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STORMWATER MANAGEMENT PLAN

MS4 GENERAL PERMIT COMPLIANCE

2020 UPDATE

CITY OF
Chelsea
MASSACHUSETTS

swmp

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CERTIFICATION

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Printed Name Thomas G. Ambrosino

Signature [signature] Date 10/29/20

1.0 INTRODUCTION / OVERVIEW

1.1 Regulatory Summary and Purpose

The Federal Water Pollution Control Act (WPCA), initially enacted in 1948, established ambient water quality standards to specify acceptable levels of pollution in lieu of preventing the causes of water pollution. The 1972 amendments to the WPCA, referred to as the Clean Water Act (CWA), implemented measures which were focused on establishing effluent limitations on point sources, or 'any discernable, confined, and discrete conveyance… from which pollutants are or may be discharged."

The 1972 CWA introduced the National Pollutant Discharge Elimination System (NPDES). The NPDES program was established as the fundamental regulatory mechanism of the CWA, requiring direct dischargers of pollutants into waters of the United States to obtain a NPDES permit. Between 1972 and 1987, the NPDES permit program focused on improving surface water quality by reducing pollutants of industrial process wastewater and municipal sewage. During this period, several nationwide studies on water quality, most notably the United States Environmental Protection Agency (EPA) National Urban Runoff Plan (NURP), identified stormwater discharges as a significant source of water pollution.

The results of the NURP and similar studies, resulted in the reauthorization of the CWA in 1987 with the passage of the Water Quality Act (WQA). The WQA established a legal framework and required EPA to develop a comprehensive phased program for regulating municipal and industrial stormwater discharges under the NPDES permit program.

The NPDES Phase I Rule, which was issued in November 1990, addressed stormwater dischargers from medium to large municipal separate storm sewer systems (MS4s), which were communities serving a population of at least 100,000 people, as well as stormwater discharges from 11 categories of industrial activity.

The NPDES Phase II rule, which was promulgated in December 1999, addressed small MS4s serving a population of less than 100,000 people in urbanized areas. The Phase II rule requires that all MS4s located within "urbanized areas" as defined by the Bureau of the Census latest decennial Census automatically comply with the Phase II Stormwater regulations. Since Chelsea is located within an urbanized area (see map in Appendix B), the EPA designated the City as a Phase II community, which must comply with the NPDES regulations. In May 2003, the EPA and the Massachusetts Department of Environmental Protection (MassDEP) jointly issued the NPDES General Permit for Discharges from Small MS4s and in July 2003, Chelsea submitted the required Notice of Intent (NOI) for inclusion under this General Permit.

The 2003 NPDES Phase II MS4 General Permit (2003 MS4 Permit) required the City of Chelsea to develop, implement, and enforce a Stormwater Management Program (SWMP). The objectives of the SWMP were to reduce the discharge of pollutants from the MS4 to the maximum extent practicable, to protect water quality, and to satisfy the appropriate water quality requirements of the CWA.

The 2003 MS4 Permit expired on May 1, 2008 but was administratively continued for covered permittees until a new MS4 Permit was issued on April 4th, 2016 and became effective on July 1, 2018. A copy of the 2016 MS4 Permit is included in Appendix C. On September 26, 2018, the City submitted a Notice of Intent to EPA to obtain coverage under the 2016 MS4 Permit. A copy of this Notice of Intent is included in Appendix D. EPA posted the City's Notice of Intent for public comment on April 1, 2019 for a 30-day period. The City received authorization from EPA to discharge under the 2016 MS4 Permit on May 30, 2019. A copy of the City's Authorization to Discharge is included in Appendix D.

Since the City of Chelsea was previously covered under the 2003 Small MS4 General Permit, the City currently has many practices and programs in place related to stormwater management and pollution prevention. This plan update coordinates and incorporates these programs, policies, guidelines and practices into one document and expands their reach to encompass the requirements and goals of the 2016 MS4 Permit. The objectives of the MS4 Permit are accomplished through the implementation of Best Management Practices (BMPs) for each of the following six minimum control measures.

- Public education and outreach
- Public involvement / participation
- Illicit discharge detection and elimination
- Construction site stormwater runoff control
- Post-construction stormwater management in new development or redevelopment
- Pollution prevention/good housekeeping

The City's efforts to comply with these BMPs, as outlined in their NOI, are included in Section 2.0.

1.2 City Governance and Structure

Chelsea's current charter was approved by the Massachusetts House and the Senate on August 22, 1994 and signed by the Governor on August 26, 1994. The Charter was fully implemented on August 18, 1995, with appointment of the first City Manager.

The Charter mandates the Council-Manager form of government, which replaced the prior Mayor-Alderman form of government. The voters of Chelsea continue to elect the policy makers in the form of a City Council (the Council) who in turn select the City Manager. The City Manager is the chief executive of the City and is responsible for the day-to-day administration of City affairs.

The Charter requires the implementation of a coordinated budget process. The Council and School Committee share responsibility and coordinate their activities. In addition, the Charter requires the City to implement and undertake annual processes for capital planning, long-term financial forecasting and an open operating budget development process. The City has successfully implemented all the financial mandates required by the Charter.

The Charter includes an initiative petition procedure that allows citizens to recommend the adoption of local laws which, if not enacted by the City Council or the School Committee, would appear on the ballot for approval or rejection by all of the voters. Measures passed by the Council, with some specific exceptions, are subject to the referendum process. Recall of elected officials who have earned the dissatisfaction of a majority of citizens is provided.

Various entities within the City have the responsibility for implementation of the MS4 Permit requirements as outlined in this plan and include the following:

- Department of Public Works
- Planning and Development
- Health and Human Services
- Department of Inspectional Services

Specific representatives from each of these departments or committees responsible for implementation of the SWMP are outlined in the table below:

Table 1.1
PARTIES RESPONSIBLE FOR SWMP IMPLEMENTATION

Name	Title	Affiliation
Fidel Maltez	Commissioner (Director)	Public Works
Louis Mammolette, PE	City Engineer	Public Works
Rebecca Wright	Assistant City Engineer	Public Works
Shavaun Callahan	D3 Primary Drinking Water Operator/ WSD Compliance Manager	Public Works
John DePriest	Director	Planning and Development
Luis Prado	Director	Health and Human Services
Mike McAteer	Director	Inspectional Services
Lou Cetina	Assistant Superintendent	Water Sewer Drain

1.3 City Demographic Information

Chelsea is located in Suffolk County and has a total area of 1.8 square miles of land area (4.6 square kilometers). It is bordered by Revere to the northeast, Everett to the northwest, and the Chelsea River to the south and east. As of 2018, the population of Chelsea is estimated to be 40,160 according to the US Census Bureau. Chelsea has a density of over 16,036 people per square mile, one of the highest in the country. The racial makeup of the City is 49.6% white, 7.1% Black or African American, 0.2% Native American, 3.6% Asian, 0.0% Pacific Islander, and 30.8% from two or more races. Hispanic or Latino of any race is 65.9% of the population. As of 2017, the median income for a household in the City was $51,839 and the per capita income for the City was $23,340. About 19.5% of the population is below the poverty line.

Chelsea is comprised of eleven neighborhoods: Admirals Hill, Addison-Orange, Bellingham Square, Box District, Carter Park-Wyndham Area, Chelsea Square, Chelsea Commons, Mill Hill, Prattville, Soldiers Home, and Waterfront District.

Principal highways located within the boundaries of Chelsea include Route 1, known locally as the Tobin Bridge and Northeast Expressway, which runs north to south; and Route 16, known locally as Revere Beach Parkway, which runs from west to northeast. There are approximately 3.2 miles of state-maintained roadways within the City.

Climate within Chelsea ranges from January average minimum temperature of 22 degrees Fahrenheit (°F) to July average maximum temperature of 82°F. The average annual precipitation is 42.5 inches, relatively distributed throughout the year. The wettest month of the year is November with an average precipitation of 3.98 inches.

1.4 Water Resources

Located on a peninsula in Boston Harbor, Chelsea is virtually surrounded by tidally influenced surface waters. It lies within the Mystic River Sub-Basin of the Boston Harbor Watershed. The major surface waters in or abutting Chelsea include the Chelsea River (also known as "Chelsea Creek"), the Mystic River (including Island End River), and Mill Creek.

The Chelsea River begins at the end of Mill Creek and where the cities of Chelsea, East Boston, and Revere meet. The Chelsea River flows southwesterly to the Mystic River near Boston Harbor. It is a shipping channel, supporting large ocean-fairing tankers with typical cargos of liquid petroleum products and road salt.

The Island End River begins north of Chelsea in the community of Everett but flows underground through a series of culverts until it outlets in the southwest corner of Chelsea. It flows south for a short length along the border between Chelsea and Everett before entering the Mystic River.

The Mystic River begins at the outlet of Lower Mystic Lake in Arlington and flows through the communities of Charlestown, Chelsea, Boston, Everett, Medford, and Somerville before discharging to the Boston Inner Harbor.

Mill Creek begins at the outlet of three stormwater outfalls located along the northern border with Revere, and then flows southeast to the Chelsea River. It defines much of the border between the cities of Chelsea and Revere.

All impairments and outfalls discharging to these water bodies are summarized in Table 1.2 below:

Table 1.2
RECEIVING WATERS AND IMPAIRMENTS

Waterbody	Impairment	Number of Outfalls Discharging to Receiving Water
Chelsea River - From confluence with Mill Creek, Chelsea/Revere to confluence with Boston Inner Harbor, Chelsea/East Boston/Charlestown (MA71-06) *(Class SB(CSO) Water)*	Debris/Trash, Ammonia (Un-ionized), Fecal Coliform*, Other, Dissolved Oxygen, PCBs in Fish Tissue, Petroleum Hydrocarbons, Sediment Screening Value (Exceedence), Odor, Turbidity	7
Mill Creek - From Route 1, Chelsea/Revere to confluence with Chelsea River, Chelsea/Revere. (MA71-08) *(Class SB Water)*	Fecal Coliform*, Other, PCB in Fish Tissue	14
Mystic River - Amelia Earhart Dam, Somerville/Everett to confluence with Boston Inner Harbor, Chelsea/Charlestown (Includes Island End River). (MA71-03) *(Class SB(CSO) Water)*	Ammonia (Un-ionized), Fecal Coliform*, Foam/Flocs/Scum, Oil and Grease, Other, Dissolved Oxygen, PCB in Fish Tissue, Petroleum Hydrocarbons, Sediment Screening Value (Exceedence), Odor	3

Note: Impairments which (*) have an approved TMDL. Applicable TMDLs are identified in Section 6.0.

1.5 Interconnections

The City of Chelsea also has five locations where its MS4 connects with another MS4 under another municipality's jurisdiction, all of which are discharges from the City of Everett. There are no known interconnections that originate in Chelsea and discharge to another MS4.

1.6 Endangered Species and Historic Properties Determination

The 2016 MS4 Permit requires that Chelsea demonstrate that all activities regulated under this permit will not adversely affect endangered and threatened species or critical habitat, or impact federal historic properties on the National Register of Historic Properties (NRHP). The City must demonstrate that there is no critical habitat for any endangered species within its boundaries, and if such a habitat exists, that no best management practice shall interfere with that habitat. Chelsea must also certify that no discharge will affect a property that is listed or eligible for listing on the NRHP, that any such effects have written acknowledgements from the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (THPO), or other representative that such effects shall be mitigated, and written proof that any best management practices constructed under this permit will include measures to minimize harmful effects on these properties.

Through consultation with the US Fish & Wildlife Service (USFWS), it was determined that there are no threatened, endangered, or candidate species or critical habitats within the City of Chelsea, nor in proximity to Chelsea's stormwater system or discharges. Therefore, the City has determined that it can certify eligibility under USFWS Criterion A for coverage under the permit. A copy of the Information, Planning, and Conservation generated preliminary determination letter indicating that no listed species of critical habitat is present within the City of Chelsea is appended to the City's Notice of Intent included in Appendix D.

Chelsea can certify eligibility under Criterion A on their Notice of Intent for coverage under the permit because the City was previously covered under the 2003 MS4 Permit, and conditions have not changed since that determination. Chelsea does have multiple federal historic places, including several historic districts: Downtown Chelsea Residential Historic District (88000718), Chelsea Square Historic District (09000144), Naval Hospital Boston Historic District (73000851), Bellingham Square Historic District (85000030). Chelsea also has several historic properties: Chelsea Garden Cemetery (01000089), Kimball, C. Henry House (82004464), Bellingham-Cary House (74000908), and Congregation Agudath Shalom, also known as the Walnut Street Synagogue (93000283). These historic properties are located at a minimum of 1250 feet away from any impaired water body. It has been determined to be very unlikely that any disturbance would impact these properties. Prior to construction of any structural BMPs, the City will consult with the State Historic Preservation Officer by submitting a completed Project Notification Form to confirm that the proposed project will not impact any federal historic properties.

1.7 Increased Discharges

Any increased discharges (including increased pollutant loadings) through the MS4 to waters of the United States are subject to Massachusetts antidegradation regulations at 314 CMR 4.04. Section 2.1.2 of the 2016 MS4 Permit requires the City of Chelsea to comply with the provisions of 314 CMR 4.04 including information submittal requirements and obtaining authorization for increased discharges where appropriate. Any authorization by MassDEP for an increased discharge is required to be incorporated into this SWMP.

The City understands that there shall be no increased discharges, including increased pollutant loadings, from the MS4 to impaired waters listed in categories 5 or 4b on the most recent Massachusetts Integrated Report of Waters listed pursuant to Clean Water Act section 303(d) and 305(b), unless the City demonstrates that there is no net increase in loading from the MS4 to the impaired water of the pollutant(s) for which the waterbody is impaired. If necessary, the City of Chelsea will demonstrate compliance with this provision by either:

- Documenting that the pollutant(s) for which the waterbody is impaired is not present in the MS4's discharge and retaining documentation of this finding with the SWMP; or
- Documenting that the total load of the pollutant(s) of concern from the MS4 to any impaired portion of the receiving water will not increase as a result of the activity and retain documentation of this finding in the SWMP.

1.8 Surface Water Drinking Supplies

Section 3.0 of the MS4 Permit requires permittees to prioritize discharges to public drinking water supply sources in implementation of the SWMP. The City does not have any discharges to surface drinking water supply sources or their tributaries.

2.0 MINIMUM CONTROL MEASURES

2.1 Introduction

This section of the report provides a summary of the regulatory requirements for each of the six minimum control measures as defined under the MS4 General Permit. It also provides a summary of those stormwater management practices that the City currently employs. As part of the requirements of the NOI submitted to EPA on September 26, 2018, as included in Appendix D, the City has established a list of the BMPs that it plans to implement in order to comply with each of the six minimum control measures. These BMPs will be implemented over the next five years (i.e. the permit term); however, the City will have up to 20 years to implement some of the permit requirements as indicated. The City's progress with respect to implementation of the BMPs, and other stormwater related activities, are summarized in annual reports submitted to EPA in accordance with the MS4 Permit. Under the 2003 MS4 Permit, the City made significant progress in compliance with many of the elements now required by the 2016 MS4 Permit. The City of Chelsea submitted annual reports to EPA, in compliance with the 2003 MS4 Permit, between 2004 and 2018. Links to these reports are included in Appendix E. Annual Reports submitted after 2018 under the 2016 MS4 Permit are included in Appendix J.

The BMPs selected for each minimum control measure are summarized and briefly described in this section. Specific details for each BMP including measurable goals, implementation dates and individuals responsible for implementation are stated in each of the respective sections. The City Manager, Board of Health, Planning & Development Department, and the Department of Public Works (DPW) will be responsible for implementation and/or future enforcement of each of the BMPs for the six minimum control measures.

Compliance with requirements of the permit related to water quality limited waters and approved Total Maximum Daily Loads (TMDLs) is included in Section 6.

Checklists outlining requirements for Permit Years 1 through 5 are included in Appendix F.

2.2 Permit Requirements and Implementation Timeframes (Permit Year 2 Updates)

2.2.1 Public Education and Outreach

The public education and outreach minimum control measure requires the City to make educational information available to the public and other stakeholders specified by the permit. Chelsea has been participating in public education and outreach activities since the 2003 MS4 Permit was enacted.

<u>Regulatory Requirement:</u>

Section 2.3.2 of the 2016 MS4 General Permit requires permittees to "implement an education program that includes educational goals based on stormwater issues of significance within the MS4 area. The ultimate objective of a public education program is to increase knowledge and change behavior of the public so that pollutants in stormwater are reduced."

Existing City Practices:

Chelsea provides public education and outreach to residents on a variety of subjects through multiple medias including, but not limited to water and sewer bill stuffers, bulletin boards in the schools and city offices, the City's website, the local cable access channel, and the local newspaper. Chelsea also provides public education and outreach materials in Spanish and other languages making up its population. Some information relating to stormwater topics has previously been distributed in this manner, and the City will continue to expand this effort. Example public education and outreach materials from the City's website are provided in Appendix G of this document.

Chelsea DPW maintains its own web page, www.chelseama.gov/public-works. On the main page, there are links to Water and Sewer Services which further links to a Stormwater Management Services page. The City of Chelsea also works with the Mystic River Watershed Association (MyRWA) to best utilize public education efforts.

In addition to all the work being performed by the City at present, this new iteration of the permit requires additional public education measures. Chelsea must distribute two targeted messages within five years to the following audiences, spaced at least one year apart for each audience:

1. Residents
2. Businesses, Institutions and Commercial Facilities
3. Developers (Construction)
4. Industrial Facilities

In order to accomplish this, the City will implement the following BMPs:

BMP: Meeting
Description: Continue partnership program with GreenRoots Inc. and MyRWA.
Targeted Audiences: Residents
Responsible Department/Parties: DPW
Measurable Goals: DPW and partners will conduct public forums on a yearly basis and track the number of attendees.
Message Dates: Completed during Permit Year 1 (FY2019) and ongoing throughout the permit term.

BMP: Web Page
Description: Provide stormwater educational information on the City's website addressing stormwater runoff information.
Targeted Audiences: Residents
Responsible Department/Parties: DPW
Measurable Goals: DPW will continue to update the City's Stormwater Management webpage with stormwater runoff information and links to relevant resources targeted at residents and will track the number of visitors to the site.
Message Dates: Completed during Permit Year 2 (FY2020) and materials to be maintained throughout the permit term.

BMP: Social Media (Added after NOI)
Description: Publish information to The City's official Facebook page with tips about stormwater management and links to additional information, including posts about proper pet waste management.
Targeted Audiences: Residents

Responsible Department/Parties: DPW
Measurable Goals: Track the number of followers of the City's Facebook page.
Message Dates: Completed during Permit Years 1 and 2 and to be continued throughout the permit term.

BMP: Brochures/ Pamphlets
Description: Distribute educational materials regarding good housekeeping practices, including equipment, inspection, waste disposal, dumpster maintenance, use and storage of de-icing materials, and parking lot sweeping.
Targeted Audiences: Industrial Facilities
Responsible Department/Parties: DPW
Measurable Goals: Distribute brochures and maintain a list of all recipients.
Message Dates: Was not implemented during Permit Year 2 (FY2020) and is to be implemented in Permit Year 3 (2021).

BMP: Brochures/ Pamphlets
Description: Distribute brochures to prospective developers and contractors outlining sediment and erosion control requirements during construction.
Targeted Audiences: Developers (Construction)
Responsible Department/Parties: Planning Department
Measurable Goals: Make brochures available to developers in the Planning Department. Track number of brochures distributed. Verify that sediment and erosion control practices are being followed during site inspections.
Message Dates: To be implemented during Permit Year 3 (FY2021).

BMP: Brochures/ Pamphlets
Description: Provide stormwater educational pamphlets addressing lawn/grounds maintenance, use of salt/ de-icing materials, etc.
Targeted Audiences: Businesses, Institutions, and Commercial Facilities
Responsible Department/Parties: DPW
Measurable Goals: Distribute pamphlets to businesses, institutions and commercial facilities, and maintain a list of all recipients.
Message Dates: To be implemented during Permit Year 3 (FY2021).

BMP: Brochures/ Pamphlets
Description: Distribute information to industrial facilities on compliance with EPA's Multi-Sector General Permit.
Targeted Audiences: Industrial Facilities
Responsible Department/Parties: DPW
Measurable Goals: Track number of industrial facilities reached.
Message Dates: To be implemented during Permit Year 4 (FY2022).

BMP: Brochures/ Pamphlets
Description: Make available to developers information on green infrastructure practices for construction projects.
Targeted Audiences: Developers (Construction)
Responsible Department/Parties: Planning Department
Measurable Goals: Make brochures available to developers in the Planning Department. Track number of brochures distributed.

Message Dates: To be implemented during Permit Year 4 (FY2022).

BMP: Web Page
Description: Update the City's website to include information on vehicle maintenance, fertilizer use, parking lot sweeping, ice removal optimization, and waste/material storage for local businesses.
Targeted Audiences: Businesses, Institutions and Commercial Facilities
Responsible Department/Parties: DPW
Measurable Goals: Track number of visits to web site.
Message Dates: To be completed during Permit Year 5 (FY2023) and materials to be maintained throughout the permit term.

Public education materials utilized in the implementation of the City's SWMP are included in Appendix G.

2.2.2 Public Involvement / Participation

Regulatory Requirement:

Section 2.3.3 of the 2016 MS4 Permit requires the permittee to "provide opportunities to engage the public to participate in the review and implementation of the permittee's SWMP." Public participation benefits the program by increasing public support, including additional expertise and involving community groups/organizations.

Existing City Practices:

The City encourages public involvement within the community, and residents participate in a number of different ways. Due to its urban setting, Chelsea has a particular focus on programs aimed at participation and involvement at the youth level. Involvement with stormwater related activities is and will continue to be coordinated through existing organizations, including GreenRoots Inc., MyRWA, and the City's internal youth and community groups.

BMP: SWMP Review
Description: The Engineering Department will make the SWMP available to the public and provide for public comment annually.
Responsible Department/Parties: Engineering
Measurable Goals: Allow annual review of stormwater management plan by posting of stormwater management plan on City website.
Message Dates: The SWMP was made publicly available during Permit Years 1 and 2 (FY2019) and is to be continued for the duration of the permit as the SWMP is updated annually.

BMP: Meetings
Description: Hold coordination meetings with MyRWA.
Responsible Department/Parties: DPW
Measurable Goals: Attend Mystic River Steering Committee meetings on a quarterly basis and continue coordination with Mystic River Watershed Association.
Message Dates: Coordination with MyRWA continues from Permit Year 1 (FY2020) and is to be maintained throughout the permit term.

BMP: Volunteer Water Quality Monitoring
Description: DPW facilitates teams of volunteers to perform water quality monitoring in selected areas.
Responsible Department/Parties: DPW
Measurable Goals: Continue relationship with MyRWA.
Message Dates: To be implemented during Permit Year 1 (FY2019) and continued for the duration of the permit. Volunteer coordination in permit year 2 (FY2020) was limited due to COVID-19 restrictions.

BMP: Collection Days
Description: Hold household hazardous waste and used oil collection day.
Responsible Department/Parties: DPW
Measurable Goals: Continue to hold Household Hazardous Waste Day in April at the Chelsea High School's Carter Street Parking Lot for Chelsea residents. Track amount and type of waste collected.
Message Dates: Held annually during Permit Year 1 (FY2019) and Permit Year 2 (FY2020), and to be continued for the duration of the permit.

2.2.3 Illicit Discharge Detection and Elimination

Regulatory Requirement:

Section 2.3.4 of the 2016 MS4 General Permit requires the permittee to develop a written Illicit Discharge Detection and Elimination (IDDE) program. The IDDE program is designed to "systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges."

Existing City Practices:

Chelsea developed and began implementation of a comprehensive IDDE Program as a response to a 2009 Administrative Consent Order from the EPA to address storm drain discharges of pollutants into Mill Creek, Chelsea Creek, the Island End River, and the Mystic River. The IDDE Program was included in the previous iteration of Chelsea's SWMP, completed in 2010, and is discussed in detail later in this SWMP. The City also updated its existing sewer and drain ordinances in October 2009 to provide more specific provisions for prevention and enforcement of illicit discharges. Lastly, the City will continue their effort to extend IDDE educational outreach by making information available to the public through the City's website and continue to train employees on illicit discharge detection and elimination.

These permit requirements can be achieved through implementation of the following BMPs:

BMP: SSO Inventory
Description: Develop inventory of all Sanitary Sewer Overflows (SSO) that have occurred in the last 5 years in accordance with permit conditions.
Responsible Department/Parties: DPW
Measurable Goals: Complete within 1 year of effective date of permit, and report SSOs annually.
Message Dates: Completed during Permit Year 1 (FY2019) and is updated annually. It is included in Appendix K.

BMP: Storm Sewer System Map

Description: Continue to update storm/ drainage map annually during IDDE field investigations or as changes are otherwise identified.
Responsible Department/Parties: DPW
Measurable Goals: Continue annual map updates as a result of IDDE field investigations or as changes are otherwise identified.
Message Dates: Annual map updates were completed in Permit Year 1 and Permit Year 2 and are to be continued annually throughout the duration of the permit term.

BMP: Written IDDE Program
Description: Update existing written IDDE plan as needed to satisfy all permit requirements.
Responsible Department/Parties: Engineering
Measurable Goals: Complete update within 1 year of the effective date of permit and update as required thereafter.
Message Dates: Completed during Permit Year 1 (FY2019).

BMP: Implement IDDE Program
Description: Continue ongoing catchment investigations according to program and permit conditions.
Responsible Department/Parties: Engineering
Measurable Goals: Complete 10 years after effective date of permit. Continue to track annually the number of illicit connections that are identified and removed.
Message Dates: IDDE Program was implemented prior to Permit Year 1 (FY 2019) and will continue throughout the duration of the permit term.

BMP: Employee Training
Description: Train employees on IDDE implementation.
Responsible Department/Parties: DPW
Measurable Goals: Train annually. Track number of employees trained.
Message Dates: Completed in November 2019 and September 2020. To be continued annually for the duration of the permit.

BMP: Conduct Dry Weather Screening
Description: Continue dry weather screening and sampling procedures in accordance with permit conditions.
Responsible Department/Parties: Engineering
Measurable Goals: Complete all dry weather screening and sampling within 3 years of permit effective date. Track number of outfalls that are screened.
Message Dates: Continue annual dry weather screening, as required per Chelsea's ACO. Additional parameter dry weather screening per MS4 requirements was completed in 2018. Dry weather screening has been completed for Permit Year 1 (FY 2019) and Permit Year 2 (FY2020).

BMP: Conduct Wet Weather Screening
Description: Continue wet weather outfall screening and sampling procedures in accordance with permit conditions.
Responsible Department/Parties: Engineering
Measurable Goals: Complete all wet weather screening and sampling within 10 years of permit effective date. Continue to track number of outfalls that are screened and sampled annually.
Message Dates: Continue annual wet weather screening, as required per Chelsea's ACO. Additional parameter wet weather screening per MS4 requirements was completed in 2018. Wet weather screening has been completed for Permit Year 1 (FY 2019) and Permit Year 2 (FY2020).

BMP: Ongoing Screening
Description: Conduct dry and wet weather screening (as necessary).
Responsible Department/Parties: Engineering
Measurable Goals: Complete outfall screening upon completion of IDDE program implementation.
Message Dates: Screening has been completed for Permit Year 1 (FY 2019) and Permit Year 2 (FY2020) and will continue annually, per Chelsea's ACO.

BMP: IDDE Ordinance/Bylaw
Description: Continue to prohibit illicit discharges as outlined in the City's ordinances and take enforcement actions as needed.
Responsible Department/Parties: DPW
Measurable Goals: Report the number of enforcement actions taken annually.
Message Dates: Completed in Permit Year 1 (FY2019).

BMP: Catchment Investigation Procedures
Description: Develop written catchment investigation procedures and incorporate into the IDDE Plan.
Responsible Department/Parties: DPW
Measurable Goals: Amend written IDDE Plan as needed with catchment investigation procedures.
Message Dates: Completed in Permit Year 1 (FY2019

BMP: Assessment and Priority Ranking of Outfalls/ Interconnections
Description: Assess and rank the potential for all catchments to have illicit discharges.
Responsible Department/Parties: DPW/ Health Department
Measurable Goals: Determine ranking and priority order for screening outfalls and interconnections.
Message Dates: Completed prior to Permit Year 1 (FY2019)..

BMP: Follow-up Ranking
Description: Update catchment prioritization and ranking as additional dry weather screening information becomes available.
Responsible Department/Parties: Engineering
Measurable Goals: The outfall ranking described above shall be amended by the City as new sampling results become available after the first round of dry-weather screening and sampling.
Message Dates: Completed in Permit Year 1 (FY2019) and Permit Year 2 (FY2020) and to be annually updated throughout the duration of the permit term.

2.2.4 Construction Site Stormwater Runoff Control

Regulatory Requirement:

Section 2.3.5 of the 2016 MS4 Permit requires the permittee to create a program to "minimize or eliminate erosion and maintain sediment on site so that it is not transported in stormwater and allowed to discharge to a water of the US through the permittee's MS4." The permittee will conduct site plan reviews, site inspections and include procedures for public involvement.

Existing City Practices:

Construction site runoff control (CSRC) is accomplished in a variety of methods in Chelsea. Projects disturbing one acre or more require a NPDES General Permit for Construction Activities, and Chelsea requires that all contractors show proof that they have applied for coverage under this permit prior to starting construction. CSRC for all projects governed by the Wetlands Protection Act, regardless of size, is regulated by the Chelsea Conservation Commission. Simple utility connection and street opening permits are issued through the DPW and Building Permits are issued through the Inspectional Services Department (ISD). Throughout construction, staff members from appropriate city departments perform site inspections related to their area of expertise to ensure that requirements are being met. The City also recently updated its existing ordinances to provide specific provisions with respect to CSRC.

To attain compliance with the 2016 MS4 Permit, the City will implement the following BMPs to supplement the guidelines set forth in their ordinances.

BMP: Site Inspection and Enforcement of Erosion and Sediment Control (ESC) Measures
Description: Develop written procedures for site inspections and enforcement.
Responsible Department/Parties: Planning Department, Engineering
Measurable Goals: Report on the number of site inspections and enforcement actions annually.
Message Dates: Completed in Permit Year 1 (FY2019) and Permit Year 2 (FY2020) and to be annually updated throughout the duration of the permit term.).

BMP: Site Plan Review
Description: Develop written procedures for site plan review that meet permit requirements and begin implementation.
Responsible Department/Parties: Planning Department, Engineering
Measurable Goals: Report on the number of site plan reviews conducted, inspections conducted, and enforcement actions taken annually.
Message Dates: Completed in Permit Year 1 (FY2019) and Permit Year 2 (FY2020) and to be annually updated throughout the duration of the permit term.).

BMP: Erosion and Sediment Control
Description Continue to require construction operators to implement a sediment and erosion control program and enhance program as needed to meet permit requirements. Review and update existing ordinance as needed to ensure that construction operators implement a sediment and erosion control program that includes BMPs that are appropriate for conditions at the construction site in accordance with permit requirements.
Responsible Department/Parties: Engineering, Planning Department

Measurable Goals: Continue to enforce existing sediment and erosion control requirements, and update regulations as needed.
Message Dates: Completed in Permit Year 1 (FY2019) and Permit Year 2 (FY2020) and to be annually updated throughout the duration of the permit term..

BMP: Waste Control
Description: Update existing ordinance to include requirements for construction site operators to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes.
Responsible Department/Parties: Planning Department
Measurable Goals: Review existing practices and modify if necessary.
Message Dates: Completed in Permit Year 1 (FY2019).

2.2.5 Post-Construction Stormwater Management

Regulatory Requirement:

Section 2.3.6 of the 2016 MS4 Permit requires the permittee to require developers to "reduce the discharge of pollutants found in stormwater through the retention or treatment of stormwater after construction on new or redeveloped sites." In this case, a site is defined as the "area extent of construction activities which includes but is not limited to the creation of new impervious cover and improvement of existing impervious cover." New Development is defined as construction activity that results in a total earth disturbance area equal to or greater than one acre on land that did not have any impervious area before work began. Redevelopment is defined as any construction activity that disturbs greater than or equal to one acre and does not meet the requirements to be designated as new development.

Existing City Practices and Amendments:

Post-Construction Runoff Control (PCRC) is primarily regulated by the Department of Planning & Development through City Ordinances, with input from the DPW and ISD. Where appropriate, the City will also enlist the services of a consulting engineer to provide detailed review of proposed projects. Due to its old and urban nature, there is no new development in Chelsea; everything is redevelopment. Site Plan Review provisions in the Zoning Ordinance govern all applications to "build, alter or expand any building, structure or use." Stormwater management for proposed redevelopment is handled through the Site Plan Review process, including compliance with City design standards, formal public hearings, and requirements for structural and non-structural BMPs. In addition to the Site Plan Review process, projects falling under the Wetlands Protection Act also require review and approval by the Chelsea Conservation Commission. After the review process has been completed, any necessary changes are then incorporated into the construction drawings prior to issuance of any permits for the work.

The City updated its existing ordinances in 2009 to provide written provisions with respect to PCRC. The revised ordinance included requirements for the use of BMPs on all future developments of public or private property, including provisions for proper O&M of structural BMPs, and also included references directly linking the City's ordinances to federal and state stormwater regulatory mechanisms to ensure that requirements remain current.

In order to comply with the requirements of the 2016 MS4 Permit, the City shall implement the following BMPs:

BMP: As-Built Plans for On-Site Stormwater Control
Description: Update existing ordinance to require submission of as-built drawings within two years, and long term operation and maintenance of BMPs as needed to meet permit requirements.
Responsible Department/Parties: Planning Department, Engineering
Measurable Goals: Review existing practices for submission of as-built plans and long-term O&M for completed projects and modify as necessary.
Message Dates: Draft ordinance language completed in Permit Year 2 (FY2020), but adoption of language delayed to Permit Year 3 (FY2021) by COVID-19 Restrictions.

BMP: Target Properties to Reduce Impervious Areas
Description: Identify at least 5 permittee-owned properties that could be modified or retrofitted with BMPs to reduce impervious areas and update annually.
Responsible Department/Parties: Engineering
Measurable Goals: Report annually on retrofitted properties.
Message Dates: Complete within 4 years of the permit effective date (FY2022).

BMP: Allow Green Infrastructure Practices
Description Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist.
Responsible Department/Parties: Planning Department, Engineering
Measurable Goals: Review existing practices and implement recommendations of report, where feasible.
Message Dates: Complete within 4 years of the permit effective date (FY2022).

BMP: Street Design and Parking Lot Guidelines
Description: Develop a report assessing requirements that affect the creation of impervious cover. The assessment will help determine if changes to design standards for streets and parking lots can be modified to support low impact design options.
Responsible Department/Parties: Engineering, Planning Board
Measurable Goals: Complete assessment and implement recommendations of the report where feasible.
Message Dates: Complete within 4 years of the permit effective date (FY2022).

