to the municipality or another entity, the entity responsible for the cost of the maintenance must be identified. The municipality may provide the option for the applicant to convey the mitigation project to the municipality, if the applicant provides for the cost of maintenance in perpetuity.

vii. Obtain any and all necessary local, State or other applicable permits for the mitigation measure or project. Permits must be obtained prior to the municipal approval of the project for which mitigation is being provided.

viii. Demonstrate that the construction of the mitigation project coincides with the construction of the proposed project. A Certificate of Occupancy or final approval by the municipality for the project requiring mitigation cannot be issued until the mitigation project or measure receives final approval. Any mitigation project proposed by the municipality to offset the stormwater impacts of that municipality's own project must be completed within 6 months of the completion of the municipal project, in order to remain in compliance with their NJPDES General Permit.

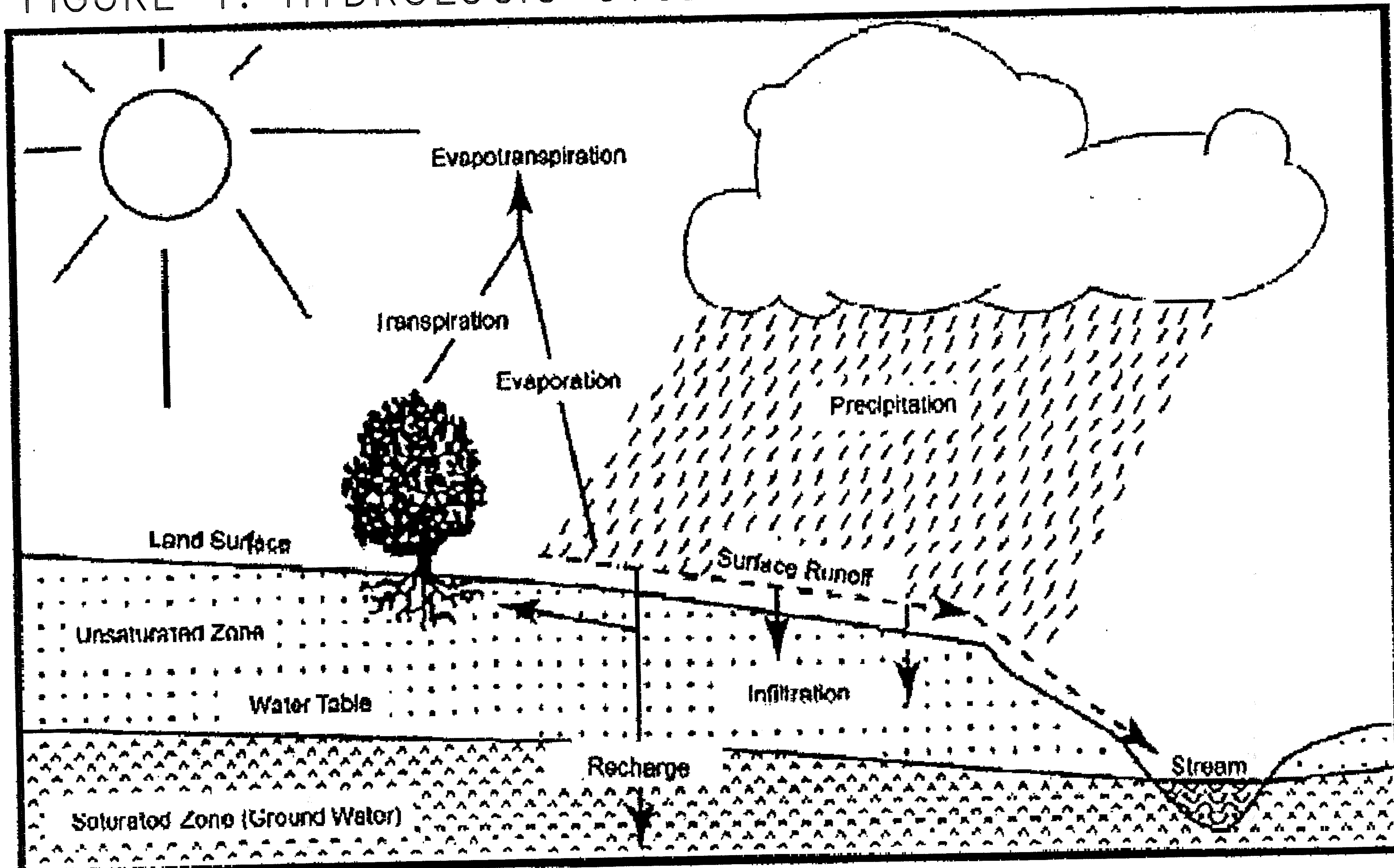
X. Stream Corridor Protection Plan (Optional)

It should be noted that there are no Special Water Resource Protection Areas designated Category One (NJAC 7:9B) or upstream perennial or intermittent streams of said waters within Moorestown. If such water bodies are found or designated at a later date, future major development within 300 feet of said waters will be regulated in accordance with NJAC 7:8-5.5(h) as outlined in the model stormwater ordinance.

However, it should further be noted that the Township recognizes the value of Riparian Buffers in minimizing Non Point Source (NPS) discharges into local waterways. As recommended in this MSWMP, riparian buffers of future developments may be considered by the Township on a case-by-case basis as well

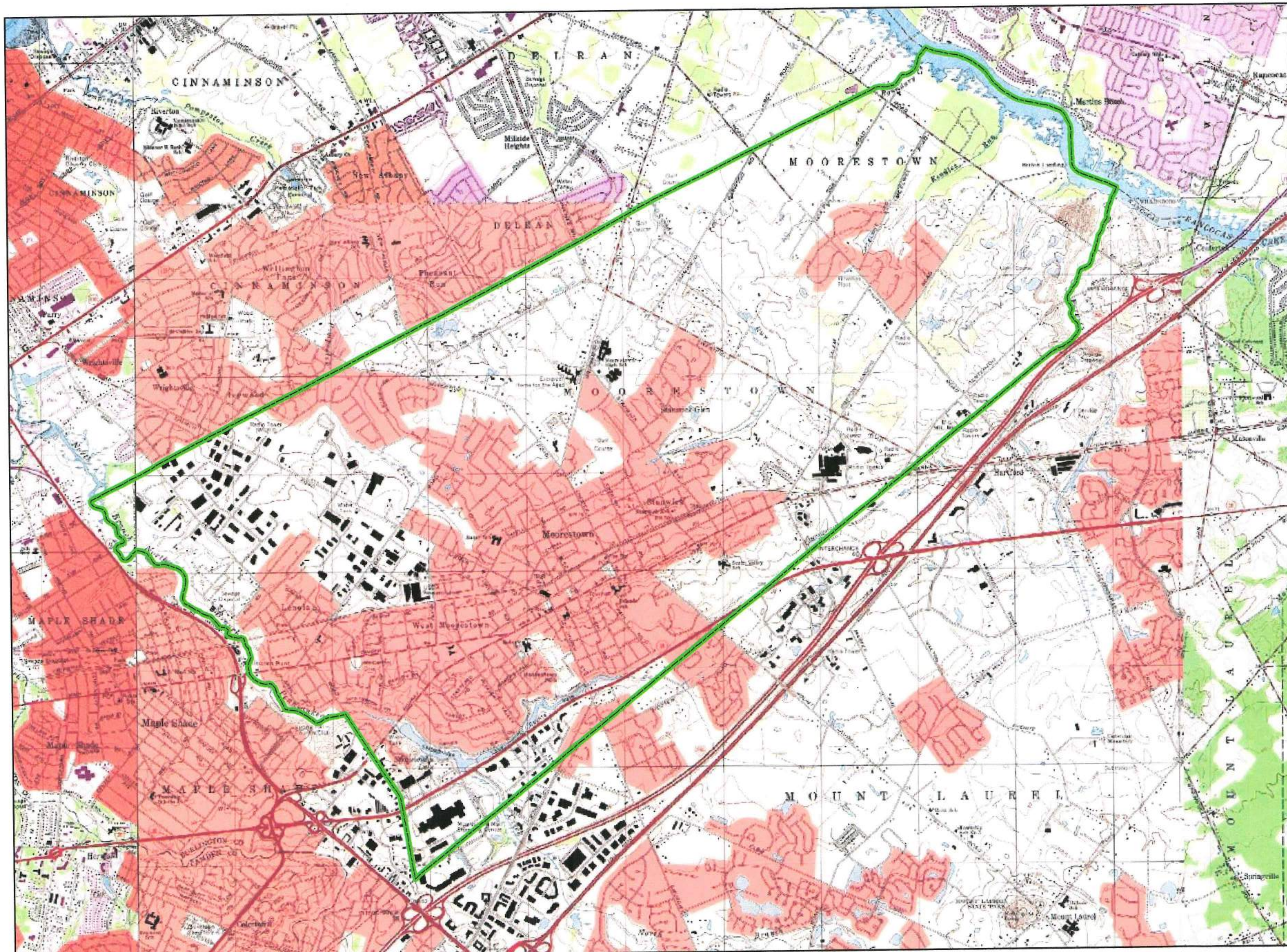
Appendix A -- Mapping

FIGURE 1: HYDROLOGIC CYCLE



Source: New Jersey Geological Survey Report GSR-32.

Moorestown Boundary on USGS Quadrangle



Legend

Municipal Boundary

N
W E
S

0 2,000 4,000 8,000
Feet

RV &A
Remington, Vernick and Arango Engineers
243 Route 130 Suite 200
Bordentown, NJ 08505
Phone: (609)-298-6017 Fax: (609)-298-8257
Web Site Address: www.rve.com

Figure 3: Township Waterways

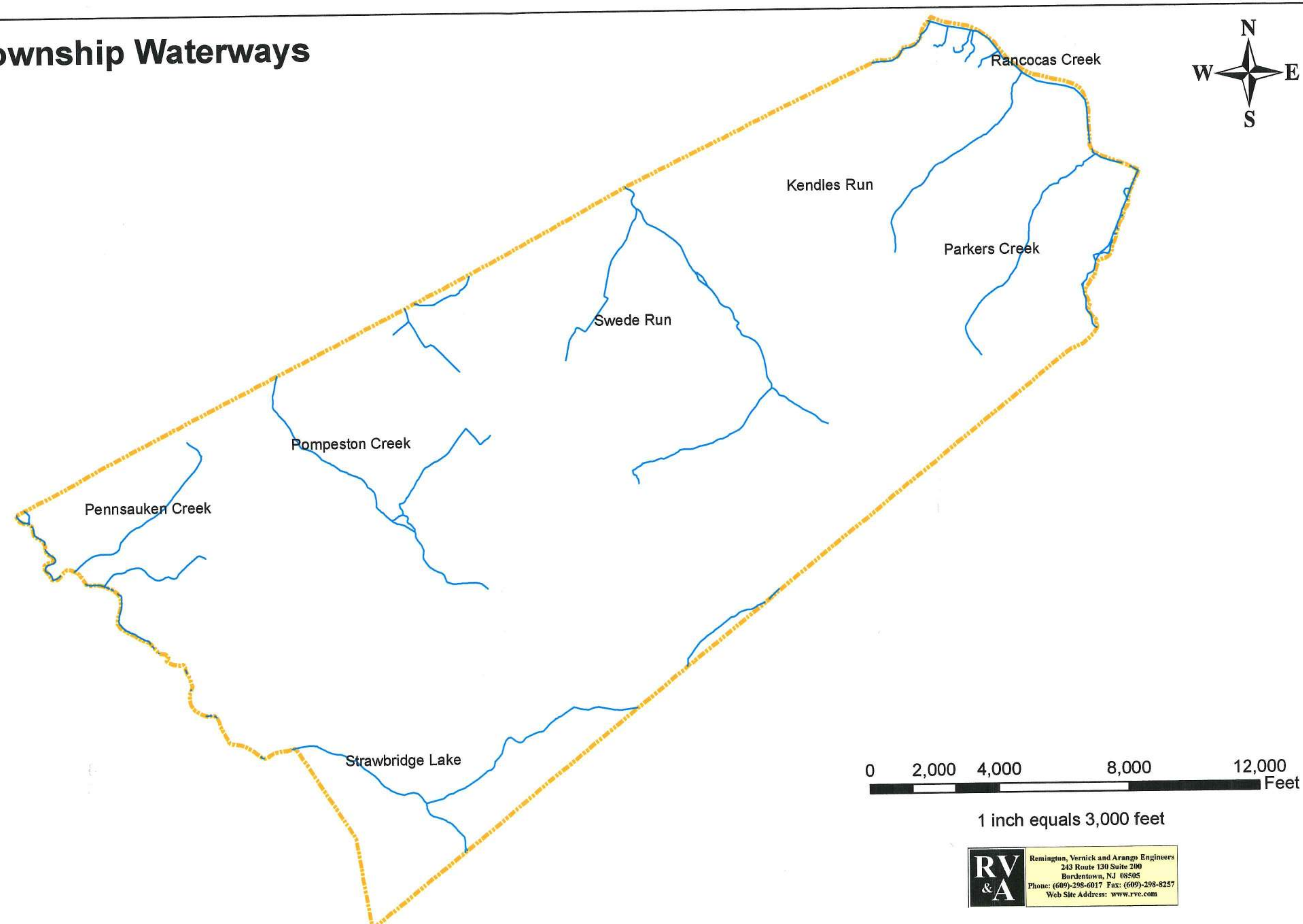


Figure 4: Groundwater Recharge

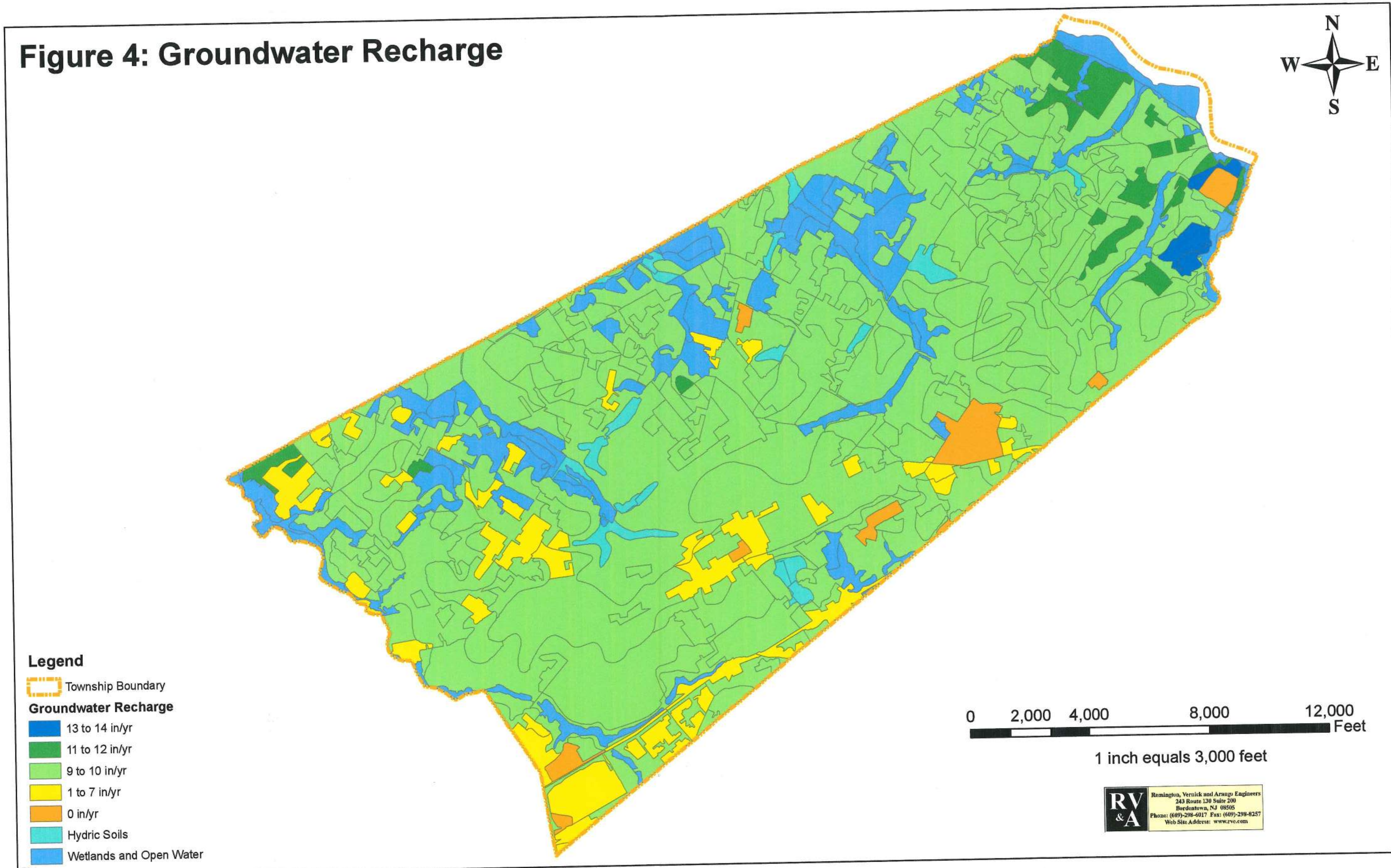


Figure 5: Wellhead Protection Areas

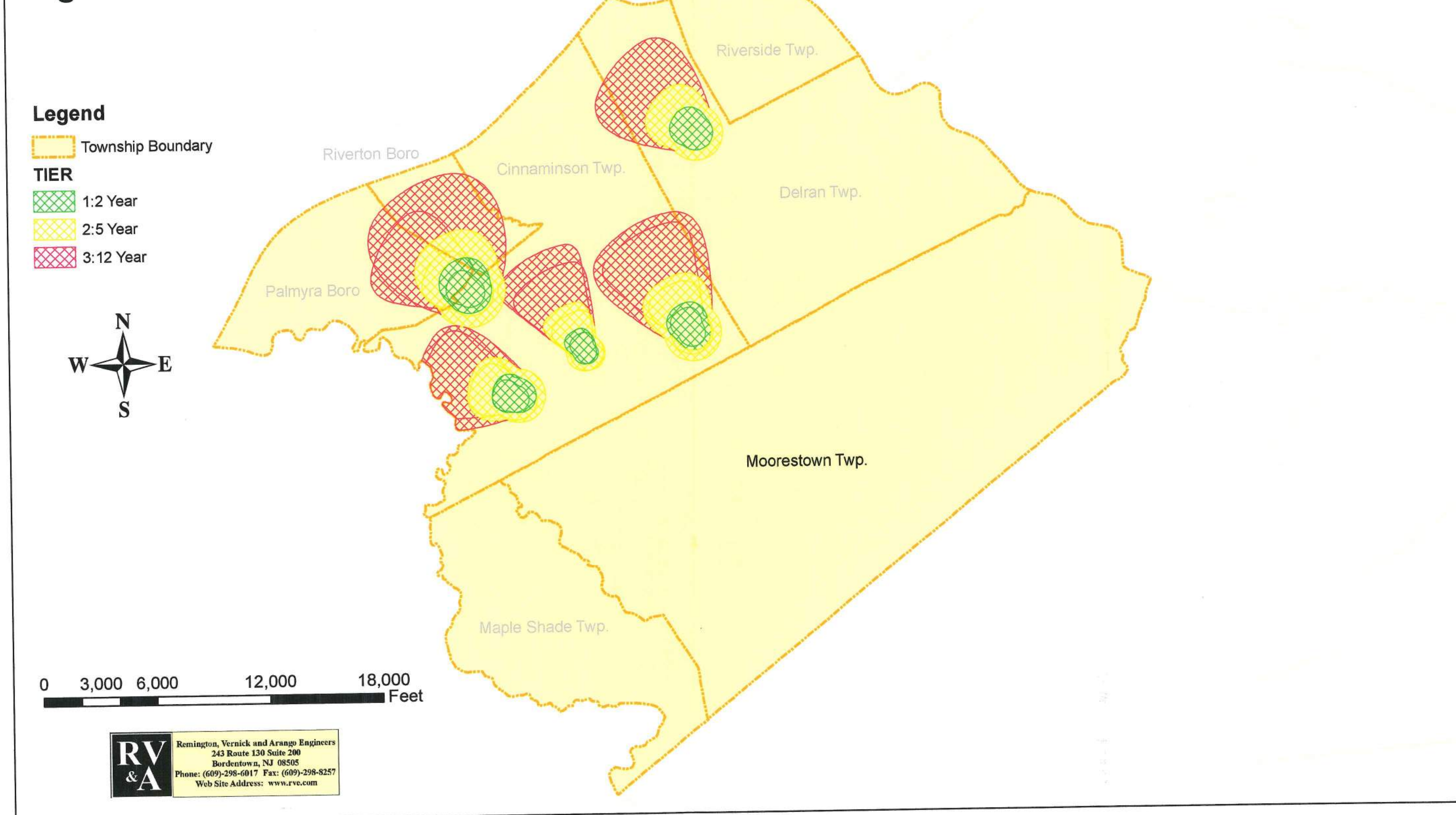


Figure 6: Hydrologic Units (HUC14s)

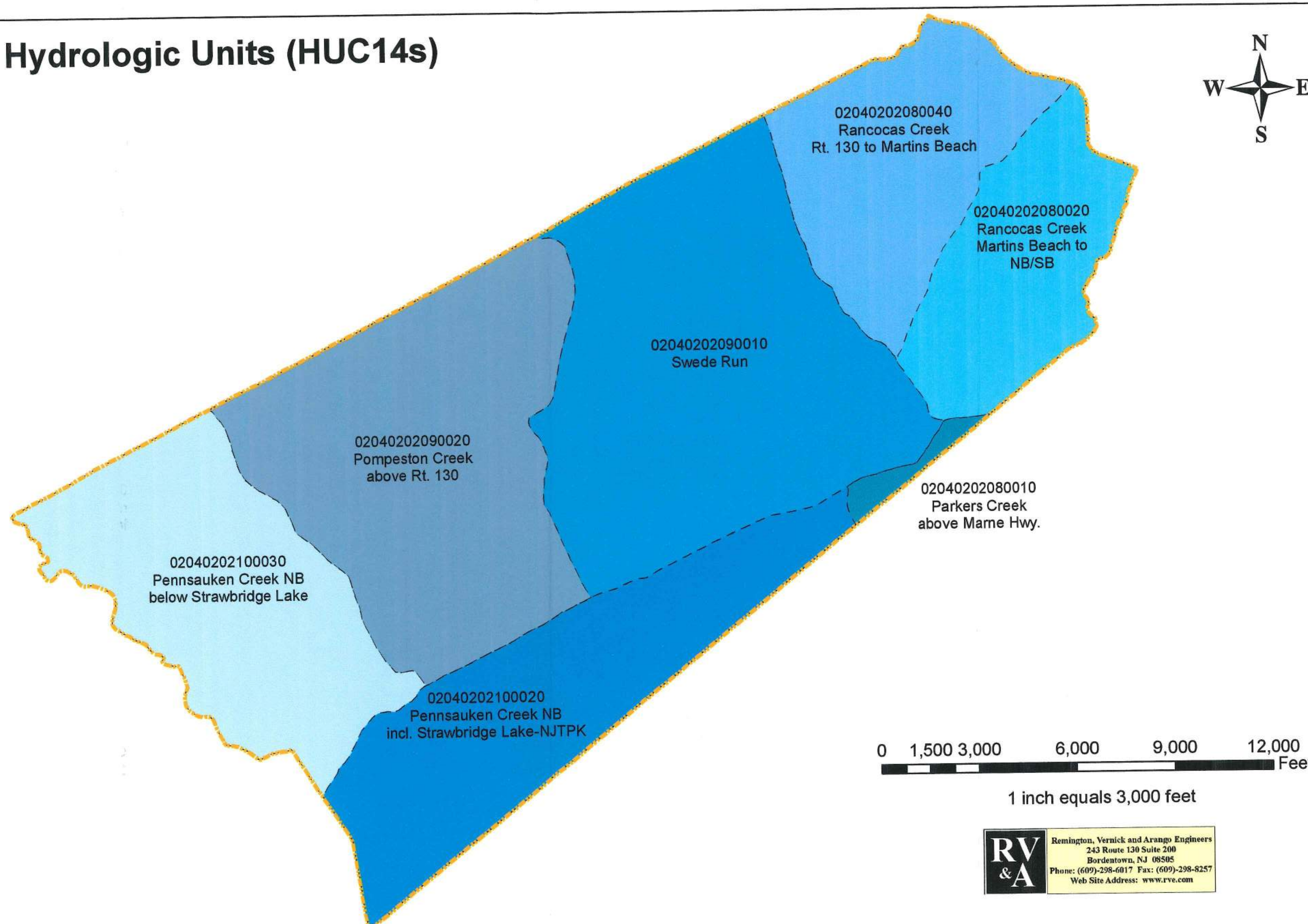
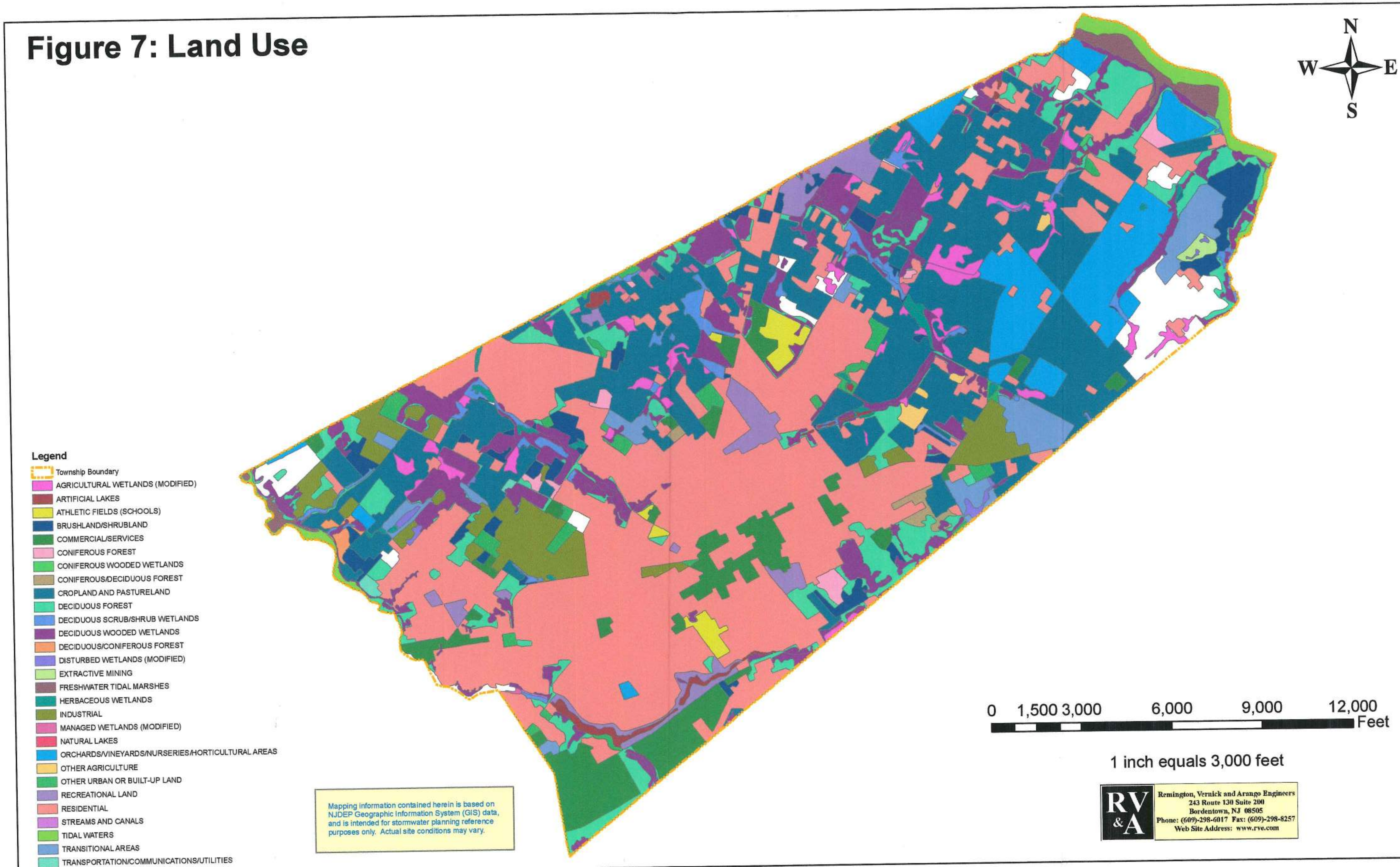
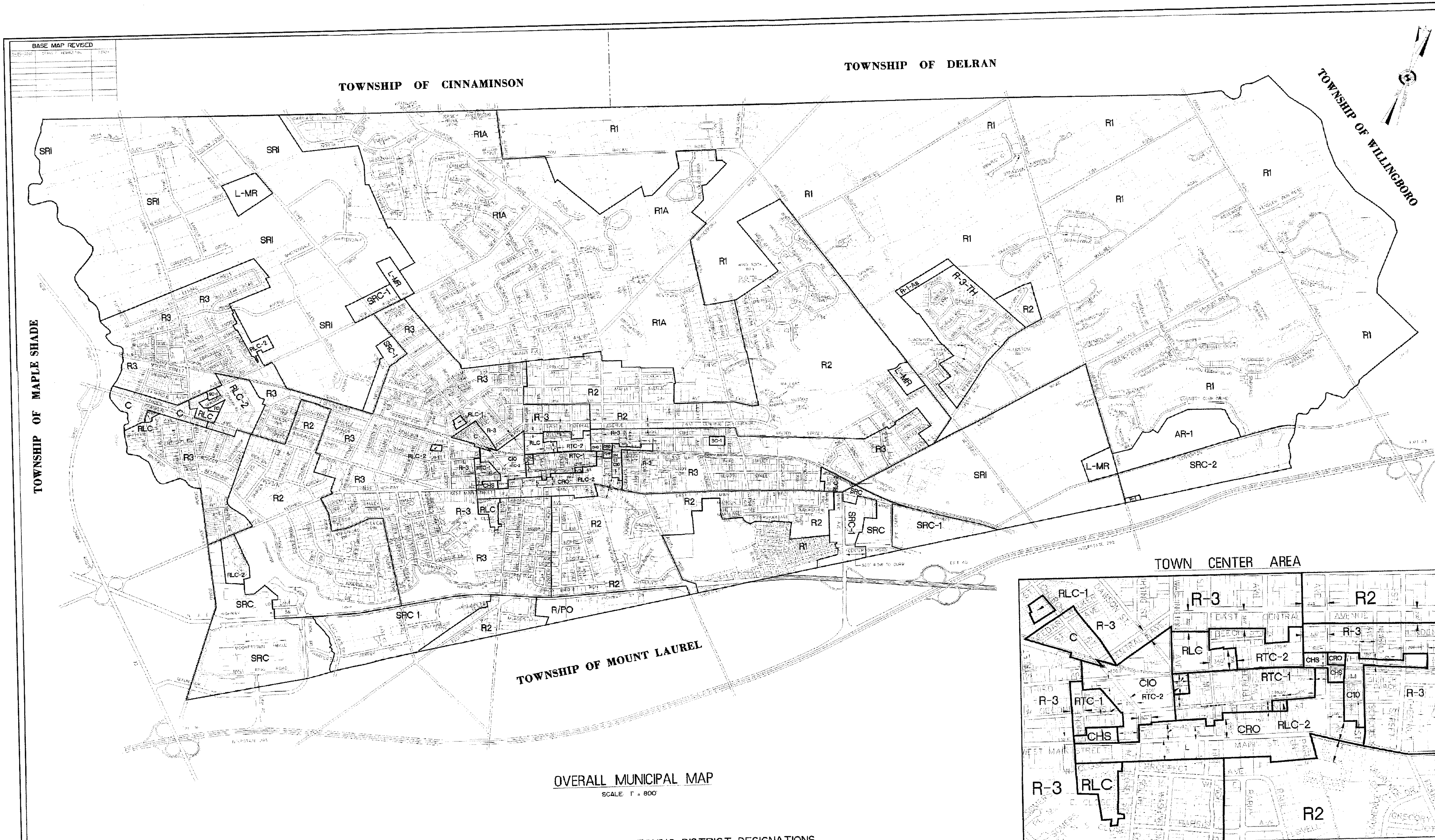


Figure 7: Land Use





OVERALL MUNICIPAL MAP

SCALE: 1" = 800'

TOWN CENTER AREA

ZONING DISTRICT DESIGNATIONS

LAST REVISED MAY-20-2005 (Ord. No. 5A-, 6-, 7-, 8-, 9-, 10- and 11-2005)

- R1 – RESIDENCE DISTRICT
- R2 – RESIDENCE DISTRICT
- R3 – RESIDENCE DISTRICT
- R1A – RESIDENCE DISTRICT
- R-1-Aa – RESIDENCE DISTRICT
- R-3-TH – RESIDENCE DISTRICT
- L-MR – LOW & MODERATE-INCOME RESIDENCE DISTRICT
- RTC-1 RESIDENCE TOWN CENTER – 1 DISTRICT
- RTC-2 RESIDENCE TOWN CENTER – 2 DISTRICT
- CIO – COMMERCIAL-INSTITUTIONAL/OFFICE DISTRICT
- CRO – COMMERCIAL-RETAIL/OFFICE DISTRICT
- CHS – COMMERCIAL HIGHWAY SERVICE DISTRICT
- C – COMMERCIAL DISTRICT
- R/PO – RESIDENTIAL/PROFESSIONAL OFFICE DISTRICT
- SRI – SPECIALLY RESTRICTED INDUSTRIAL DISTRICT
- SRC – SPECIALLY RESTRICTED COMMERCIAL DISTRICT
  - SRC-1
  - SRC-2
- RLC – RESIDENCE-LIMITED COMMERCIAL DISTRICT
  - RLC-1
  - RLC-2
- SC-1 – SENIOR CITIZEN RESIDENCE – 1 DISTRICT
- AR-1 – AGE-QUALIFIED RESIDENCE – 1 DISTRICT

ZONING MAP

Moorestown Township

BURLINGTON COUNTY NEW JERSEY

CRAIG F. REMINGTON PROFESSIONAL PLANNER LIC. NO. 1877

JOSEPH M. PETRONGOLO PROFESSIONAL PLANNER LIC. NO. 5251

Craig F. Remington
8-1-2005
CRAIG F. REMINGTON
PROFESSIONAL PLANNER LIC. NO. 1877

DISCLAIMER

THIS PLAN IS BASED ON THE ORIGINAL PREPARED BY: PENNONI ASSOCIATES INC. CONSULTING ENGINEERS & PROFESSIONAL LAND SURVEYORS, ENTITLED: "ZONING MAP" SITUATED IN THE TOWNSHIP OF MOORESTOWN, BURLINGTON COUNTY, NEW JERSEY, FILE NO. 90910O102, LAST REVISED: 12-9-2002, LAST PLOTTED: 2-11-2003.

Appendix B -- Tables

Table 1: Build-Out Analysis for HUC14 Zones

Table 2: Pollutants Loads by Land Cover

Table 3: Nonpoint Source Load at Build-Out

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202100030 - *North Branch Pennsauken Creek*							
R2	117.61	20.00%	23.52	0.00	117.61	30%	35.28
R3	446.10	25.00%	111.52	13.31	432.78	35%	151.47
RLC	8.42	35.00%	2.95	0.00	8.42	90%	7.57
RLC-2	47.65	30.00%	14.29	0.00	47.65	50%	23.82
SC-1	1.59	35.00%	0.56	0.00	1.59	35%	0.56
C	29.20	50.00%	14.60	0.00	29.20	90%	26.28
SRI	880.51	50.00%	440.25	71.73	808.78	60%	485.27
TOTALS	**1,531.07**	**39.69%**	**607.70**	**85.04**	**1,446.03**	**50.50%**	**730.26**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202090020 - *Pompeston Creek*							
R1	319.51	5.00%	15.98	0.00	319.51	25%	79.88
RI-A	922.59	25.00%	230.65	45.28	877.30	30%	263.19
R2	73.06	25.00%	18.26	8.36	64.70	30%	19.41
R3	371.00	25.00%	92.75	27.55	343.45	35%	120.21
RLC	8.97	25.00%	2.24	0.00	8.97	90%	8.07
RLC-1	1.65	25.00%	0.41	0.00	1.65	60%	0.99
RLC-2	0.68	30.00%	0.20	0.00	0.68	50%	0.34
RTC-1	30.05	30.00%	9.01	0.00	30.05	60%	18.03
RTC-2	13.16	25.00%	3.29	0.00	13.16	40%	5.26
L-MR	10.80	0.00%	0.00	10.80	0.00	--------	--------
C	9.62	25.00%	2.40	0.00	9.62	90%	8.66
CIO	23.20	50.00%	11.60	0.00	23.20	67%	15.54
CRO	19.97	50.00%	9.99	0.00	19.97	80%	15.98
CHS	3.42	60.00%	2.05	0.00	3.42	80%	2.74
SRC-1	37.37	50.00%	18.69	3.61	33.76	65%	21.95
SRI	198.44	35.00%	69.45	25.89	172.55	60%	103.53
TOTALS	**2,043.49**	**23.83%**	**486.98**	**121.49**	**1,922.00**	**35.58%**	**683.78**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202100020 - *Strawbridge Lake*							
R1	145.38	10.00%	14.54	0.00	145.38	25%	36.34
R2	559.81	15.00%	83.97	73.23	486.58	30%	145.97
R3	298.29	15.00%	44.74	1.57	296.72	35%	103.85
RLC	7.42	30.00%	2.23	0.00	7.42	90%	6.68
RLC-2	16.33	30.00%	4.90	0.00	16.33	50%	8.16
R/PO	45.07	5.00%	2.25	0.00	45.07	40%	18.03
CRO	20.57	35.00%	7.20	0.00	20.57	80%	16.46
SRC	206.87	75.00%	155.15	0.00	206.87	65%	134.46
SRC-1	172.32	75.00%	129.24	0.00	172.32	65%	112.01
TOTALS	**1,472.04**	**30.18%**	**444.22**	**74.80**	**1,397.25**	**41.65%**	**581.97**
2040202080010 - *Parkers Creek*							
SRC-1	20.11	10.00%	2.01	0.00	20.11	65%	13.07
SRI	58.47	70.00%	40.93	0.00	0.00	60%	0.00
TOTALS	**78.58**	**54.65%**	**42.94**	**0.00**	**20.11**	**65.00%**	**13.07**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202090010 - *Swede Run*							
R1	970.20	5.00%	48.51	111.13	859.07	25%	214.77
R1A	214.45	25.00%	53.61	2.98	211.47	30%	63.44
R1-Aa	8.49	25.00%	2.12	0.00	8.49	30%	2.55
R2	571.61	25.00%	142.90	102.75	468.86	30%	140.66
R3	281.28	25.00%	70.32	4.69	276.59	35%	96.81
R3-TH	122.66	25.00%	30.67	0.00	122.66	35%	42.93
RLC-2	8.73	30.00%	2.62	0.00	8.73	50%	4.36
SC-1	2.20	15.00%	0.33	0.96	1.25	35%	0.44
L-MR	9.91	30.00%	2.97	9.91	0.00	---------	---------
CIO	7.98	40.00%	3.19	0.00	7.98	67%	5.35
CHS	1.23	40.00%	0.49	0.00	1.23	80%	0.98
CRO	6.53	40.00%	2.61	0.00	6.53	80%	5.22
SRC	5.09	30.00%	1.53	0.00	5.09	65%	3.31
SRI	241.38	70.00%	168.97	0.00	241.38	60%	144.83
TOTALS	**2,451.75**	**21.65%**	**530.85**	**232.41**	**2,219.34**	**32.70%**	**725.65**

* Estimate based on aerial photography, NJDEP impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 1: Build-Out Analysis for HUC14 Zones

HUC 14 and Zone	Total Area (Acres)	Existing Impervious* (%)	Existing Impervious (Acres)	Constrained Land** (Acres)	Developable Area (Acres)	Allowable Impervious (%)	Build-out Impervious*** (Acres)
2040202080040 - *Kendles Run*							
R1	1,127.71	5.00%	56.39	121.16	1,006.55	25%	251.64
TOTALS	**1,127.71**	**5.00%**	**56.39**	**121.16**	**1,006.55**	**25.00%**	**251.64**
2040202080020 - *Rancocas Creek*							
R1	640.85	5.00%	32.04	39.92	600.93	25%	150.23
AR-1	66.59	5.00%	3.33	18.37	48.23	35%	16.88
L-MR	12.13	10.00%	1.21	4.75	7.38	---------	---------
SRC-2	105.97	50.00%	52.98	0.00	105.97	65%	68.88
SRI	76.25	50.00%	38.13	0.00	76.25	60%	45.75
TOTALS	**901.79**	**14.16%**	**127.69**	**63.03**	**838.75**	**33.59%**	**281.74**

* Estimate based on aerial photography, NJDEP Impervious cover mapping and current land use
**Less Flood Plains, Waterways, and Green Acres areas
*** In Accordance with NJDEP (Developable Area x Allowable Impervious Percentage)

Table 2: Pollutant Loads by Land Cover

Land Cover	Total Phosphorus Load (lbs/acre/year)	Total Nitrogen Load (lbs/acre/year)	Total Suspended Solids Load (lbs/acre/year)
High, Medium Density Residential	1.4	15	140
Low Density, Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1	10	120
Agricultural	1.3	10	300
Forest, Water Wetlands	0.1	3	40
Barrenland/ Transitional Area	0.5	5	60

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202100030 - North Branch Pennsauken Creek								
R2	Low Density, Rural Residential	117.61	0.60	70.57	5.00	588.05	100.00	11,761.00
R3	High/ Medium Density Residential	432.78	1.40	605.89	15.00	6,491.70	140.00	60,589.20
RLC	Urban, Mixed Urban, Other	8.42	1.00	8.42	10.00	84.20	120.00	1,010.40
RLC-2	Urban, Mixed Urban, Other	47.65	1.00	47.65	10.00	476.50	120.00	5,718.00
SC-1	High/ Medium Density Residential	1.59	1.40	2.23	15.00	23.85	140.00	222.60
C	Commercial	29.20	2.10	61.32	22.00	642.40	200.00	5,840.00
SRI	Industrial	808.78	1.50	1213.17	16.00	12,940.48	200.00	161,756.00
TOTALS				**2009.24**		**21,247.18**		**246,897.20**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202090020 - *Pompeston Creek*								
R1	Low Density, Rural Residential	319.51	0.60	191.71	5.00	1,597.55	100.00	31,951.00
RI-A	Low Density, Rural Residential	877.30	0.60	526.38	5.00	4,386.50	100.00	87,730.00
R2	Low Density, Rural Residential	64.70	0.60	38.82	5.00	323.50	100.00	6,470.00
R3	High/ Medium Density Residential	343.45	1.40	480.83	15.00	5,151.75	140.00	48,083.00
RLC	Urban, Mixed Urban, Other	8.97	1.00	8.97	10.00	89.70	120.00	1,076.40
RLC-1	Urban, Mixed Urban, Other	1.65	1.00	1.65	10.00	16.50	120.00	198.00
RLC-2	Urban, Mixed Urban, Other	0.68	1.00	0.68	10.00	6.80	120.00	81.60
RTC-1	Urban, Mixed Urban, Other	30.05	1.00	30.05	10.00	300.50	120.00	3,606.00
RTC-2	Urban, Mixed Urban, Other	13.16	1.00	13.16	10.00	131.60	120.00	1,579.20
L-MR	High/ Medium Density Residential	0.00	1.40	0.00	15.00	0.00	140.00	0.00
C	Commercial	9.62	2.10	20.20	22.00	211.64	200.00	1,924.00
CIO	Commercial	23.20	2.10	48.72	22.00	510.40	200.00	4,640.00
CRO	Commercial	19.97	2.10	41.94	22.00	439.34	200.00	3,994.00
CHS	Commercial	3.42	2.10	7.18	22.00	75.24	200.00	684.00
SRC-1	Commercial	33.76	2.10	70.90	22.00	742.72	200.00	6,752.00
SRI	Industrial	172.55	1.50	258.83	16.00	2,760.80	200.00	34,510.00
TOTALS				**1740.01**		**16744.54**		233,279.20

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202100020 - *Strawbridge Lake*								
R1	Low Density, Rural Residential	145.38	0.60	87.23	5.00	726.90	100.00	14,538.00
R2	Low Density, Rural Residential	486.58	0.60	291.95	5.00	2,432.90	100.00	48,658.00
R3	High/ Medium Density Residential	296.72	1.40	415.41	15.00	4,450.80	140.00	41,540.80
RLC	Urban, Mixed Urban, Other	7.42	1.00	7.42	10.00	74.20	120.00	890.40
RLC-2	Urban, Mixed Urban, Other	16.33	1.00	16.33	10.00	163.30	120.00	1,959.60
R/PO	High/ Medium Density Residential	45.07	1.40	63.10	15.00	676.05	140.00	6,309.80
CRO	Commercial	20.57	2.10	43.20	22.00	452.54	200.00	4,114.00
SRC	Commercial	206.87	2.10	434.43	22.00	4,551.14	200.00	41,374.00
SRC-1	Commercial	172.32	2.10	361.87	22.00	3,791.04	200.00	34,464.00
TOTALS				**1720.93**		**17318.87**		**193,848.60**
2040202080010 - *Parkers Creek*								
SRC-1	Commercial	20.11	2.10	42.23	22.00	442.42	200.00	4,022.00
SRI	Industrial	0.00	1.50	0.00	16.00	0.00	200.00	0.00
TOTALS				**42.23**		**442.42**		**4,022.00**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
20402020900010 - *Swede Run*								
R1	Low Density, Rural Residential	859.07	0.60	515.44	5.00	4,295.35	100.00	85,907.00
R1A	Low Density, Rural Residential	21.47	0.60	12.88	5.00	107.35	100.00	2,147.00
R1-Aa	Low Density, Rural Residential	8.49	0.60	5.09	5.00	42.45	100.00	849.00
R2	Low Density, Rural Residential	468.86	0.60	281.32	5.00	2,344.30	100.00	46,886.00
R3	High/ Medium Density Residential	276.59	1.40	387.23	15.00	4,148.85	140.00	38,722.60
R3-TH	High/ Medium Density Residential	122.66	1.40	171.72	15.00	1,839.90	140.00	17,172.40
RLC-2	Urban, Mixed Urban, Other	8.73	1.00	8.73	10.00	87.30	120.00	1,047.60
SC-1	High/ Medium Density Residential	1.25	1.40	1.75	15.00	18.75	140.00	175.00
L-MR	High/ Medium Density Residential	0.00	1.40	0.00	15.00	0.00	140.00	0.00
CIO	Commercial	7.98	2.10	16.76	22.00	175.56	200.00	1,596.00
CHS	Commercial	1.23	2.10	2.58	22.00	27.06	200.00	246.00
CRO	Commercial	6.53	2.10	13.71	22.00	143.66	200.00	1,306.00
SRC	Commercial	5.09	2.10	10.69	22.00	111.98	200.00	1,018.00
SRI	Industrial	241.38	1.50	362.07	16.00	3,862.08	200.00	48,276.00
TOTALS				**1789.98**		**17204.59**		**245,348.60**