BMP: Ensure the Requirements of the MA Stormwater Handbook are met
Description: Review, and update existing regulations as needed, to meet retention and treatment requirements of the permit, and require compliance with the Stormwater Management Standards.
Responsible Department/Parties: Engineering, Planning Board
Measurable Goals: Adopt, amendment, or modification of a regulatory mechanism to meet permit requirements.
Message Dates: Draft ordinance language completed in Permit Year 2 (FY2020), but adoption of language delayed to Permit Year 3 (FY2021) by COVID-19 Restrictions.

2.2.6 Pollution Prevention / Good Housekeeping

Regulatory Requirement:

Section 2.3.7 of the 2016 MS4 Permit requires the permittee to "implement an operations and maintenance program for permittee-owned operations that has a goal of preventing or reducing pollutant runoff and protecting water quality form all permittee-owned operations."

This minimum control measure includes a training component and has the ultimate goal of preventing or reducing stormwater pollution from municipal activities and facilities such as parks and open spaces, buildings and facilities, vehicles and equipment, and providing for the long-term operation and maintenance of MS4 infrastructure.

Existing City Practices:

A primary component of Chelsea's pollution prevention program is regular street sweeping. Each street in Chelsea is swept twice each month between March 1st and December 31st. To maximize the benefits of the sweeping program, parking is prohibited during sweeping and curbside rubbish removal follows sweeping by one day. The street sweeping program has been in effect for over ten years. Chelsea also maintains municipal trash receptacles strategically located throughout the City, which are emptied four times per week, to reduce litter. Under their contract for Operation & Maintenance (O&M) of the stormwater collection system, Chelsea cleans at least 450 catch basins each year to remove accumulated settleable and floatable solids.

Chelsea has performed audits of all its municipally-owned properties located within the MS4 area to assess pollution prevention and good housekeeping efforts associated with its municipal operations. The City has also provided formal training to municipal employees to increase awareness of pollution prevention and good housekeeping.

To achieve compliance with the 2016 MS4 Permit, catch basins must be no more than 50% full at any given time. To achieve this, all structures must be cleaned, measured, logged and monitored to prevent excessive sediment accumulation. The City is in the process of purchasing a CCTV truck to help identify areas for more frequent maintenance. These measures are summarized in the following BMP practices:

BMP: O&M Procedures
Description: Create written O&M procedures addressing proper storage of materials, lawn maintenance and landscaping activities, protective practices, use and storage of petroleum products, employee training, waste management procedures for buildings and facilities, location of fueling areas, evaluation of possible leaks, and storage locations of City-owned vehicles and equipment.
Responsible Department/Parties: DPW
Measurable Goals: Review existing procedures and implement.
Message Dates: Completed in 2020.

BMP: Inventory all Permittee-Owned Property
Description: Inventory all permittee-owned parks and open spaces, buildings and facilities, and vehicles and equipment and update annually.

Responsible Department/Parties: DPW
Measurable Goals: Update existing inventory from the November 2009 Audit.
Message Dates: Completed in 2020 and to be updated annually.

BMP: Infrastructure O&M
Description: Establish and implement a program for repair and rehabilitation of MS4 infrastructure.
Responsible Department/Parties: DPW
Measurable Goals: Review existing programs and update as necessary.
Message Dates: Completed in 2020 and to be updated annually.

BMP: Stormwater Pollution Prevention Plan (SWPPP)
Description: Create SWPPP for DPW maintenance garage.
Responsible Department/Parties: DPW
Measurable Goals: Provide inspections quarterly and training annually thereafter. Track number of employees trained annually.
Message Dates: Completed in 2020 and to be updated annually.

BMP: Catch Basin Cleaning
Description: Establish schedule for catch basin cleaning such that each catch basin is no more than 50% full and clean catch basins on that schedule.
Responsible Department/Parties: DPW
Measurable Goals: Clean catch basins on established schedule and report number of catch basins cleaned and volume of material removed annually.
Message Dates: An informal catch basin cleaning schedule has been in place prior to 2018. A schedule for catch basin cleaning optimization is targeted for 2020.

BMP: Street Sweeping Program
Description: Continue to sweep all streets and permitee-owned parking lots at least once a year in accordance with permit conditions.
Responsible Department/Parties: DPW
Measurable Goals Continue ongoing program of sweeping every street twice a month from April to November, and report annually the miles of roadway swept or the volume of material removed.
Message Dates: Completed in 2019 and to be continued for the duration of the permit term.

BMP: Road Salt Use Optimization Program
Description: Establish and implement a program to optimize the use of road salt, while maintaining public safety standards.
Responsible Department/Parties: DPW
Measurable Goals: Implement salt use optimization during deicing season.
Message Dates: Completed in Permit Year 1 (FY2019).

BMP: Catch Basin Optimization
Description: Develop and implement a plan to optimize inspection, cleaning, and maintenance of catch basins to ensure that permit conditions are met.
Responsible Department/Parties: DPW
Measurable Goals: Complete and implement.
Message Dates: A standard operating procedure for catch basin cleaning was implemented in 2020. An optimization plan is targeted for Permit Year 3 (FY2021).

3.0 REGULATORY STANDARDS

3.1 Introduction

In order to prevent pollutants from entering the drainage system and being discharged to the environment with stormwater, Chelsea has implemented a wide variety of Best Management Practices (BMPs) categorized under the six minimum control measures as discussed earlier in this document. The control measures for Illicit Discharge Detection and Elimination, Construction Site Stormwater Runoff Control, and Post-Construction Stormwater Management are focused on improving stormwater pollution prevention into the future by ensuring that all new construction includes appropriate requirements for BMPs. To ensure post-construction stormwater management, the City previously developed and adopted the following under the 2003 MS4 Permit.

- Regulatory mechanisms establishing legal authority, prohibitions and requirements
- Design and construction standards governing stormwater infrastructure
- Requirements for long-term Operation and Maintenance (O&M) of structural BMPs.

Additional information regarding the City's current regulatory mechanisms adopted under the 2003 MS4 Permit, as well as the status of the City's compliance with the 2016 MS4 Permit regulatory requirements are included in this section.

3.2 Existing Stormwater Regulatory Mechanisms

In 2009, under the 2003 MS4 Permit, the City made revisions to existing City ordinances to address the requirements of the NPDES Phase II permit, and to improve stormwater management city-wide. The majority of revisions are contained in Article V. Sewers and Storm Drains of Chapter 30 – Water and Sewer Systems of Chelsea's Code of Ordinances. A copy of this Ordinance is included in Appendix H.

3.3 Review of Regulatory Mechanisms for Compliance with the 2016 MS4 Permit (Permit Year 2 Update)

A comprehensive review was conducted to evaluate whether the City's existing regulatory mechanisms for construction and post-construction stormwater management comply with the 2016 MS4 Permit requirements, and identify what modifications, if any, are needed to bring the City into compliance. The findings are discussed below.

3.3.1 Construction Site Stormwater Runoff Control

The 2016 MS4 Permit builds on the requirements of the 2003 MS4 Permit for construction site runoff control and requires the following (Year 1 requirements):

Site Inspection & Enforcement

Permit Requirement: Development of written procedures for site inspections and enforcement of sediment and erosion control measures. These procedures shall clearly define who is responsible for *site inspections as well as who has authority to implement enforcement procedures. The program shall provide that the permittee may, to the extent authorized by law, impose sanctions to ensure compliance with the local program. These procedures and regulatory authorities shall be documented in the SWMP.*

Excerpts from Chelsea's Regulations that Support Permit Requirement:
Section 32-224. of the City's Storm Drains Ordinance generally outlines the requirements for site inspections of systems designed to manage stormwater prior to discharge to the public drain, though no specific inspection procedures are included in the ordinance. Inspection procedures should be maintained at City Hall per the Department of Public Works or the Planning Board. This Section clearly states that the owner is responsible for annual inspections performed by the manufacturer. The director, defined as the director of public works, has the ability to enforce maintenance, repair, or replacement of the systems.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.
"Sec. 30-224. - Maintenance, cleaning and inspection of systems to manage stormwater.
…
(a) Where systems are provided on a property to treat or otherwise manage stormwater prior to discharge to the public drain, public combined sewer, or natural outlet, the system shall be maintained continuously in satisfactory and effective operation by the owner at the owner's expense, including all maintenance and cleaning of the system as may be recommended by the system manufacturer, and annual inspection of the system by a person authorized by the manufacturer. Whenever such systems become clogged, broken, obstructed, out of order, unfit for drainage purposes, or detrimental to the public drain or to the receiving water, the owner, agent, occupant or person having charge of any such system shall, when directed by written notice from the director, remove, reconstruct, alter, cleanse or repair the system, as the conditions thereof require. In case of neglect or refusal to comply with such notice within five days after the same is given, the director may cause the system to be removed, reconstructed, repaired, altered or cleaned, as the director may deem expedient, at the expense of the owner, agent, occupant or other person so notified, who shall also be liable to pay the penalty provided for in this chapter.
(b) The owner of such facilities shall maintain a written record describing the date and type of all cleaning, maintenance and inspections performed, and the identity and qualifications of the person who performed such tasks. Records shall be maintained for six years and shall be made available for inspection and copying by the DPW. By March 31 of each year, the owner shall submit to the DPW a written record of the date and type of all maintenance, cleaning, and inspection performed during the prior calendar year. Records shall be specific to the site, system, and work performed. The director may reject any records that are not site specific."

Sediment and Erosion Control BMPs

Permit Requirement: Requirements for construction site operators performing land disturbance activities within the MS4 jurisdiction that result in stormwater discharges to the MS4 to implement a sediment and erosion control program that includes BMPs appropriate for the conditions at the construction site. The program may include references to BMP design standards in state manuals, such as the Massachusetts Stormwater Handbook or design standards developed by the MS4. EPA supports and encourages the use of design standards in local programs. Examples of appropriate sediment and erosion control measures for construction sites include local requirements to:

- *Minimize the amount of disturbed area and protect natural resources*
- *Stabilize sites when projects are complete, or operations have temporarily ceased*

- *Protect slopes on the construction site*
- *Protect all storm drain inlets and armor all newly constructed outlets*
- *Use perimeter controls at the site*
- *Stabilize construction site entrances and exists to prevent off-site tracking*
- *Inspect stormwater controls at consistent intervals*

Excerpts from Chelsea's Ordinances that Support Permit Requirement: Within its Water and Sewer Systems' Ordinance, Chelsea requires that owners of property wishing to establish a new or repair an old connection to the MS4 or otherwise discharge stormwater to an outlet, must first prepare and implement a sediment and erosion control plan.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.
"Sec. 30-223. - Stormwater management.
(a) All owners of existing properties shall implement industry standard structural and nonstructural best management practices (BMPs) to minimize the discharge of pollutants carried by stormwater runoff from their properties to any public drain or natural outlet.
(b) Every owner seeking to establish a new connection to the public drain or combined sewer, or natural outlet; to reconstruct, repair or modify an existing connection for a facility undergoing expansion; or as otherwise deemed necessary by the director under this chapter, may be required to do the following:
(1) Prepare and implement a stormwater management plan that identifies regulatory, structural, administrative, managerial, maintenance, physical and chemical measures or devices designed to prevent the discharge of pollutants to stormwater.
(2) Prepare and implement an erosion and sedimentation control plan to prevent the erosion of soil and the introduction of sediment into the public sewers and drains, during and after construction."

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.
"Sec. 30-220. - Pollution prevention in the stormwater collection system.
In order to maintain the city's efforts in prohibiting pollutants from being discharged into its waterways the following is required:
…
(2) The proponents of all construction projects within the city must submit to DPW for approval a plan to manage sediment and erosion control, which includes stormwater and drainage, at the proposed location prior to or in conjunction with its building permit application. No building permits shall be approved and issued until such plan has been approved by the director."

Control of Wastes

Permit Requirement: Requirements for construction site operators within the MS4 jurisdiction to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes. These wastes may not be discharged to the MS4.

Excerpts from Chelsea's Ordinances that Support Permit Requirement: Construction waste is explicitly referenced in the Sewers and Storm Drains Ordinance. It is made clear that the City will take action to prevent non-stormwater discharges to the City's MS4 at the cost of the property owner.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.

"Sec. 30-219. - Use of the public drains.

(a) No person shall directly or indirectly discharge or cause to be discharged any pollutants, as defined by federal and state surface water quality standards, to any building storm drain, public drain or natural outlet. No person shall directly or indirectly discharge or cause to be discharged, any sewage or any other waters not composed entirely of stormwater into a building storm drain or public drain except as provided in subsection (c) of this section. Each user shall provide reasonable and appropriate protection from any discharge, including accidental discharges, in violation of this chapter or any federal or state laws or regulations. No person shall directly or indirectly dump, discharge or cause to be discharged into any catchbasin, any solid waste, construction debris, paint or painting product, antifreeze, hazardous waste, oil, gasoline, grease and all other automotive and petroleum products, solvents and degreasers, drain cleaners, commercial and household cleaners, soap, detergent, ammonia, food and food waste, grass or yard waste, leaves, animal feces, dirt, sand, gravel or other pollutant. Any person determined by the director to be responsible for the direct or indirect discharge of any of the substances stated in this subsection to a catchbasin may be held responsible for cleaning the catchbasin, paying the cost for such cleaning or for paying any penalties assessed by the DPW."

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.

"Sec. 30-220. - Pollution prevention in the stormwater collection system.

In order to maintain the city's efforts in prohibiting pollutants from being discharged into its waterways the following is required:

(1) In accordance with the city's illicit discharge detection and elimination plan nonstormwater discharges to the city's small MS4 system are strictly prohibited. Failure to comply with this section will require the immediate stoppage of such discharge and removal of any condition causing such discharge upon the order of the director or designee. If such orders are not complied with within seven days of issuance, the city will take such action that is necessary to remedy the situation and the cost of such action shall be the sole responsibility of the property owner. "

Site Plan Review Inspection and Enforcement

Permit Requirement: Development of written procedures for site plan review, inspection and enforcement. The site plan review procedure shall include a pre-construction review by the permittee of the site design, the planned operations at the construction site, planned BMPs during the construction phase, and the planned BMPs to be used to manage runoff created after development. The review procedure shall incorporate procedures for the consideration of potential water quality impacts, and procedures for the receipt and consideration of information submitted by the public. The site plan review procedure shall also include evaluation of opportunities for use of low impact design and green infrastructure. When the opportunity exists, the permittee shall encourage project proponents to incorporate these practices into the site design. The procedures for site inspection conducted by the permittee shall include the requirement that inspections occur during construction of BMPs as well as after construction of BMPs to ensure they are working as described in the approved plans, clearly defined procedures for inspections including qualifications necessary to perform the *inspections, the use of mandated inspections forms if appropriate, and procedure for tracking the number of site reviews, inspections, and enforcement actions.*

Excerpts from Chelsea's Regulations that Support Permit Requirement: Chelsea's Sewers and Storm Drains Ordinance requires that written records of all maintenance and inspections be kept by the owner of stormwater management systems and provided to the DPW yearly. Inspections must be performed yearly by a party approved by the manufacturer. However, it would be beneficial to include written inspection procedures for Sediment and Erosion Control inspections.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.

"Sec. 30-224. - Maintenance, cleaning and inspection of systems to manage stormwater.

…

(a) Where systems are provided on a property to treat or otherwise manage stormwater prior to discharge to the public drain, public combined sewer, or natural outlet, the system shall be maintained continuously in satisfactory and effective operation by the owner at the owner's expense, including all maintenance and cleaning of the system as may be recommended by the system manufacturer, and annual inspection of the system by a person authorized by the manufacturer. Whenever such systems become clogged, broken, obstructed, out of order, unfit for drainage purposes, or detrimental to the public drain or to the receiving water, the owner, agent, occupant or person having charge of any such system shall, when directed by written notice from the director, remove, reconstruct, alter, cleanse or repair the system, as the conditions thereof require. In case of neglect or refusal to comply with such notice within five days after the same is given, the director may cause the system to be removed, reconstructed, repaired, altered or cleaned, as the director may deem expedient, at the expense of the owner, agent, occupant or other person so notified, who shall also be liable to pay the penalty provided for in this chapter.

(b) The owner of such facilities shall maintain a written record describing the date and type of all cleaning, maintenance and inspections performed, and the identity and qualifications of the person who performed such tasks. Records shall be maintained for six years and shall be made available for inspection and copying by the DPW. By March 31 of each year, the owner shall submit to the DPW a written record of the date and type of all maintenance, cleaning, and inspection performed during the prior calendar year. Records shall be specific to the site, system, and work performed. The director may reject any records that are not site specific."

Overall Compliance:

Construction site stormwater runoff control is well documented. Chelsea's ordinances outline requirements for sediment and erosion control, control of wastes, plan review, inspections, and enforcement mechanisms. Chelsea may seek to augment its ordinance by further documenting its review and inspection procedures in separate, written documents.

3.3.2 Post-Construction Stormwater Management

The 2016 MS4 Permit builds on the requirements of the 2003 MS4 Permit for post construction runoff from new development and redevelopment and requires the following (Year 2 requirements):

Low Impact Development

Permit Requirement: *Low Impact Development (LID) site planning and design strategies must be used to the maximum extent feasible.*

Excerpts from Chelsea's Regulations that Support Permit Requirement: Neither Chelsea's Water and Sewer Systems Ordinance (Chapter 30 of the City Code of Ordinances) nor its Zoning Bylaw requires or encourages that Low Impact Development planning and design be utilized.

Recommended Modifications:
Requirements for the use of LID planning and design should be added to the Water and Sewer Systems Bylaw.

BMP Design Guidance

Permit Requirement: *The design of treatment and infiltration practices should follow the guidance in Volume 2 of the Massachusetts Stormwater Handbook, as amended, or other federally or State approved BMP design guidance.*

Excerpts from Chelsea's Regulations that Support Permit Requirement: Within its Sewer and Storm Drains' Ordinance, Chelsea requires that stormwater management practices be designed to conform to any City regulations, and in the absence of such regulations, to the standards of one of several listed documents.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.

"Sec. 30-223. - Stormwater management.

…

(c) All systems required by this section shall be of a type and capacity approved by the director, and shall be located so as to be readily and easily accessible for operation, maintenance, cleaning and inspection. The design and installation of the systems shall all conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city. In the absence of such specifications or in amplification thereof, the materials and procedures set forth in appropriate specifications of the American Society for Testing and Materials, the WEF Manual of Practice No. 9, Design and Construction of Urban Stormwater Management Systems and Gravity Sanitary Sewer Design and Construction, New England Interstate Water Pollution Control Commission, New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works, and title V of the State Environmental Code shall apply. Design and installation shall be at the facility owner's expense. The owner shall notify the director when the systems are ready for inspection and connection to the public drain. The connection shall be made under the supervision of the director or designee. If the applicant fails to make such notifications, any and all costs to uncover the systems as necessary for inspection shall be borne by the applicant.

<u>Compliance with the Stormwater Management Standards for New Development</u>

<u>Permit Requirement</u>: *Stormwater Management systems on new development sites shall be designed to:*

- *Not allow new stormwater conveyances to discharge untreated stormwater in accordance with Massachusetts Stormwater Handbook Standard 1;*
- *Control peak runoff rates in accordance with Massachusetts Stormwater Handbook Standard 2;*
- *Recharge groundwater in accordance with Massachusetts Stormwater Handbook Standard 3;*
- *Eliminate or reduce the discharge of pollutants from land uses with higher pollutant loads as defined in the Massachusetts Stormwater Handbook in accordance with Massachusetts Stormwater Handbook Standard 5;*
- *Protect Zone 2 or Interim Wellhead Protection Areas of public water supplies in accordance with Massachusetts Stormwater Handbook Standard 6;*
- *Implement long term maintenance practices in accordance with Massachusetts Stormwater Handbook Standard 9;*
- *Require that all stormwater management systems be designed to:*

  1. *Retain the volume of runoff equivalent to, or greater than, one (1) inch multiplied by the total post-construction impervious surface area on the site;*

     AND/OR

  2. *Remove 90% of the average annual load of TSS generated from the total post-construction impervious surface area on the site AND 60 % of the average annual load of TP generated from the post-construction impervious surface area on the site. Pollutant removal shall be calculated consistent with EPA Region 1's Evaluation tool provided by EPA Region 1, where available. If EPA Region 1 tools do not address the planned or installed BMP performance any federally or State approved BMP design guidance or performance standards may be used to calculated BMP performance.*

<u>Excerpts from Chelsea's Regulations that Support Permit Requirement</u>: Within its Sewer and Storm Drains' Ordinance, Chelsea requires that stormwater management practices be designed to conform to any City regulations, and in the absence of such regulations, to the standards of one of several listed documents.

<u>Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.</u>

"Sec. 30-223. - Stormwater management.

…

(c) All systems required by this section shall be of a type and capacity approved by the director, and shall be located so as to be readily and easily accessible for operation, maintenance, cleaning and inspection. The design and installation of the systems shall all conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city. In the absence of such specifications or in amplification thereof, the materials and procedures set forth in appropriate specifications of the American Society for Testing and Materials, the WEF Manual of Practice No. 9,

Design and Construction of Urban Stormwater Management Systems and Gravity Sanitary Sewer Design and Construction, New England Interstate Water Pollution Control Commission, New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works, and title V of the State Environmental Code shall apply. Design and installation shall be at the facility owner's expense. The owner shall notify the director when the systems are ready for inspection and connection to the public drain. The connection shall be made under the supervision of the director or designee. If the applicant fails to make such notifications, any and all costs to uncover the systems as necessary for inspection shall be borne by the applicant.

Recommended Modifications: The Massachusetts Stormwater Management Handbook should be included as a reference document as well as the specific standards listed above and in the MS4 permit documents. The volumetric and pollutant loading requirement should also be included.

Compliance with the Stormwater Management Standards for Redevelopment

Permit Requirement: Stormwater management systems on redevelopment sites shall meet the following standards to the maximum extent feasible:

- *Not allow new stormwater conveyances to discharge untreated stormwater in accordance with Massachusetts Stormwater Handbook Standard 1;*
- *Control peak runoff rates in accordance with Massachusetts Stormwater Handbook Standard 2;*
- *Recharge groundwater in accordance with Massachusetts Stormwater Handbook Standard 3;*
- *The pretreatment and structural best management practices requirements of Standards 5 (eliminate or reduce the discharge of pollutants from land uses with higher pollutant loads as defined in the Massachusetts Stormwater Handbook) and 6 (protect Zone 2 or Interim Wellhead Protection Areas of public water supplies in accordance with Massachusetts Stormwater Handbook Standard 6);*
- *Stormwater management systems on redevelopment sites shall also improve existing conditions by requiring that stormwater management systems be designed to:*
    1. *Retain the volume of runoff equivalent to, or greater than 0.8 inch multiplied by the total post-construction impervious surface area on the site;*
       AND/OR
    2. *Remove 80% of the average annual post-construction load of TSS generated from the total post-construction impervious area on the site AND 50% of the average annual load of TP generated from the total post-construction impervious surface area on the site. Pollutant removal shall be calculated consistent with EPA Region 1's Evaluation tool provided by EPA Region 1, where available. If EPA Region 1 tools do not address the planned or installed BMP performance any federally or State approved BMP design guidance or performance standards may be used to calculated BMP performance.*
- *Stormwater management systems on redevelopment sites may utilize offsite mitigation within the same USGS HUC10 as the redevelopment site to meet the equivalent retention or pollutant removal requirements indicated above.*

Excerpts from Chelsea's Regulations that Support Permit Requirement: Within its Sewer and Storm Drains' Ordinance, Chelsea requires that stormwater management practices be designed to conform to any City regulations, and in the absence of such regulations, to the standards of one of several listed documents. See the excerpted section of Sec. 30-223 above.

Recommended Modifications: The Massachusetts Stormwater Management Handbook should be included as a reference document as well as the specific standards listed above and in the MS4 permit documents. The volumetric and pollutant loading requirement should also be included. Should the City not wish to differentiate between new and re-development projects, the City may utilize the more strict new development standards for redevelopment as well.

Permit Requirement: Redevelopment activities that are exclusively limited to maintenance and improvement of existing roadways, (including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving projects) shall improve existing conditions where feasible and are exempt from any of the parts listed previously in part d. Roadway widening or improvements that increase the amount of impervious area on the redevelopment site by greater than or equal to a single lane width shall meet the requirements of part d fully.

Excerpts from Chelsea's Regulations that Support Permit Requirement: Every owner wishing to establish a new connection or modify an existing connection to the public drain or natural outlet, must prepare a stormwater management plan as defined by the requirements of Sec. 30-223 – Stormwater Management in the City's Storm Drains Ordinance. There are no exceptions given to maintenance work. Additional applicability should be considered for projects where land in disturbed but a new or modified connection to the public drain is not needed.

Submission of As-Builts

Permit Requirement: The permittee shall require, at a minimum, the submission of as-built drawings no later than two (2) years after completion of construction projects. The as-built drawings must depict all on site controls, both structural and non-structural, designed to manage the stormwater associated with the completed site (post construction stormwater management).

Excerpts from Chelsea's Regulations that Support Permit Requirement: Chelsea's Water and Sewer Systems Ordinance (Chapter 30 of the City Code of Ordinances) does not place any requirement on the submittal of as-built drawings for stormwater site controls.

Recommended Modifications:
Requirements for the submittal of as-built plans should be added to the Water and Sewer Systems Bylaw. Changes are highlighted in bold.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.
"Sec. 30-223. - Stormwater management.
…
(d) Prior to startup of all systems required by this section, owners of such systems shall submit to the director for review and approval, an operation and maintenance (O&M) plan for the system ***and as-built drawings depicting all site controls designed to manage the stormwater on site****. The O&M plan shall include, at a minimum, a detailed listing of all operation, inspection, maintenance, cleaning or other procedures or activities required to ensure that the system operates in a continuously satisfactory and effective manner. The O&M plan shall be prepared at the owner's*

expense, and include site-specific procedures and activities as recommended by the system manufacturer for the particular installation."

Long-term Operation & Maintenance

Permit Requirement*: The new development/redevelopment program shall have procedures to ensure adequate long-term operation and maintenance of stormwater management practices that are put in place after the completion of a construction project. These procedures may include the use of dedicated funds or escrow accounts for development projects or the acceptance of ownership by the permittee of all privately owned BMPs. These procedures may also include the development of maintenance contracts between the owner of the BMP and the permittee. Alternatively, these procedures may include the submission of an annual certification documenting the work that has been done over the last 12 months to properly operate and maintain the stormwater control measures. The procedures to require submission of as-built drawings and ensure long term operation and maintenances shall be a part of the SWMP.*

Excerpts from Chelsea's Regulations that Support Permit Requirement: Chelsea's Sewers and Storm Drains Ordinance requires that owners of all stormwater management systems submit a detailed Operation and Maintenance Plan to be approved by the Director of Public Works prior to startup.

Chapter 30 – Water and Sewer Systems, Article V. – Sewers and Storm Drains, Division 2. Storm Drains.

"Sec. 30-223. - Stormwater management.

…

(d) Prior to startup of all systems required by this section, owners of such systems shall submit to the director for review and approval, an operation and maintenance (O&M) plan for the system. The O&M plan shall include, at a minimum, a detailed listing of all operation, inspection, maintenance, cleaning or other procedures or activities required to ensure that the system operates in a continuously satisfactory and effective manner. The O&M plan shall be prepared at the owner's expense, and include site-specific procedures and activities as recommended by the system manufacturer for the particular installation."

Overall Compliance (Permit Year 2 Update):

Some of the post-construction site stormwater runoff control required of the 2016 MS4 permit is documented in Chelsea's ordinances, including language for Operation & Maintenance of stormwater management practices. During permit year 2, Chelsea drafted updates to its Water and Sewer Systems ordinance to include more detailed language regarding the design of stormwater management BMPs, the submission of as-built drawings, and the inclusion of Low Impact Design practices. All regulatory updates pertaining to post-construction stormwater management were initially Year 2 requirements, however modifications made to the Permit in June 2020 extended the deadline to Year 3. The City is scheduled to vote on all drafted regulatory updates on October 5, 2020.

4.0 IDDE MONITORING AND PROGRESS

4.1 IDDE Plan

The 2016 MS4 Permit defines an illicit discharge "as any discharge to a municipal separate storm sewer that is not composed entirely of stormwater" including, but not limited to:

- Fixed point source discharges such as illegal/improper sanitary or floor drain connections, and cross connections between the sanitary and drainage infrastructure,
- Isolated or recurring discharges such as illegal dumping and improper disposal of waste from boats, and
- Indirect sources that infiltrate into the drainage system through cracks/defects in infrastructure, such as sanitary wastes from failing sewer pipes.

Exceptions do exist in the regulation for the discharge of clean water from sources such as water line flushing, fire-fighting operations, non-contact cooling waters, and for other discharges that have separately obtained a permit from the NPDES Program.

The City of Chelsea developed and implemented an Illicit Discharge Detection and Elimination (IDDE) Plan in response to a 2009 EPA Administrative Consent Order concerning non-stormwater discharges from the MS4 and its tributaries to the Mystic River. The purpose of the plan was to create a methodology for investigating the municipal storm drain system, identifying illicit connections, and removing identified sources of illicit discharge.

Revisions to the IDDE Plan are being prepared to ensure compliance with the requirements set forth in the 2016 MS4 Permit.

The City has already assessed within existing catchments the potential for illicit discharges by obtaining and evaluating data regarding the following:

- Sensitivity or critical nature of the receiving water or environment
- Severity of the illicit connection indicator parameters
- Potential for direct or indirect public exposure
- Areas with chronic problems and inadequate level of service
- Areas proposed for infrastructure capital improvements

Since the City has already ranked and prioritized their catchments for investigation, most notably based on available outfall sampling data, the City has a strong understanding of problem catchment areas. To complete an additional ranking exercise seems redundant and priority for ongoing investigations is being assigned to outfalls as determined by the criteria above, and available outfall sampling data.

4.1.1 Mapping

The City's entire drainage system has been mapped, outfalls have been identified, and interconnections from other MS4s into Chelsea have been located. Each outfall and interconnection have been analyzed to create a defined catchment area that includes the portion of City that contributes drainage from catch basins. Field reconnaissance was performed to determine that the City has approximately:

- 10 miles of stormwater drains and 40 miles of sanitary and combined sewage collection conduit/piping ranging in size from 6-inches in diameter to 6-feet in diameter,
- 1,350 catch basins,
- 24 municipal outfalls,
- 37 non-municipal outfalls, and
- 5 interconnections from Everett to Chelsea; no known interconnections from Chelsea to other MS4s.

4.1.2 Sampling and Analysis

In 2006, Chelsea began annual monitoring of municipal stormwater outfalls. The monitoring consisted of inspection and, if appropriate, sampling of discharges at each outfall during alternating dry and wet-weather conditions once per year. Intermunicipal connections are also a part of this program.

For the testing purposes, a dry-weather period is defined as a minimum of 48 hours without precipitation. All outfalls are inspected for the presence of dry weather flow at the time of monitoring. For both dry and wet weather monitoring, samples are collected and analyzed for ammonia-nitrogen, Escherichia Coliform (E-coli), Enterococcus, surfactants, and specific conductance by a contract laboratory. Samples are analyzed onsite for temperature and total chlorine with test kits. Visual observations are also recorded. All samples are analyzed, and that data is tabulated and submitted to EPA annually.

4.1.3 Field Investigation

The scope of field investigation in support of Chelsea's IDDE Plan is determined based on site-specific factors for each individual outfall including, but not limited to factors such as the size, density, and land uses in the tributary drainage area; the configuration, diameters, and total footage of drain pipe in the tributary area; the specific pollutants identified during monitoring; and other potential environmental influences. Selected field investigation methods incorporate important elements from the EPA New England IDDE Protocol, while also taking into account the difficulties that a municipality would face in attempting to finance and procure contracts for combined field identification and removal construction efforts. The scope of work for field investigation aims to substantially reduce the amount of area that might require a comprehensive, and costly, IDDE field investigation approach, as presented in Phase III of the EPA New England IDDE Protocol.

The field investigation methods to be utilized include, but are not limited to the following, and may be utilized in combination:

- In small tributary areas, or as confirmation of findings from other field investigation work, various methods include:

  - Television Inspection of Drains: Drain pipes will be inspected internally to pinpoint and evaluate connections. Television inspection will consist of passing a closed circuit television (CCTV) camera through all or a portion of the drain segments containing suspected illicit connections. The City is in the process of purchasing its own CCTV Truck.
  - Smoke Testing of Drains: Smoke testing may be utilized in selected areas in an attempt to locate illicit connections. Smoke testing will consist of the introduction of a non-toxic smoke into drainage segments containing suspected illicit discharges and observing adjacent buildings for signs of illicit connections (e.g., smoke emanating from sewer vent stacks, floor drains, and cleanouts).
  - Dyed-water Testing: Buildings adjacent to that drainage system will be tested with dyed-water to determine the discharge location for its building drains. Dyed water tests will consist of pouring dyed-water into to plumbing fixtures and observing the sanitary sewer and drainage system downstream in an attempt to confirm connection.
  - ZoomCam Inspection: Drainage structures will be inspected with a “zoom camera-on-a-stick” in an attempt to gather additional information and narrow the location of observed dry-weather flow.

- Dry-weather Assessment: Topside inspection of drain manholes and other structures will be made during a period of dry weather to make area-wide determinations regarding the existence (and location) of continuous dry-weather flows. For structures observed to have dry-weather flow, the estimated quantity and visual characteristics such as color, odor, solids, or turbidity will also be documented. In key locations observed to have dry-weather flow, grab samples will be collected and analyzed for ammonia, fluoride, pH, potassium, surfactants, and temperature with portable meters and test kits. Key locations for sampling are those upstream manholes where dry-weather flow is first observed, or at junction points downstream from these manholes. At drainage structures where dry-weather flow ceases to be observed, the drain system will be isolated by sandbag or plug for a period of 24-48 hours to verify that no intermittent illicit discharges exist in tributary drainage upstream of that structure.

- Comprehensive Dry-Weather Discharge Investigation: If required to identify the source of illicit discharges, Chelsea will conduct a comprehensive dry-weather discharge investigation. The comprehensive investigation will follow a “top down” approach similar to that outlined in Phase III of the EPA New England IDDE Protocol. Each manhole-to-manhole segment of drain in the area of concern will be isolated for 24 to 48 hours during a dry weather period to determine if any intermittent dry-weather flow is present. If intermittent flow is captured, grabs samples will be collected and analyzed for ammonia, fluoride, pH, potassium, surfactants, and temperature with portable meters and test kits. If contaminant concentrations exceed benchmarks, the investigation will be stopped until such time as all illicit discharges to that drain segment are identified and removed, and repeat investigation shows no further evidence of contaminated dry-weather flow. If there is no dry-weather flow captured, or if sample results indicate contaminant concentrations below benchmark criteria, the investigation will proceed to the next drain segment downstream.