Table 3: Nonpoint Source Loads at Build-out

HUC 14 and Zone	Land Cover	Developable Area (Acres)	TP (lbs/acre/yr)	TP (lbs/yr)	TN (lbs/acre/year)	TN (lbs/yr)	TSS (lbs/acre/yr)	TSS (lbs/yr)
2040202080040 - *Kendles Run*								
R1	Low Density, Rural Residential	1006.55	0.60	603.93	5.00	5,032.75	100.00	100,655.00
TOTALS				**603.93**		**5,032.75**		**100,655.00**
2040202080020 - *Rancocas Creek*								
R1	Low Density, Rural Residential	600.93	0.60	360.56	5.00	3,004.65	100.00	60,093.00
AR-1	High/ Medium Density Residential	48.23	1.40	67.52	15.00	723.45	140.00	6,752.20
L-MR	High/ Medium Density Residential	7.38	1.40	10.33	15.00	110.70	140.00	1,033.20
SRC-2	Commercial	105.97	2.10	222.54	22.00	2,331.34	200.00	21,194.00
SRI	Industrial	76.25	1.50	114.38	16.00	1,220.00	200.00	15,250.00
TOTALS				**775.32**		**7390.14**		**104,322.40**

Stormwater Permit

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Mail Code - 401-02B
Water Pollution Management Element
Bureau of Nonpoint Pollution Control
P.O. Box 420 – 401 E. State St.
Trenton, NJ 08625-0420
Tel: (609) 633-7021 / Fax: (609) 777-0432
http://www.state.nj.us/dep/dwq/bnpc_home.htm

BOB MARTIN
Commissioner

November 9, 2017

Re: R9 - Tier A Municipal Stormwater General Permit
NJPDES: NJ0141852 PI ID #: 50577
NJPDES MASTER GENERAL PERMIT PROGRAM INTEREST
Trenton City, Mercer

Dear Interested Party:

Enclosed is a **final** New Jersey Pollutant Discharge Elimination System (NJPDES) permit action identified above which has been issued in accordance with N.J.A.C. 7:14A. The Tier A Municipal Stormwater General Permit authorizes the discharge of stormwater from small municipal separate storm sewer systems (MS4). The permit was issued in response to USEPA's Phase II rules. Tier A municipalities are generally located within the more densely populated regions of the state or along or near the coast. The Tier A permit addresses stormwater quality issues related to both new and existing development.

A summary of the significant and relevant comments received on the draft action during the public comment period, the Department's responses, and an explanation of any changes from the draft action have been included in the Response to Comments document attached hereto as per N.J.A.C. 7:14A-15.16.

The final Tier A MS4 NJPDES permit and supporting documents are also posted at http://www.nj.gov/dep/dwq/tier_a.htm. Here you can find a crosswalk which provides a detailed comparison of changes from 2009 to this 2017 permit, and a Frequently Asked Questions document. These documents will be useful in understanding the final permit.

Questions or comments regarding the final action should be addressed to Stephen Boyer at (609) 633-7021.

Sincerely,

James J. Murphy, Chief
Bureau of Nonpoint Pollution Control

Enclosures
c: Permit Distribution List

NEW JERSEY POLLUTANT DISCHARGE ELIMINATION SYSTEM

The New Jersey Department of Environmental Protection hereby grants you a NJPDES permit for the facility/activity named in this document. This permit is the regulatory mechanism used by the Department to help ensure your discharge will not harm the environment. By complying with the terms and conditions specified, you are assuming an important role in protecting New Jersey's valuable water resources. Your acceptance of this permit is an agreement to conform with all of its provisions when constructing, installing, modifying, or operating any facility for the collection, treatment, or discharge of pollutants to waters of the state. If you have any questions about this document, please feel free to contact the Department representative listed in the permit cover letter. Your cooperation in helping us protect and safeguard our state's environment is appreciated.

Permit Number: NJ0141852

Final: Stormwater Discharge Master General Permit Renewal

Permittee:
Master General Permit
Per Individual Notice of Authorization

Co-Permittee:

Property Owner:
NJDEP DIVISION OF WATER QUALITY
401 E STATE ST
Trenton, NJ 08625

Location Of Activity:
Master General Permit
Per Individual Notice of Authorization

Authorization(s) Covered Under This Approval	Issuance Date	Effective Date	Expiration Date
R9 -Tier A Municipal Stormwater General Permit	11/09/2017	01/01/2018	12/31/2022

By Authority of:
Commissioner's Office

DEP AUTHORIZATION
James J. Murphy, Chief
Bureau of Nonpoint Pollution Control
Water Pollution Management Element

(Terms, conditions and provisions attached hereto)

PART I
GENERAL REQUIREMENTS:
NJPDES

A. General Requirements of all NJPDES Permits

1. Requirements Incorporated by Reference

a. The permittee shall comply with all conditions set forth in this permit and with all the applicable requirements incorporated into this permit by reference. The permittee is required to comply with the regulations, including those cited in paragraphs b. through e. following, which are in effect as of the effective date of the final permit.

b. General Conditions

Penalties for Violations	N.J.A.C. 7:14-8.1 et seq.
Incorporation by Reference	N.J.A.C. 7:14A-2.3
Toxic Pollutants	N.J.A.C. 7:14A-6.2(a)4i
Duty to Comply	N.J.A.C. 7:14A-6.2(a)1 & 4
Duty to Mitigate	N.J.A.C. 7:14A-6.2(a)5 & 11
Inspection and Entry	N.J.A.C. 7:14A-2.11(e)
Enforcement Action	N.J.A.C. 7:14A-2.9
Duty to Reapply	N.J.A.C. 7:14A-4.2(e)3
Signatory Requirements for Applications and Reports	N.J.A.C. 7:14A-4.9
Effect of Permit/Other Laws	N.J.A.C. 7:14A-6.2(a)6 & 7 & 2.9(c)
Severability	N.J.A.C. 7:14A-2.2
Administrative Continuation of Permits	N.J.A.C. 7:14A-2.8
Permit Actions	N.J.A.C. 7:14A-2.7(c)
Reopener Clause	N.J.A.C. 7:14A-6.2(a)10
Permit Duration and Renewal	N.J.A.C. 7:14A-2.7(a) & (b)
Consolidation of Permit Process	N.J.A.C. 7:14A-15.5
Confidentiality	N.J.A.C. 7:14A-18.2 & 2.11(g)
Fee Schedule	N.J.A.C. 7:14A-3.1
Treatment Works Approval	N.J.A.C. 7:14A-22 & 23

c. Operation And Maintenance

Need to Halt or Reduce not a Defense	N.J.A.C. 7:14A-2.9(b)
Proper Operation and Maintenance	N.J.A.C. 7:14A-6.12

d. Monitoring And Records

Monitoring	N.J.A.C. 7:14A-6.5
Recordkeeping	N.J.A.C. 7:14A-6.6
Signatory Requirements for Monitoring Reports	N.J.A.C. 7:14A-6.9

e. Reporting Requirements

Planned Changes	N.J.A.C. 7:14A-6.7
Reporting of Monitoring Results	N.J.A.C. 7:14A-6.8
Noncompliance Reporting	N.J.A.C. 7:14A-6.10 & 6.8(h)
Hotline/Two Hour & Twenty-four Hour Reporting	N.J.A.C. 7:14A-6.10(c) & (d)
Written Reporting	N.J.A.C. 7:14A-6.10(e) &(f) & 6.8(h)
Duty to Provide Information	N.J.A.C. 7:14A-2.11, 6.2(a)14 & 18.1
Schedules of Compliance	N.J.A.C. 7:14A-6.4
Transfer	N.J.A.C. 7:14A-6.2(a)8 & 16.2

PART II

GENERAL REQUIREMENTS: DISCHARGE CATEGORIES

A. Additional Requirements Incorporated By Reference

a. The Stormwater Management rules at N.J.A.C. 7:8.

b. Conditions for General Permits at N.J.A.C. 7:14A-6.13, including the Department's authority to require, for due cause, a Tier A Municipality to apply for and obtain a different stormwater permit for specific activities otherwise authorized under this permit.

c. Additional Conditions applicable to UIC permits at N.J.A.C. 7:14A-8.9, UIC Corrective Action (N.J.A.C. 7:14A-8.11) and UIC Operating Criteria (N.J.A.C. 7:14A-8.16).

d. Conditions for reopening and modification of small MS4 permits at N.J.A.C. 7:14A-16.4(b) and N.J.A.C. 7:14A-25.7(b).

e. Requirements for Discharges to Ground Water at N.J.A.C. 7:14A-7.

f. National Pollutant Discharge Elimination System (NPDES) Electronic Reporting rule at 40 CFR Part 127.

B. General Conditions

1. Notification of Non-Compliance

a. The Tier A Municipality shall notify the Department of any non-compliance when required by N.J.A.C. 7:14A-6.10 by contacting the DEP Hotline at 1-877-WARN-DEP.

2. Discharge of Pollutants

a. For discharges authorized by this permit, the Tier A Municipality is exempt from N.J.A.C. 7:14A-6.2(a)2. This exemption means that the discharge of any pollutant not specifically regulated in this NJPDES permit or listed and quantified in the RFA shall not constitute a violation of the permit.

3. Standard Reporting Requirements – Electronic Reporting of NJPDES Information

a. Unless already required by this permit to be submitted electronically by an earlier date, effective December 21, 2020, the below identified documents and reports shall be electronically submitted via the Department's designated electronic submission service:

   i. General permit authorization requests (i.e. RFAs);

   ii. General permit termination/revocation requests; and

   iii. Municipal separate storm sewer system (MS4) program reports (see Part IV.G).

4. Other Regulatory Requirements

a. Permit conditions remain in effect and enforceable until and unless the permit is modified, renewed or revoked by the Department.

b. The issuance of this permit shall not be considered as a waiver of any applicable federal, State or local rules, regulations and ordinances.

c. In accordance with N.J.A.C. 7:14A-6.2(a)7, this permit does not authorize any infringement of State or local law or regulations, including, but not limited to, N.J.A.C. 7:50 (the Pinelands rules), N.J.A.C. 7:1-E (Discharges of Petroleum and other Hazardous Substances), regulations concerning threatened and endangered species and their designated critical habitat, and other Department rules. No discharge of hazardous substances (as defined in N.J.A.C. 7:1E-1.6) resulting from an onsite spill shall be deemed to be "pursuant to and in compliance with this permit" within the meaning of the Spill Compensation and Control Act at N.J.S.A. 58:10-23.11c.

d. While the Tier A Municipality is required to comply with applicable operation and maintenance requirements of N.J.A.C. 7:14A-6.12(a), the Tier A Municipality is exempt from the operations and maintenance manual requirements of N.J.A.C. 7:14A-6.12(c). This exemption applies only to discharges authorized under this permit and does not alter the operation and maintenance requirements for municipally or privately owned stormwater facilities specified in this permit or N.J.A.C. 7:8.

C. Eligibility

1. Permit Scope

a. The Tier A MS4 NJPDES Permit applies to all areas of New Jersey as follows:

i. This permit applies to all municipalities assigned to Tier A under N.J.A.C. 7:14A-25.3(a)1. Tier A Municipalities are generally located within the more densely populated regions of the state or along or near the Atlantic coast.

ii. On a case-by-case basis, the Department may use this permit to regulate municipalities assigned to Tier B under N.J.A.C. 7:14A-25.3(a). As used in this permit, the term "Tier A Municipality" includes Tier B Municipalities that seek or obtain authorization under this provision of this permit.

b. This permit applies to the owner or operator of the Municipal Separate Storm Sewer System (MS4) meaning the Tier A Municipality. The owner or operator is responsible for ensuring compliance with this permit.

c. The short title of this permit is the "Tier A MS4 NJPDES permit."

2. Authorized Discharges Under the Tier A MS4 NJPDES Permit

a. Eligible Stormwater Discharges – Except as provided in Part II.C.3 below, this permit authorizes all new and existing stormwater discharges to surface water and groundwater from:

i. Small MS4s (as defined at N.J.A.C. 7:14A-1.2) owned or operated by Tier A Municipalities; and

ii. Municipal maintenance yards and other ancillary operations (see Part IV.B.5.c) owned or operated by Tier A Municipalities.

b. Eligible Non-Stormwater Discharges – Except as identified in Part II.C.3.e below, the following new and existing non-stormwater discharges from small MS4s owned or operated by Tier A Municipalities and from Municipal maintenance yards and other ancillary operations (see Part IV.B.5.c) owned or operated by Tier A Municipalities are eligible for authorization under this permit:

i. Potable water line flushing and discharges from potable water sources, excluding the discharge of filter backwash and first flush water from potable well development/redevelopment activities utilizing chemicals in accordance with N.J.A.C. 7:9D. The volume of first flush water, which is a minimum of three times the volume of the well water column, shall be handled and disposed of properly;

ii. Uncontaminated ground water (e.g. infiltration, crawl space or basement sump pumps, foundation or footing drains, rising ground waters);

iii. Air conditioning condensate (excluding contact and non-contact cooling water; and industrial refrigerant condensate);

iv. Irrigation water (including landscape and lawn watering runoff);

v. Flows from springs, riparian habitats, wetlands, water reservoir discharges and diverted stream flows;

vi. Residential car washing water; and dechlorinated swimming pool discharges from single family residential homes;

vii. Sidewalk, driveway and street wash water;

viii. Flows from firefighting activities including the washing of fire fighting vehicles;

ix. Flows from clean water rinsing of beach maintenance equipment immediately following use and only if the equipment is used for its intended purpose;

x. Flows from clean water rinsing of equipment and vehicles used in the application of salt and de-icing materials. Prior to rinsing, all equipment shall be cleaned using dry methods such as shoveling and sweeping. Recovered materials are to be returned to storage or properly discarded; and

xi. Rinsing of equipment in Part II.C.2.b.ix and x, above is limited to exterior, undercarriage, and exposed parts and does not apply to engines or other enclosed machinery.

3. Discharges Not Authorized Under the Tier A MS4 NJPDES Permit

a. Stormwater Discharges Associated with Industrial Activity

i. The Tier A MS4 NJPDES Permit does not authorize “stormwater discharge associated with industrial activity” as defined in N.J.A.C. 7:14A-1.2 except as otherwise specifically provided in this permit.

ii. Types of facilities that a Tier A Municipality might operate and that are considered to be engaging in “industrial activity” include but are not limited to certain: 1) landfills; 2) transportation facilities (including certain local passenger transit and air transportation facilities); 3) facilities handling domestic sewage or sewage sludge; and 4) steam electric power generating facilities.

iii. Any municipality that operates an industrial facility with such a discharge must submit a separate Request for Authorization (RFA) or individual permit application for that discharge (see www.nj.gov/dep/dwq/forms_storm.htm). An RFA submitted for the Tier A MS4 NJPDES Permit does not qualify as an RFA for such a discharge.

iv. Yard Trimmings and Wood Waste Management Sites that are not owned and operated by the Tier A Municipality.

b. Stormwater Discharges Associated with Construction Activity

i. The Tier A MS4 NJPDES Permit does not authorize "stormwater discharges associated with construction activity" as described in N.J.A.C. 7:14A-24.10(a). In general, this is the discharge to surface water of stormwater from construction activity that disturbs at least one acre.

ii. Any municipality that operates a construction site with such a discharge shall submit a separate RFA under NJPDES Permit No. NJ0088323 (General Stormwater Permit Construction Activity, see www.nj.gov/dep/dwq/5g3.htm), or an application for an individual permit for that discharge. An RFA submitted for the Tier A MS4 NJPDES Permit does not qualify as an RFA for such a discharge. See Part IV.B.3 of the Tier A MS4 NJPDES Permit.

c. Stormwater Discharges Authorized under Another NJPDES Permit

i. The Tier A MS4 NJPDES Permit does not authorize any stormwater discharge that is authorized under another NJPDES permit.

ii. A Tier A Municipality does not have to implement measures contained in this NJPDES permit for stormwater discharges at facilities owned or operated by that municipality that are regulated under a separate NJPDES stormwater permit authorizing those discharges.

d. Stormwater Discharges that Conflict with a Water Quality Management Plan

i. The Tier A MS4 NJPDES Permit does not authorize stormwater discharges from projects or activities that conflict with an adopted Areawide or Statewide Water Quality Management Plan.

e. Non-Stormwater Discharges that are Contributors of Pollutants

i. If any of the discharges listed in Part II.C.2.b above are identified by the Tier A Municipality as a significant contributor of pollutants to or from the MS4, the Tier A Municipality must address the discharge as an illicit connection or as an improper disposal of waste as specified in Part IV.B.6 of this permit.

D. Administrative Process

1. Automatic Renewal of Authorizations

a. Upon reissuance of this general permit, existing authorizations shall be automatically renewed as provided by N.J.A.C. 7:14A-6.13(d)9 and 25.4(a)3 using the information provided in the permittees' most recently submitted RFA.

2. Notification of Changes

a. A Tier A Municipality shall provide a corrected RFA to the Department within 90 days of the effective date of a renewed authorization under this general permit if any information in its most recently submitted RFA is no longer true, accurate, and/or complete.

b. The Tier A Municipality shall notify the Department of any changes of its Municipal Stormwater Program Coordinator information using www.nj.gov/dep/dwq/pdf/msrp_update_form.pdf

c. A Tier A Municipality that already has authorization to discharge from a small MS4 under the Tier A permit does not need to submit an RFA for the expansion (e.g. new residential development) of an existing small MS4.

3. Requests for Authorization (RFA, see www.nj.gov/dep/dwq/forms_storm.htm)

a. New RFAs under the Tier A MS4 permit

i. A single RFA is required for the entire eligible discharge from the small MS4 owned or operated by and located within a single municipality. Multiple RFAs are not required for multiple municipal operations (e.g., municipally owned and operated maintenance yards or other ancillary operations, facilities, garages, and/or offices).

ii. An RFA shall include at a minimum: the name and address of the municipality; the name and address of the Municipal Stormwater Program Coordinator; a certification acknowledging the best management practices and measurable goals specified in the permit; and any other information as required by the Department.

b. Upon receipt of an RFA the Department may, in accordance with N.J.A.C. 7:14A-6.13, do one of the following:

i. Issue notification of authorization under this permit;

ii. Deny authorization under this permit and require submittal of an application for an individual permit; or

iii. Deny authorization under this permit and require submittal of an RFA for another general permit.

c. Reassignment of Municipality to Tier A

i. If a municipality receives notice from the Department (pursuant to N.J.A.C. 7:14A-25.3(a)(3)) that it has been reassigned from Tier B to Tier A (pursuant to N.J.A.C. 7:14A-25.3(a)(1) and (2)), the deadline to submit an RFA is 180 days after the receipt of that notice, unless the Department approves a later date.

PART III
Recordkeeping and Reporting

The Tier A Municipality shall keep records necessary to document, in the Annual Report and Certification, the status of compliance with the conditions of this permit. The requirement to keep records and to submit an Annual Report and Certification is found at Part IV.G of this permit.

PART IV

SPECIFIC REQUIREMENTS: NARRATIVE

Notes and Definitions

A. Footnotes

1. Acronyms

a. Stormwater acronyms included in this permit are as follows:

i. "BMP" - Best Management Practice

ii. "CFR" - Code of Federal Regulations

iii. "EDPA" - Effective Date of Permit Authorization

iv. "MS4" - Municipal Separate Storm Sewer System

v. "MSWMP" - Municipal Stormwater Management Plan

vi. "MSRP" - Municipal Stormwater Regulation Program

vii. "MTD" - Manufactured Treatment Device

viii. "N.J.A.C." - New Jersey Administrative Code

ix. "NJPDES" - New Jersey Pollutant Discharge Elimination System

x. "N.J.S.A." - New Jersey Statutes Annotated

xi. "RSIS" - Residential Site Improvement Standards

xii. "SPPP" - Stormwater Pollution Prevention Plan

xiii. "TMDL" - Total Maximum Daily Load

2. Internal Cross References

a. For the purposes of this permit:

i. References to Part IV Notes and Definitions are preceded with the words "Notes and Definitions" (e.g. Notes and Definitions Part IV.A.1 refers to Acronyms).

ii. References to Part IV Tier A MS4 NJPDES Permit are not preceded by descriptive text (e.g. Part IV.A.1 refers to Overview of the Tier A MS4 NJPDES Permit).