- If an illicit discharge is found and under municipal responsibility, then the connection is removed, documented, and reported in the annual report to EPA.

- If an illicit discharge is found and under non-municipal responsibility, the City will undertake removal of illicit discharges under non-municipal responsibility through City ordinances via prohibitions against illicit connections and provisions detailing legal authority for enforcement. Owners of private property will be required to eliminate illicit discharges from their properties, through progressive enforcement steps including letter to the property owners and notice posted to the building.

4.1.4 Sanitary Sewer Overflows (Permit Year 2 Update)

The City of Chelsea has consistently maintained an inventory of Sanitary Sewer Overflows (SSOs). Since 2013, sixteen SSOs have occurred. Table 1.3 below gives an abbreviated list of the SSO's in the past 5 years. The inventory as recorded beginning in 2013 can be found in Appendix K.

Table 1.3
Sanitary Sewer Overflow Inventory

Date	Location	Estimated Volume (gal)	SSO Type	Cause
8/1/13	7 Jones Ave	<1,000	Basement backup	Sewer blockage
12/29/13	73 Addison St	10,000-100,000	Basement backup	Rain and sewer line blockage
1/25/14	59 Essex St	<10,000	Basement backup	Sewer Blockage - line inaccessible
12/12/14	193 Nichols St	<1,000	Basement backup	Rain and sewer line blockage
3/16/15	22-24 Washington Ave	200	Basement backup	Sewer system blockage/ rags in pipe
2/16/16	300 Third St	25,000	SMH Surcharge, pumped to CB by prop owner	Sewer blockage
3/2/16	Eleanor @ Clark	<1,000	SMH Surcharge, flow to CB	Rain and sewer line blockage
4/11/16	75 Botswain Way	1,000	Sanitary sewer manhole to CB to receiving water / Island End	Sewer Blockage/ unknown
5/25/16	330 Third St	15,000	Drain structure onsite to ground surface	Sewer system blockage / towels, rags, vegetables
6/22/16	32 Everett Ave	10,000	CMH Surcharge	Sewer blockage/collapse - inaccessible
09/09/16	41-43 Central Ave	100	Basement backup	Sewer blockage/collapse
10/22/16	Normandy Rd	Unknown	Sanitary sewer manhole	Rain event/ blockage
4/27/17	79 & 87 Gillooly Rd	<2,000	Basement backup	Sewer blockage
7/18/17	City-wide	Unknown	Basement backup	Rainfall
9/30/17	21 Jones	2,500-3,000	Basement backup	Sewer surcharge; no cap on cleanout
3/22/19	149 Everett	<10,000	CB surcharge; flow to CB on Combined Sewer	Sewer collapse
9/31/2020	12 Hawthorn St.	400	Basement backup	Sewer collapse

In the event of an overflow or bypass, the City makes a report within 24 hours by phone to MassDEP, EPA, and other relevant parties. Verbal notification is followed by a written report in accordance with MassDEP's Sanitary Sewer Overflow (SSO)/Bypass notification form within five (5) calendar days of becoming aware of the overflow or backup.

5.0 STANDARD OPERATING PROCEDURES

5.1 MS4 Permit Requirement

As part of the minimum control measure for Pollution Prevention/Good Housekeeping for Municipal Operations, the MS4 Permit requires permittees to implement an Operations and Maintenance (O&M) program for permittee-owned facilities and activities to prevent or reduce pollutant runoff and protect water quality. The O&M Program is required to include the following elements:

1) An inventory of all permittee-owned facilities.
2) Written O&M procedures for the following activities:
    a. Parks and open space
    b. Buildings and facilities where pollutants are exposed to runoff
    c. Vehicles and equipment
3) A written program detailing the activities and procedures the permittee will implement so that MS4 infrastructure is maintained in a timely manner to reduce the discharge of pollutants from the MS4, to include:
    a. Optimization of routine inspections, cleaning and maintenance of catch basins.
    b. Implementation of procedures for sweeping and/or cleaning streets, and permittee-owned parking lots.
    c. Proper storage and disposal of catch basin cleanings and street sweepings.
    d. Implementation of procedures for winter road maintenance.
    e. Implementation of inspection and maintenance frequencies and procedures for storm drain systems and stormwater treatment structures.
4) Written records for all maintenance activities, inspections and training.

5.2 Inventory of Municipal Facilities (Permit Year 2 Update)

Chelsea has developed a comprehensive Operations and Maintenance (O&M) Plan to meet permit requirements, included in Appendix I. The inventory of municipally-owned facilities and property, including vehicles, equipment, and stormwater treatment structures is included in Appendix C of the O&M Plan.

5.3 Operation and Maintenance Procedures for Municipal Activities and Facilities (Permit Year 2 Update)

Chelsea's comprehensive O&M Plan includes Standard Operating Procedures (SOPs) which address the MS4 Permit requirements. SOPs associated with the identified municipal activities and facilities were developed by September 2020 and are updated as needed. The SOPs are included in the O&M Plan which is located in Appendix I. The following SOPs are included:

- Parks and Open Space Management
- Fuel and Oil Handling
- Hazardous Materials Storage and Handling
- Spill Response
- Operation and Maintenance of Buildings and Facilities
- Operation and Maintenance of Municipal Vehicles and Equipment

- Catch Basin Inspection and Cleaning
- Street Sweeping
- Winter Road Maintenance

5.4 Catch Basin Cleaning and Optimization (Permit Year 2 Update)

The City currently has approximately 1,350 catch basins, of which at least 450 are cleaned each year. The City disposes of the accumulated sediments in accordance with state and local requirements. In addition to annual cleaning, the City performs catch basin cleaning as needed or in response to complaints or inquiries.

To meet requirements of the 2016 MS4 Permit, the City will need to optimize catch basin inspection, cleaning and maintenance such that the following conditions are met:

- Inspection and maintenance of catch basins located near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment) are prioritized. Catch basins in such areas must be cleaned more frequently if inspection and maintenance activities indicate excessive sediment or debris loading.

- A schedule must be established such that the frequency of routine cleaning ensures that no catch basin at any time will be more than 50 percent full. A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin.

- If a catch basin sump is more than 50 percent full during two consecutive routine inspections/cleaning events, the City must document the finding, investigate the contributing drainage area for sources of excessive sediment loading, and to the extent practicable, abate contributing sources.

- The City shall maintain documentation, including metrics and other information, used to reach the determination that the established plan for cleaning and maintenance is optimal and meets the requirements of the MS4 Permit, including a log of catch basins cleaned and inspected.

- The City must continue to track and report the following information to EPA annually:

    - Total number of catch basins city-wide
    - Number of catch basins inspected
    - Number of catch basins cleaned
    - Total volume or mass of material removed from all catch basins

The City is currently working to collect data as part of their optimization plan to ensure that no catch basin is more than 50% full. Procedures exist in the O&M Plan for what actions to take if a catch basin is found to be more than 50% full.

6.0 TMDLS AND WATER QUALITY LIMITED WATERS

6.1 Discharges to Water Quality Limited Waters

Under Massachusetts General Law (MGL) Chapter 21, MassDEP is responsible for monitoring the waters of the Commonwealth, identifying those waters that are impaired, and developing a plan to bring them back into compliance with Massachusetts Surface Water Quality Standards. The list of impaired waters, better known as the "303(d) List," identifies impaired surface waters and the reasons for impairment.

Once a waterbody is identified as impaired, MassDEP is required by the Federal Clean Water Act (CWA) to develop a strategy for restoring the health of the impaired waterbody. The process of developing this strategy, which is generally referred to as a Total Maximum Daily Load (TMDL), includes identifying the type of pollutant, and the potential sources of the pollutant, in addition to determining the maximum amount of pollutant that can be discharged to a specific surface water body in order to meet surface water quality standards. Part of the TMDL also includes the development of a plan to help in meeting the Total Maximum Daily Load limits once they have been established. These impaired waters are listed under Category 4A in Part 2 of the Massachusetts Integrated List of Waters. Based on the 2016 Integrated List of Waters Massachusetts, Chelsea does not currently have any surface water bodies within its boundaries for which a TMDL has been developed. However, a Pathogen TMDL was approved in 2018, after the 2016 Integrated List of Waters was released, which identifies several surface water bodies in Chelsea as having a TMDL. Therefore, these water bodies are instead listed under Category 5 of the 2016 Integrated List of Waters as requiring a TMDL. In Chelsea, these water bodies include segment MA71-06 of the Chelsea River, segment MA71-08 of Mill Creek, and segment MA71-03 of the Mystic River. The list of receiving waters and impairments can be found in Table 1.2.

6.2 Bacteria/Pathogens Impairments

Impaired waters in Chelsea with an approved TMDL for a bacteria/pathogen impairment include segment MA71-06 of the Chelsea River for Fecal Coliform, segment MA71-08 of Mill Creek for Fecal Coliform, and segment MA-71-03 of the Mystic River for Fecal Coliform. In October 2018, the EPA and the DEP approved a Pathogen TMDL for the Boston Harbor watershed, which includes the Mystic River Sub-basin and, thus, Chelsea. A copy of this document is included in Appendix L of this document.

To ensure attainment of Water Quality Standards (WQS) throughout the waterbody, MassDEP emphasizes the simplest and most readily understood way of meeting the TMDL is to have a goal of bacteria sources not exceeding the WQS criteria at the point of discharge. Therefore, Waste Load Allocations (WLA) have been set equal to the WQS Criteria and assigned to the portion of stormwater that discharges to surface waters via storm drains. Therefore, in order to limit bacterial contamination in the watershed, the TMDL sets forth an expectation that discharges from Chelsea's MS4 to the segments of the Chelsea River (71-06) and Mystic River (71-03) not exceed 35 colonies Enterococci per 100mL and single sample nor 104 colonies per 100mL for non-CSO discharges. The TMDL sets forth an expectation that discharges from Chelsea's MS4 to the segment of the Mill Creek (71-08) not exceed 88 organisms Fecal Coliform per 100mL nor 10% of the samples exceed 269 organisms per 100 mL. It sets these standards based on fecal coliform densities in Coliform Forming Units per 100 milliliters (CFU/100mL). As discussed throughout this SWMP, Chelsea is implementing BMPs to address this TMDL goal.

For any illicit sources including illicit discharges to stormwater systems and sewer system overflows (SSOs) the goal is complete elimination (100% reduction), therefore, addressing MS4 discharges containing pollutants from illicit sewer connections, SSOs, and failing sewer/drain infrastructure is of primary importance. Chelsea is addressing these sources through its IDDE BMPs. The TMDL also lists non-point sources from stormwater runoff as a major source of pathogens in the watershed, which Chelsea is addressing through a variety BMPs currently in place or under development.

The TMDL also lists a few sources that are not applicable to Chelsea - including failing septic systems, wastewater treatment plants, and swimmers – and, thus, no BMPs have been developed specific to these sources. Elimination of Combined Sewer Overflows (CSOs) is of utmost importance in the TMDL and to Chelsea but is outside the scope of this SWMP.

6.2.1 Public Education and Outreach

The City is required to comply with the impaired waters requirements for bacteria/pathogens for the Chelsea and Mystic Rivers and Mill Creek. The City must supplement its residential education and outreach program with an annual message encouraging the proper management of pet waste. The Animal Waste Ordinance (Sec. 4-8, Article I, Chapter 4, Chelsea Code of Ordinances) stipulates that the owner of every animal shall be responsible for the removal of any fecal matter deposited by the owner's animal on the owner's property, public walks, recreation areas or private property. The City maintains a website dedicated to the dissemination of information regarding stormwater management to the public, including an interactive map of dog waste stations and cigarette butlers. Additional information on pet waste could be provided on this platform. The City maintains an interactive map of dog waste collection stations on its main webpage.

6.2.2 Illicit Discharge

All 24 of Chelsea's outfalls discharge to a waterbody with a bacteria/pathogen impairment and are monitored under the IDDE plan. The priority status of those outfalls has been determined by the progress achieved since the IDDE program beginning in 2009. A priority ranking system would be redundant in Chelsea, and investigative priority will be given to those outfalls which show any sign of illicit connection over the course of routine testing that Chelsea has engaged in to date.

6.3 Oil and Grease and Turbidity Impairments

Impaired waters in Chelsea without an approved TMDL for a specific impairment (that could be related to stormwater discharges) include segment MA71-06 of the Chelsea River for petroleum hydrocarbons and turbidity, and segment MA-71-03 of the Mystic River for petroleum hydrocarbons.

The City is required to comply with the impaired waters requirements for solids and oil and grease for the Chelsea and Mystic Rivers. The City's ordinances regarding stormwater management must include a requirement that for new development and redevelopment, stormwater management systems designed on commercial and industrial land use areas draining to impaired waters incorporate spill containment isolation.

Street sweeping and catch basin cleaning must also be increased in high density tributary areas as needed. The City currently sweeps all public streets at least once per week between March 1st and

December 31st. At least 450 catch basins are cleaned each year, with a goal to clean 100% of Chelsea's catch basins in the future. This current, aggressive street sweeping and catch basin cleaning frequency may be adequate to meet the conditions of the permit.

6.4 Phosphorus Impairments

Though an upstream segment of the Mystic River does have a phosphorus impairment, segment 71-03 of the Mystic River which extends from the Amelia Earhart Dam, Somerville/Everett to its confluence with the Boston Inner Harbor, Chelsea/Charlestown, is not currently impaired for Phosphorus according to the 2016 Integrated List of waters. Therefore, no additional provisions regarding phosphorus impairments are needed for Chelsea. Correspondence with the EPA confirming this can be found is included in Appendix D.

7.0 REPORTING, EVALUATION AND MODIFICATION

7.1 MS4 Permit Reporting

The MS4 Permit requires submission of annual reports assessing the effectiveness of the proposed BMPs and reporting if the minimum control measures were met. The initial report is due 90 days from the close of the reporting period, or September 29th, 2019, and annually thereafter. Reports are to be submitted to both EPA and MADEP. At a minimum, the report should include the following:

- The status of compliance with permit conditions, including an assessment of the appropriateness of the selected BMPs and progress toward achieving the selected measurable goals for each minimum control measure.
- Results of any information collected and analyzed, including monitoring data, if any. Outfall screening and monitoring data collected shall be submitted for both the reporting cycle and cumulative for the permit term.
- A summary of the stormwater activities planned for the next reporting cycle.
- A change in any identified best management practices or measurable goals for any minimum control measure.
- Notice of relying on another governmental entity to satisfy some of the permit obligations, if applicable.

As indicated in an earlier section, copies of past annual reports submitted by Chelsea are referenced in Appendix E of this SWMP. Chelsea will append future annual reports, and that prepared in 2019, in compliance with the 2016 MS4 Permit as they are prepared in Appendix J.

7.2 Evaluation of SWMP Success

This SWMP should be considered a dynamic document that is modified as necessary to account for changes such as in drainage infrastructure, laws and regulations, and City leadership and policy. The success of programs implemented by the SWMP – such as IDDE – should also be evaluated to ensure that they are accomplishing the goals for which they were intended and in a method and timetable that continues to be appropriate. In addition, the SWMP should be reviewed and revised as necessary to keep text and appendices current. For example:

- After each year of stormwater monitoring to update appended findings and priorities.
- As needed to keep appended IDDE investigation, identification and removal documentation current.
- After each NPDES stormwater permit renewal to incorporate new requirements, as well as append copies of new permits and associated Notices of Intent (NOIs).

- After adoption of any new or revised ordinances or other regulatory mechanisms related to stormwater or drainage infrastructure.

Chelsea undertook this SWMP, in part, in order to ensure the protection of its water resources and the large investment in drainage infrastructure. Periodic review and revision of this written document will help achieve these goals on a perpetual basis.

7.3 Modifications to the SWMP or Notice of Intent (Permit Year 2 Update)

As discussed above, minor modifications to this SWMP should be made on a regular and frequent basis to keep it current. Annual updates have been denoted in the section or subsection heading. However, major changes to the SWMP or needed modifications to the NOI for inclusion under the NPDES Permit require an official process. In accordance with the MS4 Permit, modifications to the SWMP or NOI may be made under the following provisions:

- At any time, the City may add (but not subtract or replace) components, controls or requirements to the SWMP.
- The City may request to replace an ineffective or infeasible BMP specifically identified in the SWMP with an alternative BMP at any time as long as the basis for the change is documented in the SWMP by, at a minimum:
  - An analysis of why the BMP is ineffective or infeasible (or cost prohibitive).
  - Expectations on the effectiveness of the replacement BMP.
  - An analysis of why the replacement BMP is expected to achieve the goals of the BMP to be replaced.
- The City shall indicate BMP modifications along with a brief explanation of the modification in each Annual Report.

At this time, Chelsea does not anticipate any major modifications to the SWMP or NOI requiring official notification.

APPENDIX A

Abbreviations and Definition

ABBREVIATIONS AND DEFINITIONS

Best Management Practices (BMPs) - schedules of activities, practices (and prohibitions of practices), structures, vegetation, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Common Plan of Development - A "larger common plan of development or sale" is a contiguous area where multiple separate and distinct construction activities may be taking place at different times different schedules under one plan. For example, if developer buys a 20-acre lot and builds roads, installs pipes, and runs electricity with the intention of constructing homes or other structures sometime in the future, this would be considered a larger common plan of development or sale. If the land is parceled off or sold, and construction occurs on plots that are less than one acre by separate, independent builders, this activity still would be subject to stormwater permitting requirements if the smaller plots were included on the original site plan.

Control Measure - refers to any BMP or other method (including effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the United States.

Director - a Regional Administrator of the Environmental Protection Agency or an authorized representative.

Discharge - when used without qualification, means the "discharge of a pollutant."

Discharge of a pollutant - any addition of any “pollutant” or combination of pollutants to “waters of the United States” from any “point source,” or any addition of any pollutant or combination of pollutants to the waters of the “contiguous zone” or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. This includes additions of pollutants into waters of the United States from surface runoff which is collected or channeled by man; or discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

Discharge-related activities - activities which cause, contribute to, or result in stormwater and allowable non-stormwater point source discharges, and measures such as the siting, construction and operation of BMPs to control, reduce, or prevent pollution in the discharges.

Disturbance - action to alter the existing vegetation and/or underlying soil of a site, such as clearing, grading, site preparation (e.g., excavating, cutting, and filling), soil compaction, and movement and stockpiling of top soils.

Existing Discharger – an operator applying for coverage under this permit for discharges covered previously under an NPDES general or individual permit.

Facility or Activity - any NPDES “point source” or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the NPDES
program.

Federal Facility – Any buildings, installations, structures, land, public works, equipment, aircraft, vessels, and other vehicles and property, owned by, or constructed or manufactured for the purpose of leasing to, the federal government.

Illicit Discharge - any discharge to a municipal separate storm sewer that is not composed entirely of stormwater except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire fighting activities.

Impaired Water – A water is impaired if it does not meet one or more of its designated use(s). For purposes of this permit, "impaired" refers to categories 4 and 5 of the five-part categorization approach used for classifying the water quality standards attainment status for water segments under the TMDL program. Impaired waters compilations are also sometimes referred to as "303(d) lists." Category 5 waters are impaired because at least one designated use is not being supported or is threatened and a TMDL is needed. Category 4 waters indicate that at least one designated use is not being supported but a TMDL is not needed (4a indicates that a TMDL has been approved or established by EPA; 4b indicates other required control measures are expected in result in the attainment of water quality standards in a reasonable period of time; and 4c indicates that the nonattainment of the water quality standard is the result of pollution (e.g. habitat) and is not caused by a pollutant). See USEPA's 2006 Integrated Report Guidance, July 29, 2005 for more detail on the five-part categorization of waters [under EPA National TMDL Guidance http://www.epa.gov/owow/tmdl/policy.html]).

Impervious Surface- Any surface that prevents or significantly impedes the infiltration of water into the underlying soil. This can include but is not limited to: roads, driveways, parking areas and other areas created using non porous material; buildings, rooftops, structures, artificial turf and compacted gravel or soil.

Industrial Activity - the ten categories of industrial activities included in the definition of "stormwater discharges associated with industrial activity," as defined in 40 CFR 122.26(b)(14)(i)-(ix) and (xi).

Industrial Stormwater - stormwater runoff associated with the definition of "stormwater discharges associated with industrial activity."

Interconnection – the point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is eventually conveyed to a water of the United States. Interconnections shall be treated similarly to outfalls throughout the permit.

Junction Manhole - For the purposes of this permit, a junction manhole is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.

Key Junction Manhole - For the purposes of this permit, key junction manholes are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole as a key junction manhole would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

Municipal Separate Storm Sewer - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designed or used for collecting or conveying stormwater; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Municipal Separate Storm Sewer System (MS4) - means all separate storm sewers that are defined as "large" or "medium" or "small" municipal storm sewer systems pursuant to paragraphs 40 CFR 122.26 (b)(4) and (b)(7), or designated under paragraph 40 126.26(a) (1)(v). For the purposes of this permit "MS4" may also refer to the permittee with jurisdiction over the sewer system.

New Development – any construction activities or land alteration resulting in total earth disturbances greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) on an area that has not previously been developed to include impervious cover. (see part 2.3.6. of the permit)

New Discharger – For the purposes of this permit, a new discharger is an entity that discharges stormwater from a new facility with an entirely new separate storm sewer system that is not physically located on the same or adjacent land as an existing facility and associated system operated by the same MS4.

New Source - any building, structure, facility, or installation from which there is or may be a "discharge of pollutants," the construction of which commenced:

- after promulgation of standards of performance under section 306 of the CWA which are applicable to such source, or
- after proposal of standards of performance in accordance with section 306 of the CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.

No exposure - all industrial materials or activities are protected by a storm-resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff.

One Lane Width – The width of the travel lane for a roadway. Lane width does not include shoulders, curbs, and on-street parking areas.

Outfall Catchment – The land area draining to a single outfall or interconnection. The extent of an outfall's catchment is determined not only by localized topography and impervious cover but also by the location of drainage structures and the connectivity of MS4 pipes.

Owner or operator - the owner or operator of any "facility or activity" subject to regulation under the NPDES program.

Person - an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point source - any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Pollutant - dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste discharged into water.

Pollutant of concern – A pollutant which causes or contributes to a violation of a water quality standard, including a pollutant which is identified as causing an impairment in a State's 303(d) list.

Redevelopment – for the purposes of part 2.3.6., any construction, land alteration, or improvement of impervious surfaces resulting in total earth disturbances greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) that does not meet the definition of new development (see above).

Runoff coefficient - the fraction of total rainfall that will appear at the conveyance as runoff.

Site – for the purposes of part 2.3.6., the area extent of construction activities, including but not limited to the creation of new impervious cover and improvement of existing impervious cover (e.g. repaving not covered by 2.3.6.a.ii.4.d.)

Small Municipal Separate Storm Sewer System – all separate storm sewer systems that are (i) owned or operated by the United States, a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district, or drainage district, or similar entity or an Indian tribe or an authorized Indian tribal organization or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States, and (ii) not defined as "large" or "medium" municipal separate storm sewer system pursuant to paragraphs 40 CFR 122.26 (b)(4) and (b)(7), or designated under paragraph 40 126.26(a) (1)(v). This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. This term does not include separate storm sewers in very discrete areas, such as individual buildings.

Small MS4 – means a small municipal separate storm sewer system.

Stormwater - stormwater runoff, snow melt runoff, and surface runoff and drainage.

Stormwater Discharges Associated with Construction Activity - a discharge of pollutants in stormwater runoff from areas where soil disturbing activities (e.g., clearing, grading, or excavating), construction materials, or equipment storage or maintenance (e.g., fill piles, borrow areas, concrete truck washout, fueling), or other industrial stormwater directly related to the construction process (e.g., concrete or asphalt batch plants) are located. (See 40 CFR 122.26(b)(14)(x) and 40 CFR 122.26(b)(15).

Stormwater Discharges Associated with Industrial Activity - the discharge from any conveyance that is used for collecting and conveying stormwater and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program under Part 122. For the categories of industries identified in this section, the term includes, but is not limited to, stormwater discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste water (as defined at part 401 of this chapter); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and final products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater. For the purposes of this paragraph, material handling activities include storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with stormwater drained from the above described areas. Industrial facilities include those that are federally, State, or municipally owned or operated that meet the description of the facilities listed in Appendix D of this permit. The term also includes those facilities designated under the provisions of 40 CFR 122.26(a)(1)(v).

Total Maximum Daily Loads (TMDLs) - A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL includes wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources and/or natural background, and must include a margin of safety (MOS) and account for seasonal variations. (See section 303(d) of the Clean Water Act and 40 CFR 130.2 and 130.7).

Urbanized Area – US Census designated area comprised of a densely settled core of census tracts and/or census blocks that meet minimum population density requirements, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. For the purposes of this permit, Urbanized Areas as defined by any Census since 2000 remain subject to stormwater regulation even if there is a change in the reach of the Urbanized Area because of a change in more recent Census
data.

Water Quality Limited Water – for the purposes of this permit, a water quality limited water is any waterbody that does not meet applicable water quality standards, including but not limited to waters listed in categories 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b).

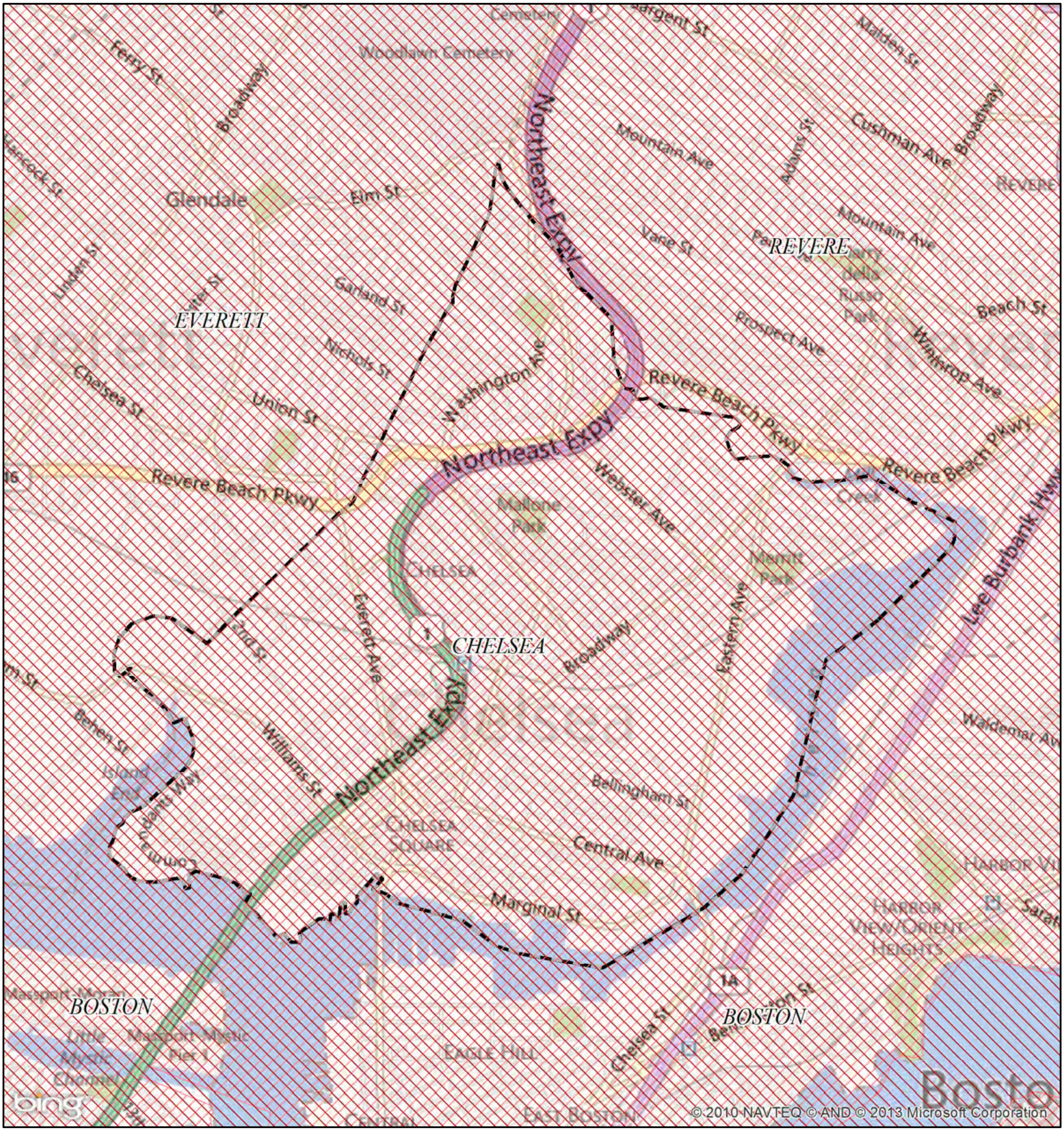
Water Quality Standards - A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States and EPA adopt WQS to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (See CWA sections 101(a)2 and 303(c)).

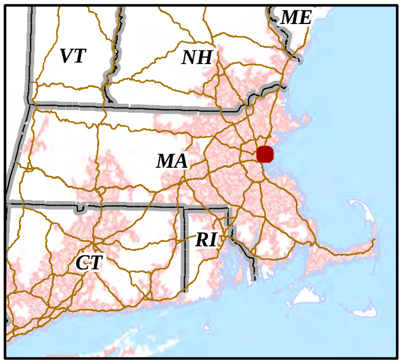
ABBREVIATIONS AND ACRONYMS

BMP – Best Management Practice
BPJ – Best Professional Judgment
CGP – Construction General Permit
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DCIA – Directly Connected Impervious Area
EPA – U. S. Environmental Protection Agency
ESA – Endangered Species Act
USFWS – U. S. Fish and Wildlife Service
IA – Impervious Area
IDDE – Illicit Discharge Detection and Elimination
LA – Load Allocations
MS4 – Municipal Separate Storm Sewer System
MSGP – Multi-Sector General Permit
NHPA – National Historic Preservation Act
NMFS – U. S. National Marine Fisheries Service
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
NRHP – National Register of Historic Places
NSPS – New Source Performance Standard
PCP – Phosphorus Control Plan
SHPO – State Historic Preservation Officer
SPCC – Spill Prevention, Control, and Countermeasure
SWMP – Stormwater Management Program
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
TSS – Total Suspended Solids
WLA – Wasteload Allocation
WQS – Water Quality Standard

APPENDIX B

Regulated Area Map





NPDES Phase II Stormwater Program
Automatically Designated MS4 Areas
Chelsea MA

Town Population: 35264
Regulated Population: 35264
(Populations estimated from 2010 Census)

Regulated Area:

UA Based on 2000 Census	UA Based on 2010 Census

0 1 Kilometers
0 1 Miles

EPA

Urbanized Areas, Town Boundaries:
US Census (2000, 2010)
Base map © 2013 Microsoft Corporation
and its data suppliers

US EPA Region 1 GIS Center Map #8824, 8/9/2013

APPENDIX C

2016 MS4 Permit

Minor Permit Modification Summary

The following permit has been modified in accordance with 40 CFR §122.63:

Permit Name: GENERAL PERMITS FOR STORMWATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS IN MASSACHUSETTS

Issue date: April 4, 2016

Effective Date: July 1, 2018

The following minor modifications were made on November 7, 2018**:**

Page	Modification
2	Table of Contents was updated to reflect the changes below
3	Table of Contents was updated to reflect the changes below
5	Line was added before first bullet point for consistency
6	Line was removed between parts for consistency
8	Lines were added and removed between parts for consistency
8	Typos were fixed
11	Extra word was removed
11	Extra spaces were removed between words for consistency
12	Extra spaces were removed between words for consistency
12	Extra words were removed
12	Text was moved to a bullet point in the last paragraph of part 1.10.2 instead of as part of the 1.10.3 title for consistency
12	Duplicate words and symbols were deleted
13	Bullets were moved to the correct subsection, consistent with other relevant sections of the permit
14	Typos were fixed
15	Extra spaces were removed between words for consistency
16	Extra spaces were removed between words for consistency
27	Extra spaces were removed between words for consistency
27	Duplicate character was removed
29	Typo was fixed
30	Duplicate character was removed
32	Lines were added before bullet points for consistency
33	Lines were added and removed between paragraphs for consistency
34	Line was added before bullet points for consistency
34	Typo was fixed
34	Duplicate spaces were removed
35	Typo was fixed
35	Line was added before bullet points for consistency
36	Lines were added before bullet points and in between parts for consistency
37	Lines were added before bullet points and in between parts for consistency
38	Line was added in between parts for consistency
38	Typos were fixed

39	Line was added in between paragraphs for consistency
39	Typos were fixed
41	Lines were added before bullets for consistency
42	Typos were fixed
43	Typo was fixed
44	Line was added for consistency
46	Typo was fixed
50	Typo was fixed
51	Typo was fixed
54	Line was added for consistency
55	Line was added for consistency
56	Typo was fixed
56	Line was added for consistency
57	Lines were added and removed for consistency

United States Environmental Protection Agency (EPA)
National Pollutant Discharge Elimination System (NPDES)

GENERAL PERMITS FOR STORMWATER DISCHARGES FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS IN MASSACHUSETTS

AUTHORIZATION TO DISCHARGE UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Clean Water Act (CWA), as amended (33 U.S.C. §1251 *et seq.*), and the Massachusetts Clean Waters Act, as amended (M.G.L. Chap.21 §§ 26-53), any operator of a small municipal separate storm sewer system whose system:

- Is located in the areas described in part 1.1;
- Is eligible for coverage under part 1.2 and part 1.9; and
- Submits a complete and accurate Notice of Intent in accordance with part 1.7 of this permit and EPA issues a written authorization

is authorized to discharge in accordance with the conditions and the requirements set forth herein.

The following appendices are also included as part of these permits:
Appendix A – Definitions, Abbreviations, and Acronyms;
Appendix B – Standard permit conditions applicable to all authorized discharges;
Appendix C – Endangered Species Act Eligibility Guidance;
Appendix D – National Historic Preservation Act Eligibility Guidance;
Appendix E – Information required for the Notice of Intent (NOI);
Appendix F – Requirements for MA Small MS4s Subject to Approved TMDLs;
Appendix G – Impaired Waters Monitoring Parameter Requirements;
Appendix H – Requirements related to discharges to certain water quality limited waterbodies;

These permits become effective on **July 1, 2017**.

These permits and the authorization to discharge expire at midnight, **June 30, 2022**.

Signed this 4th day of April, 2016

Ken

Ken Moraff, Director
Office of Ecosystem Protection
United States Environmental Protection Agency
5 Post Office Square – Suite 100
Boston, Massachusetts 02109-3912

Signed this 4th day of April 2016

Douglas E. Fine
Assistant Commissioner for Water Resources
Department of Environmental Protection
One Winter Street
Boston, Massachusetts 02108

TABLE OF CONTENTS

1.0. Introduction

This document consists of three (3) general permits listed in part 1.1. Each general permit is applicable to a particular type of municipal system within Massachusetts. Many of the permit terms and conditions are applicable across all regulated entities, and therefore are presented just once in parts 1-2, part 4, and Appendices A through E. Other conditions are applicable to a particular set of authorized entities; these terms and conditions are included in parts 3, and 5 and Appendices F through H. Throughout the permit, the terms "this permit" or "the permit" will refer to the three general permits.

1.1. Areas of Coverage

This permit covers small municipal separate storm sewer systems (MS4s) located in the Commonwealth of Massachusetts:

- Traditional Cities and Towns (NPDES Permit No. MAR041000)
- State, federal, county and other publicly owned properties (Non-traditional) (MAR042000)
- State transportation agencies (except for MassDOT- Highway Division) (MAR043000)

1.2. Eligibility

The MS4 shall meet the eligibility provisions described in part 1.2.1 and part 1.9 to be eligible for authorization under this permit.

1.2.1. Small MS4s Covered

This permit authorizes the discharge of stormwater from small MS4s as defined at 40 CFR § 122.26(b) (16). This includes MS4s described in 40 CFR §122.32(a) (1) and (a) (2). An MS4 is eligible for coverage under this permit if it is:

- A small MS4 within the Commonwealth of Massachusetts;
- Not a large or medium MS4 as defined in 40 CFR §§122.26(b)(4) or (7);
- Located either fully or partially within an urbanized area as determined by the latest Decennial Census by the Bureau of Census as of the effective date of this permit (the 2010 Census); or
- Located in a geographic area designated by EPA as requiring a permit.

If the small MS4 is not located entirely within an urbanized area, only the portion of the MS4 that is located within the urbanized area is regulated under 40 CFR §122.32(a) (1).

A small municipal separate storm sewer system means all separate storm sewers that are:

- Owned or operated by the United States, a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to state law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under state law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States.
- Not defined as large or medium municipal separate storm sewer systems pursuant to 40 CFR § 122.26(b) (4) and (b) (7) or designated under 40 CFR § 122.26(a) (1) (v).
- This term includes systems similar to separate storm sewer systems in municipalities such as systems at military bases, large hospitals or prison complexes, and highways

and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

1.3. Limitations on Coverage

This permit does not authorize the following:

a. Stormwater discharges mixed with sources of non-stormwater unless such non-stormwater discharges are:

- Authorized under a separate NPDES permit; or
- A non-stormwater discharge as listed in part 1.4.

b. Stormwater discharges associated with industrial activity as defined in 40 CFR §122.26 (b) (14) (i)-(ix) and (xi).

c. Stormwater discharges associated with construction activity as defined in 40 CFR §122.26(b) (14) (x) or (b) (15).

d. Stormwater discharges currently authorized under another NPDES permit, including discharges covered under other regionally issued general permits.

e. Stormwater discharges or discharge related activities that are likely to adversely affect any species that are listed as endangered or threatened under the Endangered Species Act (ESA) or result in the adverse modification or destruction of habitat that is designated as critical under the ESA. The permittee shall follow the procedures detailed in Appendix C to make a determination regarding eligibility. The permittee shall certify compliance with this provision on the submitted NOI.

f. Stormwater discharges whose direct or indirect impacts do not prevent or minimize adverse effects on any Essential Fish Habitat.

g. Stormwater discharges, or implementation of a stormwater management program, which adversely affects properties listed or eligible to be listed on the National Register of Historic Places. The permittee shall follow the procedures detailed in Appendix D to make a determination regarding eligibility. The permittee shall certify compliance with this provision on the submitted NOI.

h. Stormwater discharges prohibited under 40 CFR § 122.4.

i. Stormwater discharges to the subsurface subject to state Underground Injection Control (UIC) regulations. Although the permit includes provisions related to infiltration and groundwater recharge, structural controls that dispose of stormwater into the ground may be subject to UIC regulation requirements. Authorization for such discharges shall be obtained from Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Drinking Water Program, Underground Injection Control, One Winter Street, Boston, MA 02108 – phone 617-292-5859.

j. Any non-traditional MS4 facility that is a “new discharger” as defined in part 5.1.4. and discharges to a waterbody listed in category 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b) due to nutrients (Total Nitrogen or (Total Phosphorus), metals (Cadmium, Copper, Iron, Lead or Zinc), solids (TSS or Turbidity), bacteria/pathogens (E. Coli, Enteroccus or Fecal Coliform), chloride (Chloride) or oil and grease

(Petroleum Hydrocarbons or Oil and Grease), or discharges to a waterbody with an approved TMDL for any of those pollutants.

1.4. Non-Stormwater Discharges

The following categories of non-stormwater discharges are allowed under this permit *unless* the permittee, EPA, or the MassDEP identifies any category or individual discharge of non-stormwater discharge in part 1.4.a-r as a significant contributor of pollutants to the MS4, then that category or individual discharge is not allowed under part 1.4, but rather shall be deemed an "illicit discharge" under part 2.3.4.1, and the permittee shall address that category or individual discharge as part of the Illicit Discharge Detection and Elimination (IDDE) Program described in part 2.3.4 of this permit.

a. Water line flushing
b. Landscape irrigation
c. Diverted stream flows
d. Rising ground water
e. Uncontaminated ground water infiltration (as defined at 40 CFR § 35.2005(20))
f. Uncontaminated pumped ground water
g. Discharge from potable water sources
h. Foundation drains
i. Air conditioning condensation
j. Irrigation water, springs
k. Water from crawl space pumps
l. Footing drains
m. Lawn watering
n. Individual resident car washing
o. Flows from riparian habitats and wetlands
p. De-chlorinated swimming pool discharges
q. Street wash waters
r. Residential building wash waters without detergents

Discharges or flows from firefighting activities are allowed under this permit need only be addressed where they are identified as significant sources of pollutants to waters of the United States.

1.5. Permit Compliance

Non-compliance with any of the requirements of this permit constitutes a violation of the permit and the CWA and may be grounds for an enforcement action and may result in the imposition of injunctive relief and/or penalties.

1.6. Continuation of this Permit

If this permit is not reissued prior to the expiration date, it will be administratively continued in accordance with the Administrative Procedure Act and remain in force and effect for discharges that were authorized prior to expiration. If a small MS4 was granted permit authorization prior to the expiration date of this permit, it will automatically remain authorized by this permit until the earliest of:

- Authorization under a reissued general permit following timely and appropriate submittal of a complete and accurate NOI requesting authorization to discharge under the reissued permit; or
- Issuance or denial of an individual permit for the MS4's discharges; or

- Authorization or denial under an alternative general permit.

If the MS4 operator does not submit a timely, appropriate, complete, and accurate NOI requesting authorization to discharge under the reissued permit or a timely request for authorization under an individual or alternative general permit, authorization under this permit will terminate on the due date for the NOI under the reissued permit unless otherwise specified in the reissued permit.

1.7. Obtaining Authorization to Discharge

1.7.1. How to Obtain Authorization to Discharge

To obtain authorization under this permit, a small MS4 shall:

- Be located in the areas listed in part 1.1 of this permit;
- Meet the eligibility requirements in part 1.2 and part 1.9;
- Submit a complete and accurate Notice of Intent (NOI) in accordance with the requirements of part 1.7.2; and
- EPA issues a written authorization.

1.7.2. Notice of Intent

a. Operators of Small MS4s seeking authorization to discharge under the terms and conditions of this permit shall submit a Notice of Intent that contains the information identified in Appendix E. This includes operators of small MS4s that were previously authorized under the May 1, 2003 small MS4 general permit (MS4-2003 permit).

b. The NOI shall be signed by an appropriate official (see Appendix B, Subparagraph B.11, Standard Conditions).

c. The NOI shall contain the following certification: I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print the name and title of the official, followed by signature and date.

d. The NOI shall be submitted within 90 days of the effective date of the permit. If EPA notifies an MS4 that it is designated under 40 CFR § 122.32(a) (2) or (b), the NOI shall be submitted within 180 days of receipt of notice unless granted a longer period of time by EPA.

1.7.3. Submission of Notice of Intent

a. All small MS4s shall submit a complete and accurate Notice of Intent (suggested form in Appendix E) to EPA-Region 1 at the following address:

United States Environmental Protection Agency
Stormwater and Construction Permits Section (OEP06-1)
Five Post Office Square, Suite 100

Boston, MA 02109

Or submitted electronically to EPA at the following email address: stormwater.reports@epa.gov

b. All small MS4s shall also submit a copy of the NOI to the MassDEP at the following address:

Massachusetts Department of Environmental Protection
One Winter Street -5th Floor
Boston, Massachusetts 02108
ATTN: Frederick Civian, Stormwater Coordinator

c. Late notification: A small MS4 is not prohibited from submitting a NOI after the dates provided in part 1.7.2.d. However, if a late NOI is submitted, authorization is only for discharges that occur after permit authorization is granted. EPA and MassDEP reserve the right to take enforcement actions for any unpermitted discharges. All NOIs submitted after December 21, 2020 must be submitted electronically.

1.7.4. Public Notice of NOI and Effective Date of Coverage

a. EPA will provide a public notice and opportunity for comment on the contents of the submitted NOIs. The public comment period will be a minimum of 30 calendar days.

b. Based on a review of a small MS4's NOI or other information, EPA may grant authorization, extend the public comment period, or deny authorization under this permit and require submission of an application for an individual or alternative NPDES permit. (See part 1.8) A small MS4 will be authorized to discharge under the terms and conditions of this permit upon receipt of notice of authorization from EPA.

c. Permittees whose authorization to discharge under the MS4-2003 permit, which expired on May 1, 2008, has been administratively continued in accordance with the Administrative Procedure Act 5 U.S.C. § 558(c) and 40 CFR § 122.6, who wish to obtain coverage under this permit, must submit a new NOI requesting permit coverage in accordance with the requirements of part 1.7 of this permit to EPA within 90 days after the effective date of this permit. Permittees whose authorization to discharge under the expired MS4-2003 permit was administratively continued, who fail to submit a timely, complete and accurate NOI or an application for an individual NPDES permit within 90 days after the effective date of this permit will be considered to be discharging without a permit (see 40 CFR § 122.28(b)(3)(iii)).

1.8. Individual Permits and Alternative General Permits

a. EPA may require a small MS4 to apply for and obtain authorization under either an individual NPDES permit or an alternative NPDES general permit. Any interested person may petition EPA in accordance with the provisions of 40 CFR § 122.26(f) to require a small MS4 to apply for and/or obtain authorization under either an individual NPDES permit or an alternative NPDES general permit. If EPA requires a small MS4 to apply for an individual or alternative NPDES permit, EPA will notify the small MS4 in writing that a permit application is required. This notification will include a brief statement of the reasons for this decision and will provide application information and an application deadline. If a small MS4 is authorized under the MS4-2003 permit or this permit and fails to submit an individual NPDES or an alternative general permit NPDES permit application as required by EPA, then the authorization under the MS4-2003 permit or this permit to the small MS4 is automatically terminated at the end of the date specified by EPA as the deadline for application submittal. EPA reserves the right to take enforcement action for any unpermitted discharge.

b. A small MS4 may request to be excluded from this general permit by applying for an individual permit or authorization under an alternative general permit. In such a case, a small MS4 shall submit an individual permit application in accordance with the requirements of 40 CFR § 122.33(b) (2) (i) or § 122.33(b) (2) (ii), with reasons supporting the request, to EPA at the address listed in part 1.7.3 of this permit. The request may be granted by issuance of an individual permit or authorization under an alternative general permit if EPA determines that the reasons stated by the small MS4 are adequate to support the request. (See 40 CFR § 122.28(b) (3)).

c. When an individual NPDES permit is issued, or a small MS4 is authorized to discharge under an alternative NPDES general permit, authorization under this permit automatically terminates on the effective date of the individual permit or the date of authorization of coverage under the alternative general permit.

1.9. Special Eligibility Determinations

1.9.1. Documentation Regarding Endangered Species

The small MS4 shall certify eligibility regarding endangered species in the NOI required by part 1.7.2. The Stormwater Management Program (SWMP) shall include documentation supporting the permittee’s eligibility determination with regard to federal Endangered and Threatened Species and Critical Habitat Protection, including:

- Results of the Appendix C U.S. Fish and Wildlife Service endangered species screening determination; and
- If applicable, a description of the measures the small MS4 shall implement to protect federally listed endangered or threatened species, or critical habitat, including any conditions imposed by the U.S. Fish and Wildlife Service. If a permittee fails to document and implement such measures, the permittee’s discharges are ineligible for coverage under this permit.

1.9.2. Documentation Regarding Historic Properties

The small MS4 shall certify eligibility regarding historic properties on the NOI required by part 1.7.2. The SWMP shall include documentation supporting the small MS4’s eligibility determination with regard to Historic Properties Preservation, including:

- Information on whether the permittee’s stormwater discharges, allowable non-stormwater discharges, or stormwater discharge-related activities would have an effect on a property that is listed or eligible for listing on the National Register of Historic Properties (NRHP);
- Where such effects may occur, any documents received by the permittee or any written agreements the permittee has made with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (THPO), or other Tribal representative to mitigate those effects;
- Results of the Appendix D historic property screening investigations; and
- If applicable, a description of the measures the permittee shall implement to avoid or minimize adverse impacts on places listed, or eligible for listing, on the NRHP, including any conditions imposed by the SHPO or THPO. If the permittee fails to

document and implement such measures, those discharges are ineligible for coverage under this permit.

1.10. Stormwater Management Program (SWMP)

a. The permittee shall develop and implement a written (hardcopy or electronic) SWMP. The SWMP shall be signed in accordance with Appendix B, Subsection 11, including the date of signature. A signature and date is required for initial program preparation and for any significant revision to the program, which shall be in writing. The written SWMP shall be completed within one (1) year of the effective date of the permit.

The SWMP is the document used by the permittee to describe and detail the activities and measures that will be implemented to meet the terms and conditions of the permit. The SWMP shall accurately describe the permittees plans and activities. The document should be updated and/or modified during the permit term as the permittee's activities are modified, changed or updated to meet permit conditions during the permit term.

b. Permittees authorized by the MS4-2003 permit shall modify or update their existing Best Management Practices (BMPs) and measurable goals to meet the terms and conditions of part 2.3 of this permit within one (1) year of the effective date of the permit. These modifications and updates shall be reflected in the written (hardcopy or electronic) SWMP. Permittees authorized by the MS4-2003 permit shall continue to implement their existing SWMP until the program has been updated.

1.10.1. Stormwater Management Program Availability

a. The permittee shall retain a copy of the current SWMP required by this permit at the office or facility of the person listed as the program contact on the submitted Notice of Intent (NOI). The SWMP shall be immediately available to representatives from EPA, MassDEP, U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) at the time of an onsite inspection or upon request.

b. The permittee shall make the SWMP available to the public during normal business hours. The permittee shall also post the SWMP online[1] if the permittee has a website on which to post the SWMP.

1.10.2. Contents and Timelines of the Stormwater Management Program for 2003 permittees

The following information must be included in the SWMP within one (1) year of the permit effective date and updated annually thereafter, as necessary:

- Identification of names and titles of people responsible for program implementation. If a position is currently unfilled, list the title of the position and modify the SWMP with the name once the position is filled;
- Documentation of compliance with part 1.9.1;
- Documentation of compliance with part 1.9.2;

[1] Should a permittee not wish to post mapping information included in the SWMP (see part 1.10.2) on their website for public safety reasons, they must state the reason either with or within the online SWMP and provide how the MS4 mapping information can be obtained. The permittee must retain the entire SWMP, including all completed mapping, at a location where it can be made available to the public during normal business hours.

- Documentation of authorization of all new or increased discharges granted by MassDEP in compliance with part 2.1.2;
- Listing of all discharges identified pursuant to part 2.1.1 and description of response;
- Description of practices to achieve compliance with part 2.3 (MEP requirements) identified in the permittee's NOI and any updates to those BMPs within the first year;
  For each permit condition in part 2.3 identify:
  - The person(s) or department responsible for the measure;
  - The BMPs for the control measure or permit requirement;
  - The measurable goal(s) for each BMP. Each measurable goal shall include milestones and timeframes for its implementation and have a quantity or quality associated with its endpoint. Each goal shall have a measure of assessment associated with it;
- Sanitary Sewer Overflow (SSO) inventory including all of the information required in part 2.3.4.4.b;
- Written IDDE Program pursuant to part 2.3.4.6;
- Written procedures for site inspections and enforcement of sediment and erosion control procedures in accordance with part 2.3.5;
- Description of measures to avoid or minimize impacts to surface public drinking water supply sources. The permittee is also encouraged to include provisions to notify public water supplies in the event of an emergency. Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Drinking Water Program, One Winter Street, Boston, MA 02108 – phone 617.292.5770.
- Description of activities to achieve compliance with part 3.0;
- Annual program evaluation (part 4.1). Update annually and maintain copies.

The following information must be included in the SWMP within two (2) years of the permit effective date and updated annually thereafter, as necessary:

- Listing of all receiving waterbody segments, their classification under the applicable state water quality standards, any impairment(s) and associated pollutant(s) of concern, applicable TMDLs and WLAs, and number of outfalls from the MS4 that discharge to each waterbody. In addition to the receiving water, the permittee shall document in the SWMP all surface public drinking water sources that may be impacted by MS4 discharges;
- Listing of all interconnected MS4s and other separate storm sewer systems receiving a discharge from the permitted MS4, the receiving waterbody segment(s) ultimately receiving the discharge, their classification under the applicable state water quality standards, any impairment(s) and associated pollutant(s) of concern, applicable TMDLs and WLAs, and the number of interconnections;
- Written procedures to require submission of as-built drawings and ensure long term operation and maintenance in accordance with part 2.3.6.a.iii;
- The map of the separate storm sewer system required by part 2.3.4.5.

The following information must be included in the SWMP within four (4) years of the permit effective date and updated annually thereafter, as necessary:

- Report(s) assessing current street design and parking lot guidelines and other local requirements within the municipality that affect the creation of impervious cover.

The following information must be included in the SWMP concurrent with the applicable deadlines in Appendix F and H and updated annually thereafter, as necessary:

- Description of practices to achieve compliance with part 2.2.1 (TMDL requirements) including:
  - The person(s) or department responsible for the measure;
  - The BMPs for the control measure or permit requirement;
  - The measurable goal(s) for each BMP. Each measurable goal shall include milestones and timeframes for its implementation and have a quantity or quality associated with its endpoint. Each goal must have an associated measure of assessment.
- Description of practices to achieve compliance with part 2.2.2 (discharges to certain water quality limited waters subject to additional requirements) including:
  - The person(s) or department responsible for the measure;
  - The BMPs for the control measure or permit requirement;
  - The measurable goal(s) for each BMP. Each measurable goal shall include milestones and timeframes for its implementation and have a quantity or quality associated with its endpoint. Each goal must have an associated measure of assessment;
- Description of any other practices to achieve compliance with part 2.1 (water quality based requirements)

1.10.3. Contents and Timelines of the Stormwater Management Program for New Permittees

a. Permittees seeking authorization for the first time shall meet all deadlines contained in this permit except the following:

- Timelines for public education requirements in part 2.3.2.c shall be extended by one (1) year and need to include one (1) message to each audience over the permit term;
- The ordinances, by-laws, or other regulatory mechanisms required by parts 2.3.4, 2.3.5 and 2.3.6 shall be completed as soon as possible, but no later than three (3) years from the permit effective date; and
- All other deadlines in part 2.3.4 shall be extended by three (3) years.
- All other deadlines in part 2.3.5, 2.3.6 and 2.3.7 shall be extended by two (2) years.
- All deadlines for discharges to water quality limited waters without a TMDL under part 2.2.2 shall be extended by two (2) years.

b. Contents of the Stormwater Management Program for New Permittees

The following information must be included in the SWMP within one (1) year of the permit effective date and updated annually thereafter, as necessary:

- Identification of names and titles of people responsible for program implementation. If a position is currently unfilled, list the title of the position and modify the SWMP with the name once the position is filled;
- Documentation of compliance with part 1.9.1;
- Documentation of compliance with part 1.9.2;
- Documentation of authorization of all new or increased discharges granted by MassDEP in compliance with part 2.1.2;
- Listing of all discharges identified pursuant to part 2.1.1 and description of response;
- Description of practices to achieve compliance with part 2.3 (MEP requirements) identified in the permittee's NOI and any updates to those BMPs within the first year;

For each permit condition in part 2.3 identify:
- The person(s) or department responsible for the measure;
- The BMPs for the control measure or permit requirement;
- The measurable goal(s) for each BMP. Each measurable goal shall include milestones and timeframes for its implementation and have a quantity or quality associated with its endpoint. Each goal shall have a measure of assessment associated with it;

- Description of measures to avoid or minimize impacts to surface public drinking water supply sources. The permittee is also encouraged to include provisions to notify public water supplies in the event of an emergency. Massachusetts Department of Environmental Protection, Bureau of Resource Protection, Drinking Water Program, One Winter Street, Boston, MA 02108 – phone 617.292.5770. Description of activities to achieve compliance with part 3.0;
- Annual program evaluation (part 4.1). Update annually and maintain copies.

The following information must be included in the SWMP within three (3) years of the permit effective date and updated annually thereafter, as necessary:

- Written procedures for site inspections and enforcement of sediment and erosion control procedures in accordance with part 2.3.5;

The following information must be included in the SWMP within four (4) years of the permit effective date and updated annually thereafter, as necessary:

- Outfall and interconnection inventory;
- Sanitary Sewer Overflow (SSO) inventory including all of the information required in part 2.3.4.4.b;
- Written IDDE Program pursuant to part 2.3.4.6.
- Written operation and maintenance procedures for municipal activities in part 2.3.7.a.ii;
- Written program detailing the activities and procedures the permittee will implement so that the MS4 infrastructure is maintained in a timely manner to reduce the discharge of pollutants from the MS4 in accordance with part 2.3.7.a.iii.1;
- Written procedures to require submission of as-built drawings and ensure long term operation and maintenance in accordance with part 2.3.6.a.iii;

The following information must be included in the SWMP within five (5) years of the permit effective date and updated annually thereafter, as necessary:

- Phase 1 of the map of the separate storm sewer system required by part 2.3.4.5;
- Listing of all receiving waterbody segments, their classification under the applicable state water quality standards, any impairment(s) and associated pollutant(s) of concern, applicable TMDLs and WLAs, and number of outfalls from the MS4 that discharge to each waterbody. In addition to the receiving water, the permittee shall document in the SWMP all surface public drinking water sources that may be impacted by MS4 discharges;
- Listing of all interconnected MS4s and other separate storm sewer systems receiving a discharge from the permitted MS4, the receiving waterbody segment(s) ultimately receiving the discharge, their classification under the applicable state water quality standards, any impairment(s) and associated pollutant(s) of concern, applicable TMDLs and WLAs, and the number of interconnections;

The following information must be included in the SWMP within six (6) years of the permit effective date and updated annually thereafter, as necessary:

- Report(s) assessing current street design and parking lot guidelines and other local requirements within the municipality that affect the creation of impervious cover.

The following information must be included in the SWMP concurrent with the applicable deadlines in Appendix F and H (extended by two (2) years) and updated annually thereafter, as necessary:

- Description of practices to achieve compliance with part 2.2.1 (discharges subject to requirements related to approved TMDLs)including:
  - The person(s) or department responsible for the measure;
  - The BMPs for the control measure or permit requirement;
  - The measurable goal(s) for each BMP. Each measurable goal shall include milestones and timeframes for its implementation and have a quantity or quality associated with its endpoint. Each goal must have an associated measure of assessment.
- Description of practices to achieve compliance with part 2.2.2 (discharges to certain water quality limited waters subject to additional requirements) including:
  - The person(s) or department responsible for the measure;
  - The BMPs for the control measure or permit requirement;
  - The measurable goal(s) for each BMP. Each measurable goal shall include milestones and timeframes for its implementation and have a quantity or quality associated with its endpoint. Each goal must have an associated measure of assessment;
- Description of any other practices to achieve compliance with part 2.1 (water quality based requirements).

2.0. Non-Numeric Effluent Limitations

The permittee shall develop, implement, and enforce a program to reduce the discharge of pollutants from the MS4 to the maximum extent practicable; to protect water quality and to satisfy the appropriate water quality requirements of the Clean Water Act and the Massachusetts Water Quality Standards.

2.1. Water Quality Based Effluent Limitations

Pursuant to Clean Water Act 402(p)(3)(B)(iii), this permit includes provisions to ensure that discharges from the permittee's small MS4 do not cause or contribute to an exceedance of water quality standards, in addition to requirements to reduce the discharge of pollutants to the maximum extent practicable. The requirements found in this part and part 2.2 constitute appropriate water quality based effluent limits of this permit. Requirements to reduce the discharge of pollutants to the maximum extent practicable are set forth in part 2.3.

2.1.1. Requirement to Meet Water Quality Standards

a. The permittee shall reduce the discharge of pollutants such that the discharges from the MS4 do not cause or contribute to an exceedance of water quality standards.

b. If there is a discharge from the MS4 to a waterbody (or its tributaries in some cases) that is subject to an approved TMDL identified in part 2.2.1, the permittee is subject to the requirements of part 2.2.1 and Appendix F of this permit and the permittee shall comply with all applicable schedules and requirements in Appendix F. A permittee's compliance with all applicable requirements and BMP implementation schedules in Appendix F applicable to it will constitute compliance with part 2.1.1.a. of the Permit.

c. If there is a discharge from the MS4 to a waterbody (or its tributaries in some cases) that is water quality limited (see definition in Appendix A) due to nutrients (Total Nitrogen or Total Phosphorus), metals (Cadmium, Copper, Iron, Lead or Zinc), solids (TSS or Turbidity), bacteria/pathogens (E. Coli, Enterococcus or Fecal Coliform), chloride (Chloride) or oil and grease (Petroleum Hydrocarbons or Oil and Grease) and is not subject to an approved TMDL, or the MS4 is located within a municipality listed in part 2.2.2.a.-b., the permittee is subject to the requirements of part 2.2.2 and Appendix H of this permit and the permittee shall comply with all applicable schedules and requirements in Appendix H. A permittee's compliance with all applicable requirements and BMP implementation schedules in Appendix H applicable to it will constitute compliance with part 2.1.1.a. of the Permit.

d. Except where a pollutant of concern in a discharge is subject to the requirements of part 2.2.1 and/or part 2.2.2 of this permit or is the result of an illicit discharge and subject to part 2.3.4 of this Permit, if a pollutant in a discharge from the MS4 is causing or contributing to a violation of applicable water quality criteria[2] for the receiving water, the permittee shall, as expeditiously as possible, but no later than 60 days of becoming aware of the situation, reduce or eliminate the pollutant in its discharge such that the discharge meets applicable water quality criteria.

2.1.2. Increased Discharges

a. Any increased discharge, including increased pollutant loading(s) through the MS4 to waters of the United States is subject to Massachusetts antidegradation regulations at 314 CMR 4.04. The permittee shall comply with the provisions of 314 CMR 4.04 including information submittal requirements and obtaining authorization for increased discharges where appropriate[3]. Any authorization of an increased discharge by MassDEP shall be incorporated into the permittee's SWMP. If an applicable MassDEP approval specifies additional conditions or requirements, then those requirements are incorporated into this permit by reference. The permittee must comply with all such requirements.

b. There shall be no increased discharges, including increased pollutant loading(s) from the MS4 to impaired waters listed in categories 5 or 4b on the most recent Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b) unless the permittee demonstrates that there is no net increase in loading from the MS4 to the impaired water of the pollutant(s) for which the waterbody is impaired. The permittee may demonstrate compliance with this provision by *either:*

i. Documenting that the pollutant(s) for which the waterbody is impaired is not present in the MS4's discharge and retaining documentation of this finding with the SWMP; or

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[2] Applicable water quality criteria are part of the state standards that have been federally approved as of the effective date of this permit and are compiled by EPA at http://www.epa.gov/waterscience/standards/wqslibrary/

[3] Contact MassDEP for guidance on compliance with 314 CMR 4.04

ii. Documenting that the total load of the pollutant(s) of concern from the MS4 to any impaired portion of the receiving water will not increase as a result of the activity and retaining documentation of this finding in the SWMP. Unless otherwise determined by the Permittee, USEPA or by MassDEP that additional demonstration is necessary, compliance with the requirements of part 2.2.2 and part 2.3.6 of this Permit, including all reporting and documentation requirements, shall be considered as demonstrating no net increase as required by this part.

c. The requirements of this part are independent of permit conditions requiring reduction in discharges of pollutants as set forth in parts 2.1.1 and 2.2 (water quality based requirements) and 2.3 (requirements to reduce discharge of pollutants to the maximum extent practicable). Permittees remain subject to requirements to reduce the discharge of pollutants from the MS4 as set forth in those parts.

2.2. Discharges to Certain Impaired Waters

The permittee shall identify in the SWMP and Annual Reports all MS4 discharges, including both outfalls and interconnections to other MS4s or other separate storm sewer systems, that:

- Are subject to Total Maximum Daily Load (TMDL) related requirements as identified in part 2.2.1.
- Are subject to additional requirements to protect water quality as identified in part 2.2.2.

The discharge location from an interconnection shall be determined based on the receiving water of the outfall from the interconnected system.

2.2.1. Discharges Subject to Requirements Related to an Approved TMDL

a. "Approved TMDLs" are those that have been approved by EPA as of the date of issuance of this permit.

b. The MS4s specified below discharge to waters within Massachusetts that are subject to TMDLs, or in some cases, to tributaries of such waters, and shall comply with the requirements of Appendix F, part A. Appendix F identifies, by section, the provisions the permittee shall implement to be consistent with the terms of the approved TMDL. Alternatively, EPA may notify the permittee that an individual permit application is necessary in accordance with part 1.8.a.

i. The following is a list of municipalities in the Charles River Watershed:

1.

Arlington	Mendon
Ashland	Milford
Bellingham	Millis
Belmont	Natick
Brookline	Needham
Cambridge	Newton
Dedham	Norfolk

Dover	Sherborn
Foxborough	Walpole
Franklin	Waltham
Holliston	Watertown
Hopedale	Wayland
Hopkinton	Wellesley
Lexington	Weston
Lincoln	Westwood
Medfield	Wrentham
Medway	

Permittees that operate regulated MS4s located in municipalities listed above that discharge to the Charles River or its Tributaries shall meet the requirements of Appendix F, part A.I with respect to the reduction of phosphorus discharges from their MS4.

ii. The following is a list of municipalities that contain a lake or pond subject to an approved lake or pond phosphorus TMDL in the Northern Blackstone Basin, Chicopee Basin, Connecticut Basin, French Basin, Millers Basin or in the watershed of Bare Hill Pond, Flint Pond, Indian Lake, Lake Boon, Lake Quinsigamond, Leesville Pond, Salisbury Pond, Quaboag Pond or Quacumquasit Pond.

1.

Auburn	Millbury
Charlton	Oxford
Dudley	Shrewsbury
Gardner	Spencer
Grafton	Springfield
Granby	Stow
Hadley	Templeton
Harvard	Westminster
Hudson	Winchendon
Leicester	Wilbraham
Ludlow	

Permittees that operate regulated MS4s in the above municipalities that discharge to waterbodies listed on Table F-6 in Appendix F or their tributaries, and any other MS4 that discharges to waterbodies listed on Table F-6 in Appendix F or their tributaries, shall meet the requirements of Appendix F, part A.II with respect to reduction of phosphorus discharges from their MS4.

iii. The following is a list of municipalities that contain waters subject to an approved TMDL for bacteria or pathogens.

1.

Abington	Marshfield
Acushnet	Mashpee
Andover	Mattapoisett
Avon	Medfield
Barnstable	Medway
Bedford	Melrose
Bellingham	Mendon
Belmont	Milford
Berkley	Millis
Beverly	Milton
Billerica	Nahant
Bourne	Natick
Brewster	Needham
Bridgewater	New Bedford
Brockton	Newton
Brookline	Norfolk
Burlington	North Andover
Cambridge	Norton
Canton	Norwell
Chatham	Norwood
Cohasset	Orleans
Concord	Peabody
Danvers	Pembroke
Dartmouth	Plymouth
Dedham	Raynham
Dennis	Rehoboth
Dighton	Revere
Dover	Rockland
Duxbury	Rockport
East Bridgewater	Salem
Eastham	Sandwich
Essex	Saugus
Everett	Scituate
Fairhaven	Seekonk
Fall River	Sharon
Falmouth	Sherborn
Foxborough	Somerset
Franklin	Stoughton

Freetown	Swampscott
Gloucester	Swansea
Hanover	Taunton
Hanson	Tewksbury
Harwich	Wakefield
Holliston	Walpole
Hopedale	Waltham
Hopkinton	Wareham
Ipswich	Watertown
Kingston	Wellesley
Lawrence	Wellfleet
Lexington	West Bridgewater
Lincoln	Weston
Lynn	Westport
Lynnfield	Westwood
Malden	Whitman
Manchester	Wilmington
Mansfield	Winthrop
Marblehead	Yarmouth
Marion	

The operators of MS4s located in municipalities listed above that discharge to a waterbody segment listed on Table F-8 in Appendix F and any other MS4 that discharges directly to a waterbody segment listed on Table F-8 in Appendix F shall meet the requirements of Appendix F, part A.III with respect to reduction of bacteria/pathogens discharges from their MS4.

iv. The following is a list of municipalities located on Cape Cod that contain waters subject to an approved TMDL for nitrogen (Total Nitrogen).

1.

Bourne
Barnstable
Chatham
Falmouth
Harwich
Mashpee
Orleans
Yarmouth

Permittees that operate regulated MS4s located in the municipalities above that discharge to waterbodies found on Table F-9 in Appendix F or their tributaries and any other MS4 that discharges to waterbodies found on Table F-9 in Appendix F or their tributaries shall meet the requirements of Appendix F, part A.IV with respect to reduction of nitrogen discharges from their MS4.

v. The following is a list of municipalities located in the Assabet River Watershed:

1.

Acton	Hudson
Berlin	Littleton
Bolton	Marlborough
Boxborough	Maynard
Boylston	Northborough
Ca rlisle	Shrewsbury
Clinton	Stow
Concord	Westborough
Grafton	Westford
Harvard	

Permittees that operate regulated MS4s located in the municipalities above that discharge to the Assabet River or its tributaries shall meet the requirements of Appendix F part A.V with respect to reduction of phosphorus discharges from their MS4.

c. The MS4s specified below discharge to waters, or tributaries of waters, that have been identified in an adjacent state's approved TMDL as being impaired due, in part, to MS4 stormwater discharges in Massachusetts, and shall comply with the requirements of Appendix F, part B. Appendix F identifies, by section, the provisions the permittee shall implement to be consistent with the reasonable assumptions related to Massachusetts MS4 discharges. Alternatively, EPA may notify the permittee that an individual permit application is necessary in accordance with part 1.8.a.

i. The following is a list of municipalities in Massachusetts located in the watershed of Long Island Sound, which has an approved TMDL for nitrogen (Total Nitrogen).