3. Department Resources for Guidance Relating to MS4 Issues

a. MS4 main website and related links: www.nj.gov/dep/dwq/msrp_home.htm

b. MS4 Tier A Guidance document: www. nj.gov/dep/dwq/tier_a_guidance.htm

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c. Construction Site Stormwater Runoff: www.nj.gov/dep/dwq/5g3.htm

d. Snow Removal and Disposal Policy: www.nj.gov/dep/dwq/bnpc_home.htm

e. Green Infrastructure and related links: www.nj.gov/dep/gi/

f. Stormwater management information and training tools: www.nj.gov/dep/stormwater/

g. Public education for stormwater pollution: www.cleanwaternj.org

h. Clean Communities, a statewide litter abatement program: www.njclean.org

i. Total Maximum Daily Load (TMDL) information: www.nj.gov/dep/dwq/msrp-tmdl-rh.htm

4. EPA Resources for Guidance Relating to MS4 Issues

a. EPA's MS4 website and related links:
www.epa.gov/npdes/stormwater-discharges-municipal-sources

b. EPA's National Menu of Stormwater Best Management Practices:
www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater

c. EPA's guidance for Green Infrastructure:
http://water.epa.gov/infrastructure/greeninfrastructure/index.cfm

d. Guidance from EPA Region 3 for municipalities that wish to improve their municipal stormwater programs: www.epa.gov/npdes/pubs/region3_factsheet_swmp.pdf

e. EPA's Trash Free Waters resource page: www.epa.gov/trash-free-waters

f. Illicit Discharge Detection and Elimination Guidance
www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf

B. Definitions

1. Definitions

a. All words and terms used in this permit shall have meanings as defined in the "Regulations Concerning the New Jersey Pollutant Discharge Elimination System" (N.J.A.C. 7:14A), unless otherwise stated or unless the context clearly requires a different meaning.

b. "Catch Basin" means a cistern, vault, chamber or well that is usually built along a street as part of the storm sewer system to capture sediment, debris, and pollutants.

c. "Effective Date of Permit Authorization" means the date the permittee's authorization to discharge under this Tier A MS4 NJPDES permit becomes effective. This date may be found on the permittee's Authorization to Discharge.

d. "Existing permittee" means a municipality that held an authorization to discharge under the Tier A MS4 NJPDES permit on or before December 31, 2017.

e. "Green infrastructure" means methods of stormwater management that reduce wet weather/stormwater volume, flow, or changes the characteristics of the flow into combined or separate sanitary or storm sewers, or surface waters, by allowing the stormwater to infiltrate, to be treated by vegetation or by soils, or to be stored for reuse. Green infrastructure includes, but is not limited to, pervious paving, bioretention basins, vegetated swales, and cisterns.

f. "Illicit connection" means any physical or non-physical (i.e. leak, flow, or overflow into the municipal separate storm sewer system) connection that discharges the following to a municipal separate storm sewer system (unless that discharge is authorized under a NJPDES permit other than this Tier A MS4 NJPDES permit);

   i. Domestic sewage;

   ii. Non-contact cooling water, process wastewater, or other industrial waste (other than stormwater); or

   iii. Any category of non-stormwater discharges that a permittee for the MS4 identifies as a source or significant contributor of pollutants pursuant to 40 C.F.R. 122.34(b)(3)(iii).

g. "Maintenance plan" means a maintenance plan pursuant to N.J.A.C. 7:8-5.2(b) and 5.8 prepared by the design engineer for the stormwater management measures incorporated into the design of a major development.

h. "Major development" means any development that provides for ultimately disturbing one or more acres of land and any additional development defined as "major development" by a municipality's stormwater control ordinance. Disturbance is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation. Projects undertaken by any government agency which otherwise meet the definition of "major development" but which do not require approval under the Municipal Land Use Law, N.J.S.A. 40:55D-1et seq., are also considered "major development."

i. "Manufactured treatment device" means a pre-fabricated stormwater treatment structure utilizing settling, filtration, absorptive/adsorptive materials, vortex separation, vegetative components, and/or other appropriate technology to remove pollutants from stormwater runoff.

j. "Municipal separate storm sewer" means a municipal separate storm sewer as defined in N.J.A.C. 7:14A-1.2.

k. "Municipality" means a municipality as defined in the Municipal Land Use Law at N.J.S.A. 40:55D-5, that is, any city, borough, town, township, or village.

l. "New permittee" means a municipality that obtains its first authorization to discharge under the Tier A MS4 NJPDES permit on or after January 1, 2018.

m. "Permanent structure" means a permanent building or permanent structure that is anchored to a permanent foundation with an impermeable floor, and that is completely roofed and walled (a door is recommended, but not required). A fabric frame structure is a permanent structure if it meets the following specifications:

   i. Concrete blocks, jersey barriers or other similar material shall be placed around the interior of the structure to protect the side walls during loading and unloading of de-icing materials;

   ii. The design shall prevent stormwater run-on and run through and the fabric cannot leak;

   iii. The structure shall be erected on an impermeable slab;

   iv. The structure cannot be open sided; and

   v. The structure shall have a roll up door or other means of sealing the access way from wind driven rainfall.

n. "Small MS4" means all municipal separate storm sewers (other than "large" or "medium" municipal separate storm sewer systems as defined in N.J.A.C. 7:14A-1.2) that are:

   i. Owned or operated by municipalities described under N.J.A.C. 7:14A-25.1(b);

   ii. Owned or operated by county, State, interstate, or Federal agencies, and located at public complexes as described under N.J.A.C. 7:14A-25.2(a)2;

   iii. Owned or operated by county, State, interstate, or Federal agencies, and located at highways and other thoroughfares as described under N.J.A.C. 7:14A-25.2(a)3; or

   iv. Owned or operated by county, State, interstate, Federal, or other agencies, and receive special designation under N.J.A.C. 7:14A-25.2(a)4.

   v. Note that all MS4s covered under the Tier A MS4 NJPDES permit are "small MS4s".

o. "Solids and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids as defined at N.J.A.C. 7:14A-25.6(b)3iii.

p. "Storm drain inlet" means the point of entry into the storm drain system and is, where a catch basin is present, the uppermost portion (or cover) of a catch basin.

q. "Stormwater" means water resulting from precipitation (including rain and snow) that runs off the land's surface; is transmitted to the subsurface; is captured by separate storm sewers or other sewerage or drainage facilities; or is conveyed by snow removal equipment.

r. "Stormwater facility" includes, but is not limited to: catch basins, detention basins, retention basins, filter strips, riparian buffers, infiltration trenches, sand filters, constructed wetlands, wet basins, bioretention systems, low flow bypasses, and stormwater conveyances. Stormwater facilities include structural stormwater management measures.

s. "Stormwater management basin" means an excavation or embankment and related areas designed to retain stormwater runoff. A stormwater management basin may either be normally dry (that is, a detention basin or infiltration basin), retain water in a permanent pool (a retention basin or wet pond), or be planted mainly with wetland vegetation (most constructed stormwater wetlands).

t. "Stormwater management measure" means any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal non-stormwater discharges into stormwater conveyances. Stormwater management measures include stormwater facilities.

u. "Stream scouring" means the erosion or removal of streambed or bank material by the physical action of flowing water and the sediment that it carries.

v. "Subsurface infiltration/detention system" means a vault, perforated pipe, and/or stone bed that is located entirely below the ground surface and that temporarily stores and attenuates stormwater runoff."

w. "Tier A Municipality's MS4" means an MS4 owned and operated by a Tier A Municipality.

x. "Wood waste" means source separated whole trees, tree trunks, tree parts, tree stumps, brush and leaves provided that they are not composted, and lumber (non-chemically treated and unpainted);

y. "Yard trimmings" means grass clippings, leaves, wood chips from tree parts, and brush.

z. "Yard waste" means loose leaves and grass clippings.

Tier A Municipal Stormwater General Permit

A. Permit Overview

1. Overview of the Tier A MS4 NJPDES Permit

a. The Tier A Municipality (i.e. the permittee) is required to develop, update, implement and enforce an MS4 stormwater program. A primary objective of the MS4 stormwater program is to implement best management practices and other measures that are designed to achieve the permit's requirement to reduce the discharge of pollutants from the Tier A Municipality's MS4, municipal maintenance yards and other ancillary operations, to the maximum extent practicable pursuant to N.J.A.C. 7:14A-25.6(a)1 and 40 CFR 122.34(a), to protect water quality, and to satisfy the applicable water quality requirements of the Clean Water Act.

2. Primary Plans Required by the Tier A MS4 NJPDES Permit

a. The Stormwater Pollution Prevention Plan (SPPP) documents the Tier A Municipality's stormwater program and describes the measures necessary for compliance with the Statewide Basic Requirements as well as any Other Control Measures, Additional Measures and/or Optional Measures (if deemed appropriate). See Part IV.F (SPPP) and Attachment A (Measurable Goals and Implementation Schedule for Existing Permittees) and Attachment A-1 (Measurable Goals and Implementation Schedule for New Permittees).

b. A significant component of the SPPP is the Municipal Stormwater Management Plan (MSWMP). The MSWMP is also a component of the municipal master plan (N.J.S.A. 40:55D-94). The MSWMP describes the municipality's strategy, structure and process for addressing stormwater runoff from new development and redevelopment to ensure compliance with the Stormwater Management rules (N.J.A.C. 7:8 et seq.). This strategy, structure and process also constitutes much of the post construction stormwater management program in this permit. See Part IV.B.4 (Post Construction). Any MSWMP that complies with N.J.A.C. 7:8 also complies with this condition and Part IV.B.4.f (MSWMP).

3. Summary of Tier A MS4 NJPDES Permit Requirements

a. The Tier A Municipality shall develop, update, implement and enforce a stormwater program as documented in an SPPP to ensure compliance with:

   i. The Statewide Basic Requirements. See Part IV.B;

   ii. Other Control Measures. See Part IV.C;

   iii. Additional Measures. See Part IV.D; and

   iv. Optional Measures, if deemed appropriate See Part IV.E.

b. The Tier A Municipality shall develop, update, implement and maintain a written SPPP in conformance with Attachment A (Measurable Goals and Implementation Schedule for Existing Permittees) and Attachment A-1 (Measurable Goals and Implementation Schedule for New Permittees). See Part IV.A.2.a and IV.F (SPPP).

c. The Tier A Municipality shall submit an Annual Report and Certification summarizing the status of compliance with this permit. See Part IV.G (Annual Report and Certification).

d. The Tier A Municipality shall adopt, amend and implement a written MSWMP. See Part IV.A.2.b and B.4.f (MSWMP).

Tier A Municipal Stormwater General Permit

e. The Tier A Municipality shall modify and update its stormwater program (including applicable plans and ordinances) to conform with applicable new legislation; or new or amended regulations. Such modification shall be completed and effective within 12 months of written notification by the Department of the need for modification.

B. Statewide Basic Requirements and Associated Conditions

1. Minimum Standards for Public Involvement and Participation Including Public Notice

a. Tier A Municipalities shall comply with applicable State and local public notice requirements when providing for public participation in the development and implementation of a MS4 stormwater program. Requirements include but are not limited to:

i. The Open Public Meetings Act ("Sunshine Law," N.J.S.A. 10:4-6 et seq.);

ii. Statutory procedures for the enactment of ordinances (N.J.S.A. 40:49-2), including the municipal stormwater control ordinance and other ordinances adopted to comply with Part IV of this permit; and

iii. The Municipal Land Use Law concerning the adoption or amendment of the MSWMP (N.J.S.A. 40:55D-13, 28 and 94), and the review of applications for development (N.J.S.A. 40:55D-12). The Tier A Municipality shall also ensure that applicants for development meet the notice requirements of N.J.S.A. 40:55D-12.

b. Tier A Municipalities shall make elements of its MS4 stormwater program available to the public:

i. Provide the current SPPP upon request as required by Part IV.F.1.g (SPPP);

ii. Post the current SPPP on its website to the extent required by Part IV.F.1.f (SPPP); and

iii. Post the current MSWMP and all ordinances required by this permit on its website or otherwise comply with the notification requirements of N.J.A.C. 7:8-4.4(e). See Part IV.B.4.f (MSWMP), 4.g (Stormwater Control Ordinance), 5.a (Community Wide Ordinances).

c. The Tier A Municipality may involve another entity (e.g. a watershed association) to satisfy one or more of the Tier A Municipality's NJPDES permit condition(s) (or component thereof) through the implementation of one or more best management practices or control measures. See Part IV.F.4 (Implementation of SPPP Conditions through Shared or Contracted Services).

d. The Tier A Municipality shall maintain records necessary to demonstrate compliance with the public participation requirements of a, above.

e. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Public Involvement and Participation specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

f. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Public Involvement and Participation specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

2. Minimum Standards for Local Public Education and Outreach

a. The Tier A Municipality shall implement a Public Education and Outreach Program that focuses on educational and pollution prevention activities about the impacts of stormwater discharges on surface water and groundwater and to involve the public in reducing pollutants in stormwater and mitigating flow. The Tier A Municipality shall annually conduct activities that total at least 12 points and include activities from at least three of the five categories as set forth in Attachment B (Points System for Public Education and Outreach Activities). At a minimum, at least one of the activities shall involve educating businesses and the general public of hazards associated with illicit connections and improper disposal of waste. Records shall be kept necessary to demonstrate compliance with this requirement, including date of activities and any other relevant documentation.

b. The Tier A Municipality shall label all storm drain inlets for those drains that do not have permanent wording cast into the structure of the inlet. The Tier A Municipality shall also maintain the legibility of those labels and replace any labels that are missing or not legible. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for specific measures. This requirement shall include the following:

    i. All storm drain inlets along sidewalks that are adjacent to municipal streets;

    ii. All storm drain inlets within plazas, parking areas or maintenance yards that are operated by the municipality.

c. The Tier A Municipality shall advertise public involvement program(s) pertaining to education and outreach activities on the municipality's website, through a mailing, through newspaper advertisement, or other similar means.

d. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Local Public Education and Outreach specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

e. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Local Public Education and Outreach specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

3. Minimum Standards for Construction Site Stormwater Runoff

a. Construction site stormwater runoff activities are authorized under a separate NJPDES permit, generally the Construction Activity Stormwater General Permit No. NJ0088323 pursuant to N.J.A.C. 7:14A-25.6(b)2 (or an individual permit pursuant to N.J.A.C. 7:14A-24.7(a)2). See Part II.C.3.b and www.nj.gov/dep/dwq/5g3.htm. Pursuant to N.J.A.C. 7:14A-25.7(b), the Tier A Municipality is not required to reference construction site stormwater runoff control in its SPPP.

4. Minimum Standards for Post Construction Stormwater Management in New Development and Redevelopment

a. The Tier A Municipality shall develop, update, implement and enforce its stormwater management program to address post construction stormwater runoff in new development and redevelopment and to ensure compliance with the Stormwater Management rules at N.J.A.C. 7:8 et seq. In general, the regulations at N.J.A.C. 7:8:

    i. Contain requirements for stormwater management plans and stormwater control ordinances;

ii. Provide information for the adoption and implementation of municipal stormwater management plans and regional stormwater management plans; and

iii. Establish design, performance and maintenance standards for stormwater management measures and establish safety standards for stormwater management basins.

b. The post construction stormwater management program established by the Tier A Municipality shall address stormwater runoff from the following types of major development unless any additional development is defined as "major development" by a municipality's stormwater control ordinance:

i. New development and redevelopment projects that disturb one acre or more and are not operated by the municipality (e.g. retail stores, residential complexes);

ii. New development and redevelopment projects that disturb one acre or more and are operated by the municipality itself (e.g. town complex); and

iii. All new development and redevelopment projects that disturb less than one acre and are part of a larger common plan of development or sale (e.g. phased residential development) that ultimately disturbs one acre or more.

c. The post construction stormwater management program established by the Tier A Municipality shall require compliance with the applicable design, performance and maintenance standards established under N.J.A.C. 7:8 et seq. for major development as defined in this permit.

d. The Tier A Municipality shall review and analyze development applications for compliance with Part IV.B.4 (Post Construction) of this permit even if a separate permit is required by the Department for the same or similar activity (e.g. a Land Use permit).

e. The post construction stormwater management program established by the Tier A Municipality shall ensure that any residential development and redevelopment projects that are subject to the Residential Site Improvement Standards (RSIS) for stormwater management (N.J.A.C. 5:21-7) comply with those standards, including any exception, waiver, or special area standard that was approved under N.J.A.C. 5:21 et seq.

f. The Tier A Municipality shall adopt, amend and implement a written Municipal Stormwater Management Plan (MSWMP), pursuant to N.J.A.C. 7:8 et seq., to describe the framework of the Tier A Municipality's strategy, structure and process for its post construction stormwater management program.

i. The Tier A Municipality shall submit the adopted plan for approval to the County review agency in accordance with N.J.A.C. 7:8-4;

ii. The Tier A Municipality shall notify the Department and post the approved plan and any amendments on its website (or otherwise comply with the notification requirements of N.J.A.C. 7:8-4.4(e)) within thirty days of the effective date of the plan. See Part IV.B.1.b.iii (Public Involvement and Participation);

iii. The Tier A Municipality shall review and update its MSWMP as necessary, and as a part of the reexamination of its municipal master plan in accordance with N.J.A.C. 7:8-4.3(c) and (d).

g. In order to implement the post construction stormwater management program, the Tier A Municipality shall adopt, amend, implement and enforce a municipal stormwater control ordinance. The Tier A Municipality shall develop and adopt the contents of the ordinance in accordance with N.J.A.C. 7:8 et seq. A sample stormwater ordinance consistent with the requirements of the Stormwater Management Rules is posted at www.nj.gov/dep/stormwater/bmp_manual2.htm and a sample stormwater ordinance applicable to Pinelands Area Municipalities is posted at www.nj.gov/dep/stormwater/pinelands.htm. The municipal stormwater control ordinance shall include, at a minimum, the following elements:

   i. Control aspects of residential development and redevelopment projects that are not pre-empted by the RSIS;

   ii. Control stormwater from non-residential development and redevelopment projects, in accordance with the requirements at N.J.A.C. 7:8 et seq.; and

   iii. Set forth special area standards approved by the Site Improvement Advisory Board for residential development or redevelopment projects under N.J.A.C. 5:21-3.5.

h. The Tier A Municipality shall only grant a variance or exemption from the design and performance standards for stormwater management measures if the municipality has a mitigation plan which meets the following requirements:

   i. A mitigation plan must be included in an approved MSWMP and stormwater control ordinance(s). The mitigation plan shall identify measures that are necessary to offset the deficit created by granting the variance or exemption, and can be provided through a menu of design and performance standards with corresponding mitigation projects for different drainage areas within the municipality. See Chapter 3 of the NJ Stormwater BMP Manual at www.nj.gov/dep/stormwater/ for guidance; and

   ii. The municipality submits, within 30 days after the grant of a variance or exemption, a written report to the county review agency and the Department describing the variance or exemption and the required mitigation. Submit the written report to the Department at:
   NJDEP-DWQ-BNPC
   Mail Code 401-02B
   PO Box 420
   Trenton, NJ 08625-0420

i. The Tier A Municipality shall:

   i. Enforce, through the stormwater control ordinance(s) or a separate ordinance, compliance with the standards set forth in Attachment C (Design Standards for Storm Drain Inlets) of this permit to control passage of solid and floatable materials through storm drain inlets not installed by the Tier A Municipality; and

   ii. Comply with the standards set forth in Attachment C (Design Standards for Storm Drain Inlets) of this permit to control passage of solid and floatable materials through storm drain inlets installed by the municipality.

j. The Tier A Municipality shall ensure adequate long-term cleaning, operation and maintenance of stormwater management measures:

   i. Pursuant to Part IV.C.1.a (Stormwater Facilities Maintenance), owned or operated by the Tier A Municipality; and

ii. Pursuant to Part IV.C.1.b (Stormwater Facilities Maintenance), not owned or operated by the Tier A Municipality.

k. For each structural and non-structural stormwater measure (e.g. stormwater management basin, subsurface infiltration/detention system, manufactured treatment device, green infrastructure), the Tier A Municipality shall:

i. Complete a Major Development Stormwater Summary (as posted on the Department's website at www.nj.gov/dep/dwq/tier_a_forms.htm; courtesy copy provided as Attachment D of this permit) when an application is made to the Tier A Municipality after EDPA;

ii. Update the Major Development Stormwater Summary while stormwater measures are being installed;

iii. Finalize the Major Development Stormwater Summary once certificate of occupancy is issued; and

iv. Maintain a completed Major Development Stormwater Summary and make it available to the Department upon request.

l. The Stormwater Management rules (N.J.A.C. 7:8) and the Residential Site Improvement Standards for stormwater management (N.J.A.C. 5:21-7), independently and as implemented in this permit, apply to all areas of the Tier A Municipality.

m. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Post Construction Stormwater Management in New Development and Redevelopment specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

n. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Post Construction Stormwater Management in New Development and Redevelopment specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

5. Minimum Standards for Pollution Prevention / Good Housekeeping for Municipal Operators

a. Community Wide Ordinances: The Tier A Municipality shall adopt and enforce the following community wide ordinances to address improper disposal of waste:

i. Pet Waste Ordinance: Adopt and enforce an ordinance that requires pet owners or their keepers to immediately and properly dispose of their pet's solid waste deposited on any property, public or private, not owned or possessed by that person. Information on the Pet Waste Ordinance and the benefits of proper disposal of pet solid waste shall be distributed with pet licenses. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for a sample ordinance.

ii. Wildlife Feeding Ordinance: Adopt and enforce an ordinance that prohibits the feeding of any wildlife (e.g. Canada Geese) in any public park or on any other property owned or operated by the Tier A Municipality. Exclusions include wildlife confined in zoos, parks, or rehabilitation centers as well the following unconfined animals: (1) wildlife at environmental education centers; (2) feral cats as part of an approved Trap-Neuter-Release program; and (3) other kinds of unconfined animals, if any, that the ordinance specifically lists and excludes for reasons set forth in the ordinance. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for a sample ordinance.

iii. Litter Control Ordinance: Adopt and enforce a litter ordinance or enforce the existing State litter statute at N.J.S.A 13:1E-99.3. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for a sample ordinance.

iv. Improper Disposal of Waste Ordinance: Adopt and enforce an ordinance prohibiting the improper spilling, dumping, or disposal of materials other than stormwater into the MS4 system excluding those discharges as allowable under Part II.C.2.b. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for a sample ordinance.

v. Containerized Yard Waste/Yard Waste Collection Program Ordinances: (1) Adopt and enforce an ordinance that prohibits placing non-containerized yard wastes (defined as leaves and/or grass clippings) into the street; or (2) develop and implement a non-containerized yard waste collection and disposal program that includes adoption and enforcement of an ordinance that prohibits placing non-containerized yard waste at the curb or along the street within 10 feet of any storm drain inlet and at any time other than a set yard waste collection schedule. The frequency of yard waste pickups shall be determined at the discretion of the Tier A Municipality but shall be part of a set yard waste collection schedule which is noticed to all municipal residents and businesses. Any area, which the municipality determines to have no yard waste, will be exempt from the collections. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for sample ordinances.

vi. Private Storm Drain Inlet Retrofitting Ordinance: Adopt and enforce an ordinance requiring the retrofitting of existing storm drain inlets on private property to meet the standard in Attachment C (Design Standard for Storm Drain Inlets). Specifically, this ordinance: 1) shall apply to storm drain inlets, on property not owned or operated by the Tier A Municipality (e.g. condominium associations), that are in direct contact (i.e. contiguous) to repaving; repairing (excluding individual pothole repair); resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen); and reconstruction or alteration of facilities; and 2) shall not apply to a residential lot with one single family house. For a sample ordinance see www.nj.gov/dep/dwq/tier_a.htm.

vii. Additional ordinance requirements of this permit are found at Part IV.B.4.g (Stormwater Control Ordinance) above and Part IV.B.6.d (Illicit Connection Ordinance) below.

b. Community Wide Measures: The Tier A Municipality shall develop and continue to implement the following community wide pollution prevention/good housekeeping measures to control solids and floatables:

i. Street Sweeping: Tier A Municipalities shall sweep, at a minimum of once per month (weather and street surface conditions permitting), all streets (including roads or highways) that meet all of the following criteria: (1) the street is owned or operated by the municipality; (2) the street is curbed and has storm drains; (3) the street has a posted speed limit of 35 miles per hour or less; (4) the street is not an entrance or exit ramp; and (5) the street is in a predominantly commercial area.

ii. Catch Basin and Storm Drain Inlet Inspection and Cleaning: The Tier A Municipality shall inspect storm drain inlets and any associated catch basins that it owns or operates and remove sediment, trash, or debris when present. Each catch basin and inlet shall be inspected at least once every five years. The Tier A Municipality shall clean any municipally owned or operated storm drain inlet or catch basin as frequently as necessary to eliminate recurring problems and restore proper function.