1.

Adams	North Adams
Agawam	Northampton
Amherst	Oxford
Ashburnham	Palmer
Ashby	Paxton
Auburn	Pelham
Belchertown	Pittsfield
Charlton	Richmond
Cheshire	Russell
Chicopee	Rutland
Dalton	South Hadley
Douglas	Southampton

Dudley	Southbridge
East Longmeadow	Southwick
Easthampton	Spencer
Gardner	Springfield
Granby	Sturbridge
Hadley	Sutton
Hampden	Templeton
Hatfield	Ware
Hinsdale	Webster
Holyoke	West Springfield
Lanesborough	Westfield
Leicester	Westhampton
Lenox	Westminster
Longmeadow	Wilbraham
Ludlow	Williamsburg
Millbury	Winchendon
Monson	

Permittees that operate regulated MS4s located in the municipalities above that discharge to a water within the Connecticut River Watershed, the Housatonic River Watershed, or the Thames River Watershed shall meet the requirements of Appendix F part B. I with respect to nitrogen discharges from their MS4.

ii. The following is a list of municipalities in Massachusetts identified in a TMDL as containing MS4s contributing phosphorus to waterbody segments that have out of state approved TMDLs for phosphorus:

1.

Attleboro
North Attleborough
Plainville
Rehoboth
Seekonk
Swansea

Permittees that operate regulated MS4s located in the municipalities above that discharge to a waterbody found on Table F-12 in Appendix F or its tributaries shall meet the requirements of Appendix F part B. II with respect to phosphorus discharges from their MS4.

iii. The following is a list of municipalities in Massachusetts identified in a TMDL as containing MS4s contributing bacteria/pathogens to waterbody segments that have out of state approved TMDLs for bacteria/pathogens:

1.

Attleboro

North Attleborough
Plainville
Rehoboth
Seekonk

Permittees that operate regulated MS4s located in the municipalities above that discharge to a waterbody found on Table F-13 in Appendix F or its tributaries shall meet the requirements of Appendix F part B. III with respect to bacteria/pathogens discharges from their MS4.

iv. The following is a list of municipalities in Massachusetts identified in a TMDL as containing MS4s contributing metals (cadmium, lead, aluminum iron) to waterbody segments that have out of state approved TMDLs for metals (cadmium, lead, aluminum, iron):

1.

Attleboro
North Attleborough
Plainville
Seekonk

Permittees that operate regulated MS4s located in the municipalities above that discharge to a waterbody found on Table F-14 in Appendix F or its tributaries shall meet the requirements of Appendix F part B. IV with respect to metals discharges from their MS4.

2.2.2. Discharges to Certain Water Quality Limited Waters Subject to Additional Requirements

For purposes of this permit, a 'water quality limited water body' is any water body that does not meet applicable water quality standards, including but not limited to waters listed in categories 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b).

If there is a discharge from the MS4 to a water quality limited waterbody where pollutants typically found in stormwater (specifically nutrients (Total Nitrogen or Total Phosphorus), solids (TSS or Turbidity), bacteria/pathogens (E. Coli, Enteroccus or Fecal Coliform), chloride (Chloride), metals (Cadmium, Copper, Iron, Lead or Zinc) and oil and grease (Petroleum Hydrocarbons or Oil and Grease)) are the cause of the impairment and there is not an approved TMDL, or the MS4 is located in a town listed in part 2.2.2.a.-b, the permittee shall comply with the provisions in Appendix H applicable to it.

In the absence of a defined pollutant reduction target and where no approved TMDL has been established, this permit part and Appendix H define an iterative approach addressing pollutant reductions to waterbodies where the permittee's discharge is causing or contributing to an excursion above water quality standards due to nutrients (Total Nitrogen Total Phosphorus), solids (TSS or Turbidity), bacteria/pathogens (E. Coli, Enteroccus or Fecal Coliform), chloride (Chloride), metals (Cadmium, Copper, Iron, Lead or Zinc) or oil and grease (Petroleum Hydrocarbons or Oil and Grease).

a. Discharges to water quality limited waterbodies where nitrogen (Total Nitrogen) is the cause of the impairment, or their tributaries

i. The requirements of this part are applicable to:

1. Permittees (including traditional and non-traditional MS4s) that own or operate an MS4 in the following municipalities. Discharges from MS4s within these municipalities are to waterbodies that are impaired due to nitrogen (Total Nitrogen), or their tributaries.

Abington	Mattapoisett
Acushnet	Middleborough
Attleboro	New Bedford
Avon	Norton
Barnstable	Peabody
Berkley	Pembroke
Bourne	Plainville
Bridgewater	Plymouth
Brockton	Plympton
Carver	Raynham
Dartmouth	Rehoboth
Dighton	Rochester
East Bridgewater	Salem
Easton	Seekonk
Fairhaven	Sharon
Fall River	Somerset
Foxborough	Stoughton
Freetown	Swansea
Halifax	Taunton
Hanson	Wakefield
Holbrook	Wareham
Kingston	West Bridgewater
Lakeville	Westport
Lynnfield	Whitman
Mansfield	Wrentham
Marion	Yarmouth

2. Any other permittee that, during the permit term, becomes aware that its discharge is to a waterbody that is water quality limited due to nitrogen (Total Nitrogen), or a tributary of such water.

ii. Permittees subject to part 2.2.2.a.i above shall meet the requirements of Appendix H part I with respect to the control of nitrogen discharges from their MS4;

iii. During development of their Notice of Intent, the permittee may determine that all discharges from the regulated area through their MS4 are outside of a watershed that contains a nitrogen (Total Nitrogen) impairment in a downstream segment. The permittee shall retain all documentation used in this determination as part of their NOI and are relieved from the requirements of part 2.2.2.a.i and Appendix H part I.

b. Discharges to water quality limited waterbodies where phosphorus ("Total Phosphorus") is the cause of the impairment, or their tributaries

i. The requirements of this part are applicable to:

1. Permittees (including traditional and non-traditional MS4s) that own or operate an MS4 in the following municipalities. Discharges from MS4s within these municipalities are to waterbodies that are impaired due to phosphorus (Total Phosphorus), or their tributaries.

Abington	Lynn
Acushnet	Lynnfield
Andover	Malden
Arlington	Mansfield
Ashburnham	Marlborough
Ashland	Mashpee
Auburn	Medfield
Avon	Medford
Ayer	Melrose
Barnstable	Mendon
Bedford	Methuen
Belchertown	Millbury
Belmont	Millville
Billerica	Milton
Blackstone	North Andover
Bolton	Northbridge
Brewster	Norton
Bridgewater	Norwood
Brockton	Oxford
Burlington	Peabody
Cambridge	Pembroke
Canton	Pepperell
Carlisle	Pittsfield
Carver	Quincy
Chelmsford	Randolph
Chelsea	Reading

Clinton	Revere
Concord	Rockland
Dalton	Salem
Dedham	Scituate
Douglas	Seekonk
Dover	Sharon
Dracut	Shirley
Dunstable	Shrewsbury
East Bridgewater	Somerville
Eastham	Southampton
Easthampton	Spencer
Everett	Springfield
Falmouth	Stoneham
Fitchburg	Stoughton
Foxborough	Sudbury
Framingham	Sutton
Gloucester	Taunton
Grafton	Tewksbury
Granby	Townsend
Groton	Tyngsborough
Halifax	Upton
Hanover	Uxbridge
Hanson	Wakefield
Harvard	Walpole
Haverhill	Wareham
Hinsdale	Watertown
Hopkinton	Wayland
Hudson	West Bridgewater
Lancaster	Westfield
Lawrence	Westminster
Leicester	Westwood
Lenox	Whitman
Leominster	Wilmington
Lexington	Winchendon
Littleton	Winchester
Lowell	Winthrop
Lunenburg	Woburn
Lynn	

2. Any other permittee that, during the permit term, becomes aware that its discharge is to a waterbody that is water quality limited due to phosphorus (“Total Phosphorus”), or to a tributary of such water.

ii. The permittees subject to part 2.2.2.b.i. above shall meet all requirements of Appendix H part II with respect to the control of phosphorus discharges from the MS4.

iii. During development of their Notice of Intent, the permittee may determine that all discharges from the regulated area through their MS4 are outside of a watershed that contains a phosphorus (“Total Phosphorus”) impairment in a downstream segment. The permittee shall retain all documentation used in this determination as part of their NOI and are relieved from the requirements of part 2.2.2.b.i and Appendix H part II.

c. Discharges to water quality limited waterbodies where bacteria or pathogens is the cause of the impairment

i. The requirements of this part are applicable to:

1. Any MS4 discharge identified by the permittee on their Notice of Intent as discharging directly to an impaired waterbody on the most recent EPA approved Massachusetts 303(d) list where bacteria or pathogens (E. Coli, Enteroccus or Fecal Coliform) is the cause of the impairment.
2. Any other MS4 that, during the permit term, becomes aware that its discharge is to a waterbody that is water quality limited due to bacteria or pathogens.

ii. The permittees subject to part 2.2.2.c.i. shall meet all requirements of Appendix H part III with respect to reduction of bacteria or pathogens discharges from the MS4.

d. Discharges to water quality limited waterbodies where chloride (Chloride) is the cause of the impairment

i. The requirements of this part are applicable to:

1. Any MS4 discharge identified by the permittee on their Notice of Intent as discharging directly to an impaired waterbody on the most recent EPA approved Massachusetts 303(d) list where chloride (Chloride) is the cause of the impairment.
2. Any other MS4 that, during the permit term, becomes aware that its discharge is to a waterbody that is water quality limited due to chloride (Chloride).

ii. The permittees subject to part 2.2.2.d.i. shall meet all requirements of Appendix H part IV with respect to reduction of chloride discharges from the MS4.

e. Discharges to water quality limited waterbodies where oil and grease (Petroleum Hydrocarbons or Oil and Grease), solids (TSS or Turbidity) or metals (Cadmium, Copper, Iron, Lead or Zinc) is the cause of the impairment

i. The requirements of this part are applicable to:

1. Any MS4 discharge identified by the permittee on their Notice of Intent as discharging directly to an impaired waterbody on the most recent EPA

approved Massachusetts 303(d) list where oil and grease, solids or metals (Oil and Grease, Petroleum Hydrocarbons TSS, Turbidity, Cadmium, Copper, Iron, Lead or Zinc) is the cause of the impairment.

2. Any other MS4 that, during the permit term, becomes aware that its discharge is to a waterbody that is water quality limited due to oil and grease (Petroleum Hydrocarbons or Oil and Grease), solids (TSS or Turbidity) or metals (Cadmium, Copper, Iron, Lead or Zinc).

ii. The permittees subject to part 2.2.2.d.i. shall meet all requirements of Appendix H part V with respect to reduction of solids, oil and grease or metals discharges from the MS4.

2.3. Requirements to Reduce Pollutants to the Maximum Extent Practicable (MEP)

The permittee shall reduce the discharge of pollutants from the MS4 to the maximum extent practicable (MEP) as detailed in parts 2.3.2 through 2.3.7.

2.3.1. Control Measures

a. Permittees authorized under the MS4-2003 permit shall continue to implement their existing SWMPs while updating their SWMPs pursuant to this permit. This permit does not extend the compliance deadlines set forth in the MS4-2003 permit.

b. Implementation of one or more of the minimum control measures described in parts 2.3.2- 2.3.7 or other permit requirements may be shared with another entity (including another interconnected MS4) or the other entity may fully implement the measure or requirement, if the following requirements are satisfied:

- The other entity, in fact, implements the control measure.
- The particular control measure or component thereof undertaken by the other entity is at least as stringent as the corresponding permit requirement.
- The other entity agrees to implement the control measure on the permittee's behalf. The annual reports must specify that the permittee is relying on another entity to satisfy some of its permit obligations and specify what those obligations are.
- If the permittee is relying on another governmental entity regulated under 40 CFR §122 to satisfy all of its permit obligations, including the obligation to file annual reports, the permittee shall note that fact in its NOI, but is not required to file annual reports.
- The permittee remains responsible for compliance with all permit obligations if the other entity fails to implement the control measures (or component thereof). The permittee may enter into a legally binding agreement with the other entity regarding the other entity's performance of control measures, but the permittee remains ultimately responsible for permit compliance.

2.3.2. Public Education and Outreach

Objective: The permittee shall implement an education program that includes educational goals based on stormwater issues of significance within the MS4 area. The ultimate objective of a public education program is to increase knowledge and change behavior of the public so that pollutants in stormwater are reduced.

a. The permittee shall continue to implement the public education program required by the MS4-2003 permit by distributing educational material to the MS4 community. The educational program shall define educational goals, express specific messages, define the targeted audience for each message, and identify responsible parties for program implementation. If appropriate for the target audience, materials may be developed in a language other than English. At a minimum, the program shall provide information concerning the impact of stormwater discharges on water bodies within the community, especially those waters that are impaired or identified as priority waters. The program shall identify steps and/or activities that the public can take to reduce the pollutants in stormwater runoff and their impacts to the environment.

b. The educational program shall include education and outreach efforts for the following four audiences: (1) residents, (2) businesses, institutions (churches, hospitals), and commercial facilities, (3) developers (construction), and (4) industrial facilities, unless one of these audiences is not present in the MS4 community. In such a situation, the MS4 must document in both the NOI and SWMP which audience is absent from the community and no educational messages are required to that audience.

c. The permittee shall distribute a minimum of two (2) educational messages over the permit term to each audience identified in part 2.3.2.b. The distribution of materials to each audience shall be spaced at least a year apart. Educational messages may be printed materials such as brochures or newsletters; electronic materials such as websites; mass media such as newspaper articles or public service announcement (radio or cable); targeted workshops on stormwater management, or displays in a public area such as town/city hall. The permittee may use existing materials if they are appropriate for the message the permittee chooses to deliver or the permittee may develop its own educational materials. The permittee may partner with other MS4s, community groups or watershed associations to implement the education program to meet this permit requirement.

Some EPA educational materials are available at: http://cfpub.epa.gov/npstbx/index.html.

d. The permittee shall, at a minimum, consider the topics listed in part 2.3.2.d.i. – iv when developing the outreach/education program. The topics are not exclusive and the permittee shall focus on those topics most relevant to the community.

i. Residential program: effects of outdoor activities such as lawn care (use of pesticides, herbicides, and fertilizers and information on Massachusetts Regulation 331 CMR 31 pertaining to proper use of phosphorus containing fertilizers on turf grasses) on water quality; benefits of appropriate on-site infiltration of stormwater; effects of automotive work and car washing on water quality; proper disposal of swimming pool water; proper management of pet waste; maintenance of septic systems. If the small MS4 area has areas serviced by septic systems, the permittee shall consider information pertaining to maintenance of septic systems as part of its education program.

ii. Business/Commercial/Institution program: proper lawn maintenance (use of pesticides, herbicides and fertilizer, and information on Massachusetts Regulation 331 CMR 31 pertaining to proper use of phosphorus containing fertilizers on turf grasses); benefits of appropriate on-site infiltration of stormwater; building maintenance (use of detergents); use of salt or other de-icing and anti-icing materials (minimize their use); proper storage of salt or other de-icing/anti-icing materials (cover/prevent runoff to storm system and contamination to ground water); proper storage of materials (emphasize pollution prevention); proper management of waste materials and dumpsters (cover and pollution prevention); proper management of parking lot surfaces (sweeping); proper car care activities (washing of vehicles and maintenance); and proper disposal of swimming pool water by entities such as motels, hotels, and health and country clubs (discharges must be dechlorinated and otherwise free from pollutants).

iii. Developers and Construction: proper sediment and erosion control management practices; information about Low Impact Development (LID) principles and technologies; and information about EPA's construction general permit (CGP). This education can also be a part of the Construction Site Stormwater Runoff Control measure detailed in part 2.3.5.

iv. Industrial program: equipment inspection and maintenance; proper storage of industrial materials (emphasize pollution prevention); proper management and disposal of wastes; proper management of dumpsters; minimization of use of salt or other de-icing/anti-icing materials; proper storage of salt or other de-icing/anti-icing materials (cover/prevent runoff to storm system and ground water contamination); benefits of appropriate on-site infiltration of stormwater runoff from areas with low exposure to industrial materials such as roofs or employee parking; proper maintenance of parking lot surfaces (sweeping); and requirements for coverage under EPA's Multi-Sector General Permit.

e. The program shall show evidence of focused messages for specific audiences as well as evidence that progress toward the defined educational goals of the program has been achieved. The permittee shall identify methods that it will use to evaluate the effectiveness of the educational messages and the overall education program. Any methods used to evaluate the effectiveness of the program shall be tied to the defined goals of the program and the overall objective of changes in behavior and knowledge.

f. The permittee shall modify any ineffective messages or distribution techniques for an audience prior to the next scheduled message delivery.

g. The permittee shall document in each annual report the messages for each audience; the method of distribution; the measures/methods used to assess the effectiveness of the messages, and the method/measures used to assess the overall effectiveness of the education program.

2.3.3. Public Involvement and Participation

Objective: The permittee shall provide opportunities to engage the public to participate in the review and implementation of the permittee's SWMP.

a. All public involvement activities shall comply with state public notice requirements (MGL Chapter 30A, Sections 18 – 25 – effective 7/10/2010). The SWMP and all annual reports shall be available to the public.

b. The permittee shall annually provide the public an opportunity to participate in the review and implementation of the SWMP.

c. The permittee shall report on the activities undertaken to provide public participation opportunities including compliance with part 2.3.3.a. Public participation opportunities pursuant to part 2.3.3.b may include, but are not limited to, websites; hotlines; clean-up teams; monitoring teams; or an advisory committee.

2.3.4. Illicit Discharge Detection and Elimination (IDDE) Program

Objective: The permittee shall implement an IDDE program to systematically find and eliminate sources of non-stormwater discharges to its municipal separate storm sewer system and implement procedures to prevent such discharges.

a. Legal Authority - The IDDE program shall include adequate legal authority to: prohibit illicit discharges; investigate suspected illicit discharges; eliminate illicit discharges, including discharges from properties not owned by or controlled by the MS4 that discharge into the MS4 system; and implement appropriate enforcement procedures and actions. Adequate legal authority consists of a currently effective ordinance, by-law, or other regulatory mechanism. For permittees authorized by the MS4-2003 permit, the ordinance, by-law, or other regulatory mechanism was a requirement of the MS4-2003 permit and was required to be effective by May 1, 2008. For new permittees the ordinance, by-law, or other regulatory mechanism shall be in place within 3 years of the permit effective date.
b. During the development of the new components of the IDDE program required by this permit, permittees authorized by the MS4-2003 permit must continue to implement their existing IDDE program required by the MS4-2003 permit to detect and eliminate illicit discharges to their MS4.

2.3.4.1. Definitions and Prohibitions

The permittee shall prohibit illicit discharges and sanitary sewer overflows (SSOs) to its MS4 and require removal of such discharges consistent with parts 2.3.4.2 and 2.3.4.4 of this permit.

An SSO is a discharge of untreated sanitary wastewater from a municipal sanitary sewer.

An illicit discharge is any discharge to a municipal separate storm sewer that is not composed entirely of stormwater, except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire fighting activities.

2.3.4.2. Elimination of Illicit Discharges

a. Upon detection of an illicit discharge, the permittee shall locate, identify and eliminate the illicit discharge as expeditiously as possible. Upon identification of the illicit source the MS4 notify all responsible parties for any such discharge and require immediate cessation of improper disposal practices in accordance with its legal authorities. Where elimination of an illicit discharge within 60 days of its identification as an illicit discharge is not possible, the permittee shall establish an expeditious schedule for its elimination and report the dates of identification and schedules for removal in the permittee's annual reports. The permittee shall immediately commence actions necessary for elimination. The permittee shall diligently pursue elimination of all illicit discharges. In the interim, the permittee shall take all reasonable and prudent measures to minimize the discharge of pollutants to and from its MS4.

b. The period between identification and elimination of an illicit discharge is not a grace period. Discharges from an MS4 that are mixed with an illicit discharge are not authorized by this Permit (part 1.3.a) and remain unlawful until eliminated.

2.3.4.3. Non-Stormwater Discharges

The permittee may presume that the sources of non-stormwater listed in part 1.4 of this permit need not be addressed. However, if the permittee identifies any of these sources as significant contributors of pollutants to the MS4, then the permittee shall implement measures to control these sources so they are no longer significant contributors of pollutants, and/or eliminate them entirely, consistent with part 2.3.4.

2.3.4.4. Sanitary Sewer Overflows

a. Upon detection of an SSO the permittee shall eliminate it as expeditiously as possible and take interim mitigation measures to minimize the discharge of pollutants to and from its MS4 until elimination is completed.

b. The permittee shall identify all known locations where SSOs have discharged to the MS4 within the previous five (5) years. This shall include SSOs resulting, during dry or wet weather, from inadequate conveyance capacities, or where interconnectivity of the storm and sanitary sewer infrastructure allows for communication of flow between the systems. Within one (1) year of the effective date of the permit, the permittee shall develop an inventory of all identified SSOs indicating the following information, if available:

    1. Location (approximate street crossing/address and receiving water, if any);
    2. A clear statement of whether the discharge entered a surface water directly or entered the MS4;
    3. Date(s) and time(s) of each known SSO occurrence (i.e., beginning and end of any known discharge);
    4. Estimated volume(s) of the occurrence;
    5. Description of the occurrence indicating known or suspected cause(s);
    6. Mitigation and corrective measures completed with dates implemented; and
    7. Mitigation and corrective measures planned with implementation schedules.

   The permittee shall maintain the inventory as a part of the SWMP and update the inventory annually, all updates shall include the information in part 2.3.4.4.b.1-7.

c. In accordance with Paragraph B.12 of Appendix B of this permit, upon becoming aware of an SSO to the MS4, the permittee shall provide oral notice to EPA within 24 hours. Additionally, the permittee shall provide written notice to EPA and MassDEP within five (5) days of becoming aware of the SSO occurrence and shall include the information in the updated inventory. The notice shall contain all of the information listed in part 2.3.4.4.b. Where common notification requirements for SSOs are included in multiple NPDES permits issued to a permittee, a single notification may be made to EPA as directed in the permittee's wastewater or CSO NPDES permit and constitutes compliance with this part.

d. The permittee shall include and update the SSO inventory in its annual report, including the status of mitigation and corrective measures implemented by the permittee to address each SSO identified pursuant to this part.

e. The period between detection and elimination of a discharge from the SSO to the MS4 is not a grace period. Discharges from an MS4 that are mixed with an SSO are not authorized by this Permit (part 1.3.a) and remain unlawful until eliminated.

2.3.4.5. System mapping

The permittee shall develop a revised and more detailed map than was required by the MS4-2003 permit. This revised map of the MS4 shall be completed in two phases as outlined below. The mapping shall include a depiction of the permittee's separate storm sewer system in the permit area. The mapping is intended to facilitate the identification of key infrastructure and factors influencing proper system operation, and the potential for illicit sanitary sewer discharges.

a. Phase I: The system map shall be updated within two (2) years of the permit effective date to include the following information:

- Outfalls and receiving waters (required by MS4-2003 permit)
- Open channel conveyances (swales, ditches, etc.)
- Interconnections with other MS4s and other storm sewer systems
- Municipally-owned stormwater treatment structures (e.g., detention and retention basins, infiltration systems , bioretention areas, water quality swales, gross particle separators, oil/water separators, or other proprietary systems)
- Waterbodies identified by name and indication of all use impairments as identified on the most recent EPA approved Massachusetts Integrated List of waters report pursuant to Clean Water Act section 303(d) and 305(b)
- Initial catchment delineations. Any available system data and topographic information may be used to produce initial catchment delineations. For the purpose of this permit, a catchment is the area that drains to an individual outfall or interconnection.

b. Phase II: The system map shall be updated annually as the following information becomes available during implementation of catchment investigation procedures in part 2.3.4.8. This information must be included in the map for all outfalls within ten (10) years of the permit effective date:

- Outfall spatial location (latitude and longitude with a minimum accuracy of +/-30 feet)
- Pipes
- Manholes
- Catch basins
- Refined catchment delineations. Catchment delineations shall be updated to reflect information collected during catchment investigations
- Municipal sanitary sewer system (if available)
- Municipal combined sewer system (if applicable).

c. Recommended elements to be included in the system map as information becomes available:

- Storm sewer material, size (pipe diameter) and age
- Sanitary sewer system material, size (pipe diameter) and age
- Privately-owned stormwater treatment structures
- Where a municipal sanitary sewer system exists, properties known or suspected to be served by a septic system, especially in high-density urban areas
- Area where the permittee's MS4 has received or could receive flow from septic system discharges (e.g., areas with poor soils, or high ground water elevations unsuitable for conventional subsurface disposal systems)
- Seasonal high water table elevations impacting sanitary alignments
- Topography
- Orthophotography

- Alignments, dates and representation of work completed (with legend) of past illicit discharge investigations (e.g., flow isolation, dye testing, CCTV)
- Locations of suspected, confirmed and corrected illicit discharges (with dates and flow estimates).

d. The mapping may be produced by hand or through computer-aided methods (e.g. GIS). The required scale and detail of the map shall be appropriate to facilitate a rapid understanding of the system by the permittee, EPA and the state. In addition, the mapping shall serve as a planning tool for the implementation and phasing of the IDDE program and demonstration of the extent of complete and planned investigations and corrections. The permittee shall update the mapping as necessary to reflect newly discovered information and required corrections or modifications.

e. The permittee shall report on the progress towards the completion of the system map in each annual report.

2.3.4.6. Written Illicit Discharge Detection and Elimination Program

The IDDE program shall be recorded in a written (hardcopy or electronic) document. The IDDE program shall include each of the elements described in parts 2.3.4.7 and part 2.3.4.8, unless the permittee provides a written explanation within the IDDE program as to why a particular element is not applicable to the permittee.

Notwithstanding the permittee's explanation, EPA may at any time determine that a particular element is in fact applicable to the permittee and require the permittee to add it to the IDDE program. The written (hardcopy or electronic) IDDE program shall be completed within one (1) year of the effective date of the permit and updated in accordance with the milestones of this part. The permittee shall implement the IDDE program in accordance with the goals and milestones contained in this part.

a. The written (hardcopy or electronic) IDDE program shall include a reference or citation of the authority the permittee will use to implement all aspects of the IDDE program.

b. <u>Statement of IDDE Program Responsibilities</u> - The permittee shall establish a written (hardcopy or electronic) statement that clearly identifies responsibilities with regard to eliminating illicit discharges. The statement shall identify the lead municipal agency(ies) or department(s) responsible for implementing the IDDE Program as well as any other agencies or departments that may have responsibilities for aspects of the program (e.g., board of health responsibilities for overseeing septic system construction; sanitary sewer system staff; inspectional services for enforcing plumbing codes; town counsel responsibilities in enforcement actions, etc.). Where multiple departments and agencies have responsibilities with respect to the IDDE program specific areas of responsibility shall be defined and processes for coordination and data sharing shall be established and documented.

c. <u>Program Procedures</u> – The permittee shall include in the written IDDE program all written procedures developed in accordance with the requirements and timelines in parts 2.3.4.7 and 2.3.4.8 below. At a minimum this shall include the written procedures for dry weather outfall screening and sampling and for catchment investigations.

2.3.4.7. Assessment and Priority Ranking of Outfalls/Interconnections

The permittee shall assess and priority rank the outfalls in terms of their potential to have illicit discharges and SSOs and the related public health significance. This ranking will determine the priority order for screening of outfalls and interconnections pursuant to part 2.3.4.7.b, catchment investigations for evidence of illicit discharges and SSOs pursuant to part 2.3.4.8, and provides the basis for determining permit milestones of this part.

a. Outfall/Interconnection Inventory and Initial Ranking:
An initial outfall and interconnection inventory and priority ranking to assess illicit discharge potential based on existing information shall be completed within one (1) year from the effective date of the permit; an updated inventory and ranking will be provided in each annual report thereafter. The inventory shall be updated annually to include data collected in connection with the dry weather screening and other relevant inspections conducted by the permittee.

i. The outfall and interconnection inventory will identify each outfall and interconnection discharging from the MS4, record its location and condition, and provide a framework for tracking inspections, screenings and other activities under the permittee's IDDE program.

- An outfall means a point source as defined by 40 CFR § 122.2 as the point where the municipal separate storm sewer discharges to waters of the United States. An outfall does not include open conveyances connecting two municipal separate storm sewers or pipes, tunnels or other conveyances that connect segments of the same stream or other waters of the United States and that are used to convey waters of the United States. (40 CFR § 122.26(b)(9)). However, it is strongly recommended that a permittee inspect all accessible portions of the system as part of this process. Culverts longer than a simple road crossing shall be included in the inventory unless the permittee can confirm that they are free of any connections and simply convey waters of the United States.
- An interconnection means the point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is conveyed to waters of the United States or to another storm sewer system and eventually to a water of the United States.

ii. The permittee shall classify each of the permittee's outfalls and interconnections into one of the following categories:

- Problem Outfalls: Outfalls/interconnections with known or suspected contributions of illicit discharges based on existing information shall be designated as Problem Outfalls. This shall include any outfalls/interconnections where previous screening indicates likely sewer input.[4] Problem Outfalls need not be screened pursuant to part 2.3.4.7.b.
- High Priority Outfalls: Outfalls/interconnections that have not been classified as Problem Outfalls and that are:
  - discharging to an area of concern to public health due to proximity of public beaches, recreational areas, drinking water supplies or shellfish beds;
  - determined by the permittee as high priority based on the characteristics listed below or other available information;
- Low Priority Outfalls: Outfalls/interconnections determined by the permittee as low priority based on the characteristics listed below or other available information.
- Excluded outfalls: Outfalls/interconnections with no potential for illicit discharges may be

[4] Likely sewer input indicators are any of the following:
- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

excluded from the IDDE program. This category is limited to roadway drainage in undeveloped areas with no dwellings and no sanitary sewers; drainage for athletic fields, parks or undeveloped green space and associated parking without services; cross-country drainage alignments (that neither cross nor are in proximity to sanitary sewer alignments) through undeveloped land.

iii. The permittee shall priority rank outfalls into the categories above (except for excluded outfalls), based on the following characteristics of the defined initial catchment area where information is available:

- Past discharge complaints and reports.
- Poor receiving water quality- the following guidelines are recommended to identify waters as having a high illicit discharge potential: exceeding water quality standards for bacteria; ammonia levels above 0.5 mg/l; surfactants levels greater than or equal to 0.25 mg/l.
- Density of generating sites- Generating sites are those places, including institutional, municipal, commercial, or industrial sites, with a potential to generate pollutants that could contribute to illicit discharges. Examples of these sites include, but are not limited to, car dealers; car washes; gas stations; garden centers; and industrial manufacturing areas.
- Age of development and infrastructure – Industrial areas greater than 40 years old and areas where the sanitary sewer system is more than 40 years old will probably have a high illicit discharge potential. Developments 20 years or younger will probably have a low illicit discharge potential.
- Sewer conversion – contributing catchment areas that were once serviced by septic systems, but have been converted to sewer connections may have a high illicit discharge potential.
- Historic combined sewer systems – contributing areas that were once serviced by a combined sewer system, but have been separated may have a high illicit discharge potential.
- Surrounding density of aging septic systems – Septic systems thirty years or older in residential land use areas are prone to have failures and may have a high illicit discharge potential.
- Culverted streams – any river or stream that is culverted for distances greater than a simple roadway crossing may have a high illicit discharge potential.
- Water quality limited waterbodies that receive a discharge from the MS4 or waters with approved TMDLs applicable to the permittee, where illicit discharges have the potential to contain the pollutant identified as the cause of the water quality impairment.
- The permittee may also consider additional relevant characteristics, including location-specific characteristics; if so, the permittee shall include the additional characteristics in its written (hardcopy or electronic) IDDE program.

b. Dry Weather Outfall and Interconnection Screening and Sampling
All outfalls/interconnections (excluding Problem and excluded Outfalls) shall be inspected for the presence of dry weather flow within three (3) years of the permit effective date. The permittee shall screen all High and Low Priority Outfalls in accordance with their initial ranking developed at part 2.3.4.7.a.

i. Written procedure: The permittee shall develop an outfall and interconnection screening and sampling procedure to be included in the IDDE program within one (1) year of the permit effective date. This procedure shall include the following procedures for:

- sample collection,
- use of field kits,

- storage and conveyance of samples (including relevant hold times), and
- field data collection and storage.

An example screening and sampling protocol (*EPA New England Bacterial Source Tracking Protocol*) can be found on EPA's website.

ii. Weather conditions: Dry weather screening and sampling shall proceed only when no more than 0.1 inches of rainfall has occurred in the previous 24-hour period and no significant snow melt is occurring.

iii. Screening requirements: For each outfall/interconnection:

1. The permittee shall record all of the following information and include it in the outfall/interconnection inventory and priority ranking:

    - unique identifier,
    - receiving water,
    - date of most recent inspection,
    - dimensions,
    - shape,
    - material (concrete, PVC),
    - spatial location (latitude and longitude with a minimum accuracy of +/-30 feet,
    - physical condition,
    - indicators of potential non-stormwater discharges (including presence or evidence of suspect flow and sensory observations such as odor, color, turbidity, floatables, or oil sheen).

2. If an outfall/interconnection is inaccessible or submerged, the permittee shall proceed to the first accessible upstream manhole or structure for the observation and sampling and report the location with the screening results.

3. If no flow is observed, but evidence of illicit flow exists, the permittee shall revisit the outfall during dry weather within one week of the initial observation, if practicable, to perform a second dry weather screening and sample any observed flow (proceed as in iv. below).