iii. Tier A Municipality Storm Drain Inlet Retrofit: The Tier A Municipality shall retrofit existing Tier A Municipality owned or operated storm drain inlets that are: (1) in direct contact with any repaving, repairing (excluding individual pothole repair), or resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen); or (2) in direct contact with any reconstruction or alteration of facilities. Storm drain inlet retrofits shall meet the standard in Attachment C (Design Standards for Storm Drain Inlets).

c. Municipal Maintenance Yards and Other Ancillary Operations: The Tier A Municipality shall implement the best management practices described in Attachment E (Best Management Practices for Municipal Maintenance Yards and Other Ancillary Operations) for municipal maintenance yards and other ancillary operations owned or operated by the Tier A Municipality. Ancillary operations include but are not limited to impound yards, permanent and mobile fueling locations, and yard trimmings and wood waste management sites. The Inventory of Material and Machinery, and Inspections and Good Housekeeping practices specified in Attachment E shall be conducted at all municipal maintenance yards and other ancillary operations. Best Management Practices shall be implemented for the following activities, whenever such activities occur:

i. Fueling Operations;

ii. Discharge of Stormwater from Secondary Containment;

iii. Vehicle Maintenance;

iv. On-Site Equipment and Vehicle Washing and Wash Wastewater Containment;

v. Salt and De-icing Material Storage and Handling;

vi. Aggregate Material and Construction Debris Storage;

vii. Street Sweepings, Catch Basin Clean Out, and Other Material Storage;

viii. Yard Trimmings and Wood Waste Management Sites that are owned and operated by the Tier A Municipality; and

ix. Roadside Vegetation Management.

d. Employee Training: The Tier A Municipality shall develop, update and implement an employee training program to address Tier A MS4 NJPDES permit components and SPPP requirements. All municipal employees shall receive training on those stormwater topics applicable to their title and duties within 3 months of commencement of duties. Records including sign in sheet(s), date(s) of training, and training agenda(s) shall be kept in the SPPP. Training shall occur at least once every two years, unless otherwise specified below:

i. Yard Waste Collection Program (if applicable) – Provide training on frequency of yard waste pickups and schedule; and policy for how and when yard waste can be placed curbside. See Part IV.B.5.a.v (Yard Waste Ordinance).

ii. Monthly Sweeping of Certain Streets in Predominantly Commercial Areas - Provide training on sweeping schedules and proper management of materials collected. See Part IV.B.5.b.i (Street Sweeping).

iii. Illicit Connection Elimination and Outfall Pipe Mapping - Provide training on the impacts associated with illicit connections and details of the program including investigation techniques, physical observations, field sampling, and mapping procedures. See Part IV.B.6 (MS4 Outfall Pipe Mapping, and Illicit Discharge) and the National Menu of Stormwater Best Management Practices at www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater.

iv. Outfall Pipe Stream Scouring Detection and Control - Provide training on how to identify outfall pipe stream scouring and contributing factors. See Part IV.B.6.b (Stream Scouring).

v. Maintenance Yard Operations (including Ancillary Operations) - Provide training annually on inventory of materials and machinery, inspections and good housekeeping; fueling operations; discharge of stormwater from secondary containment; vehicle maintenance; on-site equipment and vehicle washing and wash wastewater containment; salt and de-icing material storage and handling; aggregate material and construction debris storage; street sweeping, catch basin clean out, and other material storage; yard trimmings and wood waste management sites. See Part IV.B.5.c (Municipal Maintenance Yards and Other Ancillary Operations).

vi. Waste Disposal Education - Provide training on the impacts associated with improper waste disposal, how to respond to inquiries regarding improper waste disposal, and appropriate enforcement authority.

vii. Municipal Ordinances - Provide training on the following ordinances: Pet Waste Ordinance; Wildlife Feeding Ordinance; Litter Control Ordinance; Improper Disposal of Waste Ordinance; Containerized Yard Waste/Yard Waste Collection Ordinance; and the Private Storm Drain Inlet Ordinance. Training shall include an overview of these ordinance requirements, enforcement policies and the repercussions of non-compliance with these ordinances. See Part IV.B.5.a (Community Wide Ordinances).

viii. Stormwater Facility Maintenance – Provide training annually on maintenance of stormwater facilities, and catch basin and inlet cleaning methods. See Part IV.C.1 (Stormwater Facilities Maintenance), and Part IV.B.5.b.ii (Catch Basin and Storm Drain Inlets).

ix. Construction Activity/Post-Construction Stormwater Management in New Development and Redevelopment - Provide general training on the permitting requirements for construction activity and Post-Construction Stormwater Management in New Development and Redevelopment. See Part IV.B.3 (Construction Site Runoff) and B.4 (Post Construction).

x. Provide general training annually on the Tier A Municipality’s SPPP, applicable recordkeeping requirements, and detailed training on any component applicable to an employee’s title and duties. See Part IV.F (SPPP).

xi. Training may also be conducted on stormwater-related topics that serve an educational purpose for employees.

e. Stormwater Management Design Review Training: The Tier A Municipality shall ensure that all design engineers, municipal engineers and other individuals that review the stormwater management design for development and redevelopment projects on behalf of the municipality, complete the Department approved Stormwater Management Design Review Course (see www.nj.gov/dep/stormwater/training.htm) once every five years. This includes those individuals that review any projects that are subject to the Tier A Municipality's municipal stormwater management plan and control ordinance as described in Part IV.B.4 (Post Construction). Individuals that will review stormwater management design and have not completed this course within the past five years must attend the next scheduled course offering. If unable to attend, the Tier A Municipality must notify the Department in writing no later than thirty days after the missed course offering explaining why attendance was not possible and what alternate arrangements are being made. Training completed within five calendar years prior to EDPA qualifies towards this requirement. The Tier A Municipality is required to maintain a list of the dates and names of training program participants in its SPPP.

f. Municipal Board and Governing Body Member Related Training: The Tier A Municipality shall ensure that municipal board and governing body members that review and approve applications for development and redevelopment projects, complete the "Asking the Right Questions in Stormwater Review Training Tool" posted at www.nj.gov/dep/stormwater/training.htm. This includes those individuals that review any projects for compliance with Part IV.B.4 (Post Construction) of this permit. Training must be completed by current municipal board and governing body members on or before EDPA + 6 months and by new members within six months of commencing duties. Once per term of service thereafter, municipal board and governing body members must review at least one of the tools offered under Post-Construction Stormwater Management found at the website above. The Tier A Municipality is required to maintain a list of the dates and names of training program participants in its SPPP.

g. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Pollution Prevention / Good Housekeeping for Municipal Operators specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

h. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Pollution Prevention / Good Housekeeping for Municipal Operators specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

6. Minimum Standards for MS4 Outfall Pipe Mapping, and Illicit Discharge and Scouring Detection and Control

a. Outfall Pipe Mapping: Tier A Municipalities shall develop, update and maintain an outfall pipe map showing the location of the end of all MS4 outfall pipes (tidal and non-tidal) owned or operated by the Tier A Municipality which discharge to a surface water body. The outfall pipe map shall:

i. Be current at the end of each calendar year;

ii. Show the location (and name, where known to the municipality) of all surface water bodies receiving discharges from those outfall pipes;

iii. Be included in the SPPP;

iv. Be provided to the Department by Existing Permittees on or before EDPA + 12 months and by New Permittees on or before EDPA + 36 months. New data points subsequently added to the map shall be provided to the Department annually thereafter; and

v. Be submitted electronically by December 21, 2020 via the Department's designated electronic submission service.

b. Stream Scouring: Tier A Municipalities shall develop, update and implement a program to detect, investigate and control any localized stream scouring from stormwater outfall pipes owned or operated by the municipality. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for specific measures. The Tier A Municipality shall, at a minimum:

i. Inspect each outfall pipe which discharges to a stream for localized stream scouring in the vicinity of the outfall pipe. Each outfall pipe shall be inspected at least once every five years;

ii. Inspect any outfall pipes newly identified in compliance with Part IV.B.6.a for localized stream scouring in the vicinity of the outfall pipe;

iii. When localized stream scouring is detected, document sources of stormwater that contribute to the outfall pipes identified in i and ii, above. Each identified source shall be investigated; and (1) where identified sources are located on property owned or operated by the Tier A Municipality, corrective action to reduce stormwater rate or volume shall be taken by the municipality when feasible, or (2) where identified sources are within the jurisdiction of but not located on property owned or operated by the Tier A Municipality, the municipality shall ensure proper operation and maintenance of stormwater facilities located thereon pursuant to Part IV.C.1.b (Stormwater Facilities Maintenance), below;

iv. Prioritize, schedule and complete remediation of identified localized stream scouring and take action based upon the requirements of Part IV.B.6.b.iii(1) and (2), above. If not completed, a schedule for completion shall be maintained as required in Part IV.C.1.a.iv (Stormwater Facilities Maintenance); and

v. All stream scouring restoration shall be made in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey at N.J.A.C. 2:90-1 (e.g., Conduit Outlet Protection 12-1) and the requirements for bank stabilization and channel restoration found at N.J.A.C. 7:13 et seq. All associated maintenance or repairs to stormwater facilities shall be made in accordance with N.J.A.C 7:8.

c. Illicit Discharge Detection and Elimination: The Tier A Municipality shall develop, update, implement and enforce an ongoing Illicit Discharge Detection and Elimination Program in accordance with this permit. This program shall be documented in the written SPPP, as required in Part IV.F.1.a.iii (SPPP). See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for specific measures. See also USEPA Guidance at www3.epa.gov/npdes/pubs/idde_manualwithappendices.pdf. The Tier A Municipality shall, at a minimum:

i. Conduct visual dry weather inspection of all outfall pipes owned or operated by the municipality at least once every five years to determine if dry weather flow or other evidence of illicit discharge is present. Dry weather flow is flow occurring 72 hours after a rain event.

ii. Investigate the source if evidence of illicit discharge is found;

iii. Eliminate non-stormwater discharges that are traced to their source and found to be illicit connections;

iv. Document investigations and actions taken using the Department's Illicit Connection Inspection Report Form. See www.nj.gov/dep/dwq/tier_a_forms.htm;

v. Inspect any outfall pipes newly identified in compliance with Part IV.B.6.a for illicit discharges;

vi. Investigate dry weather flows discovered during routine inspection and maintenance of other elements of the MS4; and

vii. Investigate, within three months of receipt, complaints and reports of illicit connections, including those from operating entities of interconnected MS4s.

d. The Tier A Municipality shall adopt and enforce an ordinance that prohibits illicit connections to the municipal separate storm sewer system operated by the Tier A Municipality. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for a sample ordinance.

e. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for MS4 Outfall Pipe Mapping, and Illicit Discharge and Scouring Detection and Control specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

f. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for MS4 Outfall Pipe Mapping, and Illicit Discharge and Scouring Detection and Control specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

C. Other Control Measures

1. Minimum Standards for Stormwater Facilities Maintenance

a. The Tier A Municipality shall develop, update and implement a program to ensure adequate long-term cleaning, operation and maintenance of all municipally owned or operated stormwater facilities.

i. Stormwater facility inspection and maintenance must be performed pursuant to any maintenance plans, or more frequently as needed, to ensure the proper function and operation of the stormwater facility. See www.nj.gov/dep/stormwater/maintenance_guidance.htm.

ii. The Tier A Municipality shall maintain a log sufficient to demonstrate compliance with this section; including but not limited to the stormwater facility inspected, location information of the facility inspected (location information must be specific enough to locate and identify the stormwater facility in the field; e.g. geographic coordinates), name of inspector, date of inspection, findings, and any preventative and corrective maintenance performed. Example Maintenance Logs and Inspection Records forms which are sufficient to demonstrate compliance with this section are available at www.nj.gov/dep/stormwater/maintenance_guidance.htm.

iii. The Tier A Municipality shall certify annually that municipally owned or operated stormwater facilities are properly functioning.

iv. If stormwater facilities were found not to be functioning properly and repairs were not made, then necessary preventive and corrective maintenance shall be documented and prioritized, and a schedule for such repairs shall be maintained. The Tier A Municipality shall prioritize this schedule based upon but not limited to: (1) environmental, health and safety concerns; (2) the findings of catch basin and storm drain inlet inspections performed pursuant to Part IV.B.5.b.ii, above; (3) the findings of stream scouring inspections performed pursuant to Part IV.B.6.b, above; and (4) to incorporate the findings pursuant to Part IV.C.2 (TMDL Information), below.

b. The Tier A Municipality shall develop, update, implement and enforce a program to ensure adequate long-term cleaning, operation and maintenance of stormwater facilities not owned or operated by the Tier A Municipality, not subject to the conditions of another NJPDES stormwater permit and constructed after February 7, 1984.

i. The Tier A Municipality shall ensure that stormwater facility maintenance is performed pursuant to any maintenance plans, or more frequently as needed to ensure the proper function and operation of the stormwater facility. See www.nj.gov/dep/stormwater/maintenance_guidance.htm.

ii. The Tier A Municipality shall maintain a log sufficient to demonstrate compliance with this section; including but not limited to the actions taken by the municipality to enforce compliance with the long-term cleaning, operation and maintenance program; the stormwater facility that was the subject of the action; location information of the facility that was the subject of the action (location information must be specific enough to locate and identify the stormwater facility in the field; e.g. geographic coordinates); the name of person taking the action; the date of the action; and the findings. Example Maintenance Logs and Inspection Records forms which are sufficient to demonstrate compliance with this section are available at www.nj.gov/dep/stormwater/maintenance_guidance.htm.

c. The Tier A Municipality shall maintain copies of all maintenance plans, as defined in Notes and Definitions Part IV.B.1.g of this permit, for stormwater facilities approved by the municipality. The Tier A municipality shall make copies of these maintenance plans available to the Department upon request.

d. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Stormwater Facilities Maintenance specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

e. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Stormwater Facilities Maintenance specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

2. Minimum Standards for Total Maximum Daily Load (TMDL) Information

a. Incorporation of TMDL Information Into the SPPP

i. The Tier A Municipality shall annually review approved or adopted TMDL reports to identify stormwater related pollutants listed therein and associated with any segment of surface water wholly or partially within or bordering the Tier A Municipality. This information may be accessed at www.nj.gov/dep/dwq/msrp-tmdl-rh.htm;

ii. The Tier A Municipality shall use TMDL information identified in i, above to, at a minimum, (1) assist in the prioritization of stormwater facility maintenance including schedules for repairs required at Part IV.B.6.b.iv (Stream Scouring) and IV.C.1.a.iv (Stormwater Facilities Maintenance), above; and (2) identify and develop strategies to address specific sources of stormwater related pollutants contributing to discharges authorized under this Tier A MS4 NJPDES permit. Strategies may include but are not limited to those found in the implementation section of approved or adopted TMDL reports (for examples see “Total Maximum Daily Load (TMDL) Guidance for Tier A MS4 Permittees” found at www.nj.gov/dep/dwq/msrp-tmdl-rh.htm); and

iii. The Tier A Municipality shall annually update its SPPP to list information identified in i and ii, above; and

iv. The Tier A Municipality shall incorporate any strategies identified in ii(2), above as an Optional Measure. See Part IV.E (Optional Measures) and Part IV.F.1.c (SPPP), below.

b. Existing Permittee: An existing permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Total Maximum Daily Load (TMDL) Information specified in Attachment A for Existing Permittees (Measurable Goals and Implementation Schedule).

c. New Permittee: A new permittee shall meet the minimum standards of this permit, and the measurable goals (including any recordkeeping) and implementation schedules for Total Maximum Daily Load (TMDL) Information specified in Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

D. Additional Measures

1. Incorporation of Additional Measures

a. Additional Measures are non-numeric (e.g., best management practices) or numeric effluent limitations that are expressly required to be included in a Tier A Municipality’s stormwater program by a TMDL; a regional stormwater management plan; other elements of an adopted areawide Water Quality Management Plan; or the adopted Statewide Water Quality Management Plan.

b. The Department will provide written notice of the adoption of any Additional Measure(s) to any affected Tier A Municipality. The Department will list each adopted Additional Measure in a minor modification to the Tier A MS4 NJPDES permit. For any required Additional Measure(s) other than numeric effluent limitations, the required Additional Measure(s) will specify the best management practices that shall be implemented and the measurable goals. The required Additional Measure(s) will also specify the implementation schedule.

E. Optional Measures

1. Incorporation of Optional Measures

a. Optional Measures are BMPs, developed by the Tier A Municipality, that extend beyond the requirements of the Tier A MS4 NJPDES permit and that prevent or reduce pollution to waters of the State.

b. The Tier A Municipality may, at its own discretion, incorporate Optional Measures into its MS4 stormwater program. Such BMPs shall be identified in the SPPP as Optional Measures.

c. Failure to implement an Optional Measure identified in the SPPP shall not be considered a violation of the NJPDES permit.

2. Refuse Container / Dumpster Ordinance

a. Tier A Municipalities have the option of adopting and enforcing an ordinance requiring dumpsters and other refuse containers that are outdoors or exposed to stormwater to be covered at all times. This ordinance serves to prevent the spilling, dumping, leaking, or otherwise discharge of liquids, semi-liquids or solids from the containers. This ordinance is not intended for litter receptacles; individual homeowner trash and recycling containers; containers that hold large bulky items (e.g., furniture, bound carpet and padding); permitted temporary demolition containers; and refuse containers at industrial facilities authorized to discharge stormwater under a valid NJPDES permit. For a sample ordinance see www.nj.gov/dep/dwq/tier_a.htm.

F. Stormwater Pollution Prevention Plan (SPPP)

1. SPPP Requirements

a. The Tier A Municipality shall develop, update, implement, and maintain a written SPPP (see the Tier A Municipal Guidance document www.nj.gov/dep/dwq/tier_a_guidance.htm) that:

   i. Identifies the person designated as the Municipal Stormwater Program Coordinator (Stormwater Coordinator) per Part IV.F.2 below, and the members of the SPPP Team.

   ii. Documents the municipality's Tier A MS4 Stormwater Program including a description of shared or contracted services as allowed under Part IV.F.4, below.

   iii. Describes the measures necessary for compliance with all components of the Tier A MS4 NJPDES permit including all measures described in Part IV.B, C, D and E above.

   iv. Reflects the measurable goals, implementation schedules, record keeping and other requirements in Attachment A for Existing Permittees and Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule).

b. The Tier A Municipality's Stormwater Coordinator shall sign and date the SPPP per Part IV.F.3, below.

c. The Tier A Municipality shall review the SPPP at least annually and update it as often as necessary to reflect changes related to the municipality's Tier A MS4 Stormwater Program. Any amendments to the SPPP:

   i. Shall continue to meet the requirements of this permit;

   ii. Shall be signed and dated by the Stormwater Coordinator; and

   iii. Shall be retained for a period of at least five years from the date of amendment unless the Department issues a written notice to extend the retention period.

d. The SPPP shall include any records required by this Tier A MS4 NJPDES permit. See Attachment A for Existing Permittees and Attachment A-1 for New Permittees (Measurable Goals and Implementation Schedule) for additional detail.

e. The Department may notify the Tier A Municipality at any time that the SPPP does not meet one or more of the minimum requirements. Within thirty (30) days after receiving such notification unless otherwise specified by the Department, the Tier A Municipality shall amend the SPPP to adequately address all deficiencies, and written certification of such amendments shall be submitted to the Department.

f. The current SPPP shall be posted on the Tier A Municipality's website no later than EDPA + 90 days with updates posted annually thereafter. The version posted on the website can exclude:

i. Inspection logs and other required record keeping; and

ii. The names of SPPP Team members but must include the name of the Stormwater Coordinator.

g. The SPPP shall be made available to the Department and public upon request pursuant to N.J.A.C. 7:14A-25.6(j)2.

h. New Permittee: A new permittee shall create a written SPPP as required by this section by EDPA + 12 months.

2. Designation of the Municipal Stormwater Program Coordinator (Stormwater Coordinator)

a. Each Tier A Municipality shall designate a Stormwater Coordinator.

b. The Stormwater Coordinator shall be either a principal executive officer or a ranking elected official as required at N.J.A.C. 7:14A-4.9(a)3;

c. A principal executive officer or ranking elected official of the Tier A Municipality may assign this responsibility, as allowed at N.J.A.C. 7:14A-4.9(b), to a duly authorized representative who has overall responsibility for the operation of municipal stormwater facilities or municipal environmental matters;

d. If an assignment under b or c, above changes, then a new assignment of responsibility shall be submitted to the Department. This is accomplished through completion of the online MSRP Annual Report (see Part IV.G Annual Report and Certification below) or the Stormwater Program Coordinator Information Update Sheet posted at www.nj.gov/dep/dwq/pdf/msrp_update_form.pdf. This information shall be submitted to the Department within 30 days of such change taking place.

3. Responsibilities of the Municipal Stormwater Program Coordinator (Stormwater Coordinator)

a. The Tier A Municipality shall designate a Municipal Stormwater Program Coordinator (Stormwater Coordinator). The Stormwater Coordinator is responsible for:

i. Coordinating the permittee's implementation of the SPPP and Tier A MS4 NJPDES permit conditions;

ii. Signing and dating the SPPP;

iii. Coordinating the completion and submittal of the Annual Report and Certification; and

iv. Certifying, signing and dating the Annual Report.

4. Implementation of SPPP Conditions through Shared or Contracted Services

a. The Tier A Municipality may rely on another governmental, private, or nonprofit entity to satisfy one or more of the Tier A Municipality's MS4 NJPDES permit conditions, or component thereof, through the implementation of best management practices or control measures. This is only allowable provided the following conditions are met:

   i. The other entity implements the best management practice(s) or control measure(s);

   ii. The particular best management practice(s) or control measure(s), or component(s) thereof, is at least as stringent or as frequent as the corresponding NJPDES permit requirement;

   iii. The other entity agrees in writing or is required by law to implement the measure(s), or component(s) thereof, in such a manner that is in compliance with the Tier A MS4 NJPDES permit on the Tier A Municipality's behalf; and

   iv. The Tier A Municipality specifies in its SPPP (1) which NJPDES permit conditions will be implemented by another entity and (2) the name of the responsible entity.

b. For any projects or activities which the Tier A Municipality assigns to another entity which is a private contractor, the awarded contract shall require the contractor to conduct such projects or activities in such a manner that is in compliance with the Tier A MS4 NJPDES permit.

c. The Tier A Municipality is responsible for compliance with this permit if the other entity fails to implement the measure(s) or component(s), thereof.