4. Where dry weather flow is found at an outfall/interconnection, at least one (1) sample shall be collected, and:

    a) Samples shall be analyzed at a minimum for:

        - ammonia,
        - chlorine,
        - conductivity,
        - salinity,
        - *E. coli* (freshwater receiving water) or enterococcus (saline or brackish receiving water),
        - surfactants (such as MBAS),
        - temperature, and

- pollutants of concern[5]

b) All analyses with the exception of indicator bacteria and pollutants of concern can be performed with field test kits or field instrumentation and are not subject to 40 CFR part 136 requirements. Sampling for bacteria and pollutants of concern shall be conducted using the analytical methods found in 40 CFR §136, or alternative methods approved by EPA in accordance with the procedures in 40 CFR §136. Sampling for ammonia and surfactants must use sufficiently sensitive methods to detect those parameters at or below the threshold indicator concentrations of 0.5 mg/L for ammonia and 0.25 mg/L for surfactants. Sampling for residual chlorine must use a method with a detection limit of 0.02 mg/L or 20 ug/L.

iv. The permittee may rely on screening conducted under the MS4-2003 permit, pursuant to an EPA enforcement action, or by the state or EPA to the extent that it meets the requirements of part 2.3.4.7.b.iii.4. All data shall be reported in each annual report. Permittees that have conducted substantially equivalent monitoring to that required by part 2.3.4.7.b as part of an EPA enforcement action can request an exemption from the requirements of part 2.3.4.7.b by submitting a written request to EPA and retaining exemption approval from EPA as part of the SWMP. Until the permittee receives formal written approval of the exemption from part 2.3.4.7.b from EPA the permittee remains subject to all requirements of part 2.3.4.7.b.

v. The permittee shall submit all screening data used in compliance with this part in its Annual Report.

c. Follow-up ranking of outfalls and interconnections:

i. The permittee's outfall and interconnection ranking (2.3.4.7.a) shall be updated to reprioritize outfalls and interconnections based on information gathered during dry weather screening (part 2.3.4.7.b).

ii. Outfalls/interconnections where relevant information was found indicating sewer input to the MS4 or sampling results indicating sewer input[6] shall be considered highly likely to contain illicit discharges from sanitary sources, and such outfalls/interconnections shall be ranked at the top of the High Priority Outfalls category for investigation. At this time, permittees may choose to rank other outfalls and interconnections based on any new information from the dry weather screening.

iii. The ranking can be updated continuously as dry weather screening information becomes available, but shall be completed within three (3) years of the effective date of the permit.

2.3.4.8. Catchment Investigations

The permittee shall develop a systematic procedure to investigate each catchment associated with an

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[5] Where the discharge is directly into a water quality limited water or a water subject to an approved TMDL as indicated in Appendix F; the sample shall be analyzed for the pollutant(s) of concern identified as the cause of the impairment as specified in Appendix G

[6] Likely sewer input indicators are any of the following:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

outfall or interconnection within their MS4 system.

a. Timelines:

- A written catchment investigation procedure shall be developed within 18 months of the permit effective date in accordance with the requirements of part 2.3.4.8.b below.
- Investigations of catchments associated with Problem Outfalls shall begin no later than two (2) years from the permit effective date.
- Investigations of catchments associated with High and Low Priority Outfalls shall follow the ranking of outfalls updated in part 2.3.4.7.c.
- Investigations of catchments associated with Problem Outfalls shall be completed within seven (7) years of the permit effective date
- Investigations of catchments where any information gathered on the outfall/interconnection identifies sewer input[7] shall be completed within seven (7) years of the permit effective date.
- Investigations of catchments associated with all High- and Low-Priority Outfalls shall be completed within ten (10) years of the permit effective date.

*For the purposes of these milestones, an individual catchment investigation will be considered complete if all relevant procedures in part 2.3.4.8.c. and 2.3.4.8.d. below have been completed.

b. A written catchment investigation procedure shall be developed that:

i. **Identifies maps, historic plans and records, and other sources of data**, including but not limited to plans related to the construction of the storm drain and of sanitary sewers, prior work performed on the storm drains or sanitary sewers, board of health or other municipal data on septic system failures or required upgrades, and complaint records related to SSOs, sanitary sewer surcharges, and septic system breakouts. These data sources will be used in identifying system vulnerability factors within each catchment.

ii. **Includes a manhole inspection methodology** that shall describe a storm drain network investigation that involves systematically and progressively observing, sampling (as required below) and evaluating key junction manholes (see definition in Appendix A) in the MS4 to determine the approximate location of suspected illicit discharges or SSOs. The manhole inspection methodology may either start from the outfall and work up the system or start from the upper parts of the catchment and work down the system or be a combination of both practices. Either method must, at a minimum, include an investigation of each key junction manhole within the MS4, even where no evidence of an illicit discharge is observed at the outfall. The manhole inspection methodology must describe the method the permittee will use. The manhole inspection methodology shall include procedures for dry and wet weather investigations.

iii. **Establishes procedures to isolate and confirm sources of illicit discharges** where manhole investigations or other physical evidence or screening has identified that MS4 alignments are influenced by illicit discharges or SSOs. These shall include isolation of the drainage area for implementation of more detailed investigations, inspection of additional manholes along the alignment to refine the location of potential contaminant sources, and methods such as sandbagging key junction manhole inlets, targeted internal plumbing inspections, dye testing,

[7] Likely sewer input indicators are any of the following:

- Olfactory or visual evidence of sewage,
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and bacteria levels greater than the water quality criteria applicable to the receiving water, or
- Ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and detectable levels of chlorine.

video inspections, or smoke testing to isolate and confirm the sources.

c. Requirements for each catchment investigation associated with an outfall/interconnection:

i. For each catchment being investigated, the permittee shall review relevant mapping and historic plans and records gathered in accordance with Part 2.3.4.8.b.i. This review shall be used to identify areas within the catchment with higher potential for illicit connections. The permittee shall identify and record the presence of any of the following specific **System Vulnerability Factors (SVFs)**:

- History of SSOs, including, but not limited to, those resulting from wet weather, high water table, or fat/oil/grease blockages;
- Common or twin-invert manholes serving storm and sanitary sewer alignments;
- Common trench construction serving both storm and sanitary sewer alignments;
- Crossings of storm and sanitary sewer alignments where the sanitary system is shallower than the storm drain system;
- Sanitary sewer alignments known or suspected to have been constructed with an underdrain system;
- Inadequate sanitary sewer level of service (LOS) resulting in regular surcharging, customer back-ups, or frequent customer complaints;
- Areas formerly served by combined sewer systems;
- Sanitary sewer infrastructure defects such as leaking service laterals, cracked, broken, or offset sanitary infrastructure, directly piped connections between storm drain and sanitary sewer infrastructure, or other vulnerability factors identified through Inflow/Infiltration Analyses, Sanitary Sewer Evaluation Surveys, or other infrastructure investigations.

EPA recommends the permittee include the following in their consideration of System Vulnerability Factors:

- Sewer pump/lift stations, siphons, or known sanitary sewer restrictions where power/equipment failures or blockages could readily result in SSOs;
- Any sanitary sewer and storm drain infrastructure greater than 40 years old;
- Widespread code-required septic system upgrades required at property transfers (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance);
- History of multiple Board of Health actions addressing widespread septic system failures (indicative of inadequate soils, water table separation, or other physical constraints of the area rather than poor owner maintenance);

The permittee shall document the presence or absence of System Vulnerability Factors for each catchment, retain this documentation as part of its IDDE program, and report this information in Annual Reports. Catchments with a minimum of one (1) System Vulnerability Factor are subject to wet weather sampling requirements of part 2.3.4.8.c.ii.2.

ii. For each catchment, the permittee must inspect key junction manholes and gather catchment information on the locations of MS4 pipes, manholes, and the extent of the contributing catchment.

1. For all catchments
   a) Infrastructure information shall be incorporated into the permittee's mapping required at part 2.3.4.5; the permittee will refine their catchment delineation based on the field investigation where appropriate.

b) The SVF inventory for the catchment will be updated based on information obtained during the inspection, including common (twin invert) manholes, directly piped connections between storm drains and sanitary sewer infrastructure, common weir walls, sanitary sewer underdrain connections and other structural vulnerabilities where sanitary discharges could enter the storm drain system during wet weather.
    1) **Where a minimum of one (1) SVF is identified based on previous information or the investigation, a wet weather investigation must be conducted at the associated outfall (see below).**

c) During dry weather, key junction manholes[8] shall be opened and inspected systematically for visual and olfactory evidence of illicit connections (e.g., excrement, toilet paper, gray filamentous bacterial growth, or sanitary products present).
    1) If flow is observed, the permittee shall sample the flow at a minimum for ammonia, chlorine and surfactants and can use field kits for these analyses.
    2) Where sampling results or visual or olfactory evidence indicate potential illicit discharges or SSOs, the area draining to the junction manhole shall be flagged for further upstream investigation.

d) Key junction and subsequent manhole investigations will proceed until the location of suspected illicit discharges or SSOs can be isolated to a pipe segment between two manholes. If no evidence of an illicit discharge is found, catchment investigations will be considered complete upon completion of key junction manhole sampling.

2. <u>For all catchments with a minimum of one (1) SVF identified</u>

a) The permittee shall meet the requirements above for dry weather screening

b) The permittee shall inspect and sample under wet weather conditions to the extent necessary to determine whether wet weather-induced high flows in sanitary sewers or high groundwater in areas served by septic systems result in discharges of sanitary flow to the MS4.
    1) The permittee shall conduct at least one wet weather screening and sampling at the outfall that includes the same parameters required during dry weather screening, part 2.3.4.7.b.iii.4.
    2) Wet weather sampling and screening shall proceed during or after a storm event of sufficient depth or intensity to produce a stormwater discharge. EPA strongly recommends sampling during the spring (March through June) when groundwater levels are relatively high.
    3) The permit does not require a minimum rainfall event prior to wet weather screening. However, permittees may incorporate provisions that assist in targeting such discharges, including avoiding sampling during the initial period of discharge ("first flush") and/or identifying minimum storm event intensities likely to trigger sanitary sewer interconnections.

c) This sampling can be done upon completion of any dry weather investigation but must be completed before the catchment investigation is marked as complete.

iii. All data collected as part of the dry and wet weather catchment investigations shall be recorded and reported in each annual report.

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[8] Where catchments do not contain junction manholes, the dry weather screening and sampling shall be considered as meeting the manhole inspection requirement. In these catchments, dry weather screenings that indicate potential presence of illicit discharges shall be further investigated pursuant to part 2.3.4.8.d. Investigations in these catchments may be considered complete where dry weather screening reveals no flow; no evidence of illicit discharges or SSOs is indicated through sampling results or visual or olfactory means; and no wet weather System Vulnerability Factors are identified.

d. Identification/Confirmation of illicit source
Where the source of an illicit discharge has been approximated between two manholes in the permittee's MS4, the permittee shall isolate and identify/confirm the source of the illicit discharge using more detailed methods identified in their written procedure (2.3.4.8.b.iii). For outfalls that contained evidence of an illicit discharge, catchment investigations will be considered complete upon confirmation of all illicit sources.

e. Illicit discharge removal
When the specific source of an illicit discharge is identified, the permittee shall exercise its authority as necessary to require its removal pursuant to part 2.3.4.2 or 2.3.4.3.

i. For each confirmed source the permittee shall include in the annual report the following information:

- the location of the discharge and its source(s);
- a description of the discharge;
- the method of discovery;
- date of discovery;
- date of elimination, mitigation or enforcement action OR planned corrective measures and a schedule for completing the illicit discharge removal; and
- estimate of the volume of flow removed.

ii. Within one year of removal of all identified illicit discharges within a catchment area, confirmatory outfall or interconnection screening shall be conducted. The confirmatory screening shall be conducted in dry weather unless System Vulnerability Factors have been identified, in which case both dry weather and wet weather confirmatory screening shall be conducted. If confirmatory screening indicates evidence of additional illicit discharges, the catchment shall be scheduled for additional investigation.

2.3.4.9. Indicators of IDDE Program Progress

The permittee shall define or describe indicators for tracking program success and evaluate and report on the overall effectiveness of the IDDE program in each annual report. At a minimum the permittee shall document in each annual report:

- the number of SSOs and illicit discharges identified and removed,
- the number and percent of total outfall catchments served by the MS4 evaluated using the catchment investigation procedure,
- all dry weather and wet weather screening and sampling results and
- the volume of sewage removed

2.3.4.10 Ongoing Screening

Upon completion of all catchment investigations pursuant to part 2.3.4.8.c and illicit discharge removal and confirmation (if necessary) pursuant to paragraph 2.3.4.8.e, each outfall or interconnection shall be reprioritized for screening in accordance with part 2.3.4.7.a and scheduled for ongoing screening once every five years. Ongoing screening shall consist of dry weather screening and sampling consistent with part 2.3.4.7.b; wet weather screening and sampling shall also be required at outfalls where wet weather screening was required due to SVFs and shall be conducted in accordance with part 2.3.4.8.c.ii. All sampling results shall be reported in the permittee's annual report.

2.3.4.11 Training

The permittee shall, at a minimum, annually provide training to employees involved in IDDE program about the program, including how to recognize illicit discharges and SSOs. The permittee shall report on the frequency and type of employee training in the annual report.

2.3.5. Construction Site Stormwater Runoff Control

Objective: The objective of an effective construction stormwater runoff control program is to minimize or eliminate erosion and maintain sediment on site so that it is not transported in stormwater and allowed to discharge to a water of the U.S through the permittee's MS4. The construction site stormwater runoff control program required by this permit is a separate and distinct program from EPA's stormwater construction permit program. (http://cfpub1.epa.gov/npdes/stormwater/cgp.cfm)

a. Permittees shall implement and enforce a program to reduce pollutants in any stormwater runoff discharged to the MS4 from all construction activities that result in a land disturbance of greater than or equal to one acre within the regulated area. The permittee's program shall include disturbances less than one acre if that disturbance is part of a larger common plan of development or sale that would disturb one or more acres. Permittees authorized under the MS4-2003 permit shall continue to implement and enforce their existing program and modify as necessary to meet the requirements of this part.

b. The permittee does not need to apply its construction program requirements to projects that receive a waiver from EPA under the provisions of 40 CFR § 122.26(b) (15) (i).

c. The permittee shall develop and implement a construction site runoff control program that includes the elements in Paragraphs i. through v. of this part:

i. An ordinance or regulatory mechanism that requires the use of sediment and erosion control practices at construction sites. In addition to addressing sediment and erosion control, the ordinance must include controls for other wastes on construction sites such as demolition debris, litter and sanitary wastes. Development of an ordinance or other regulatory mechanism was a requirement of the MS4-2003 permit (See part II.B.4 and part IV.B.4).The ordinance or other regulatory mechanism required by the MS4-2003 permit shall have been effective by May 1, 2008.

ii. Written (hardcopy or electronic) procedures for site inspections and enforcement of sediment and erosion control measures. If not already existing, these procedures shall be completed within one (1) year from the effective date of the permit. The procedures shall clearly define who is responsible for site inspections as well as who has authority to implement enforcement procedures. The program shall provide that the permittee may, to the extent authorized by law, impose sanctions to ensure compliance with the local program. These procedures and regulatory authorities shall be documented in the SWMP.

iii. Requirements for construction site operators performing land disturbance activities within the MS4 jurisdiction that result in stormwater discharges to the MS4 to implement a sediment and erosion control program that includes BMPs appropriate for the conditions at the construction site. The program may include references to BMP design standards in state manuals, such as the Massachusetts Stormwater Handbook[9], or design standards developed by the MS4. EPA supports and encourages the use of design standards in local programs. Examples of appropriate sediment and erosion control measures for construction sites include local requirements to:

1. Minimize the amount of disturbed area and protect natural resources;
2. Stabilize sites when projects are complete or operations have temporarily ceased;
3. Protect slopes on the construction site;
4. Protect all storm drain inlets and armor all newly constructed outlets;
5. Use perimeter controls at the site;
6. Stabilize construction site entrances and exits to prevent off-site tracking;
7. Inspect stormwater controls at consistent intervals.

iv. Requirements for construction site operators within the MS4 jurisdiction to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes. These wastes may not be discharged to the MS4.

v. Written procedures for site plan review and inspection and enforcement. If not already existing, the procedures for site plan review and inspection and enforcement shall be completed within one (1) year from the effective date of the permit. The site plan review procedure shall include a pre-construction review by the permittee of the site design, the planned operations at the construction site, planned BMPs during the construction phase, and the planned BMPs to be used to manage runoff created after development. The review procedure shall incorporate procedures for the consideration of potential water quality impacts, and procedures for the receipt and consideration of information submitted by the public. The site plan review procedure shall also include evaluation of opportunities for use of low impact design and green infrastructure. When the opportunity exists, the permittee shall encourage project proponents to incorporate these practices into the site design. The procedures for site inspections conducted by the permittee shall include the requirement that inspections occur during construction of BMPs as well as after construction of BMPs to ensure they are working as described in the approved plans, clearly defined procedures for inspections including qualifications necessary to perform the inspections, the use of mandated inspection forms if appropriate, and procedure for tracking the number of site reviews, inspections, and enforcement actions. This tracking information shall be included as part of each annual report required by part 4.4.

2.3.6. Stormwater Management in New Development and Redevelopment (Post Construction Stormwater Management)

Objective: The objective of this control measure is to reduce the discharge of pollutants found in stormwater through the retention or treatment of stormwater after construction on new or redeveloped sites. For the purposes of this part (2.3.6.), the following definitions apply:

site is defined as the area extent of construction activities, including but not limited to the creation of new impervious cover and improvement of existing impervious cover (e.g. repaving not covered by 2.3.6.a.ii.4.d.)

[9] The handbook is available at: http://www.mass.gov/dep/water/laws/policies.htm#storm

new development is defined as any construction activities or land alteration resulting in total earth disturbances equal to or greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) on an area that has not previously been developed to include impervious cover.

redevelopment is defined as any construction, land alteration, or improvement of impervious surfaces resulting in total earth disturbances equal to or greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) that does not meet the definition of new development (see above).

a. Permittees shall develop, implement, and enforce a program to address post-construction stormwater runoff from all new development and redevelopment sites that disturb one or more acres and discharge into the permittees MS4 at a minimum. Permittees authorized under the MS4-2003 permit shall continue to implement and enforce their program and modify as necessary to meet the requirements of this part.

i. The permittee's new development/ redevelopment program shall include sites less than one acre if the site is part of a larger common plan of development or redevelopment which disturbs one or more acre.

ii. The permittee shall develop or modify, as appropriate, an ordinance or other regulatory mechanism within two (2) years of the effective date of the permit to contain provisions that are at least as stringent as the following:

1. Low Impact Development (LID) site planning and design strategies must be used to the maximum extent feasible.

2. The design of treatment and infiltration practices should follow the guidance in Volume 2 of the Massachusetts Stormwater Handbook, as amended, or other federally or State approved[10] BMP design guidance.

3. Stormwater management systems on new development sites shall be designed to:

a) Not allow new stormwater conveyances to discharge untreated stormwater in accordance with Massachusetts Stormwater Handbook Standard 1;
b) Control peak runoff rates in accordance with Massachusetts Stormwater Handbook Standard 2[11];
c) Recharge groundwater in accordance with Massachusetts Stormwater Handbook Standard 3[12];
d) Eliminate or reduce the discharge of pollutants from land uses with higher pollutant loads as defined in the Massachusetts Stormwater Handbook in accordance with Massachusetts Stormwater Handbook Standard 5;
e) Protect Zone II or Interim Wellhead Protection Areas of public water supplies in accordance with Massachusetts Stormwater Handbook Standard 6[13];

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[10] State approved includes any state in the United States, including, but not limited to, approved guidance by the Commonwealth of Massachusetts
[11] Requirement necessary for Section 401 water quality certification by Massachusetts
[12] Requirement necessary for Section 401 water quality certification by Massachusetts
[13] Requirement necessary for Section 401 water quality certification by Massachusetts

f) Implement long term maintenance practices in accordance with Massachusetts Stormwater Handbook Standard 9; and
g) Require that all stormwater management systems be designed to:
   1) Retain the volume of runoff equivalent to, or greater than, one (1.0) inch multiplied by the total post-construction impervious surface area on the site AND/OR
   2) Remove 90% of the average annual load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site[14] AND 60% of the average annual load of Total Phosphorus (TP) generated from the total post-construction impervious surface area on the site[14]. Pollutant removal shall be calculated consistent with EPA Region 1's BMP Performance Extrapolation Tool or other BMP performance evaluation tool provided by EPA Region 1, where available. If EPA Region 1 tools do not address the planned or installed BMP performance any federally or State approved[15] BMP design guidance or performance standards (e.g. State stormwater handbooks and design guidance manuals) may be used to calculate BMP performance.

4. Redevelopment Requirements
   a) Stormwater management systems on Redevelopment sites shall meet the following sections of part 2.3.6.a.ii.3 to the maximum extent feasible:
      1) Part 2.3.6.a.ii.3(a) (Massachusetts Stormwater Standard 1);
      2) Part 2.3.6.a.ii.3(b) (Massachusetts Stormwater Standard 2);
      3) Part 2.3.6.a.ii.3(c) (Massachusetts Stormwater Standard 3); and
      4) The pretreatment and structural best management practices requirements of 2.3.6.a.ii.3(d) and 2.3.6.a.ii.3(e) (Massachusetts Stormwater Standards 5 and 6).
   b) Stormwater management systems on Redevelopment sites shall also improve existing conditions by requiring that stormwater management systems be designed to:
      1) Retain the volume of runoff equivalent to, or greater than, 0.80 inch multiplied by the total post-construction impervious surface area on the site AND/OR
      2) Remove 80% of the average annual post-construction load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site AND 50% of the average annual load of Total Phosphorus (TP) generated from the total post-construction impervious surface area on the site. Pollutant removal shall be calculated consistent with EPA Region 1's BMP Performance Extrapolation Tool or other BMP performance evaluation tool provided by EPA Region 1 where available. If EPA Region 1 tools do not address the planned or installed BMP performance any federally or State approved BMP design guidance or performance standards (e.g. State stormwater handbooks and design guidance manuals) may be used to calculate BMP performance.
   c) Stormwater management systems on redevelopment sites may utilize offsite mitigation within the same USGS HUC10 as the redevelopment site

[14] The required removal percentage is not required for each storm,it is the average removal over a year that is required
[15] See footnote 14

to meet the equivalent retention or pollutant removal requirements in part 2.3.6.a.ii.4(b).

d) Redevelopment activities that are exclusively limited to maintenance and improvement of existing roadways, (including widening less than a single lane, adding shoulders, correcting substandard intersections, improving existing drainage systems, and repaving projects) shall improve existing conditions where feasible and are exempt from part 2.3.6.a.ii.4(a), part 2.3.6.a.ii.4(b) and part 2.3.6.a.ii.4(c). Roadway widening or improvements that increase the amount of impervious area on the redevelopment site by greater than or equal to a single lane width shall meet the requirements of part 2.3.6.a.ii.4(a) – (c)fully.

iii. The permittee shall require, at a minimum, the submission of as-built drawings no later than two (2) years after completion of construction projects. The as-built drawings must depict all on site controls, both structural and non-structural, designed to manage the stormwater associated with the completed site (post construction stormwater management). The new development/redevelopment program shall have procedures to ensure adequate long-term operation and maintenance of stormwater management practices that are put in place after the completion of a construction project. These procedures may include the use of dedicated funds or escrow accounts for development projects or the acceptance of ownership by the permittee of all privately owned BMPs. These procedures may also include the development of maintenance contracts between the owner of the BMP and the permittee. Alternatively, these procedures may include the submission of an annual certification documenting the work that has been done over the last 12 months to properly operate and maintain the stormwater control measures. The procedures to require submission of as-built drawings and ensure long term operation and maintenance shall be a part of the SWMP. The permittee shall report in the annual report on the measures that the permittee has utilized to meet this requirement.

b. Within four (4) years of the effective date of this permit, the permittee shall develop a report assessing current street design and parking lot guidelines and other local requirements that affect the creation of impervious cover. This assessment shall be used to provide information to allow the permittee to determine if changes to design standards for streets and parking lots can be made to support low impact design options. If the assessment indicates that changes can be made, the assessment shall include recommendations and proposed schedules to incorporate policies and standards into relevant documents and procedures to minimize impervious cover attributable to parking areas and street designs. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The local planning board and local transportation board should be involved in this assessment. This assessment shall be part of the SWMP. The permittee shall report in each annual report on the status of this assessment including any planned or completed changes to local regulations and guidelines.

c. Within four (4) years from the effective date of the permit, the permittee shall develop a report assessing existing local regulations to determine the feasibility of making, at a minimum, the following practices allowable when appropriate site conditions exist:

i. Green roofs;

ii. Infiltration practices such as rain gardens, curb extensions, planter gardens, porous and pervious pavements, and other designs to manage stormwater using landscaping and structured or augmented soils; and

iii. Water harvesting devices such as rain barrels and cisterns, and the use of stormwater for non-potable uses.

The assessment should indicate if the practices are allowed in the MS4 jurisdiction and under what circumstances are they allowed. If the practices are not allowed, the permittee shall determine what hinders the use of these practices, what changes in local regulations may be made to make them allowable, and provide a schedule for implementation of recommendations. The permittee shall implement all recommendations, in accordance with the schedules, contained in the assessment. The permittee shall report in each annual report on its findings and progress towards making the practices allowable.(Information available at: http://www.epa.gov/region1/npdes/stormwater/assets/pdf/AddressingBarrier2LID.pdf and http://www.mapc.org/resources/low-impact-dev-toolkit/local-codes-lid)

d. Four (4) years from the effective date of this permit, the permittee shall identify a minimum of 5 permittee-owned properties that could potentially be modified or retrofitted with BMPs designed to reduce the frequency, volume, and pollutant loads of stormwater discharges to and from its MS4 through the reduction of impervious area. Properties and infrastructure for consideration shall include those with the potential for reduction of on-site impervious area (IA) as well as those that could provide reduction of off-site IA. At a minimum, the permittee shall consider municipal properties with significant impervious cover (including parking lots, buildings, and maintenance yards) that could be modified or retrofitted. MS4 infrastructure to be considered includes existing street right-of-ways, outfalls and conventional stormwater conveyances and controls (including swales and detention practices) that could be readily modified or retrofitted to provide reduction in frequency, volume or pollutant loads of such discharges through reduction of impervious cover.

In determining the potential for modifying or retrofitting particular properties, the permittee shall consider factors such as access for maintenance purposes; subsurface geology; depth to water table; proximity to aquifers and subsurface infrastructure including sanitary sewers and septic systems; and opportunities for public use and education. In determining its priority ranking, the permittee shall consider factors such as schedules for planned capital improvements to storm and sanitary sewer infrastructure and paving projects; current storm sewer level of service; and control of discharges to water quality limited waters, first or second order streams, public swimming beaches, drinking water supply sources and shellfish growing areas.

Beginning with the fifth year annual report and in each subsequent annual report, the permittee shall identify additional permittee owned sites and infrastructure that could be retrofitted such that the permittee maintains a minimum of 5 sites in their inventory, until such a time as when the permittee has less than 5 sites remaining. In addition, the permittee shall report on all properties that have been modified or retrofitted with BMPs to mitigate IA that were inventoried in accordance with this part. The permittee may also include in its annual report non-MS4 owned property that has been modified or retrofitted with BMPs to mitigate IA.

2.3.7. Good House Keeping and Pollution Prevention for Permittee Owned Operations

Objective: The permittee shall implement an operations and maintenance program for permittee-owned operations that has a goal of preventing or reducing pollutant runoff and protecting water quality from all permittee-owned operations.

a. Operations and Maintenance Programs

i. Within two (2) years from the effective date of the permit, the permittee shall develop, if not already developed, written (hardcopy or electronic) operations and maintenance procedures for the municipal activities listed below in part 2.3.7.a.ii. These written procedures shall be included as part of the SWMP.

ii. Within two (2) year of the effective date of this permit, the permittee shall develop an inventory of all permittee owned facilities within the categories listed below. The permittee shall review this inventory annually and update as necessary.

1. Parks and open space: Establish procedures to address the proper use, storage, and disposal of pesticides, herbicides, and fertilizers including minimizing the use of these products and using only in accordance manufacturer's instruction. Evaluate lawn maintenance and landscaping activities to ensure practices are protective of water quality. Protective practices include reduced mowing frequencies, proper disposal of lawn clippings, and use of alternative landscaping materials (e.g., drought resistant planting). Establish pet waste handling collection and disposal locations at all parks and open space where pets are permitted, including the placing of proper signage concerning the proper collection and disposal of pet waste. Establish procedures to address waterfowl congregation areas where appropriate to reduce waterfowl droppings from entering the MS4. Establish procedures for management of trash containers at parks and open space (scheduled cleanings; sufficient number). Establish procedures to address erosion or poor vegetative cover when the permittee becomes aware of it; especially if the erosion is within 50 feet of a surface water.

2. Buildings and facilities where pollutants are exposed to stormwater runoff: This includes schools (to the extent they are permittee-owned or operated), town offices, police, and fire stations, municipal pools and parking garages and other permittee-owned or operated buildings or facilities. Evaluate the use, storage, and disposal of petroleum products and other potential stormwater pollutants. Provide employee training as necessary so that those responsible for handling these products know proper procedures. Ensure that Spill Prevention Plans are in place, if applicable, and coordinate with the fire department as necessary. Develop management procedures for dumpsters and other waste management equipment. Sweep parking lots and keep areas surrounding the facilities clean to reduce runoff of pollutants.

3. Vehicles and Equipment: Establish procedures for the storage of permittee vehicles. Vehicles with fluid leaks shall be stored indoors or containment shall be provided until repaired. Evaluate fueling areas owned or operated by the permittee. If possible, place fueling areas under cover in order to minimize exposure. Establish procedures to ensure that vehicle wash waters are not discharged to the municipal storm sewer system or to surface waters. This permit does not authorize such discharges.

iii. Infrastructure Operations and Maintenance

1. The permittee shall establish within two (2) year of the effective date of the permit a written (hardcopy or electronic) program detailing the activities and procedures the permittee will implement so that the MS4 infrastructure is maintained in a timely manner to reduce the discharge of pollutants from the MS4. If the permittee has an existing program to maintain its MS4 infrastructure

in a timely manner to reduce or eliminate the discharge of pollutants from the MS4, the permittee shall document the program in the SWMP.

2. The permittee shall optimize routine inspections, cleaning and maintenance of catch basins such that the following conditions are met:

    - Prioritize inspection and maintenance for catch basins located near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment). Clean catch basins in such areas more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings.
    - Establish a schedule with a goal that the frequency of routine cleaning will ensure that no catch basin at anytime will be more than 50 percent full.
    - If a catch basin sump is more than 50 percent full during two consecutive routine inspections/cleaning events, the permittee shall document that finding, investigate the contributing drainage area for sources of excessive sediment loading, and to the extent practicable, abate contributing sources. The permittee shall describe any actions taken in its annual report.
    - For the purposes of this part, an excessive sediment or debris loading is a catch basin sump more than 50 percent full. A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin.
    - The permittee shall document in the SWMP and in the first annual report its plan for optimizing catch basin cleaning, inspection plans, or its schedule for gathering information to develop the optimization plan. Documentation shall include metrics and other information used to reach the determination that the established plan for cleaning and maintenance is optimal for the MS4. The permittee shall keep a log of catch basins cleaned or inspected.
    - The permittee shall report in each annual report the total number of catch basins, number inspected, number cleaned, and the total volume or mass of material removed from all catch basins.

3. The permittee shall establish and implement procedures for sweeping and/or cleaning streets, and permittee-owned parking lots. All streets with the exception of rural uncurbed roads with no catch basins or high speed limited access highways shall be swept and/or cleaned a minimum of once per year in the spring (following winter activities such as sanding). The procedures shall also include more frequent sweeping of targeted areas determined by the permittee on the basis of pollutant load reduction potential, based on inspections, pollutant loads, catch basin cleaning or inspection results, land use, water quality limited or TMDL waters or other relevant factors as determined by the permittee. The permittee shall report in each annual report the number of miles cleaned or the volume or mass of material removed.

    For rural uncurbed roadways with no catch basins and limited access highways, the permittee shall either meet the minimum frequencies above, or develop and implement an inspection, documentation and targeted sweeping plan within two (2) years of the effective date of the permit, and submit such plan with its year one annual report.

4. The permittee shall ensure proper storage of catch basin cleanings and street sweepings prior to disposal or reuse such that they do not discharge to receiving waters. These materials should be managed in compliance with current MassDEP policies:

   - For catch basins cleanings: http://www.mass.gov/eea/agencies/massdep/recycle/regulations/management-of-catch-basin-cleanings.html
   - For street sweepings: http://www.mass.gov/eea/docs/dep/recycle/laws/stsweep.pdf.

5. The permittee shall establish and implement procedures for winter road maintenance including the use and storage of salt and sand; minimize the use of sodium chloride and other salts, and evaluate opportunities for use of alternative materials; and ensure that snow disposal activities do not result in disposal of snow into waters of the United States. For purposes of this MS4 Permit, salt shall mean any chloride-containing material used to treat paved surfaces for deicing, including sodium chloride, calcium chloride, magnesium chloride, and brine solutions.

6. The permittee shall establish and implement inspection and maintenance frequencies and procedures for all stormwater treatment structures such as water quality swales, retention/detention basins, infiltration structures, proprietary treatment devices or other similar structures. All permittee-owned stormwater treatment structures (excluding catch basins) shall be inspected annually at a minimum.

iv. The permittee shall report in the annual report on the status of the inventory required by this part and any subsequent updates; the status of the O&M programs for the permittee-owned facilities and activities in part 2.3.7.a.ii; and the maintenance activities associated with each.

v. The permittee shall keep a written (hardcopy or electronic) record of all required activities including but not limited to maintenance activities, inspections and training required by part 2.3.7.a. The permittee shall maintain, consistent with part 4.2.a, all records associated with maintenance and inspection activities required by part 2.3.7.a.

b. Stormwater Pollution Prevention Plan (SWPPP)

The permittee shall develop and fully implement a SWPPP for each of the following permittee-owned or operated facilities: maintenance garages, public works yards, transfer stations, and other waste handling facilities where pollutants are exposed to stormwater as determined by the permittee. If facilities are located at the same property, the permittee may develop one SWPPP for the entire property. The SWPPP is a separate and different document from the SWMP required in part 1.10. A SWPPP does not need to be developed for a facility if the permittee has either developed a SWPPP or received a no exposure certification for the discharge under the Multi-Sector General Permit or the discharge is authorized under another NPDES permit.

i. No later than two (2) years from the effective date of the permit, the permittee shall develop and implement a written (hardcopy or electronic) SWPPP for the facilities described above. The SWPPP shall be signed in accordance with the signatory requirements of Appendix B – Subparagraph 11.

ii. The SWPPP shall contain the following elements:

1. Pollution Prevention Team
Identify the staff on the team, by name and title. If the position is unstaffed, the title of the position should be included and the SWPPP updated when the position is filled. The role of the team is to develop, implement, maintain, and revise, as necessary, the SWPPP for the facility.

2. Description of the facility and identification of potential pollutant sources
The SWPPP shall include a map of the facility and a description of the activities that occur at the facility. The map shall show the location of the stormwater outfalls, receiving waters, and any structural controls. Identify all activities that occur at the facility and the potential pollutants associated with each activity including the location of any floor drains. These may be included as part of the inventory required by part 2.3.7.a.

3. Identification of stormwater controls
The permittee shall select, design, install, and implement the control measures detailed in paragraph 4 below to prevent or reduce the discharge of pollutants from the permittee owned facility.

The selection, design, installation, and implementation of the control measures shall be in accordance with good engineering practices and manufacturer's specifications. The permittee shall also take all reasonable steps to control or address the quality of discharges from the site that may not originate at the facility.

If the discharge from the facility is to a water quality limited water and the facility has the potential to discharge the pollutant identified as causing the water quality limitation, the permittee shall identify the control measures that will be used to address this pollutant at the facility so that the discharge does not cause or contribute to a violation of a water quality standard.

4. The SWPPP shall include the following management practices:
    a) <u>Minimize or Prevent Exposure</u>: The permittee shall to the extent practicable either locate materials and activities inside, or protect them with storm-resistant coverings in order to prevent exposure to rain, snow, snowmelt and runoff (although significant enlargement of impervious surface area is not recommended). Materials do not need to be enclosed or covered if stormwater runoff from affected areas will not be discharged directly or indirectly to surface waters or to the MS4 or if discharges are authorized under another NPDES permit.

    b) <u>Good Housekeeping</u>: The permittee shall keep clean all exposed areas that are potential sources of pollutants, using such measures as sweeping at regular intervals. Ensure that trash containers are closed when not in use, keep storage areas well swept and free from leaking or damaged containers; and store leaking vehicles needing repair indoors.

c) Preventative Maintenance: The permittee shall regularly inspect, test, maintain, and repair all equipment and systems to avoid situations that may result in leaks, spills, and other releases of pollutants in stormwater to receiving waters. Inspections shall occur at a minimum once per quarter.

d) Spill Prevention and Response: The permittee shall minimize the potential for leaks, spills, and other releases that may be exposed to stormwater and develop plans for effective response to such spills if or when they occur. At a minimum, the permittee shall have procedures that include:

- Preventive measures such as barriers between material storage and traffic areas, secondary containment provisions, and procedures for material storage and handling.
- Response procedures that include notification of appropriate facility personnel, emergency agencies, and regulatory agencies, and procedures for stopping, containing, and cleaning up leaks, spills and other releases. Measures for cleaning up hazardous material spills or leaks shall be consistent with applicable Resource Conservation and Recovery Act (RCRA) regulations at 40 CFR section 264 and 40 CFR section 265. Employees who may cause, detect, or respond to a spill or leak shall be trained in these procedures and have necessary spill response equipment available. If possible, one of these individuals should be a member of the Pollution Prevention Team; and
- Contact information for individuals and agencies that shall be notified in the event of a leak, spill, or other release. Where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under 40 CFR section 110, 40 CFR section 117, or 40 CFR section 302, occurs during a 24-hour period, the permittee shall notify the National Response Center (NRC) at (800) 424-8802 in accordance with the requirements of 40 CFR section 110, 40 CFR section 117, and 40 CFR section 302 as soon as the permittee has knowledge of the discharge. State or local requirements may necessitate reporting spills or discharges to local emergency, public health or drinking water supply agencies, and owners of public drinking water supplies. Contact information shall be in locations that are readily accessible and available.

e) Erosion and Sediment Control: The permittee shall use structural and non-structural control measures at the facility to stabilize and contain runoff from exposed areas and to minimize or eliminate onsite erosion and sedimentation. Efforts to achieve this may include the use of flow velocity dissipation devices at discharge locations and within outfall channels where necessary to reduce erosion.

f) Management of Runoff: The permittee shall manage stormwater runoff from the facility to prevent or reduce the discharge of pollutants. This may include management practices which divert runoff from areas that are potential sources of pollutants, contain runoff in such areas, or reuse, infiltrate or treat stormwater to reduce the discharge of pollutants.

g) Salt Storage Piles or Piles Containing Salt: For storage piles of salt or piles containing salt used for deicing or other purposes (including maintenance of paved surfaces) for which the discharge during precipitation events discharges to the permittee's MS4, any other storm sewer system, or to a Water of the US, the permittee shall prevent exposure of the storage pile to precipitation by enclosing or covering the storage piles. Such piles shall be enclosed or covered within two (2) years of the permit effective date. The permittee shall implement appropriate measures (e.g., good housekeeping, diversions, containment) to minimize exposure resulting from adding to or removing materials from the pile. The permittee is encouraged to store piles in such a manner as not to impact surface water resources, ground water resources, recharge areas, and wells.

h) Employee Training: The permittee shall regularly train employees who work in areas where materials or activities are exposed to stormwater, or who are responsible for implementing activities identified in the SWPPP (e.g., inspectors, maintenance personnel), including all members of the Pollution Prevention Team. Training shall cover both the specific components and scope of the SWPPP and the control measures required under this part, including spill response, good housekeeping, material management practices, any best management practice operation and maintenance, etc. EPA recommends annual training.

The permittee shall document the following information for each training:

- The training date, title and training duration;
- List of municipal attendees;
- Subjects covered during training

i) Maintenance of Control Measures: The permittee shall maintain all control measures, required by this permit in effective operating condition. The permittee shall keep documentation onsite that describes procedures and a regular schedule for preventative maintenance of all control measures and discussions of back-up practices in place should a runoff event occur while a control measure is off-line. Nonstructural control measures shall also be diligently maintained (e.g., spill response supplies available, personnel trained).

iii. The permittee shall conduct the following inspections:

1. Site Inspections: Inspect all areas that are exposed to stormwater and all stormwater control measures. Inspections shall be conducted at least once each calendar quarter. More frequent inspections may be required if significant activities are exposed to stormwater. Inspections shall be performed when the

facility is in operation. At least one of the quarterly inspections shall occur during a period when a stormwater discharge is occurring.

The permittee shall document the following information for each facility inspection:

- The inspection date and time;
- The name of the inspector;
- Weather information and a description of any discharge occurring at the time of the inspection;
- Identification of any previously unidentified discharges from the site;
- Any control measures needing maintenance or repair;
- Any failed control measures that need replacement.
- Any SWPPP changes required as a result of the inspection.

If during the inspections, or any other time, the permittee identifies control measures that need repair or are not operating effectively, the permittee shall repair or replace them before the next anticipated storm event if possible, or as soon as practicable following that storm event. In the interim, the permittee shall have back-up measures in place.

The permittee shall report the findings from the Site Inspections in the annual report.

iv. The permittee must keep a written (hardcopy or electronic) record of all required activities including but not limited to maintenance, inspections, and training required by part 2.3.7.b.The permittee shall maintain all records associated with the development and implementation of the SWPPP required by this part consistent with the requirements of part 4.2.

3.0. Additional Requirements for Discharges to Surface Drinking Water Supplies and Their Tributaries

a. Permittees which discharge to public surface drinking water supply sources (Class A and Class B surface waters used for drinking water) or their tributaries should consider these waters a priority in the implementation of the SWMP.

b. Permittees should provide pretreatment and spill control measures to stormwater discharges to public drinking water supply sources or their tributaries to the extent feasible.

c. Direct discharges to Class A waters should be avoided to the extent feasible.

4.0. Program Evaluation, Record Keeping, and Reporting

4.1. Program Evaluation

a. The permittee shall annually self-evaluate its compliance with the terms and conditions of this permit and submit each self-evaluation in the Annual Report. The permittee shall also maintain the annual evaluation documentation as part of the SWMP.

b. The permittee shall evaluate the appropriateness of the selected BMPs in achieving the objectives of each control measure and the defined measurable goals. Where a BMP is found to be ineffective the permittee shall change BMPs in accordance with the provisions below. In addition, permittees may augment or change BMPs at any time following the provisions below:

- Changes adding (but not subtracting or replacing) components or controls may be made at any time.
- Changes replacing an ineffective or infeasible BMP specifically identified in the SWMP with an alternative BMP may be made as long as the basis for the changes is documented in the SWMP by, at a minimum:
    - An analysis of why the BMP is ineffective or infeasible;
    - Expectations on the effectiveness of the replacement BMP; and
    - An analysis of why the replacement BMP is expected to achieve the defined goals of the BMP to be replaced.

The permittee shall indicate BMP modifications along with a brief explanation of the modification in each Annual Report.

c. EPA or MassDEP may require the permittee to add, modify, repair, replace or change BMPs or other measures described in the annual reports as needed:

- To address impacts to receiving water quality caused or contributed to by discharges from the MS4; or
- To satisfy conditions of this permit

Any changes requested by EPA or MassDEP will be in writing and will set forth the schedule for the permittee to develop the changes and will offer the permittee the opportunity to propose alternative program changes to meet the objective of the requested modification.

4.2. Record Keeping

a. The permittee shall keep all records required by this permit for a period of at least five years. EPA may extend this period at any time. Records include information used in the development of any written (hardcopy or electronic) program required by this permit, any monitoring results, copies of reports, records of screening, follow-up and elimination of illicit discharges; maintenance records; inspection records; and data used in the development of the notice of intent, SWMP, SWPPP, and annual reports. This list provides examples of records that should be maintained, but is not all inclusive.

b. Records other than those required to be included in the annual report, part 4.4, shall be submitted only when requested by the EPA or the MassDEP.

c. The permittee shall make the records relating to this permit, including the written (hardcopy or electronic) stormwater management program, available to the public. The public may view the records during normal business hours. The permittee may charge a reasonable fee for copying requests. The permittee is encouraged to satisfy this requirement by posting records online.

4.3. Outfall Monitoring Reporting

a. The permittee shall monitor and sample its outfalls at a minimum through sampling and testing at the frequency and locations required in connection with IDDE screening under part 2.3.4.7.b. and 2.3.4.8.c.ii.2. The monitoring program may also include additional outfall and interconnection monitoring as determined by the permittee in connection with assessment of SWMP effectiveness pursuant to part 4.1; evaluation of discharges to water quality limited waters pursuant to part 2.2; assessment of BMP effectiveness pursuant to part 2.2 or 2.3; or otherwise.

b. The permittee shall document all monitoring results each year in the annual report. The report shall include the date, outfall or interconnection identifier, location, weather conditions at time of sampling, precipitation in previous 48 hours, field screening parameter results, and results of all analyses. The annual report shall include all of this information and data for the current reporting period and for the entire permit period.

c. The permittee shall also include in the annual report results from any other stormwater or receiving water quality monitoring or studies conducted during the reporting period where that data is being used by the permittee to inform permit compliance or program effectiveness. If such monitoring or studies were conducted on behalf of the permittee, or if monitoring or studies conducted by other entities were reported to the permittee, a brief description of the type of information gathered or received shall be included in the annual report(s) covering the time period(s) the information was received.

4.4. Annual Reports

a. The permittee shall submit annual reports each year of the permit term. The reporting period will be a one year period commencing on the permit effective date, and subsequent anniversaries thereof, except that the first annual report under this permit shall also cover the period from May 1, [year of final permit effective date] to the permit effective date. The annual report is due ninety days from the close of each reporting period.

b. The annual reports shall contain the following information:

i. A self-assessment review of compliance with the permit terms and conditions.

ii. An assessment of the appropriateness of the selected BMPs.

iii. The status of any plans or activities required by part 2.1 and/ or part 2.2, including:

- Identification of all discharges determined to be causing or contributing to an exceedance of water quality standards and description of response including all items required by part 2.1.1;
- For discharges subject to TMDL related requirements, identification of specific BMPs used to address the pollutant identified as the cause of impairment and assessment of the BMPs effectiveness at controlling the pollutant (part 2.2.1. and Appendix F) and any deliverables required by Appendix F;
- For discharges to water quality limited waters a description of each BMP required by Appendix H and any deliverables required by Appendix H.

iv. An assessment of the progress towards achieving the measurable goals and objectives of each control measure in part 2.3 including:

- Evaluation of the public education program including a description of the targeted messages for each audience; method of distribution and dates of distribution; methods used to evaluate the program; and any changes to the program.
- Description of the activities used to promote public participation including documentation of compliance with state public notice regulations.
- Description of the activities related to implementation of the IDDE program including: status of the map; status and results of the illicit discharge potential ranking and assessment; identification of problem catchments; status of all protocols described in part 2.3.4.(program responsibilities and systematic procedure); number and identifier of catchments evaluated; number and identifier of outfalls screened; number of illicit discharges located; number of illicit discharges removed; gallons of flow removed; identification of tracking indicators and measures of progress based on those indicators; and employee training.
- Evaluation of the construction runoff management including number of project plans reviewed; number of inspections; and number of enforcement actions.
- Evaluation of stormwater management for new development and redevelopment including status of ordinance development (2.3.6.a.ii.), review and status of the street design assessment(2.3.6.b.), assessments to barriers to green infrastructure (2.3.6.c), and retrofit inventory status (2.3.6.d.)
- Status of the O&M Programs required by part 2.3.7.a.
- Status of SWPPP required by part 2.3.7.b. including inspection results.
- Any additional reporting requirements in part 3.0.

v. All outfall screening and monitoring data collected by or on behalf of the permittee during the reporting period and cumulative for the permit term, including but not limited to all data collected pursuant to part 2.3.4. The permittee shall also provide a description of any additional monitoring data received by the permittee during the reporting period.

vi. Description of activities for the next reporting cycle.

vii. Description of any changes in identified BMPs or measurable goals.

viii. Description of activities undertaken by any entity contracted for achieving any measurable goal or implementing any control measure.

c. Reports shall be submitted to EPA at the following address:

United State Environmental Protection Agency
Stormwater and Construction Permits Section (OEP06-1)
Five Post Office Square, Suite 100
Boston, MA 02109

Massachusetts Department of Environmental Protection
One Winter Street – 5th Floor
Boston, MA 02108
ATTN: Frederick Civian

Or submitted electronically to EPA at the following email address: stormwater.reports@epa.gov. After December 21, 2020 all Annual Reports must be submitted electronically.

5.0. Non-Traditional MS4s

Non-traditional MS4s are MS4s owned and operated by the Commonwealth of Massachusetts, counties or other public agencies within the Commonwealth of Massachusetts, and properties owned and operated by the United States (Federal Facilities) within the Commonwealth of Massachusetts. This part addresses all non-traditional MS4s except MS4s that are owned or operated by transportation agencies, which are addressed in part 6.0 below.

5.1. Requirements for Non-Traditional MS4s

All requirements and conditions of parts 1 – 4 above apply to all Non-traditional MS4s, except as specifically provided below:

5.1.1. Public education

For the purpose of this permit, the audiences for a Non-traditional MS4 include the employees, clients and customers (including students at education MS4s), visitors to the property, tenants, long term contractors and any other contractors working at the facility where the MS4 is located. The permittee may use some of the educational topics included in part 2.3.2.d. as appropriate, or may focus on topics specific to the MS4. The permittee shall document the educational topics for each target audience in the SWMP and annual reports.

5.1.2. Ordinances and regulatory mechanisms

Some Non-traditional MS4s may not have authority to enact an ordinance, by-law, or other regulatory mechanisms. MS4s without the authority to enact an ordinance shall ensure that written policies or procedures are in place to address the requirements of part 2.3.4.5., part 2.3.4.6 and part 2.3.6.a.

5.1.3. Assessment of Regulations

Non-traditional MS4s do not need to meet the requirements of part 2.3.6.c.

5.1.4. New Dischargers

New MS4 facilities are subject to additional water quality-based requirements if they fall within the definition of “new discharger” under 40 CFR § 122.2: “A new discharger is any building, structure, facility or installation (a) from which there is or may be a ‘discharge of pollutants’ (b) that did not commence the ‘discharge of pollutants’ at a particular ‘site’ prior to August 13, 1979; (c) which is not a ‘new source’; and (d) which never received a finally effective NPDES permit for discharges at that ‘site.’ The term "site" is defined in § 122.2 to mean "the land or water area where any 'facility or activity' is physically located or conducted including adjacent land used in connection with the facility or activity."

Consistent with these definitions, a Non-traditional MS4 is a “new discharger” if it discharges stormwater from a new facility with an entirely new separate storm sewer system that is not physically located on the same or adjacent land as an existing facility and associated system operated by the same MS4.

Any Non-traditional MS4 facility that is a “new discharger” and discharges to a waterbody listed in category 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b) due to nutrients (Total Nitrogen or Total Phosphorus), metals (Cadmium, Copper, Iron, Lead or Zinc), solids (TSS or Turbidity), bacteria/pathogens (E. Coli, Enteroccus or Fecal Coliform), chloride (Chloride) or oil and grease (Petroleum Hydrocarbons or Oil and Grease), or discharges to a waterbody with an approved TMDL for any of those pollutants, is not eligible for coverage under this permit and shall apply for an individual permit.

Any Non-traditional MS4 facility that is a “new discharger” and discharges to a waterbody that is in attainment is subject to Massachusetts antidegradation regulations at 314 CMR 4.04. The permittee shall comply with the provisions of 314 CMR 4.04 including information submittal requirements and obtaining authorization for new discharges where appropriate[16]. Any authorization of new discharges by MassDEP shall be incorporated into the permittee's SWMP. If an applicable MassDEP approval specifies additional conditions or requirements, then those requirements are incorporated into this permit by reference. The permittee must comply with all such requirements.

6.0 Requirements for MS4s Owned or Operated by Transportation Agencies

This part applies to all MS4s owned or operated by any state or federal transportation agency (except Massachusetts Department of Transportation –MassDOT- Highway Division, which is subject to a separate individual permit). All requirements and conditions of this permit apply with the following exceptions:

6.1 Public education

For the purpose of this permit, the audiences for a transportation agency education program include the general public (users of the roadways), employees, and any contractors working at the location. The permittee may use some of the educational topics included in part 2.3.2.d. as appropriate, or may focus on topics specific to the agency. The permittee shall document the educational topics for each target audience.

6.2 Ordinances and regulatory mechanisms

The transportation agency may not have authority to enact an ordinance, by-law or other regulatory mechanisms. The agency shall ensure that written agency policies or procedures are in place to address the requirements of part 2.3.4.5., part 2.3.4.6 and part 2.3.6.a.

6.3 Assessment of regulations

Non-traditional MS4s do not need to meet the requirements of part 2.3.6.c.

6.4 New Dischargers

New MS4 facilities are subject to additional water quality-based requirements if they fall within the definition of “new dischargers” under 40 CFR § 122.2: “A new discharger is any building, structure, facility or installation (a) from which there is or may be a ‘discharge of pollutants’ (b) that did not commence the ‘discharge of pollutants’ at a particular ‘site’ prior to August 13, 1979; (c) which is not a ‘new source’; and (d) which never received a finally effective NPDES permit for discharges at that ‘site.’ The term "site" is defined

[16] Contact MassDEP for guidance on compliance with 314 CMR 4.04

in § 122.2 to mean "the land or water area where any 'facility or activity' is physically located or conducted including adjacent land used in connection with the facility or activity."

Consistent with these definitions, a new transportation MS4 is a “new discharger” if it discharges stormwater from a new facility with an entirely new separate storm sewer system that is not physically located on the same or adjacent land as an existing facility and associated system operated by the same MS4.

Any transportation MS4 facility that is a “new discharger” and discharges to a waterbody listed as impaired in category 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b) due to nutrients (Total Nitrogen or Total Phosphorus), metals (Cadmium, Copper, Iron, Lead or Zinc), solids (TSS or Turbidity), bacteria/pathogens (E. Coli, Enteroccus or Fecal Coliform), chloride (Chloride) or oil and grease (Petroleum Hydrocarbons or Oil and Grease), or discharges to a waterbody with an approved TMDL for any of those pollutants, is not eligible for coverage under this permit and shall apply for an individual permit.

Any transportation MS4 facility that is a “new discharger” and discharges to a waterbody that is in attainment is subject to Massachusetts antidegradation regulations at 314 CMR 4.04. The permittee shall comply with the provisions of 314 CMR 4.04 including information submittal requirements and obtaining authorization for new discharges where appropriate[17]. Any authorization of new discharges by MassDEP shall be incorporated into the permittee's SWMP. If an applicable MassDEP approval specifies additional conditions or requirements, then those requirements are incorporated into this permit by reference. The permittee must comply with all such requirements.

[17] Contact MassDEP for guidance on compliance with 314 CMR 4.04

Appendix A
Definitions, Abbreviations and Acronyms

Definitions

Best Management Practices (BMPs) - schedules of activities, practices (and prohibitions of practices), structures, vegetation, maintenance procedures, and other management practices to prevent or reduce the discharge of pollutants to waters of the United States. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Common Plan of Development - A "larger common plan of development or sale" is a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under one plan. For example, if a developer buys a 20-acre lot and builds roads, installs pipes, and runs electricity with the intention of constructing homes or other structures sometime in the future, this would be considered a larger common plan of development or sale. If the land is parceled off or sold, and construction occurs on plots that are less than one acre by separate, independent builders, this activity still would be subject to stormwater permitting requirements if the smaller plots were included on the original site plan.

Control Measure - refers to any BMP or other method (including effluent limitations) used to prevent or reduce the discharge of pollutants to waters of the United States.

Director - a Regional Administrator of the Environmental Protection Agency or an authorized representative.

Discharge - when used without qualification, means the "discharge of a pollutant."

Discharge of a pollutant - any addition of any "pollutant" or combination of pollutants to "waters of the United States" from any "point source," or any addition of any pollutant or combination of pollutants to the waters of the "contiguous zone" or the ocean from any point source other than a vessel or other floating craft which is being used as a means of transportation. This includes additions of pollutants into waters of the United States from surface runoff which is collected or channeled by man; or discharges through pipes, sewers, or other conveyances, leading into privately owned treatment works.

Discharge-related activities - activities which cause, contribute to, or result in stormwater and allowable non-stormwater point source discharges, and measures such as the siting, construction and operation of BMPs to control, reduce, or prevent pollution in the discharges.

Disturbance - action to alter the existing vegetation and/or underlying soil of a site, such as clearing, grading, site preparation (e.g., excavating, cutting, and filling), soil compaction, and movement and stockpiling of top soils.

Existing Discharger – an operator applying for coverage under this permit for discharges covered previously under an NPDES general or individual permit.

Facility or Activity - any NPDES "point source" or any other facility or activity (including land or appurtenances thereto) that is subject to regulation under the NPDES program.

Federal Facility – Any buildings, installations, structures, land, public works, equipment, aircraft, vessels, and other vehicles and property, owned by, or constructed or manufactured for the purpose of leasing to, the federal government.

Illicit Discharge - any discharge to a municipal separate storm sewer that is not composed entirely of stormwater except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and discharges resulting from fire fighting activities.

Impaired Water – A water is impaired if it does not meet one or more of its designated use(s). For purposes of this permit, "impaired" refers to categories 4 and 5 of the five-part categorization approach used for classifying the water quality standards attainment status for water segments under the TMDL program. Impaired waters compilations are also sometimes referred to as "303(d) lists." Category 5 waters are impaired because at least one designated use is not being supported or is threatened and a TMDL is needed. Category 4 waters indicate that at least one designated use is not being supported but a TMDL is not needed (4a indicates that a TMDL has been approved or established by EPA; 4b indicates other required control measures are expected in result in the attainment of water quality standards in a reasonable period of time; and 4c indicates that the non-attainment of the water quality standard is the result of pollution (e.g. habitat) and is not caused by a pollutant). See *USEPA's 2006 Integrated Report Guidance, July 29, 2005* for more detail on the five part categorization of waters [under EPA National TMDL Guidance http://www.epa.gov/owow/tmdl/policy.html]).

Impervious Surface- Any surface that prevents or significantly impedes the infiltration of water into the underlying soil. This can include but is not limited to: roads, driveways, parking areas and other areas created using non porous material; buildings, rooftops, structures, artificial turf and compacted gravel or soil.

Industrial Activity - the ten categories of industrial activities included in the definition of "stormwater discharges associated with industrial activity," as defined in 40 CFR 122.26(b)(14)(i)-(ix) and (xi).

Industrial Stormwater - stormwater runoff associated with the definition of "stormwater discharges associated with industrial activity."

Interconnection – the point (excluding sheet flow over impervious surfaces) where the permittee's MS4 discharges to another MS4 or other storm sewer system, through which the discharge is eventually conveyed to a water of the United States. Interconnections shall be treated similarly to outfalls throughout the permit.

Junction Manhole - For the purposes of this permit, a junction manhole is a manhole or structure with two or more inlets accepting flow from two or more MS4 alignments. Manholes with inlets solely from private storm drains, individual catch basins, or both are not considered junction manholes for these purposes.

Key Junction Manhole - For the purposes of this permit, key junction manholes are those junction manholes that can represent one or more junction manholes without compromising adequate implementation of the illicit discharge program. Adequate implementation of the illicit discharge program would not be compromised if the exclusion of a particular junction manhole as a key junction manhole would not affect the permittee's ability to determine the possible presence of an upstream illicit discharge. A permittee may exclude a junction manhole located upstream from another located in the immediate vicinity or that is serving a drainage alignment with no potential for illicit connections.

Municipal Separate Storm Sewer - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

(i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;

(ii) Designed or used for collecting or conveying stormwater;

(iii) Which is not a combined sewer; and

(iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Municipal Separate Storm Sewer System (MS4) - means all separate storm sewers that are defined as "large" or "medium" or "small" municipal storm sewer systems pursuant to paragraphs 40 CFR 122.26 (b)(4) and (b)(7), or designated under paragraph 40 126.26(a) (1)(v). For the purposes of this permit "MS4" may also refer to the permittee with jurisdiction over the sewer system.

New Development – any construction activities or land alteration resulting in total earth disturbances greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) on an area that has not previously been developed to include impervious cover. (see part 2.3.6. of the permit)

New Discharger – For the purposes of this permit, a new discharger is an entity that discharges stormwater from a new facility with an entirely new separate storm sewer system that is not physically located on the same or adjacent land as an existing facility and associated system operated by the same MS4.

New Source - any building, structure, facility, or installation from which there is or may be a “discharge of pollutants,” the construction of which commenced:

- after promulgation of standards of performance under section 306 of the CWA which are applicable to such source, or
- after proposal of standards of performance in accordance with section 306 of the CWA which are applicable to such source, but only if the standards are promulgated in accordance with section 306 within 120 days of their proposal.

New Source Performance Standards (NSPS) – Technology-based standards for facilities that qualify as new sources under 40 CFR 122.2 and 40 CFR 122.29.

No exposure - all industrial materials or activities are protected by a storm-resistant shelter to prevent exposure to rain, snow, snowmelt, and/or runoff.

One Lane Width – The width of the travel lane for a roadway. Lane width does not include shoulders, curbs, and on-street parking areas.

Outfall Catchment – The land area draining to a single outfall or interconnection. The extent of an outfall’s catchment is determined not only by localized topography and impervious cover but also by the location of drainage structures and the connectivity of MS4 pipes.

Owner or operator - the owner or operator of any “facility or activity” subject to regulation under the NPDES program.

Person - an individual, association, partnership, corporation, municipality, State or Federal agency, or an agent or employee thereof.

Point source - any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, landfill leachate collection system, vessel, or other floating craft from which pollutants are or may be discharged. This term does not include return flows from irrigated agriculture or agricultural stormwater runoff.

Pollutant - dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal and agricultural waste discharged into water.

Pollutant of concern – A pollutant which causes or contributes to a violation of a water quality standard, including a pollutant which is identified as causing an impairment in a State's 303(d) list.

Redevelopment – for the purposes of part 2.3.6., any construction, land alteration, or improvement of impervious surfaces resulting in total earth disturbances greater than 1 acre (or activities that are part of a larger common plan of development disturbing greater than 1 acre) that does not meet the definition of new development (see above).

Reportable Quantity Release – a release of a hazardous substance at or above the established legal threshold that requires emergency notification. Refer to 40 CFR Parts 110, 177, and 302 for complete definitions and reportable quantities for which notification is required.

Runoff coefficient - the fraction of total rainfall that will appear at the conveyance as runoff.

Significant materials - includes, but is not limited to: raw materials; fuels; materials such as solvents, detergents, and plastic pellets; finished materials such as metallic products; raw materials used in food processing or production; hazardous substances designated under section 101(14) of CERCLA; any chemical the facility is required to report pursuant to section 313 of Title III of SARA; fertilizers; pesticides; and waste products such as ashes, slag and sludge that have the potential to be released with stormwater discharges.

Site – for the purposes of part 2.3.6., the area extent of construction activities, including but not limited to the creation of new impervious cover and improvement of existing impervious cover (e.g. repaving not covered by 2.3.6.a.ii.4.d.)

Small Municipal Separate Storm Sewer System – all separate storm sewer systems that are (i) owned or operated by the United States, a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district, or drainage district, or similar entity or an Indian tribe or an authorized Indian tribal organization or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States, and (ii) not defined as "large" or "medium" municipal separate storm sewer system pursuant to paragraphs 40 CFR 122.26 (b)(4) and (b)(7), or designated under paragraph 40 126.26(a) (1)(v). This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. This term does not include separate storm sewers in very discrete areas, such as individual buildings.

Small MS4 – means a small municipal separate storm sewer system.

Stormwater - stormwater runoff, snow melt runoff, and surface runoff and drainage.

Stormwater Discharges Associated with Construction Activity - a discharge of pollutants in stormwater runoff from areas where soil disturbing activities (e.g., clearing, grading, or excavating), construction materials, or equipment storage or maintenance (e.g., fill piles, borrow areas, concrete truck washout, fueling), or other industrial stormwater directly related to the construction process (e.g., concrete or asphalt batch plants) are located. (See 40 CFR 122.26(b)(14)(x) and 40 CFR 122.26(b)(15).

Stormwater Discharges Associated with Industrial Activity - the discharge from any conveyance that is used for collecting and conveying stormwater and that is directly related to manufacturing, processing or raw materials storage areas at an industrial plant. The term does not include discharges from facilities or activities excluded from the NPDES program under Part 122. For the categories of industries identified in this section, the term includes, but is not limited to, stormwater discharges from industrial plant yards; immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; material handling sites; refuse sites; sites used for the application or disposal of process waste waters (as defined at part 401 of this chapter); sites used for the storage and maintenance of material handling equipment; sites used for residual treatment, storage, or disposal; shipping and receiving areas; manufacturing buildings; storage areas (including tank farms) for raw materials, and intermediate and final products; and areas where industrial activity has taken place in the past and significant materials remain and are exposed to stormwater. For the purposes of this paragraph, material handling activities include storage, loading and unloading, transportation, or conveyance of any raw material, intermediate product, final product, by-product or waste product. The term excludes areas located on plant lands separate from the plant's industrial activities, such as office buildings and accompanying parking lots as long as the drainage from the excluded areas is not mixed with stormwater drained from the above described areas. Industrial facilities include those that are federally, State, or municipally owned or operated that meet the description of the facilities listed in Appendix D of this permit. The term also includes those facilities designated under the provisions of 40 CFR 122.26(a)(1)(v).

Total Maximum Daily Loads (TMDLs) - A TMDL is a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL includes wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources and/or natural background, and must include a margin of safety (MOS) and account for seasonal variations. (See section 303(d) of the Clean Water Act and 40 CFR 130.2 and 130.7).

Urbanized Area – US Census designated area comprised of a densely settled core of census tracts and/or census blocks that meet minimum population density requirements, along with adjacent territory containing non-residential urban land uses as well as territory with low population density included to link outlying densely settled territory with the densely settled core. For the purposes of this permit, Urbanized Areas as defined by any Census since 2000 remain subject to stormwater regulation even if there is a change in the reach of the Urbanized Area because of a change in more recent Census data.

Water Quality Limited Water – for the purposes of this permit, a water quality limited water is any waterbody that does not meet applicable water quality standards, including but not limited to waters listed in categories 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act section 303(d) and 305(b).

Water Quality Standards - A water quality standard defines the water quality goals of a water body, or portion thereof, by designating the use or uses to be made of the water and by setting criteria necessary to protect the uses. States and EPA adopt WQS to protect public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (See CWA sections 101(a)2 and 303(c)).

ABBREVIATIONS AND ACRONYMS

BMP – Best Management Practice
BPJ – Best Professional Judgment
CGP – Construction General Permit
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 *et seq*)
DCIA – Directly Connected Impervious Area
EPA – U. S. Environmental Protection Agency
ESA – Endangered Species Act
USFWS – U. S. Fish and Wildlife Service
IA – Impervious Area
IDDE – Illicit Discharge Detection and Elimination
LA – Load Allocations
MOS – Margin of Safety
MS4 – Municipal Separate Storm Sewer System
MSGP – Multi-Sector General Permit
NHPA – National Historic Preservation Act
NMFS – U. S. National Marine Fisheries Service
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
NRHP – National Register of Historic Places
NSPS – New Source Performance Standard
NTU – Nephelometric Turbidity Unit
PCP – Phosphorus Control Plan (pertaining to Charles River Watershed phosphorus TMDL requirements only – Appendix F Part A.I)
LPCP – Lake Phosphorus Control Plan (pertaining to Lake or pond phosphorus TMDL requirements only – Appendix F Part A.II)
POTW – Publicly Owned Treatment Works
RCRA – Resource Conservation and Recovery Act
SHPO – State Historic Preservation Officer
SIC – Standard Industrial Classification
SPCC – Spill Prevention, Control, and Countermeasure
SWMP – Stormwater Management Program
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
TSS – Total Suspended Solids

USGS – United States Geological Survey
WLA – Wasteload Allocation
WQS – Water Quality Standard

Appendix B

Standard Permit Conditions

Standard Permit Conditions

Standard permit conditions in Appendix B are consistent with the general permit provisions required under 40 CFR 122.41.

B.1. Duty To Comply

You must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of the Clean Water Act and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or for denial of a permit renewal application.

A. You must comply with effluent standards or prohibitions established under section 307(a) of the Clean Water Act for toxic pollutants and with standards for sewage sludge use or disposal established under section 405(d) of the CWA within the time provided in the regulations that establish these standards or prohibitions or standards for sewage sludge use or disposal, even if the permit has not yet been modified to incorporate the requirement.

B. Penalties for Violations of Permit Conditions: The Director will adjust the civil and administrative penalties listed below in accordance with the Civil Monetary Penalty Inflation Adjustment Rule (61 FR 252, December 31, 1996, pp. 69359-69366, as corrected in 62 FR 54, March 20, 1997, pp.13514-13517) as mandated by the Debt Collection Improvement Act of 1996 for inflation on a periodic basis. This rule allows EPA's penalties to keep pace with inflation. The Agency is required to review its penalties at least once every 4 years thereafter and to adjust them as necessary for inflation according to a specified formula. The civil and administrative penalties following were adjusted for inflation starting in 1996.

1. *Criminal Penalties*.

   a. *Negligent Violations*. The CWA provides that any person who negligently violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to criminal penalties of $2,500 to $25,000 per day of violation, or imprisonment of not more than one year, or both. In the case of a second or subsequent conviction for a negligent violation, a person shall be subject to criminal penalties of not more than $50,000 per day of violation or by imprisonment of not more than two years, or both.

   b. *Knowing Violations*. The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a fine of not less than $5,000 nor more than $50,000 per day of violation, or by imprisonment for not more than 3 years, or both. In the case of a second or subsequent conviction for a knowing violation, a person shall be subject to criminal penalties of not more than $100,000 per day of violation, or imprisonment of not more than 6 years, or both.

c. *Knowing Endangerment.* The CWA provides that any person who knowingly violates permit conditions implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act and who knows at that time that he or she is placing another person in imminent danger of death or serious bodily injury shall upon conviction be subject to a fine of not more than $250,000 or by imprisonment of not more than 15 years, or both. In the case of a second or subsequent conviction for a knowing endangerment violation, a person shall be subject to a fine of not more than $500,000 or by imprisonment of not more than 30 years, or both. An organization, as defined in section 309(c)(3)(B)(iii) of the Act, shall, upon conviction of violating the imminent danger provision be subject to a fine of not more than $1,000,000 and can fined up to $2,000,000 for second or subsequent convictions.

d. *False Statement.* The CWA provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both. The Act further provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

2. *Civil Penalties.* The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to a civil penalty not to exceed the maximum amounts authorized by Section 309(d) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $32,500 per day for each violation).