G. Annual Report and Certification

1. Reporting Requirements

a. The Tier A Municipality shall complete an Annual Report, including any Supplemental Questions, using the electronic format provided by the Department via the MSRP Annual Report service accessed through the Regulatory Services Portal (www.njdeponline.com). The Annual Report shall summarize the status of compliance with the conditions of this permit. Specifically, this includes compliance for the subject year between January 1 and December 31 with the Statewide Basic Requirements (Part IV.B), Other Control Measures (Part IV.C), Additional Measures (Part IV.D), Optional Measures (Part IV.E), Stormwater Pollution Prevention Plan (Part IV.F), and any other Tier A MS4 NJPDES permit conditions listed on the Annual Report form, including Supplemental Questions.

b. The Municipal Stormwater Program Coordinator shall certify, sign and date the Annual Report.

c. Submit an Annual Report and Certification: on or before May 1st annually. The Tier A Municipality shall submit the Annual Report and Certification to the Department through the Regulatory Services Portal (instructions at www.nj.gov/dep/dwq/tier_a.htm).

d. A copy of each Annual Report and Certification shall be kept at a central location and shall be made available to the Department for inspection.

e. The Tier A Municipality shall retain the Annual Report and Certification as well as any records required to be kept by this permit for a period of at least five years.

f. The Tier A Municipality shall document in the Annual Report (1) if it relies on another entity to satisfy one or more of the Tier A Municipality's MS4 NJPDES permit conditions as described in Part IV.F.4.a (Implementation of SPPP Conditions through Shared or Contracted Services), above; (2) which NJPDES permit conditions will be satisfied by another entity; and (3) the name of the governmental, private, or nonprofit entity.

Attachment A – Measurable Goals and Implementation Schedule for Existing Permittees

General

The following table specifies the Measurable Goals and Implementation Schedule of this Tier A MS4 NJPDES Permit for Existing Permittees. Each Measurable Goal and Implementation Schedule is associated with a permit citation and a summary of the associated Minimum Standard. The summary of Minimum Standard column represents a paraphrase of permit conditions. Actual Minimum Standards are found in Part IV of the permit.

An indication of whether the cited Minimum Standard is a new requirement is provided in the last column. Where a requirement is not new and not modified (and for some that are modified), the Existing Permittee is expected to be in compliance on the Effective Date of Permit Authorization (EDPA). For most new requirements (and for some modified requirements), additional time is provided for achieving compliance.

See below for specific Measurable Goals that shall be documented in the SPPP. **The SPPP shall be updated as required by Part IV.F.1.c, above.** The Implementation Schedule refers to the date that a Minimum Standard must be incorporated into the Tier A Municipality's stormwater program, along with any ongoing requirements. In addition to the requirements of Part IV.F.1 above, the SPPP shall identify and discuss the Minimum Standard of each Statewide Basic Requirement (Part IV.B, above) and Other Control Measures (Part IV.C, above) where the following information is required for each item:

- Describe the method of implementation;
- Include required recordkeeping;
- Include an implementation schedule, consistent with permit requirements, including interim milestones;
- Include any special diagrams required by the permit (e.g., stormwater facilities map); and
- Include inspection and maintenance schedules, as appropriate.

This table does not include Measurable Goals and an Implementation Schedule for the Notes and Definitions Part IV, Part IV.A (Permit Overview), Part IV.D (Additional Measures), IV.E (Optional Measures), IV.F (SPPP), and IV.G (Annual Report and Certification) because these are not Statewide Basic Requirements or Other Control Measures (see N.J.A.C. 7:14A-25.6). While not included in this table, Notes and Definitions Part IV, Part IV.A, D, E, F, and G are permit requirements and compliance is required.

Summary of Minimum Standard (See Part IV for specific permit requirements)	Permit Cite	Measurable Goal (See Part IV for specific permit requirements)	Implementation Schedule	New Requirement?
Public Involvement and Participation Including Public Notice				
Provide for public notice under the Open Public Meetings Act, statutory procedures for enactment of ordinances, and Municipal Land Use Law when providing for public participation in the development and implementation of a stormwater program, and maintain records necessary to demonstrate compliance.	IV.B.1.a & d	Certify in each annual report that all public notice requirements have been met and relevant records kept. Reference in the SPPP the location of associated municipal records.	EDPA	No
Provide the current SPPP to the public upon request.	IV.B.1.b.i	Certify in each annual report that the SPPP was made available to the public.	EDPA	No
Post the current SPPP on the municipality's website.	IV.B.1.b.ii	Certify in each annual report that the SPPP has been posted on the municipality's website (to the extent required by Part IV.F.1.f) and that the posted SPPP is current.	EDPA + 90 days	Yes
Post the current Municipal Stormwater Management Plan (MSWMP) and related ordinances on the municipality's website.	IV.B.1.b.iii	Certify in each annual report that the MSWMP and related ordinances have been posted on the municipality's website and that the posted documents are current.	EDPA + 90 days	Yes
Local Public Education and Outreach				
Implementation of a Public Education and Outreach Program by conducting activities that total a minimum of 12 points on an annual basis.	IV.B.2.a	Certify in each annual report that the minimum point value has been met and report point totals in the Annual Report. Maintain records of materials and activities from Attachment B, including dates of activities and any other relevant documentation (e.g. brochures, pictures, sign-in sheets, press clippings).	EDPA	Modified
Label storm drain inlets, maintain the legibility of those labels, and replace labels that are missing or not legible along sidewalks that are adjacent to municipal streets; and within plazas, parking areas or maintenance yards operated by the municipality.	IV.B.2.b	Certify in each annual report that storm drains have been properly labeled and/or maintained. Records tracking storm drain inlet label status shall be kept with the SPPP.	EDPA	No

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Advertise public involvement program(s) pertaining to education and outreach activities.	IV.B.2.c	Certify in each annual report that public involvement program(s) have been properly advertised on the website, through a mailing, through newspaper advertisement, or other similar means. Public advertisement records shall be kept with the SPPP.	EDPA + 12 months	Yes
Post Construction Stormwater Management in New Development and Redevelopment				
Develop, update, implement and enforce its post construction stormwater management program in new development and redevelopment to ensure compliance with the Stormwater Management rules (N.J.A.C. 7:8).	IV.B.4.a, b, c, d, e, f, g, h, i, j, l	Certify in each annual report that the Tier A Municipality has developed, and is implementing and enforcing a program to address stormwater runoff from new development and redevelopment projects. Records demonstrating compliance with Part IV.B.4 shall be kept, or their location shall be referenced, in the SPPP.	EDPA	No
For each structural and non-structural stormwater measure (e.g. basins), for which an application is made to the municipality after EDPA, the municipality shall complete, update, finalize and maintain a Major Development Stormwater Summary.	IV.B.4.k	Certify in each annual report that Major Development Stormwater Summaries (Attachment D) have been completed and records have been maintained by the Tier A municipality. Records demonstrating compliance with Part IV.B.4 shall be kept, or their location shall be referenced, in the SPPP.	EDPA	Yes
Pollution Prevention/Good Housekeeping - Community Wide Ordinances				
Adopt and enforce a pet waste ordinance. Distribute pet waste ordinance information with pet licenses.	IV.B.5.a.i	Certify in each annual report the date the ordinance was adopted, that it is being enforced and that pet waste ordinance information is distributed with pet licenses. A log of enforcement actions and information distribution dates shall be kept in the SPPP.	EDPA	No
Adopt and enforce a wildlife feeding ordinance.	IV.B.5.a.ii	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA	No

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Adopt and enforce a litter control ordinance.	IV.B.5.a.iii	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA	No
Adopt and enforce an improper disposal of waste ordinance.	IV.B.5.a.iv	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA	No
Adopt and enforce a containerized yard waste / yard waste collection program ordinance.	IV.B.5.a.v	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA	No
Adopt and enforce a private storm drain inlet retrofitting ordinance	IV.B.5.a.vi	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA	No
Pollution Prevention/Good Housekeeping - Community Wide Measures				
Develop and continue to implement street sweeping measures as specified at Part IV.B.5.b.i.	IV.B.5.b.i	Certify in each annual report that a street sweeping schedule is being maintained as well as records including the date and areas swept, number of miles of streets swept, and the total amount of materials collected in wet tons. Include totals in the Annual Report and keep records in the SPPP.	EDPA	No
Develop and continue to implement catch basin and storm drain inlet inspection and cleaning measures as specified at Part IV.B.5.b.ii.	IV.B.5.b.ii	Certify in each annual report that a catch basin and storm drain inlet inspection and cleaning schedule is being maintained, and a log indicating the number of municipally owned and operated catch basins and inlets within the municipality, the number of catch basins and inlets inspected, and the number cleaned is being maintained. Maintain records documenting the amount of materials collected in wet tons during cleaning activities in the SPPP. Include totals in the Annual Report.	EDPA	Modified

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Develop and continue to implement storm drain inlet retrofit measures as specified at Part IV.B.5.b.iii.	IV.B.5.b.iii	Certify in each annual report that a record of the number and location of storm drain inlets retrofitted as well as the number and location of storm drain inlets exempted is being maintained. Include totals in the Annual Report and keep records in the SPPP.	EDPA	No
Pollution Prevention/Good Housekeeping - Municipal Maintenance Yards and Other Ancillary Operations				
Implement the BMP's found in Attachment E, including the Inventory of Materials and Machinery, and Inspections and Good Housekeeping practices, at Municipal Maintenance Yards and Other Ancillary Operations.	IV.B.5.c	Certify in each annual report that the SPPP includes all applicable requirements and that the requirements (including maintenance of inspection logs and tracking forms) of Attachment E have been met. Keep records required by Attachment E in the SPPP.	EDPA	No
BMPs shall be implemented for fueling operations.	IV.B.5.c.i	Certify in each annual report that BMPs in Attachment E have been implemented for fueling operations.	EDPA	No
BMPs shall be implemented for discharge of stormwater from secondary containment.	IV.B.5.c.ii	Certify in each annual report that BMPs in Attachment E have been implemented for discharge of stormwater from secondary containment.	EDPA	No
BMPs shall be implemented for vehicle maintenance.	IV.B.5.c.iii	Certify in each annual report that BMPs in Attachment E have been implemented for vehicle maintenance.	EDPA	No
BMPs shall be implemented for on-site equipment and vehicle washing and wash wastewater containment.	IV.B.5.c.iv	Certify in each annual report that BMPs in Attachment E have been implemented for on-site equipment and vehicle washing and wash wastewater containment.	EDPA	Modified
BMPs shall be implemented for salt and de-icing material storage and handling.	IV.B.5.c.v	Certify in each annual report that BMPs in Attachment E have been implemented for salt and de-icing material storage and handling.	EDPA	No
BMPs shall be implemented for aggregate material and construction debris storage.	IV.B.5.c.vi	Certify in each annual report that BMPs in Attachment E have been implemented for aggregate material and construction debris storage.	EDPA + 12 months	Yes

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
BMPs shall be implemented for street sweepings and catch basin clean-out material storage.	IV.B.5.c.vii	Certify in each annual report that BMPs in Attachment E have been implemented for street sweepings and catch basin clean-out material storage.	EDPA + 12 months	Yes
BMPs shall be implemented for yard trimmings and wood waste management sites.	IV.B.5.c.viii	Certify in each annual report that BMPs in Attachment E have been implemented for yard trimmings and wood waste management sites.	EDPA + 12 months	Yes
BMPs shall be implemented for roadside vegetation management.	IV.B.5.c.ix	Certify in each annual report that BMPs in Attachment E have been implemented for roadside vegetation management.	EDPA + 12 months	Yes
Pollution Prevention/Good Housekeeping - Training Program				
Provide training to municipal employees within 3 months of commencement of duties, and at least once every two years thereafter, to address all required components. The exceptions are Part IV.B.5.d.v, viii, and x which require annual training instead of once every two years.	IV.B.5.d	Certify in each annual report that employee training has been conducted, and maintain records including sign in sheet(s), date(s) of training, and training agenda(s). These records shall be kept in the SPPP.	EDPA + 12 months	Modified
Ensure that individuals that review development and redevelopment projects for compliance with N.J.A.C. 7:8 on behalf of the municipality complete Department approved training once every five years.	IV.B.5.e	Certify in each annual report that individuals reviewing projects have completed the required training, and maintain a list of the names and dates that individuals received training. This list shall be kept in the SPPP.	EDPA + 12 months	Yes
Ensure that current Municipal Board and Governing Body Members that review and approve applications for development and redevelopment projects complete the "Training Tool" on or before EDPA + 6 months, and by new members within 6 months of commencement of duties. Once per term of service thereafter, Municipal Board and Governing Body Members must review at least one of the tools offered under the Post-Construction Stormwater Management website.	IV.B.5.f	Certify in each annual report that municipal board and governing body members have completed the necessary training, and maintain a list of the names and dates that individuals completed training. This list shall be kept in the SPPP.	EDPA + 6 months	Yes

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
MS4 Outfall Pipe Mapping and Illicit Discharge and Scouring Detection and Control				
Develop, update and maintain an MS4 Outfall Pipe Map showing the location of the end of all outfall pipe which discharge to a surface water body.	IV.B.6.a.i	Certify in each annual report that the outfall pipe map is current at the end of the calendar year.	EDPA	No
Show the location (and name where known) of all surface water bodies receiving discharges from those outfall pipes.	IV.B.6.a.ii	Certify in each annual report that the surface water bodies associated with each outfall pipe end is located on the map.	EDPA	No
Include Outfall Pipe map in the SPPP	IV.B.6.a.iii	Certify in each annual report following the implementation deadline that the Outfall Pipe Map is included in the SPPP.	EDPA +12 months	Yes
Provide Outfall Pipe Map to the Department	IV.B.6.a.iv	Certify in each annual report following the implementation deadline that the Outfall Pipe Map and any new data points subsequently added to the map have been provided to the Department.	EDPA +12 months	Yes
Submitted the Outfall Pipe Map information to the Department electronically by December 21, 2020	IV.B.6.a.v	Submit the Outfall Pipe Map information to the Department using Department's designated electronic submission service by December 21, 2020.	12/21/2020	Yes
Develop, update and implement a program to detect, investigate and control localized stream scouring from stormwater outfall pipes.	IV.B.6.b	Certify in each annual report that municipally owned outfall pipes have received the required visual inspection at least once every five years and maintain a log indicating the number and location of outfall pipes inspected, repairs prioritized, and repairs scheduled or performed. Certify in the annual report that a repair schedule has been prepared for those that have not been completed. Keep records required by Part IV.B.6.b in the SPPP.	EDPA + 12 months	Modified

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Develop, update, implement and enforce an ongoing Illicit Discharge Detection and Elimination Program.	IV.B.6.c	Certify in each annual report that the municipality has developed a program to detect and eliminate illicit discharges and has conducted inspections required at Part IV.B.6.c at least once every five years. Document all investigations and actions taken on the Department's Illicit Connection Inspection Report Form. Keep records required by Part IV.B.6.c in the SPPP.	EDPA	Modified
Adopt and enforce an ordinance that prohibits illicit connections to the MS4 operated by the Tier A Municipality.	IV.B.6.d	Certify in each annual report that the ordinance is being maintained and the date it was adopted. A log of enforcement actions shall be kept in the SPPP.	EDPA	No
Stormwater Facilities Maintenance				
Develop, update and implement a program to ensure adequate long-term cleaning, operation and maintenance of all stormwater facilities owned or operated by the Tier A Municipality.	IV.C.1.a	Certify in each annual report that the municipality has developed, updated and implemented a program to ensure adequate long-term cleaning, operation and maintenance of all municipally owned stormwater facilities. Records required by Part IV.C.1.a, a.i, a.ii, a.iii and a.iv shall be kept, or their location shall be referenced, in the SPPP.	EDPA	Modified
Inspect and maintain stormwater facilities pursuant to any maintenance plans, or more frequently as needed, to ensure proper function and operation of each stormwater facility.	IV.C.1.a.i	Certify in each annual report that inspections and maintenance was performed pursuant to any maintenance plans, or more frequently as needed, to ensure proper function and operation of stormwater facilities.	EDPA	Modified

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Maintain a log sufficient to demonstrate compliance with this section; including but not limited a list of inspections and preventative and corrective maintenance performed, and a schedule for repairs to be made.	IV.C.1.a.ii	Certify in each annual report that a maintenance log is kept that, at a minimum, records the stormwater facility inspected, location information of the facility inspected (location information must be specific enough to locate and identify the stormwater facility in the field; e.g. geographic coordinates), name of inspector, date of inspection, findings, and any preventative and corrective maintenance performed.	EDPA	Modified
Certify annually that municipally owned or operated stormwater facilities are properly functioning.	IV.C.1.a.iii	Certify in each annual report that all municipally owned or operated stormwater facilities are properly functioning.	EDPA	No
If stormwater facilities were found not to be functioning properly and repairs not made, then necessary preventative and corrective maintenance shall be documented and prioritized and a schedule for maintenance shall be maintained.	IV.C.1.a.iv	Certify in each annual report that a prioritized schedule of necessary preventive and corrective maintenance exists for stormwater facilities inspected and found not to be functioning properly. The municipality shall prioritize this schedule as specified in Part IV.C.1.iv.	EDPA	Modified
Develop, update, implement and enforce a program to ensure adequate long-term cleaning, operation and maintenance of stormwater facilities not owned or operated by the Tier A Municipality, not subject to the conditions of another NJPDES stormwater permit and constructed after February 7, 1984.	IV.C.1.b	Certify in each annual report that the municipality has developed, updated, implemented and enforced a program to ensure adequate long-term cleaning, operation and maintenance of stormwater facilities not owned and operated by the municipality, not subject to the conditions of another NJPDES stormwater permit and constructed after February 7, 1984. Records required by Part IV.C.1.b, b.i and b.ii shall be kept, or their location shall be referenced, in the SPPP.	EDPA + 12 months	Modified

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Ensure that stormwater facility inspection and maintenance is performed pursuant to any maintenance plans, or more frequently as needed to ensure proper function and operation of each stormwater facility.	IV.C.1.b.i	Certify in each annual report that maintenance was performed pursuant to any maintenance plans, or more frequently, to ensure proper function and operation of stormwater facilities not owned and operated by the municipality.	EDPA + 12 months	Modified
Maintain a log sufficient to demonstrate compliance with this section; including but not limited actions taken by the municipality to enforce compliance with the long-term cleaning, operation and maintenance program.	IV.C.1.b.ii	Certify in each annual report that a log is being kept that, at a minimum, records the actions taken by the municipality to enforce compliance with the long-term cleaning, operation and maintenance program; the stormwater facility that was the subject of the action; location information of the facility that was the subject of the action (location information must be specific enough to locate and identify the stormwater facility in the field; e.g. geographic coordinates); the name of person taking the action; the date of the action; and the findings.	EDPA + 12 months	Modified
Maintain copies of all maintenance plans for stormwater facilities approved by the municipality, and make them available to the Department upon request.	IV.C.1.c	Certify in each annual report that copies of all maintenance plans are kept on file. Records required by Part IV.C.1.c shall be kept, or their location shall be referenced, in the SPPP.	EDPA + 12 months	Yes
Total Maximum Daily Load (TMDL) Info.				
Annually review approved or adopted TMDL reports to identify stormwater related pollutants listed therein and associated with any segment of surface water wholly or partially within or bordering the Tier A Municipality.	IV.C.2.a.i	Certify in each annual report that approved or adopted TMDLs have been identified and reviewed and stormwater related pollutants identified. Records required by Part IV.C.2.a.i, a.ii and a.iii shall be kept in the SPPP.	EDPA + 12 months	Yes

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**	**New Requirement?**
Use TMDL information identified in compliance with Part IV.C.2.a.i to: (1) assist in the prioritization of stormwater facility maintenance including schedules for repairs related to Stream Scouring and Stormwater Facilities Maintenance; and (2) identify and develop strategies to address specific sources of stormwater related pollutants contributing to discharges authorized under this Tier A MS4 NJPDES permit.	IV.C.2.a.ii	Certify in each annual report that the municipality has used information identified in compliance with Part VI.C.2.a.i to (1) assist in the prioritization of repairs as required at Part IV.B.6.b.iv (Stream Scouring) and IV.C.31.a.iv (Stormwater Facilities Maintenance); and (2) identify and develop strategies to address specific sources of stormwater related pollutants contributing to discharges authorized under this Tier A MS4 NJPDES permit.	EDPA + 12 months	Yes
Update SPPP to list information identified in Part VI.C.2.a.i and ii.	IV.C.2.a.iii	Certify in each annual report that the municipality has updated its SPPP to list information identified in Part VI.C.2.a.i and ii.	EDPA + 12 months	Yes
Incorporate any strategies identified in Part VI.C.2.a.ii(2) as an Optional Measure	IV.C.2.a.iv	Certify in each annual report that the municipality has incorporated any strategies identified in Part VI.C.2.a.ii(2) as an Optional Measure.	EDPA + 12 months	Yes

Attachment A-1 – Measurable Goals and Implementation Schedule for New Permittees

General

The following table specifies the Measurable Goals and Implementation Schedule of this Tier A MS4 NJPDES Permit for New Permittees. Each Measurable Goal and Implementation Schedule is associated with a permit citation and a summary of the associated Minimum Standard. The summary of Minimum Standard column represents a paraphrase of permit conditions. Actual Minimum Standards are found in Part IV of the permit.

See below for specific Measurable Goals that shall be documented in the SPPP. **The SPPP shall be created by EDP + 12 months and updated on annual basis thereafter as required by Part IV.F.** The Implementation Schedule refers to the date that a Minimum Standard must be incorporated into the Tier A Municipality's stormwater program, along with any ongoing requirements. In addition to the requirements of Part IV.F above, the SPPP shall identify and discuss the Minimum Standard of each Statewide Basic Requirement (Part IV.B, above) and Other Control Measures (Part IV.C, above) where the following information is required for each item:

- Describe the method of implementation;
- Include required recordkeeping;
- Include an implementation schedule, consistent with permit requirements, including interim milestones;
- Include any special diagrams required by the permit (e.g., stormwater facilities map); and
- Include inspection and maintenance schedules, as appropriate.

This table does not include Measurable Goals and an Implementation Schedule for the Notes and Definitions Part IV, Part IV.A (Permit Overview), Part IV.D (Additional Measures), IV.E (Optional Measures), IV.F (SPPP), and IV.G (Annual Report and Certification) because these are not Statewide Basic Requirements or Other Control Measures (see N.J.A.C. 7:14A-25.6). While not included in this table, Notes and Definitions Part IV, Part IV.A, D, E, F, and G are permit requirements and compliance is required.

Measurable Goals for Statewide Basic Requirements and Other Conditions of this Permit for New Permittees			
Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**
Public Involvement and Participation Including Public Notice			
Provide for public notice under the Open Public Meetings Act, statutory procedures for enactment of ordinances, and Municipal Land Use Law when providing for public participation in the development and implementation of a stormwater program, and maintain records necessary to demonstrate compliance.	IV.B.1.a & d	Certify in each annual report that all public notice requirements have been met and relevant records kept. Reference in the SPPP the location of associated municipal records.	EDPA
Provide the current SPPP to the public upon request.	IV.B.1.b.i	Certify in each annual report that the SPPP was made available to the public.	EDPA + 12 months
Post the current SPPP on the municipality's website.	IV.B.1.b.ii	Certify in each annual report that the SPPP has been posted on the municipality's website (to the extent required by Part IV.F.1.f) and that the posted SPPP is current.	EDPA + 12 months)
Post the current Municipal Stormwater Management Plan (MSWMP) and related ordinances on the municipality's website.	IV.B.1.b.iii	Certify in each annual report that the MSWMP and related ordinances have been posted on the municipality's website and that the posted documents are current.	EDPA + 90 days
Local Public Education and Outreach			
Implementation of a Public Education and Outreach Program by conducting activities that total a minimum of 12 points on an annual basis.	IV.B.2.a	Certify in each annual report that the minimum point value has been met and report point totals in the Annual Report. Maintain records of materials and activities from Attachment B, including dates of activities and any other relevant documentation (e.g. brochures, pictures, sign-in sheets, press clippings).	EDPA

Summary of Minimum Standard (See Part IV for specific permit requirements)	**Permit Cite**	**Measurable Goal** (See Part IV for specific permit requirements)	**Implementation Schedule**
Label storm drain inlets, maintain the legibility of those labels, and replace labels that are missing or not legible along sidewalks that are adjacent to municipal streets; and within plazas, parking areas or maintenance yards operated by the municipality.	IV.B.2.b	Certify in each annual report that storm drains have been properly labeled and/or maintained. Records tracking storm drain inlet label status shall be kept with the SPPP.	EDPA
Advertise public involvement program(s) pertaining to education and outreach activities.	IV.B.2.c	Certify in each annual report that public involvement program(s) have been properly advertised on the website, through a mailing, through newspaper advertisement, or other similar means. Public advertisement records shall be kept with the SPPP.	EDPA + 12 months
Post Construction Stormwater Management in New Development and Redevelopment			
Develop, update, implement and enforce its post construction stormwater management program in new development and redevelopment to ensure compliance with the Stormwater Management rules (N.J.A.C. 7:8).	IV.B.4.a, b, c, d, e, f, g, h, i, j, l	Certify in each annual report that the Tier A Municipality has developed, and is implementing and enforcing a program to address stormwater runoff from new development and redevelopment projects. Records demonstrating compliance with Part IV.B.4 shall be kept, or their location shall be referenced, in the SPPP.	EDPA
For each structural and non-structural stormwater measure (basins), for which an application is made to the municipality after EDPA, the municipality shall complete, update, finalize and maintain a Major Development Stormwater Summary.	IV.B.4.k	Certify in each annual report that Major Development Stormwater Summaries (Attachment D) have been completed and records have been maintained by the Tier A municipality. Records demonstrating compliance with Part IV.B.4 shall be kept, or their location shall be referenced, in the SPPP.	EDPA

Pollution Prevention/Good Housekeeping - Community Wide Ordinances			
Adopt and enforce a pet waste ordinance. Distribute pet waste ordinance information with pet licenses.	IV.B.5.a.i	Certify in each annual report the date the ordinance was adopted, that it is being enforced and that pet waste ordinance information is distributed with pet licenses. A log of enforcement actions and information distribution dates shall be kept in the SPPP.	EDPA + 12 months
Adopt and enforce a wildlife feeding ordinance.	IV.B.5.a.ii	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA + 12 months
Adopt and enforce a litter control ordinance.	IV.B.5.a.iii	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA + 12 months
Adopt and enforce an improper disposal of waste ordinance.	IV.B.5.a.iv	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA + 12 months
Adopt and enforce a containerized yard waste / yard waste collection program ordinance.	IV.B.5.a.v	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA + 12 months
Adopt and enforce a private storm drain inlet retrofitting ordinance	IV.B.5.a.vi	Certify in each annual report the date the ordinance was adopted and that it is being enforced. A log of enforcement actions shall be kept in the SPPP.	EDPA + 12 months
Pollution Prevention/Good Housekeeping - Community Wide Measures			
Develop and continue to implement street sweeping measures as specified at Part IV.B.5.b.i.	IV.B.5.b.i	Certify in each annual report that a street sweeping schedule is being maintained as well as records including the date and areas swept, number of miles of streets swept, and the total amount of materials collected in wet tons. Include totals in the Annual Report and keep records in the SPPP.	EDPA + 24 months

Develop and continue to implement catch basin and storm drain inlet inspection and cleaning measures as specified at Part IV.B.5.b.ii.	IV.B.5.b.ii	Certify in each annual report that a catch basin and storm drain inlet inspection and cleaning schedule is being maintained, and a log indicating the number of municipally owned and operated catch basins and inlets within the municipality, the number of catch basins and inlets inspected, and the number cleaned is being maintained. Maintain records documenting the amount of materials collected in wet tons during cleaning activities in the SPPP. Include totals in the Annual Report.	EDPA + 24 months
Develop and continue to implement storm drain inlet retrofit measures as specified at Part IV.B.5.b.iii.	IV.B.5.b.iii	Certify in each annual report that a record of the number and location of storm drain inlets retrofitted as well as the number and location of storm drain inlets exempted is being maintained. Include totals in the Annual Report and keep records in the SPPP.	EDPA + 12 months
Pollution Prevention/Good Housekeeping - Municipal Maintenance Yards and Other Ancillary Operations			
Implement the BMP's found in Attachment E, including the Inventory of Materials and Machinery, and Inspections and Good Housekeeping practices, at Municipal Maintenance Yards and Other Ancillary Operations.	IV.B.5.c	Certify in each annual report that the SPPP includes all applicable requirements and that the requirements (including maintenance of inspection logs and tracking forms) of Attachment E have been met. Keep records required by Attachment E in the SPPP.	EDPA + 12 months
BMPs shall be implemented for fueling operations.	IV.B.5.c.i	Certify in each annual report that BMPs in Attachment E have been implemented for fueling operations.	EDPA + 12 months
BMPs shall be implemented for discharge of stormwater from secondary containment.	IV.B.5.c.ii	Certify in each annual report that BMPs in Attachment E have been implemented for discharge of stormwater from secondary containment.	EDPA + 12 months
BMPs shall be implemented for vehicle maintenance.	IV.B.5.c.iii	Certify in each annual report that BMPs in Attachment E have been implemented for vehicle maintenance.	EDPA + 12 months

BMPs shall be implemented for on-site equipment and vehicle washing and wash wastewater containment.	IV.B.5.c.iv	Certify in each annual report that BMPs in Attachment E have been implemented for on-site equipment and vehicle washing and wash wastewater containment.	EDPA + 60 months
BMPs shall be implemented for salt and de-icing material storage and handling.	IV.B.5.c.v	Certify in each annual report that BMPs in Attachment E have been implemented for salt and de-icing material storage and handling.	EDPA + 60 months
BMPs shall be implemented for aggregate material and construction debris storage.	IV.B.5.c.vi	Certify in each annual report that BMPs in Attachment E have been implemented for aggregate material and construction debris storage.	EDPA + 18 months
BMPs shall be implemented for street sweepings and catch basin clean-out material storage.	IV.B.5.c.vii	Certify in each annual report that BMPs in Attachment E have been implemented for street sweepings and catch basin clean-out material storage.	EDPA + 18 months
BMPs shall be implemented for yard trimmings and wood waste management sites.	IV.B.5.c.viii	Certify in each annual report that BMPs in Attachment E have been implemented for yard trimmings and wood waste management sites.	EDPA + 18 months
BMPs shall be implemented for roadside vegetation management.	IV.B.5.c.ix	Certify in each annual report that BMPs in Attachment E have been implemented for roadside vegetation management.	EDPA + 18 months
Pollution Prevention/Good Housekeeping - Training Program			
Provide training to municipal employees within 3 months of commencement of duties, and at least once every two years thereafter, to address all required components. The exceptions are Part IV.B.5.d.v, viii, and x which require annual training instead of once every two years.	IV.B.5.d	Certify in each annual report that employee training has been conducted, and maintain records including sign in sheet(s), date(s) of training, and training agenda(s). These records shall be kept in the SPPP.	EDPA + 12 months
Ensure that individuals that review development and redevelopment projects for compliance with N.J.A.C. 7:8 on behalf of the municipality complete Department approved training once every five years.	IV.B.5.e	Certify in each annual report that individuals reviewing projects have completed the required training, and maintain a list of the names and dates that individuals received training. This list shall be kept in the SPPP.	EDPA + 12 months

Ensure that current Municipal Board and Governing Body Members that review and approve applications for development and redevelopment projects complete the “Training Tool” on or before EDPA + 6 months, and by new members within 6 months of commencement of duties. Once per term of service thereafter, Municipal Board and Governing Body Members must review at least one of the tools offered under the Post-Construction Stormwater Management website.	IV.B.5.f	Certify in each annual report that municipal board and governing body members have completed the necessary training, and maintain a list of the names and dates that individuals completed training. This list shall be kept in the SPPP.	EDPA + 6 months
MS4 Outfall Pipe Mapping and Illicit Discharge and Scouring Detection and Control			
Develop, update and maintain an MS4 Outfall Pipe Map showing the location of the end of all outfall pipe which discharge to a surface water body.	IV.B.6.a.i	Certify in each annual report following the implementation deadline that the outfall pipe map is current at the end of the calendar year.	EDPA + 36 months
Show the location (and name where known) of all surface water bodies receiving discharges from those outfall pipes.	IV.B.6.a.ii	Certify in each annual report following the implementation deadline that the surface water bodies associated with each outfall pipe end is located on the map.	EDPA + 36 months
Include Outfall Pipe map in the SPPP	IV.B.6.a.iii	Certify in each annual report following the implementation deadline that the Outfall Pipe Map is included in the SPPP.	EDPA + 36 months
Provide Outfall Pipe Map to the Department	IV.B.6.a.iv	Certify in each annual report following the implementation deadline that the Outfall Pipe Map and any new data points subsequently added to the map have been provided to the Department.	EDPA + 36 months
Submitted the Outfall Pipe Map information to the Department electronically by December 21, 2020	IV.B.6.a.v	Submit the Outfall Pipe Map information to the Department using Department’s designated electronic submission service by December 21, 2020.	12/21/2020

Develop, update and implement a program to detect, investigate and control localized stream scouring from stormwater outfall pipes.	IV.B.6.b	Certify in each annual report that municipally owned outfall pipes have received the required visual inspection at least once every five years and maintain a log indicating the number and location of outfall pipes inspected, repairs prioritized, and repairs scheduled or performed. Certify in the annual report that a repair schedule has been prepared for those that have not been completed. Keep records required by Part IV.B.6.b in the SPPP.	EDPA + 60 months
Develop, update, implement and enforce an ongoing Illicit Discharge Detection and Elimination Program.	IV.B.6.c	Certify in each annual report that the municipality has developed a program to detect and eliminate illicit discharges and has conducted inspections required at Part IV.B.6.c at least once every five years. Document all investigations and actions taken on the Department's Illicit Connection Inspection Report Form. Keep records required by Part IV.B.6.c in the SPPP.	EDPA + 60 months
Adopt and enforce an ordinance that prohibits illicit connections to the MS4 operated by the Tier A Municipality.	IV.B.6.d	Certify in each annual report that the ordinance is being maintained and the date it was adopted. A log of enforcement actions shall be kept in the SPPP.	EDPA + 12 months
Stormwater Facilities Maintenance			
Develop, update and implement a program to ensure adequate long-term cleaning, operation and maintenance of all stormwater facilities owned or operated by the Tier A Municipality.	IV.C.1.a	Certify in each annual report that the municipality has developed, updated and implemented a program to ensure adequate long-term cleaning, operation and maintenance of all municipally owned stormwater facilities. Records required by Part IV.C.1.a, a.i, a.ii, a.iii and a.iv shall be kept, or their location shall be referenced, in the SPPP.	EDPA + 18 months

Inspect and maintain stormwater facilities pursuant to any maintenance plans, or more frequently as needed, to ensure proper function and operation of each stormwater facility.	IV.C.1.a.i	Certify in each annual report that inspections and maintenance was performed pursuant to any maintenance plans, or more frequently as needed, to ensure proper function and operation of stormwater facilities.	EDPA + 18 months
Maintain a log sufficient to demonstrate compliance with this section; including but not limited a list of inspections and preventative and corrective maintenance performed, and a schedule for repairs to be made.	IV.C.1.a.ii	Certify in each annual report that a maintenance log is kept that, at a minimum, records the stormwater facility inspected, location information of the facility inspected (location information must be specific enough to locate and identify the stormwater facility in the field; e.g. geographic coordinates), name of inspector, date of inspection, findings, and any preventative and corrective maintenance performed.	EDPA + 18 months
Certify annually that municipally owned or operated stormwater facilities are properly functioning.	IV.C.1.a.iii	Certify in each annual report that all municipally owned or operated stormwater facilities are properly functioning.	EDPA + 18 months
If stormwater facilities were found not to be functioning properly and repairs not made, then necessary preventative and corrective maintenance shall be documented and prioritized and a schedule for maintenance shall be maintained.	IV.C.1.a.iv	Certify in each annual report that a prioritized schedule of necessary preventive and corrective maintenance exists for stormwater facilities inspected and found not to be functioning properly. The municipality shall prioritize this schedule as specified in Part IV.C.1.iv.	EDPA + 18 months
Develop, update, implement and enforce a program to ensure adequate long-term cleaning, operation and maintenance of stormwater facilities not owned or operated by the Tier A Municipality, not subject to the conditions of another NJPDES stormwater permit and constructed after February 7, 1984.	IV.C.1.b	Certify in each annual report that the municipality has developed, updated, implemented and enforced a program to ensure adequate long-term cleaning, operation and maintenance of stormwater facilities not owned and operated by the municipality, not subject to the conditions of another NJPDES stormwater permit and constructed after February 7, 1984. Records required by Part IV.C.1.b, b.i and b.ii shall be kept, or their location shall be	EDPA + 18 months

		referenced, in the SPPP.	
Ensure that stormwater facility inspection and maintenance is performed pursuant to any maintenance plans, or more frequently as needed to ensure proper function and operation of each stormwater facility.	IV.C.1.b.i	Certify in each annual report that maintenance was performed pursuant to any maintenance plans, or more frequently, to ensure proper function and operation of stormwater facilities not owned and operated by the municipality.	EDPA + 18 months
Maintain a log sufficient to demonstrate compliance with this section; including but not limited actions taken by the municipality to enforce compliance with the long-term cleaning, operation and maintenance program.	IV.C.1.b.ii	Certify in each annual report that a log is being kept that, at a minimum, records the actions taken by the municipality to enforce compliance with the long-term cleaning, operation and maintenance program; the stormwater facility that was the subject of the action; location information of the facility that was the subject of the action (location information must be specific enough to locate and identify the stormwater facility in the field; e.g. geographic coordinates); the name of person taking the action; the date of the action; and the findings.	EDPA + 18 months
Maintain copies of all maintenance plans for stormwater facilities approved by the municipality, and make them available to the Department upon request.	IV.C.1.c	Certify in each annual report that copies of all maintenance plans are kept on file. Records required by Part IV.C.1.c shall be kept, or their location shall be referenced, in the SPPP.	EDPA + 12 months
Total Maximum Daily Load (TMDL) Info.			
Annually review approved or adopted TMDL reports to identify stormwater related pollutants listed therein and associated with any segment of surface water wholly or partially within or bordering the Tier A Municipality.	IV.C.2.a.i	Certify in each annual report that approved or adopted TMDLs have been identified and reviewed and stormwater related pollutants identified. Records required by Part IV.C.2.a.i, a.ii and a.iii shall be kept in the SPPP.	EDPA + 12 months

Use TMDL information identified in compliance with Part IV.C.2.a.i to: (1) assist in the prioritization of stormwater facility maintenance including schedules for repairs related to Stream Scouring and Stormwater Facilities Maintenance; and (2) identify and develop strategies to address specific sources of stormwater related pollutants contributing to discharges authorized under this Tier A MS4 NJPDES permit.	IV.C.2.a.ii	Certify in each annual report that the municipality has used information identified in compliance with Part VI.C.2.a.i to (1) assist in the prioritization of repairs as required at Part IV.B.6.b.iv (Stream Scouring) and IV.C.31.a.iv (Stormwater Facilities Maintenance); and (2) identify and develop strategies to address specific sources of stormwater related pollutants contributing to discharges authorized under this Tier A MS4 NJPDES permit.	EDPA + 12 months
Update SPPP to list information identified in Part VI.C.2.a.i and ii.	IV.C.2.a.iii	Certify in each annual report that the municipality has updated its SPPP to list information identified in Part VI.C.2.a.i and ii.	EDPA + 12 months
Incorporate any strategies identified in Part VI.C.2.a.ii(2) as an Optional Measure	IV.C.2.a.iv	Certify in each annual report that the municipality has incorporated any strategies identified in Part VI.C.2.a.ii(2) as an Optional Measure.	EDPA + 12 months

Attachment B – Points System for Public Education and Outreach Activities

The Tier A Municipality shall implement a Public Education and Outreach Program that focuses on educational and pollution prevention activities about the impacts of stormwater discharges on surface water and groundwater and to involve the public in reducing pollutants in stormwater runoff and mitigating flow.

The Tier A Municipality shall **annually** conduct educational activities that total at least **12 points** and include activities from at least three of the five categories found below. At a minimum, at least one of the activities shall involve educating businesses and the general public of hazards associated with illicit connections and improper disposal of waste. Each approved activity is listed below with an assigned point value. Additional information on how to conduct these Public Education and Outreach activities can be found under Notes and Definitions Part IV.A.3 and 4 of this Tier A MS4 NJPDES permit. Records shall be kept necessary to demonstrate compliance with this requirement, including date of activities and any other relevant documentation.

Category 1: General Public Outreach		
Activity	**Description**	**Points**
Website and Social Media	Maintain a stormwater related page on the municipal website or on a municipal social media site. The web page may include links to other stormwater related resources, including the NJDEP stormwater website (www.njstormwater.org).	1
Newspaper Ad	Use Department created and approved stormwater education materials available on www.cleanwaternj.org to publish an ad in a newspaper or newsletter that serves the municipality.	1
Radio/Television	Broadcast a radio or television public service announcement from www.cleanwaternj.org on a local radio or municipal public service channel.	1
Green Infrastructure Signage	Post signs at municipally-owned green infrastructure sites that describe the function and importance of the infrastructure, contact phone number, municipal identification number, and/or website for more information. *New signs receive 0.5 credits per sign. Existing signs that are maintained or upgraded receive 0.25 credits per sign. A maximum of 5 credits are allowed.	5*
Billboard/Sign	Produce and maintain (for credit in subsequent years) a billboard or sign which can be displayed on a bus, bus stop shelter, recreation field (outfield sign), or other similar public venue.	2
Mural	Produce and maintain (for credit in subsequent years) the planning and painting of a stormwater pollution themed mural, storm drain art or other artwork at a local downtown/commercial area or other similar public venue.	2
Stormwater Facility Signage	Post signs at municipally-owned stormwater management basins or other structural stormwater related facilities that describe the function and importance of the facility, contact phone number, municipal identification number, and/or website for more information. *New signs receive 0.5 credits per sign. Existing signs that are maintained or upgraded receive 0.25 credits per sign. A maximum of 5 credits are allowed.	5*

Category 2: Targeted Audiences Outreach		
Activity	**Description**	**Points**
Stormwater Display	Present a stormwater related display or materials at any municipal event (e.g., Earth Day, town picnic), at the municipal building or other similar public venue.	1
Promotional Item	Distribute an item or items with a stormwater related message (e.g., refrigerator magnets, temporary tattoos, key chains, bookmarks, pet waste bag dispensers, coloring books, and pens or pencils). Municipality must initially have available a minimum number of the items equal to 10% of the municipal population.	2
Mailing or e-Mailing Campaign	Provide information to all known owners of stormwater facilities not owned or operated by the municipality (i.e., privately owned) highlighting the importance of proper maintenance of stormwater measures. For assistance, see information at www.nj.gov/dep/stormwater/maintenance_guidance.htm.	3
Mailing or e-Mailing Campaign	Distribute any of the Department's educational brochures, tip cards, or a municipally produced equivalent (e.g., community calendar, newsletter, or recycling schedule) via a mailing to every resident and business in the municipality.	2
Ordinance Education	Distribute a letter or e-mail from the mayor or municipal official to every resident and business in the municipality highlighting the requirements and environmental benefits of the Pet Waste, Wildlife Feeding, Litter Control, Improper Disposal of Waste, Containerized Waste/Yard Waste Collection, Private Storm Drain Inlet Retrofitting and Illicit Connection ordinances. Provide a link to the municipal website where subject ordinances are posted.	3

Category 3: School / Youth Education and Activities		
Activity	**Description**	**Points**
School Presentations	Provide water-related educational presentation(s) and/or activities to local preschool, elementary, middle, and/or high school classes using municipal staff or local partner organizations. Topics could include stormwater, nonpoint source pollution, watersheds, water conservation and water quality. For ideas, see information at www.nj.gov/dep/seeds. *Presentations receive 1 credit per presentation, with a maximum of 5 credits allowed.	5*
Water Education Workshops	Provide water-related professional development workshops for local teachers from a registered NJ Department of Education Professional Development Provider.	2
Storm Drain Labeling	Organize a project to label and/or maintain storm drain labels (that are not already precast with a message) with a scout troop, local school district, or faith based group, or other community youth group for a minimum of 40 labels. This project could also include stenciling over precast labels to improve legibility.	3
Educational Contest for Schools	Organize an educational contest with a local school district or a local community organization serving youth to design a poster, magnet, rain stick, rain barrel or other craft/art object. Contest themes shall have an appropriate stormwater message. Winning entries are to be displayed at publicly accessible locations within the municipality such as at the town hall, library, post office, or school. The winning design should be shown on the municipality's website or social media site, if practical.	3
AmeriCorps Event	Coordinate an event (e.g. volunteer stream monitoring, educational presentations, or stormwater awareness project) through AmeriCorps NJ Watershed Ambassador Program	4
Clean-up	Sponsor or organize a litter clean up for a scout troop, local school district, faith based group or other community youth group along a local waterway, public park, stormwater facility, or in an area with storm drains that discharge to a local lake or waterway.	3

Category 4: Watershed/Regional Collaboration		
Activity	**Description**	**Points**
Regional Stormwater Collaboration	Participate in a regional stormwater, community collaborative or other watershed-based group on a regular basis to discuss impaired waterbodies, TMDLs, regional stormwater related issues, or watershed restoration plans that address those waterbodies. Evaluate, develop and implement remedies that resolve stormwater-related issues within the affected waterbody or watershed.	3
Green Infrastructure Workshop	Organize or participate in a rain barrel, rain garden or other green infrastructure workshop on a regional or watershed basis. This could be a partnership exercise with a local watershed organization, utility, university, school, youth/faith based group, and/or other organization.	3
Community Activity	Organize or participate in the organization of a regional or watershed based event to carry out stormwater activities such as stormwater facility maintenance or litter clean-up. The municipality may identify and enter into a partnership agreement with a local group such as a watershed organization, utility, university, school, youth/faith based group, and/or other organization to carry out these activities	3

Category 5: Community Involvement Activities		
Activity	**Description**	**Points**
Volunteer Stormwater Assessment or Stream Monitoring	Establish a volunteer stormwater facility assessment (inspection, inventory and/or mapping) or stream monitoring program for a waterbody within the municipality in order to gauge the health of the waterway through chemical, biological or visual monitoring protocols. Contact NJDEP's AmeriCorps NJ Watershed Ambassador Program or review USEPA National Directory of Volunteer Monitoring Programs.	3
Rain Barrel Workshop	Organize or participate in a rain barrel workshop. This could be a partnership exercise with a local watershed organization, university, school, youth/faith based group, and/or other nonprofit.	3
Rain Garden Workshop	Organize or participate in a rain garden training or installation workshop. This could be a partnership exercise with a local watershed organization, university, school, youth/faith based group, and/or other nonprofit.	3
Community Event	Organize or participate in the organization of a community event to carry out stormwater activities such as stormwater measure maintenance or a stream buffer restoration. The municipality may identify and enter into a partnership agreement with a local group such as a watershed organization, university, utility, school, youth/faith based group, and/or other nonprofit to carry out these activities.	3
Community Involvement	Organize a project with a local organization to create and post signs at either green and/or gray stormwater infrastructure sites or facilities that describe the function and importance of the facility, contact phone number, municipal identification number, and/or website for more information. *Signs receive 0.5 credits per sign. A maximum of 5 credits are allowed.	5*

Attachment C - Design Standards for Storm Drain Inlets

Application of Design Standard

The below design standard applies to the following types of storm drain inlet installation or retrofit projects unless a more stringent standard is specified by the municipality's stormwater control ordinance:

- Storm drain inlets installed as part of new development and redevelopment (public or private) that disturb one acre or more;
    - Storm drain inlets installed as part of new development and redevelopment (public or private) that disturb less than one acre that are part of a larger common plan of development or sale (e.g. phased residential development) that ultimately disturbs one acre or more;
- Tier A Municipality owned or operated storm drain inlets must be retrofitted where the storm drains are (1) in direct contact with any repaving, repairing (excluding individual pothole repair), or resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen); or (2) in direct contact with any reconstruction or alteration of facilities; and
- Privately owned or operated storm drain inlets (e.g. condomium association) must be retrofitted where the storm drains are (1) in direct contact with anyrepaving, repairing (excluding individual pothole repair), or resurfacing (including top coating or chip sealing with asphalt emulsion or a thin base of hot bitumen); or (2) in direct contact with any reconstruction or alteration of facilities. This does not include single family homes.

Design Standard

Grates in pavement or other ground surfaces shall meet either of the following standards:

- The New Jersey Department of Transportation (NJDOT) bicycle safe grate standards described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (see www.nj.gov/transportation/publicat/pdf/BikeComp/introtofac.pdf); or
- A grate where each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is not greater than 0.5 inches across the smallest dimension. Note that the Residential Site Improvement Standards at N.J.A.C. 5:21include requirements for bicycle safe grates.

Examples of grates subject to this standard include grates in grate inlets; the grate portion (non-curb opening portion) of combination inlets; grates on storm sewer manholes; ditch grates; trench grates; and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads, (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors used to collect stormwater from the surface into a storm drain or surface water body

For curb-openings inlets, including curb-opening inlets in combination inlets, the clear space in the curb opening, or each individual clear space if the curb opening has two or more clear spaces, shall have an area of no more than seven (7.0) square inches or be no greater than two (2.0) inches across the smallest dimension.

Exemptions from the Design Standard

- Where each individual clear space in the curb opening in existing curb-opening inlets does not have an area of more than nine (9.0) square inches;

- Where the review agency determines that the standards would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets;

- Where flows from the water quality design storm as specified in N.J.A.C. 7:8 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:

  A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or

  A bar screen having a bar spacing of 0.5 inches;

  Note that these exemptions do not authorize any infringement of requirements in the Residential Site Improvement Standards for bicycle safe grates in new residential development (N.J.A.C. 5:21-4.18(b)2 and 7.4(b)1).

- Where flows are conveyed through a trash rack that has parallel bars with one inch (1”) spacing between the bars, to the elevation of the water quality design storm as specified in N.J.A.C. 7:8; or

- Where the Department determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet the standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.

Attachment D – Major Development Stormwater Summary

General Information

1. Project Name:
2. Municipality: County: Block(s): Lot(s):
3. Site Location (State Plane Coordinates – NAD83): E: N:
4. Date of Final Approval for Construction by Municipality:
   Date of Certificate of Occupancy:
5. Project Type (circle all that apply):
   Residential Commercial Industrial Other (please specify) ______________________
6. Soil Conservation District Project Number:
7. Did project require NJDEP Land Use Permit? Yes No Land Use Permit #:
8. Did project require the use of any mitigation measures? Yes No
   If yes, which standard was mitigated?

Site Design Specifications

1. Area of Disturbance (acres): Area of Proposed Impervious (acres):
2. List all Hydrologic Soil Groups:
3. Please Identify the Amount of Each Best Management Practices (BMPs) Utilized in Design Below:
   Bioretention Systems ___ Constructed Wetlands ___ Dry Wells ___ Extended Detention Basins ___
   Infiltration Basins ___ Combination Infiltration/Detention Basins ___ Manufactured Treatment Devices___
   Pervious Paving Systems ___ Sand Filters ___ Vegetative Filter Strips ___ Wet Ponds ___
   Grass Swales ___ Subsurface Gravel Wetlands ___ Other ______________________

Storm Event Information

Storm Event: Rainfall (inches and duration) 2 yr.: ____________ 10 yr.: ____________
100 yr.: ____________ WQ DS: ____________

Runoff Computation Method (circle one):
NRCS: Dimensionless Unit Hydrograph NRCS: Delmarva Unit Hydrograph Rational Modified Rational
Other: ______________________

Basin Specifications (answer all that apply)

If more than one basin, attach multiple sheets

1. Type of Basin: Surface/Subsurface (circle one)
2. Owner (circle one):
   Public Private: If so, Name: Phone number:
3. Basin Construction Completion Date:
4. Drain Down Time (hr.):
5. Design Soil Permeability (in./hr.):
6. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
7. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
8. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
9. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Comments:____

____

____

Name of Person Filling Out This Form: ______________________ Signature: ______________________

Title: ______________________________________ Date: ______________________

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*
10. Type of Basin: Surface/Subsurface (circle one)
11. Owner (circle one): Public Private: If so, Name: Phone number:
12. Basin Construction Completion Date:
13. Drain Down Time (hr.):
14. Design Soil Permeability (in./hr.):
15. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
16. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
17. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
18. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*
19. Type of Basin: Surface/Subsurface (circle one)
20. Owner (circle one): Public Private: If so, Name: Phone number:
21. Basin Construction Completion Date:
22. Drain Down Time (hr.):
23. Design Soil Permeability (in./hr.):
24. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
25. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
26. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
27. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Basin Specifications (answer all that apply) *If more than one basin, attach multiple sheets*
28. Type of Basin: Surface/Subsurface (circle one)
29. Owner (circle one): Public Private: If so, Name: Phone number:
30. Basin Construction Completion Date:
31. Drain Down Time (hr.):
32. Design Soil Permeability (in./hr.):
33. Seasonal High Water Table Depth from Bottom of Basin (ft.): Date Obtained:
34. Groundwater Recharge Methodology (circle one): 2 Year Difference NJGRS Other NA
35. Groundwater Mounding Analysis (circle one): Yes No If, Yes Methodology Used:
36. Maintenance Plan Submitted: Yes No Is the Basin Deed Restricted: Yes No

Name of Person Filling Out This Form: ________________________ Signature: ________________________

Title: ____ Date: ____________________________

Attachment E – Best Management Practices for Municipal Maintenance Yards and Other Ancillary Operations

The Tier A Municipality shall implement the following practices at municipal maintenance yards and other ancillary operations owned or operated by the municipality. Inventory of Materials and Machinery, and Inspections and Good Housekeeping shall be conducted at all municipal maintenance yards and other ancillary operations. All other Best Management Practices shall be conducted whenever activities described below occur. Ancillary operations include but are not limited to impound yards, permanent and mobile fueling locations, and yard trimmings and wood waste management sites.

Inventory of Materials and Machinery

The SPPP shall include a list of all materials and machinery located at municipal maintenance yards and ancillary operations which could be a source of pollutants in a stormwater discharge. The materials in question include, but are not limited to: raw materials; intermediate products; final products; waste materials; by-products; machinery and fuels; and lubricants, solvents, and detergents that are related to the municipal maintenance yard operations and ancillary operations. Materials or machinery that are not exposed to stormwater at the municipal maintenance yard or related to its operations do not need to be included.

Inspections and Good Housekeeping

1. Inspect the entire site, including the site periphery, monthly (under both dry and wet conditions, when possible). Identify conditions that would contribute to stormwater contamination, illicit discharges or negative impacts to the Tier A Municipality's MS4. Maintain an inspection log detailing conditions requiring attention and remedial actions taken for all activities occurring at Municipal Maintenance Yards and Other Ancillary Operations. This log must contain, at a minimum, a record of inspections of all operations listed in Part IV.B.5.c. of this permit including dates and times of the inspections, and the name of the person conducting the inspection and relevant findings. This log must be kept on-site with the SPPP and made available to the Department upon request. See the Tier A Municipal Guidance document (www.nj.gov/dep/dwq/tier_a_guidance.htm) for additional information.

2. Conduct cleanups of spills of liquids or dry materials immediately after discovery. All spills shall be cleaned using dry cleaning methods only. Clean up spills with a dry, absorbent material (i.e., kitty litter, sawdust, etc.) and sweep the rest of the area. Dispose of collected waste properly. Store clean-up materials, spill kits and drip pans near all liquid transfer areas, protected from rainfall.

3. Properly label all containers. Labels shall be legible, clean and visible. Keep containers in good condition, protected from damage and spillage, and tightly closed when not in use. When practical, store containers indoors. If indoor storage is not practical, containers may be stored outside if covered and placed on spill platforms or clean pallets. An area that is graded and/or bermed to prevent run-through of stormwater may be used in place of spill platforms or clean pallets. Outdoor storage locations shall be regularly maintained.

Fueling Operations

1. Establish, maintain and implement standard operating procedures to address vehicle fueling; receipt of bulk fuel deliveries; and inspection and maintenance of storage tanks, including the associated piping and fuel pumps.

   a. Place drip pans under all hose and pipe connections and other leak-prone areas during bulk transfer of fuels.

   b. Block storm sewer inlets, or contain tank trucks used for bulk transfer, with temporary berms or temporary absorbent booms during the transfer process. If temporary berms or booms are being used instead of blocking the storm sewer inlets, all hose connection points associated with the transfer of fuel shall be within the temporarily bermed or boomed area during the loading/unloading of bulk fuels. A trained employee shall be present to supervise the bulk transfer of fuel.

   c. Clearly post, in a prominent area of the facility, instructions for safe operation of fueling equipment. Include all of the following:
      - "Topping off of vehicles, mobile fuel tanks, and storage tanks is strictly prohibited"
      - "Stay in view of fueling nozzle during dispensing"
      - Contact information for the person(s) responsible for spill response.

   d. Immediately repair or replace any equipment, tanks, pumps, piping and fuel dispensing equipment found to be leaking or in disrepair.

Discharge of Stormwater from Secondary Containment

The discharge pipe/outfall from a secondary containment area (e.g. fuel storage, de-icing solution storage, brine solution) shall have a valve and the valve shall remain closed at all times except as described below. A municipality may discharge stormwater accumulated in a secondary containment area if a visual inspection is performed to ensure that the contents of aboveground storage tank have not come in contact with the stormwater to be discharged. Visual inspections are only effective when dealing with materials that can be observed, like petroleum. If the contents of the tank are not visible in stormwater, the municipality shall rely on previous tank inspections to determine with some degree of certainty that the tank has not leaked. If the municipality cannot make a determination with reasonable certainty that the stormwater in the secondary containment area is uncontaminated by the contents of the tank, then the stormwater shall be hauled for proper disposal.

Vehicle Maintenance

1. Operate and maintain equipment to prevent the exposure of pollutants to stormwater.

2. Whenever possible, conduct vehicle and equipment maintenance activities indoors. For projects that must be conducted outdoors, and that last more than one day, portable tents or covers shall be placed over the equipment being serviced when not being worked on, and drip pans shall be used at all times. Use designated areas away from storm drains or block storm drain inlets when vehicle and equipment maintenance is being conducted outdoors.

On-Site Equipment and Vehicle Washing and Wash Wastewater Containment

1. Manage any equipment and vehicle washing activities so that there are no unpermitted discharges of wash wastewater to storm sewer inlets or to waters of the State.

2. Tier A Municipalities which cannot discharge wash wastewater to a sanitary sewer or which cannot otherwise comply with 1, above, may temporarily contain wash wastewater prior to proper disposal under the following conditions:

   a. Containment structures shall not leak. Any underground tanks and associated piping shall be tested for integrity every 3 years using appropriate methods determined by "*The List of Leak Detection Evaluations for Storage Tank Systems*" created by the National Work Group on Leak Detection Evaluations (NWGLDE) or as determined appropriate and certified by a professional engineer for the site specific containment structure(s)**.**

   b. For any cathodically protected containment system, provide a passing cathodic protection survey every three years.

   c. Operate containment structures to prevent overfilling resulting from normal or abnormal operations, overfilling, malfunctions of equipment, and human error. Overfill prevention shall include manual sticking/gauging of the tank before each use unless system design prevents such measurement. Tank shall no longer accept wash wastewater when determined to be at 95% capacity. Record each measurement to the nearest ½ inch.

   d. Before each use, perform inspections of all visible portions of containment structures to ensure that they are structurally sound, and to detect deterioration of the wash pad, catch basin, sump, tank, piping, risers, walls, floors, joints, seams, pumps and pipe connections or other containment devices. The wash pad, catch basin, sump and associated drains should be kept free of debris before each use. Log dates of inspection; inspector's name, and conditions. This inspection is not required if system design prevents such inspection.

   e. Containment structures shall be emptied and taken out of service immediately upon detection of a leak. Complete all necessary repairs to ensure structural integrity prior to placing the containment structure back into service. Any spills or suspected release of hazardous substances shall be immediately reported to the NJDEP Hotline (1-877-927-6337) followed by a site investigation in accordance with N.J.A.C. 7:26C and N.J.A.C 7:26E if the discharge is confirmed.

   f. All equipment and vehicle wash wastewater placed into storage must be disposed of in a legally permitted manner (e.g. pumped out and delivered to a duly permitted and/or approved wastewater treatment facility).

   g. Maintain a log of equipment and vehicle wash wastewater containment structure clean-outs including date and method of removal, mode of transportation (including name of hauler if applicable) and the location of disposal. See Underground Vehicle Wash Water Storage Tank Use Log at end of this attachment.

   h. Containment structures shall be inspected annually by a NJ licensed professional engineer. The engineer shall certify the condition of all structures including: wash pad, catch basin, sump, tank, piping, risers to detect deterioration in the, walls, floors, joints, seams, pumps and pipe connections or other containment devices using the attached Engineer's Certification of Annual Inspection of Equipment and Vehicle Wash Wastewater Containment Structure. This certification may be waived for self-contained systems on a case-by-case basis. Any such waiver would be issued in writing by the Department.

3. Maintain all logs, inspection records, and certifications on-site. Such records shall be made available to the Department upon request.

Salt and De-icing Material Storage and Handling

1. Store material in a permanent structure.

2. Perform regular inspections and maintenance of storage structure and surrounding area.

3. Minimize tracking of material from loading and unloading operations.

4. During loading and unloading:

   a. Conduct during dry weather, if possible;

   b. Prevent and/or minimize spillage; and

   c. Minimize loader travel distance between storage area and spreading vehicle.

5. Sweep (or clean using other dry cleaning methods):

   a. Storage areas on a regular basis;

   b. Material tracked away from storage areas;

   c. Immediately after loading and unloading is complete.

6. Reuse or properly discard materials collected during cleanup.

7. Temporary outdoor storage is permitted only under the following conditions:

   a. A permanent structure is under construction, repair or replacement;

   b. Stormwater run-on and de-icing material run-off is minimized;

   c. Materials in temporary storage are tarped when not in use;

   d. The requirements of 2 through 6, above are met; and

   e. Temporary outdoor storage shall not exceed 30 days unless otherwise approved in writing by the Department;

8. Sand must be stored in accordance with Aggregate Material and Construction Debris Storage below.

Aggregate Material and Construction Debris Storage

1. Store materials such as sand, gravel, stone, top soil, road millings, waste concrete, asphalt, brick, block and asphalt based roofing scrap and processed aggregate in such a manner as to minimize stormwater run-on and aggregate run-off via surface grading, dikes and/or berms (which may include sand bags, hay bales and curbing, among others) or three sided storage bays. Where possible the open side of storage bays shall be situated on the upslope. The area in front of storage bays and adjacent to storage areas shall be swept clean after loading/unloading.

2. Sand, top soil, road millings and processed aggregate may only be stored outside and uncovered if in compliance with item 1 above and a 50-foot setback is maintained from surface water bodies, storm sewer inlets, and/or ditches or other stormwater conveyance channels.

3. Road millings must be managed in conformance with the "Recycled Asphalt Pavement and Asphalt Millings (RAP) Reuse Guidance" (see www.nj.gov/dep/dshw/rrtp/asphaltguidance.pdf) or properly disposed of as solid waste pursuant to N.J.A.C. 7:26-1 et seq.

4. The stockpiling of materials and construction of storage bays on certain land (including but not limited to coastal areas, wetlands and floodplains) may be subject to regulation by the Division of Land Use Regulation (see www.nj.gov/dep/landuse/ for more information).

Street Sweepings, Catch Basin Clean Out, and Other Material Storage

1. For the purposes of this permit, this BMP is intended for road cleanup materials as well as other similar materials. Road cleanup materials may include but are not limited to street sweepings, storm sewer clean out materials, stormwater basin clean out materials and other similar materials that may be collected during road cleanup operations. These BMPs do not cover materials such as liquids, wastes which are removed from municipal sanitary sewer systems or material which constitutes hazardous waste in accordance with N.J.A.C. 7:26G-1.1 et seq.

2. Road cleanup materials must be ultimately disposed of in accordance with N.J.A.C. 7:26-1.1 et seq. See the "Guidance Document for the Management of Street Sweepings and Other Road Cleanup Materials" (www.nj.gov/dep/dshw/rrtp/sweeping.htm).

3. Road cleanup materials placed into storage must be, at a minimum:

   a. Stored in leak-proof containers or on an impervious surface that is contained (e.g. bermed) to control leachate and litter; and

   b. Removed for disposal (in accordance with 2, above) within six (6) months of placement into storage.

Yard Trimmings and Wood Waste Management Sites

1. These practices are applicable to any yard trimmings or wood waste management site:

   a. Owned and operated by the Tier A Municipality;
      i. For staging, storing, composting or otherwise managing yard trimmings, or
      ii. For staging, storing or otherwise managing wood waste, and

   b. Operated in compliance with the Recycling Rules found at N.J.A.C. 7:26A.

2. Yard trimmings or wood waste management sites must be operated in a manner that:

   a. Diverts stormwater away from yard trimmings and wood waste management operations; and
   b. Minimizes or eliminates the exposure of yard trimmings, wood waste and related materials to stormwater.

3. Yard trimmings and wood waste management site specific practices:

   a. Construct windrows, staging and storage piles:
      i. In such a manner that materials contained in the windrows, staging and storage piles (processed and unprocessed) do not enter waterways of the State;
      ii. On ground which is not susceptible to seasonal flooding;
      iii. In such a manner that prevents stormwater run-on and leachate run-off (e.g. use of covered areas, diversion swales, ditches or other designs to divert stormwater from contacting yard trimmings and wood waste).

   b. Maintain perimeter controls such as curbs, berms, hay bales, silt fences, jersey barriers or setbacks, to eliminate the discharge of stormwater runoff carrying leachate or litter from the site to storm sewer inlets or to surface waters of the State.

   c. Prevent on-site storm drain inlets from siltation using controls such as hay bales, silt fences, or filter fabric inlet protection.

   d. Dry weather run-off that reaches a municipal stormwater sewer system is an illicit discharge. Possible sources of dry weather run-off include wetting of piles by the site operator; uncontrolled pile leachate or uncontrolled leachate from other materials stored at the site.

   e. Remove trash from yard trimmings and wood waste upon receipt.

   f. Monitor site for trash on a routine basis.

   g. Store trash in leak-proof containers or on an impervious surface that is contained (e.g. bermed) to control leachate and litter;

   h. Dispose of collected trash at a permitted solid waste facility.

   i. Employ preventative tracking measures, such as gravel, quarry blend, or rumble strips at exits.

Roadside Vegetation Management

1. Tier A Municipalities shall restrict the application of herbicides along roadsides in order to prevent it from being washed by stormwater into the waters of the State and to prevent erosion caused by de-vegetation, as follows: Tier A Municipalities shall not apply herbicides on or adjacent to storm drain inlets, on steeply sloping ground, along curb lines, and along unobstructed shoulders. Tier A Municipalities shall only apply herbicides within a 2 foot radius around structures where overgrowth presents a safety hazard and where it is unsafe to mow.

ENGINEERS CERTIFICATION OF ANNUAL INSPECTION OF EQUIPMENT AND VEHICLE WASH WASTEWATER CONTAINMENT STRUCTURE

(Complete a separate form for each vehicle wash wastewater containment structure)

Permittee: ________________________________ NJPDES Permit No: ________________________

Containment Structure Location: ____

The annual inspection of the above referenced vehicle wash wastewater containment structure was conducted on _____________ (date). The containment structure and appurtenances have been inspected for:

1. The integrity of the structure including walls, floors, joints, seams, pumps and pipe connections
2. Leakage from the structure's piping, vacuum hose connections, etc.
2 Bursting potential of tank.
3. Transfer equipment
4. Venting
5. Overflow, spill control and maintenance.
6. Corrosion, splits, and perforations to tank, piping and vacuum hoses

The tank and appurtenances have been inspected for all of the above and have been determined to be:

Acceptable ___________

Unacceptable ___________

Conditionally Acceptable ____________

List necessary repairs and other conditions: ____

____

____

____

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe the submitted information is true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment (N.J.A.C. 7:14A-2.4(d)).

Name (print): ________________________________ Seal:

Signature: ________________________________

Date: ________________________________

Underground Vehicle Wash Water Storage Tank Use Log

Name and Address of Facility ______________________________

Facility Permit Number ____________________________________

Tank ID Number ___________________ Tank Location ___________________

Tank Volume ______________ gallons Tank Height _______________ inches

95% Volume ______________ gallons 95% Volume _______________ inches

Date and Time	Inspector	Height of Product Before Introducing Liquid (inches)	Is Tank Less Than 95% Full? (Y/N)	Visual Inspection Pass? (Y/N)	Comments

Notes: The volume of liquid in the tank should be measured **before** each use.

Liquid **should not be introduced** if the tank contains liquid at 95% of the capacity or greater.

A visual inspection of all exposed portions of the collection system should be performed before each use. Use the comments column to document the inspection and any repairs.

Underground Vehicle Wash Water Storage Tank Pump Out Log

Name and Address of Facility ______________________________

Facility Permit Number ____________________________________

Tank ID Number ___________________ Tank Location ___________________

Tank Volume ______________ gallons

Date and Time of Pump Out	**Volume of Liquid Removed**	**Waste Hauler ***	**Destination of the Liquid Disposal ***

*** The Permittee must maintain copies of all hauling and disposal records and make them available for inspection.**