3. *Administrative Penalties.* The CWA provides that any person who violates a permit condition implementing Sections 301, 302, 306, 307, 308, 318, or 405 of the Act is subject to an administrative penalty, as follows:

3.1. *Class I Penalty*. Not to exceed the maximum amounts authorized by Section 309(g)(2)(A) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $11,000 per violation, with the maximum amount of any Class I penalty assessed not to exceed $32,500).

3.2. *Class II Penalty*. Not to exceed the maximum amounts authorized by Section 309(g)(2)(B) of the Act and the Federal Civil Penalties Inflation Adjustment Act (28 U.S.C. § 2461 note) as amended by the Debt Collection Improvement Act (31 U.S.C. § 3701 note) (currently $11,000 per day for each day during which the violation continues, with the maximum amount of any Class II penalty not to exceed $157,500).

B.2. Duty to Reapply

If you wish to continue an activity regulated by this permit after the expiration date of this permit, you must apply for and obtain a new permit.

B.3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for you in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

B.4. Duty to Mitigate

You must take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

B.5. Proper Operation and Maintenance

You must at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by you to achieve compliance with the conditions of this permit, including the requirements of your SWPPP. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of backup or auxiliary facilities or similar systems which are installed by you only when the operation is necessary to achieve compliance with the conditions of this permit.

B.6. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. Your filing of a request for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

B.7. Property Rights

This permit does not convey any property rights of any sort, or any exclusive privileges.

B.8. Duty to Provide Information

You must furnish to EPA or an authorized representative (including an authorized contractor acting as a representative of EPA), within a reasonable time, any information which EPA may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. You must also furnish to EPA upon request, copies of records required to be kept by this permit.

B.9. Inspection and Entry

You must allow EPA or an authorized representative (including an authorized contractor acting as a representative of EPA), upon presentation of credentials and other documents as may be required by law, to:

A. Enter upon your premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

B. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

C. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and

D. Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

B.10. Monitoring and Records

A. Samples and measurements taken for the purpose of monitoring must be representative of the volume and nature of the monitored activity.

B. You must retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three years from the date of the sample, measurement, report or application. This period may be extended by request of EPA at any time.

C. Records of monitoring information must include:

   1. The date, exact place, and time of sampling or measurements;

   2. The individual(s) who performed the sampling or measurements;

   3. The date(s) analyses were performed

4. The individual(s) who performed the analyses;
5. The analytical techniques or methods used; and
6. The results of such analyses.

D. Monitoring results must be conducted according to test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, unless other test procedures have been specified in the permit.

E. The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment for not more than 2 years, or both. If a conviction of a person is for a violation committed after a first conviction of such person under this paragraph, punishment is a fine of not more than $20,000 per day of violation, or by imprisonment of not more than 4 years, or both.

B.11. Signatory Requirements

A. All applications, including NOIs, must be signed as follows:

1. For a corporation: By a responsible corporate officer. For the purpose of this subsection, a responsible corporate officer means: (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.
2. For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or
3. For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this subsection, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

B. All reports, including SWPPPs, inspection reports, annual reports, monitoring reports, reports on training and other information required by this permit must be signed by a person described in Appendix B, Subsection 11.A above or by a duly authorized representative of that person. A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described in Appendix B, Subsection 11.A;
2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and
3. The signed and dated written authorization is included in the SWPPP. A copy must be submitted to EPA, if requested.

C. Changes to Authorization. If an authorization under Appendix B, Subsection 11.B is no longer accurate because a different operator has responsibility for the overall operation of the industrial facility, a new NOI satisfying the requirements of Subsection 11.B must be submitted to EPA prior to or together with any reports, information, or applications to be signed by an authorized representative.

D. Any person signing documents required under the terms of this permit must include the following certification:

> "I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

E. The CWA provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or non-compliance shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than 6 months per violation, or by both.

B.12. Reporting Requirements

A. Planned changes. You must give notice to EPA as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

1. The alteration or addition to a permitted facility may meet one of the criteria for determining whether a facility is a new source in 40 CFR §122.29(b); or

2. The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under 40 CFR §122.42(a)(1).

B. Anticipated noncompliance. You must give advance notice to EPA of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

C. Transfers. This permit is not transferable to any person except after notice to EPA. EPA may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the Clean Water Act. (See 40 CFR §122.61; in some cases, modification or revocation and reissuance is mandatory.)

D. Monitoring reports. Monitoring results must be reported at the intervals specified elsewhere in this permit.

1. Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms (paper or electronic) provided or specified by EPA for reporting results of monitoring of sludge use or disposal practices.

2. If you monitor any pollutant more frequently than required by the permit using test procedures approved under 40 CFR Part 136 or, in the case of sludge use or disposal, approved under 40 CFR Part 136 unless otherwise specified in 40 CFR Part 503, or as specified in the permit, the results of this monitoring must be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by EPA.

3. Calculations for all limitations which require averaging of measurements must use an arithmetic mean and non-detected results must be incorporated in calculations as the limit of quantitation for the analysis.

E. Compliance schedules. Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit must be submitted no later than 14 days following each schedule date.

F. Twenty-four hour reporting.

1. You must report any noncompliance which may endanger health or the environment. Any information must be provided orally within 24 hours

from the time you become aware of the circumstances. A written submission must also be provided within five days of the time you become aware of the circumstances. The written submission must contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

2. The following shall be included as information which must be reported within 24 hours under this paragraph.

   a. Any unanticipated bypass which exceeds any effluent limitation in the permit. (See 40 CFR §122.41(g).)

   b. Any upset which exceeds any effluent limitation in the permit

   c. Violation of a maximum daily discharge limitation for any of the pollutants listed by EPA in the permit to be reported within 24 hours. (See 40 CFR §122.44(g).)

3. EPA may waive the written report on a case-by-case basis for reports under Appendix B, Subsection 12.F.2 if the oral report has been received within 24 hours.

G. Other noncompliance. You must report all instances of noncompliance not reported under Appendix B, Subsections 12.D, 12.E, and 12.F, at the time monitoring reports are submitted. The reports must contain the information listed in Appendix B, Subsection 12.F.

H. Other information. Where you become aware that you failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Permitting Authority, you must promptly submit such facts or information.

B.13. Bypass

A. Definitions.

1. Bypass means the intentional diversion of waste streams from any portion of a treatment facility

2. Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

B. Bypass not exceeding limitations. You may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Appendix B, Subsections 13.C and 13.D.

C. Notice.

1. Anticipated bypass. If you know in advance of the need for a bypass, you must submit prior notice, if possible at least ten days before the date of the bypass.

2. Unanticipated bypass. You must submit notice of an unanticipated bypass as required in Appendix B, Subsection 12.F (24-hour notice).

D. Prohibition of bypass.

1. Bypass is prohibited, and EPA may take enforcement action against you for bypass, unless:

   a. Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;

   b. There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and

   c. You submitted notices as required under Appendix B, Subsection 13.C.

2. EPA may approve an anticipated bypass, after considering its adverse effects, if EPA determines that it will meet the three conditions listed above in Appendix B, Subsection 13.D.1.

B.14. Upset

A. Definition. Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond your reasonable control. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

B. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Appendix B, Subsection 14.C are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

C. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset must demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

1. An upset occurred and that you can identify the cause(s) of the upset;
2. The permitted facility was at the time being properly operated; and
3. You submitted notice of the upset as required in Appendix B, Subsection 12.F.2.b (24 hour notice).
4. You complied with any remedial measures required under Appendix B, Subsection 4.

D. Burden of proof. In any enforcement proceeding, you, as the one seeking to establish the occurrence of an upset, has the burden of proof.

APPENDIX C
ENDANGERED SPECIES GUIDANCE

A. Background

In order to meet its obligations under the Clean Water Act and the Endangered Species Act (ESA), and to promote the goals of those Acts, the Environmental Protection Agency (EPA) is seeking to ensure the activities regulated by this general permit do not adversely affect endangered and threatened species or critical habitat. Applicants applying for permit coverage must assess the impacts of their stormwater discharges and discharge-related activities on federally listed endangered and threatened species ("listed species") and designated critical habitat ("critical habitat") to ensure that those goals are met. Prior to obtaining general permit coverage, applicants must meet the ESA eligibility provisions of this permit by following the steps in this Appendix[1].

Applicants also have an independent ESA obligation to ensure that their activities do not result in any prohibited "take" of listed species[12]. The term "Take" is used in the ESA to include harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. "Harm" is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering. "Harass" is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering. Many of the measures required in this general permit and in these instructions to protect species may also assist in ensuring that the applicant's activities do not result in a prohibited take of species in violation of section 9 of the ESA. If the applicant has plans or activities in an area where endangered and threatened species are located, they may wish to ensure that they are protected from potential take liability under ESA section 9 by obtaining an ESA section 10 permit or by requesting formal consultation under ESA section 7. Applicants that are unsure whether to pursue a section 10 permit or a section 7 consultation for takings protection should confer with the appropriate United States Fish and Wildlife Service (USFWS) office or the National Marine Fisheries Service (NMFS), (jointly the Services).

Currently, there are 20 species of concern for applicants applying for permit coverage, namely the Dwarf wedgemussel *(Alasmidonta heterodon)*, Northeastern bulrush (*Scirpus ancistrochaetus*), Sandplain gerardia *(Agalinis acuta)*, Piping Plover (*Charadrius melodus*), Roseate Tern (*Sterna dougallii*), Northern Red-bellied cooter (*Pseudemys rubriventis)*, Bog Turtle (*Glyptemys muhlenbergii*), Small whorled Pogonia (*Isotria medeoloides*), Puritan tiger beetle (*Cicindela puritana*), American burying beetle (*Nicrophorus americanus*), Northeastern beach tiger beetle (*Cicindela dorsalis*), Northern Long-eared Bat *(Myotis septentriolis)*Atlantic Sturgeon *(Acipenser oxyrinchus*), Shortnose Sturgeon *(Acipenser brevirostrum)*, North Atlantic Right Whale (*Eubalaena glacialis*) Humpback Whale *(Megaptera novaengliae)*, Fin Whale (*Balaenoptera physalus)*, Kemp's Ridley Sea Turtle *(Lepidochelys kempii)*, Loggerhead Sea Turtle *(Caretta caretta)*, Leatherback Sea Turtle *(Dermochelys coriacea)*, and the Green Turtle *(Chelonia*

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[1] EPA strongly encourages applicants to begin this process at the earliest possible stage to ensure the notification requirements for general permit coverage are complete upon Notice of Intent (NOI) submission.

[2] Section 9 of the ESA prohibits any person from "taking" a listed species (e.g. harassing or harming it) unless: (1) the taking is authorized through an "incidental take statement" as part of completion of formal consultation according to ESA section 7; (2) where an incidental take permit is obtained under ESA section 10 (which requires the development of a habitat conversion plan; or (3) where otherwise authorized or exempted under the ESA. This prohibition applies to all entities including private individuals, businesses, and governments.

mydas). The Atlantic Sturgeon, Shortnose Sturgeon, North Atlantic Right Whale, Humpback Whale, Fin Whale, Loggerhead Sea Turtle, Kemp's Ridley Sea Turtle, Leatherback Sea Turtle and Green Turtle are listed under the jurisdiction of NMFS. The Dwarf wedgemussel, Northeastern bulrush, Sandplain gerardia, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Small whorled Pogonia, Roseate Tern, Puritan tiger beetle, Northeastern beach tiger beetle, Northern Long-eared Bat and American burying beetle are listed under the jurisdiction of the U.S. Fish and Wildlife Service.

Any applicant seeking coverage under this general permit, must consult with the Services where appropriate. When listed species are present, permit coverage is only available if EPA determines, or the applicant determines and EPA concurs, that the discharge or discharge related activities will have "no affect" on the listed species or critical habitat, or the applicant or EPA determines that the discharge or discharge related activities are "not likely to adversely affect" listed species or critical habitat and formal or informal consultation with the Services has been concluded and results in written concurrence by the Services that the discharge is "not likely to adversely affect" an endangered or threatened species or critical habitat.

EPA may designate the applicants as non-Federal representatives for the general permit for the purpose of carrying out formal or informal consultation with the Services (See 50 CFR §402.08 and §402.13). By terms of this permit, EPA has automatically designated operators as non-Federal representatives for the purpose of conducting formal or informal consultation with the U.S. Fish and Wildlife Service. EPA has not designated operators as non-Federal representatives for the purpose of conducting formal or informal consultation with the National Marine Fisheries Service. EPA has determined that discharges from MS4s are not likely to adversely affect listed species or critical habitat under the jurisdiction of the National Marine Fisheries Service. EPA has initiated informal consultation with the National Marine Fisheries Service on behalf of all permittees and no further action is required by permittees in order to fulfill ESA requirements of this permit related to species under the jurisdiction of NMFS

B. The U.S. Fish and Wildlife Service ESA Eligibility Process

Before submitting a notice of intent (NOI) for coverage by this permit, applicants must determine whether they meet the ESA eligibility criteria by following the steps in Section B of this Appendix. Applicants that cannot meet the eligibility criteria in Section B must apply for an individual permit.

The USFWS ESA eligibility requirements of this permit relating to the Dwarf wedgemussel, Northeastern bulrush, Sandplain gerardia, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Small whorled Pogonia, Roseate Tern, Puritan tiger beetle, Northeastern beach tiger beetle, Northern Long-eared Bat and American burying beetle may be satisfied by documenting that one of the following criteria has been met:

USFWS Criterion A: No endangered or threatened species or critical habitat are in proximity to the stormwater discharges or discharge related activities.

USFWS Criterion B: In the course of formal or informal consultation with the Fish and Wildlife Service, under section 7 of the ESA, the consultation resulted in either a no jeopardy opinion (formal consultation) or a written concurrence by USFWS on a finding that the stormwater discharges and discharge related activities are "not likely to adversely affect" listed species or critical habitat (informal consultation).

USFWS Criterion C: Using the best scientific and commercial data available, the effect of the stormwater discharge and discharge related activities on listed species and critical habitat have been evaluated. Based on those evaluations, a determination is made by EPA, or by the applicant and affirmed by EPA, that the stormwater discharges and discharge related activities will have "no affect" on any federally threatened or endangered listed species or designated critical habitat under the jurisdiction of the USFWS.

1. The Steps to Determine if the USFWS ESA Eligibility Criteria Can Be Met

To determine eligibility, you must assess the potential effects of your known stormwater discharges and discharge related activities on listed species or critical habitat, PRIOR to completing and submitting a Notice of Intent (NOI). You must follow the steps outlined below and document the results of your eligibility determination.

Step 1 – Determine if you can meet USFWS Criterion A

USFWS Criterion A: You can certify eligibility, according to USFWS Criterion A, for coverage by this permit if, upon completing the Information, Planning, and Conservation (IPaC) online system process, you printed and saved the preliminary determination which indicated that federally listed species or designated critical habitats are not present in the action area. See Attachment 1 to Appendix C for instructions on how to use IPaC.

If you have met USFWS Criterion A skip to Step # 4.

If you have not met USFWS Criterion A, go to Step # 2.

Step 2 – Determine if You Can Meet Eligibility USFWS Criteria B

USFWS Criterion B: You can certify eligibility according to USFWS Criteria B for coverage by this permit if you answer "Yes" to **all** of the following questions:

1) Does your action area contain one or more of the following species: Sandplain gerardia, Small whorled Pogonia, American burying beetle, Dwarf wedgemussel, Northeastern bulrush, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Roseate Tern, Puritan tiger beetle, and Northeastern beach tiger beetle?
AND
2) Did your assessment of the discharge and discharge related activities indicate that the discharge or discharge related activities "may affect" or are "not likely to adversely affect" listed species or critical habitat?
AND
3) Did you contact the USFWS and did the formal or informal consultation result in either a "no jeopardy" opinion by the USFWS (for formal consultation) or concurrence by the

USFWS that your activities would be "not likely to adversely affect" listed species or critical habitat (for informal consultation)?
AND

4) Do you agree to implement all measures upon which the consultation was conditioned?
5) Do you agree that if, during the course of the permit term, you plan to install a structural BMP not identified in the NOI that you will re-initiate informal or formal consultation with USFWS as necessary?

Use the guidance below Step 3 to understand effects determination and to answer these questions.

If you answered "Yes" to all four questions above, you have met eligibility USFWS Criteria B. Skip to Step 4.

If you answered "No" to any of the four questions above, go to Step 3.

Step 3 – Determine if You Can Meet Eligibility USFWS Criterion C

USFWS Criterion C: You can certify eligibility according to USFWS Criterion C for coverage by this permit if you answer "Yes" to both of the following question:

1) Does your action area contain one or more of the following species: Northern Long-eared Bat, Sandplain gerardia, Small whorled Pogonia and/or American burying beetle and **does not** contain one any following species: Dwarf wedgemussel, Northeastern bulrush, Piping Plover, Northern Red-bellied cooter, Bog Turtle, Roseate Tern, Puritan tiger beetle, and Northeastern beach tiger beetle?[3]
OR
2) Did the assessment of your discharge and discharge related activities and indicate that there would be "no affect" on listed species or critical habitat and EPA provided concurrence with your determination?
3) Do you agree that if, during the course of the permit term, you plan to install a structural BMP not identified in the NOI that you will to conduct an endangered species screening for the proposed site and contact the USFWS if you determine that the new activity "may affect" or is "not likely to adversely affect" listed species or critical habitat under the jurisdiction of the USFWS.

Use the guidance below to understand effects determination and to answer these questions.

If you answered "Yes" to both the question above, you have met eligibility USFWS Criterion C. Go to Step 4.

If you answered "No" to either of the questions above, you are not eligible for coverage by this permit. You must submit an application for an individual permit for your stormwater discharges. (See 40 CFR 122.21).

USFWS Effects Determination Guidance:

If you are unable to certify eligibility under USFWS Criterion A, you must assess whether your stormwater discharges and discharge-related activities "may affect", will have "no affect" or are "not likely to adversely affect" listed species or critical habitat. "Discharge-related activities" include: activities which cause, contribute to, or result in point source stormwater pollutant discharges; and measures to provide treatment for stormwater discharges including the siting, construction and operational procedures to control, reduce or prevent water pollution. Please be aware that no protection from incidental take liability is provided under this criterion.

The scope of effects to consider will vary with each system. If you are having difficulty in determining whether your system is likely to cause adverse effects to a listed species or critical habitat, you should contact the USFWS for assistance. In order to complete the determination of effects it may be necessary to follow the formal or informal consultation procedures in section 7 of the ESA.

Upon completion of your assessment, document the results of your effects determination. If your results indicate that stormwater discharges or discharge related activities will have "no affect" on threatened or endangered species or critical habitat and EPA concurs with your determination, you are eligible under USFWS Criterion C of this Appendix. Your determination may be based on measures that you implement to avoid, eliminate, or minimized adverse effects.

If the determination is "May affect" or "not likely to adversely affect" you must contact the USFWS to discuss your findings and measures you could implement to avoid, eliminate, or minimize adverse effects. If you and the USFWS reach agreement on measures to avoid adverse effects, you are eligible under USFWS Criterion B. Any terms and/or conditions to protect listed species and critical habitat that you relied on in order to complete an adverse effects determination, must be incorporated into your Storm Water Management Program (required by this permit) and implemented in order to maintain permit eligibility.

If endangered species issues cannot be resolved: If you cannot reach agreement with the USFWS on measures to avoid or eliminate adverse effects then you are not eligible for coverage under this permit. You must seek coverage under an individual permit.

Effects from stormwater discharges and discharge-related activities which could pose an adverse effect include:

- *Hydrological:* Stormwater discharges may cause siltation, sedimentation, or induce other changes in receiving waters such as temperature, salinity or pH. These effects will vary with the amount of stormwater discharged and the volume and condition of the receiving water. Where a discharge constitutes a minute portion of the total volume of the receiving water, adverse hydrological effects are less likely.
- *Habitat:* Excavation, site development, grading and other surface disturbance activities, including the installation or placement of treatment equipment may adversely affect listed species or their habitat. Stormwater from the small MS4 may inundate a listed species habitat.

- *Toxicity:* In some cases, pollutants in the stormwater may have toxic effects on listed species.

Step 4 - Document Results of the Eligibility Determination

Once the USFWS ESA eligibility requirements have been met, you shall include documentation of USFWS ESA eligibility in the Storm Water Management Program required by the permit. Documentation for the various eligibility criteria are as follows:

- USFWS Criterion A: A copy of the IPaC generated preliminary determination letter indicating that no listed species or critical habitat is present within your action area. You shall also include a statement on how you determined that no listed species or critical habitat are in proximity to your stormwater system or discharges.
- USFWS Criterion B: A dated copy of the USFWS letter of concurrence on a finding of "no jeopardy" (for formal consultation) or "not likely to adversely affect" (for informal consultation) regarding the ESA section 7 consultation.
- USFWS Criterion C: A dated copy of the EPA concurrence with the operator's determination that the stormwater discharges and discharge-related activities will have "no affect" on listed species or critical habitat.

C. Submittal of Notice of Intent

Once the ESA eligibility requirements of Part C of this Appendix have been metyoumay submit the Notice of Intent indicating which Criterion you have met to be eligible for permit coverage. Signature and submittal of the NOI constitutes your certification, under penalty of law, of eligibility for permit coverage under 40 CFR 122.21.

D. Duty to Implement Terms and Conditions upon which Eligibility was Determined

You must comply with any terms and conditions imposed under the ESA eligibility requirements to ensure that your stormwater discharges and discharge related activities do not pose adverse effects or jeopardy to listed species and/or critical habitat. You must incorporate such terms and conditions into your Storm Water Management Program as required by this permit. If the ESA eligibility requirements of this permit cannot be met, then you may not receive coverage under this permit and must apply for an individual permit.

E. Services Information

United States Fish and Wildlife Service Office

National websites for Endangered Species Information:
Endangered Species home page: http://endangered.fws.gov
ESA Section 7 Consultations: http://endangered.fws.gov/consultation/index.html
Information, Planning, and Conservation System (IPAC): http://ecos.fws.gov/ipac/

U.S. FWS – Region 5
Supervisor

New England Field Office
U.S. Fish and Wildlife Services
70 Commercial Street, Suite 300
Concord, NH 03301

Natural Heritage Network

The Natural Heritage Network comprises 75 independent heritage program organizations located in all 50 states, 10 Canadian provinces, and 12 countries and territories located throughout Latin America and the Caribbean. These programs gather, manage, and distribute detailed information about the biological diversity found within their jurisdictions. Developers, businesses, and public agencies use natural heritage information to comply with environmental laws and to improve the environmental sensitivity of economic development projects. Local governments use the information to aid in land use planning.

The Natural Heritage Network is overseen by NatureServe, the Network's parent organization, and is accessible on-line at: http://www.natureserve.org/nhp/us_programs.htm, which provides websites and other access to a large number of specific biodiversity centers.

U.S. Fish and Wildlife IPaC system instructions

Use the following protocol to determine if any federally listed species or designated critical habitats under USFWS jurisdiction exist in your action area:

Enter your project specific information into the “Initial Project Scoping” feature of the Information, Planning, and Conservation (IPaC) system mapping tool, which can be found at the following location:

http://ecos.fws.gov/ipac/

a. Indicate the action area[1] for the MS4 by either:
    a. Drawing the boundary on the map or by uploading a shapefile.
    Select “Continue”

c. Click on the “SEE RESOURCE LIST” button and on the next screen you can export a trust resources list.This will provided a list of natural resources of concern, which will include an Endangered Species Act Species list. You may also request an official species list under “REGULATORY DOCUMENTS” Save copies and retain for your records

[1] The action area is defined by regulation as all areas to be affected directly or indirectly by the action and not merely the immediate area involved in the action (50 CFR §402.02). This analysis is not limited to the "footprint" of the action nor is it limited by the Federal agency's authority. Rather, it is a biological determination of the reach of the proposed action on listed species. Subsequent analyses of the environmental baseline, effects of the action, and levels of incidental take are based upon the action area.

The documentation used by a Federal action agency to initiate consultation should contain a description of the action area as defined in the Services' regulations and explained in the Services' consultation handbook. If the Services determine that the action area as defined by the action agency is incorrect, the Services should discuss their rationale with the agency or applicant, as appropriate. Reaching agreement on the description of the action area is desirable but ultimately the Services can only consult when an action area is defined properly under the regulations.

For storm water discharges or discharge related activities, the action area should encompass the following:

- The immediate vicinity of, or nearby, the point of discharge into receiving waters.
- The path or immediate area through which or over which storm water flows from the municipality to the point of discharge into the receiving water. This includes areas in the receiving water downstream from the point of discharge.
- Areas that may be impacted by construction or repair activities. This extends as far as effects related to noise (from construction equipment, power tools, etc.) and light (if work is performed at night) may reach.

The action area will vary with the size and location of the outfall pipe, the nature and quantity of the storm water discharges, and the type of receiving waters, among other factors.

Appendix D
National Historic Preservation Act Guidance

Background

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into account the effects of Federal “undertakings” on historic properties that are either listed on, or eligible for listing on, the National Register of Historic Places. The term federal “undertaking” is defined in the NHPA regulations to include a project, activity, or program of a federal agency including those carried out by or on behalf of a federal agency, those carried out with federal financial assistance, and those requiring a federal permit, license or approval. See 36 CFR 800.16(y). Historic properties are defined in the NHPA regulations to include prehistoric or historic districts, sites, buildings, structures, or objects that are included in, or are eligible for inclusion in, the National Register of Historic Places. This term includes artifacts, records, and remains that are related to and located within such properties. See 36 CFR 800.16(1).

EPA’s issuance of a National Pollutant Discharge Elimination System (NPDES) General Permit is a federal undertaking within the meaning of the NHPA regulations and EPA has determined that the activities to be carried out under the general permit require review and consideration, in order to be in compliance with the federal historic preservation laws and regulations. Although individual submissions for authorization under the general permit do not constitute separate federal undertakings, the screening processes provides an appropriate site-specific means of addressing historic property issues in connection with EPA’s issuance of the permit. To address any issues relating to historic properties in connection with the issuance of this permit, EPA has included a screening process for applicants to identify whether properties listed or eligible for listing on the National Register of Historic Places are within the path of their discharges or discharge-related activities (including treatment systems or any BMPs relating to the discharge or treatment process) covered by this permit.

Applicants seeking authorization under this general permit must comply with applicable, State, Tribal, and local laws concerning the protection of historic properties and places and may be required to coordinate with the State Historic Preservation Officer (SHPO) and/or Tribal Historic Preservation Officer (THPO) and others regarding effects of their discharges on historic properties.

Activities with No Potential to Have an Effect on Historic Properties

A determination that a federal undertaking has no potential to have an effect on historic properties fulfills an agency’s obligations under NHPA. EPA has reason to believe that the vast majority of activities authorized under this general permit will have no potential effects on historic properties. This permit typically authorizes discharges from existing facilities and requires control of the pollutants discharged from the facility. EPA does not anticipate effects on historic properties from the pollutants in the authorized discharges. Thus, to the extent EPA’s issuance of this general permit authorizes discharges of such constituents, confined to existing channels, outfalls or natural drainage areas, the permitting action does not have the potential to cause effects on historical properties.

In addition, the overwhelming majority of sources covered under this permit will be facilities that are seeking renewal of previous permit authorization. These existing dischargers should have already addressed NHPA issues in the previous general permit as they were required to certify that they were either not affecting historic properties or they had obtained written agreement from the applicable SHPO or THPO regarding methods of mitigating potential impacts. To the extent this permit authorizes renewal of prior coverage without relevant changes in operations the discharge has no potential to have an effect on historic properties.

Activities with Potential to Have an Effect on Historic Properties

EPA believes this permit may have some potential to have an effect on historic properties the applicant undertakes the construction and/or installation of control measures that involve subsurface disturbance that involves less than 1 acre of land. (Ground disturbances of 1 acre or more require coverage under the Construction General Permit.) Where there is disturbance of land through the construction and/or installation of control measures, there is a possibility that artifacts, records, or remains associated with historic properties could be impacted. Therefore, if the applicant is establishing new or altering existing control measures to manage their discharge that will involve subsurface ground disturbance of less than 1 acre, they will need to ensure (1) that historic properties will not be impacted by their activities or (2) that they are in compliance with a written agreement with the SHPO, THPO, or other tribal representative that outlines all measures the applicant will carry out to mitigate or prevent any adverse effects on historic properties.

Examples of Control Measures Which Involve Subsurface Disturbance

The type of control measures that are presumptively expected to cause subsurface ground disturbance include:

- Dikes
- Berms
- Catch basins, drainage inlets
- Ponds, bioretention areas
- Ditches, trenches, channels, swales
- Culverts, pipes
- Land manipulation; contouring, sloping, and grading
- Perimeter Drains
- Installation of manufactured treatment devices

EPA cautions applicants that this list is non-inclusive. Other control measures that involve earth disturbing activities that are not on this list must also be examined for the potential to affect historic properties.

Certification

Upon completion of this screening process the applicant shall certify eligibility for this permit using one of the following criteria on their Notice of Intent for permit coverage:

> **Criterion A**: The discharges do not have the potential to cause effects on historic properties.

Criterion B: A historic survey was conducted. The survey concluded that no historic properties are present. Discharges do not have the potential to cause effects on historic properties.

Criterion C: The discharges and discharge related activities have the potential to have an effect on historic properties, and the applicant has obtained and is in compliance with a written agreement with the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officer (TPHO), or other tribal representative that outlines measures the applicant will carry out to mitigate or prevent any adverse effects on historic properties.

Authorization under the general permit is available only if the applicant certifies and documents permit eligibility using one of the eligibility criteria listed above. Small MS4s that cannot meet any of the eligibility criteria in above must apply for an individual permit.

Screening Process

Applicants or their consultant need to answer the questions and follow the appropriate procedures below to assist EPA in compliance with 36 CFR 800.

Question 1*:* Is the facility an existing facility authorized by the previous permit or a new facility and the applicant is not undertaking any activity involving subsurface land disturbance less than an acre?

YES - The applicant should certify that fact in writing and file the statement with the EPA. This certification must be maintained as part of the records associated with the permit.
The applicant should certify eligibility for this permit using Criterion A on their Notice of Intent for permit coverage. The applicant does not need to contact the state Historic Commission. Based on that statement, EPA will document that the project has "no potential to cause effects" (36 CFR 800.3(a)(1)). There are no further obligations under the Section 106 regulations.

NO- Go to Question 2.

Question 2*:* Is the property listed in the National Register of Historic Places or have prior surveys or disturbances revealed the existence of a historic property or artifacts?

NO - The applicant should certify that fact in writing and file the statement with the EPA. This certification must be maintained as part of the records associated with the permit.
The applicant should certify eligibility for this permit using Criterion B on their Notice of Intent for permit coverage. The applicant does not need to contact the state Historic Commission. Based on that statement, EPA will document that the project has "no potential to cause effects" (36 CFR 800.3(a)(1)). There are no further obligations under the Section 106 regulations.

YES - The applicant or their consultant should prepare a complete information submittal to the SHPO. The submittal consists of:

●Completed Project Notification Form- forms available at http://www.sec.state.ma.us/mhc/mhcform/formidx.htm;

- USGS map section with the actual project boundaries clearly indicated; and
- Scaled project plans showing existing and proposed conditions.

(1) Please note that the SHPO does not accept email for review. Please mail a paper copy of your submittal (Certified Mail, Return Receipt Requested) or deliver a paper copy of your submittal (and obtain a receipt) to:

State Historic Preservation Officer
Massachusetts Historical Commission
220 Morrissey Blvd.
Boston MA 02125.

(2) Provide a copy of your submittal and the proof of MHC delivery showing the date MHC received your submittal to:

NPDES Permit Branch Chief
US EPA Region 1 (OEP06-1)
5 Post Office Square, Suite 100
Boston MA 02109-3912.

The SHPO will comment within thirty (30) days of receipt of complete submittals, and may ask for additional information. Consultation, as appropriate, will include EPA, the SHPO and other consulting parties (which includes the applicant). The steps in the federal regulations (36 CFR 800.2 to 800.6, etc.) will proceed as necessary to conclude the Section 106 review for the undertaking. **The applicant should certify eligibility for this permit using Criterion C on their Notice of Intent for permit coverage.**

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part I: General Conditions

General Information

Name of Municipality or Organization: State

EPA NPDES Permit Number:

Primary MS4 Program Manager Contact Information

Name: Title:

Street Address Line 1

Street Address Line 2

City State Zip Code 12345-6789

Email: Phone Number: (123) 456-7890

Fax Number:

Other Information

☐ Check the box if your municipality or organization was covered under the 2003 MS4 General Permit

Stormwater Management Program (SWMP) Location (web address or physical location):

Eligibility Determination

Endangered Species Act (ESA) Determination Complete? Eligibility Criteria (check all that apply): ☐ A ☐ B ☐ C ☐ D ☐ E ☐ F

National Historic Preservation Act (NHPA) Determination Complete? Eligibility Criteria (check all that apply): ☐ A ☐ B ☐ C ☐ D

MS4 Infrastructure (if covered under the 2003 permit)

Estimated Percent of Outfall Map Complete?
(Part II,III,IV or V, Subpart B.3.(a.) of 2003 permit)

If 100% of 2003 requirements not met, enter an estimated date of completion (MM/DD/YY):

Web address where MS4 map is published:

If outfall map is unavailable on the internet an electronic or paper copy of the outfall map must be included with NOI submission (see section V for submission options)

Regulatory Authorities (if covered under the 2003 permit)

Illicit Discharge Detection and Elimination (IDDE) Authority Adopted?:
(Part II,III,IV or V, Subpart B.3.(b.) of 2003 permit)

Effective Date or Estimated Date of Adoption (MM/DD/YY):

Construction/Erosion and Sediment Control (ESC) Authority Adopted?:
(Part II,III,IV or V, Subpart B.4.(a.) of 2003 permit)

Effective Date or Estimated Date of Adoption (MM/DD/YY):

Post- Construction Stormwater Management Adopted?:
(Part II,III,IV or V, Subpart B.5.(a.) of 2003 permit)

Effective Date or Estimated Date of Adoption (MM/DD/YY):

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part II: Summary of Receiving Waters

Please list the waterbody segments to which your MS4 discharges. For each waterbody segment, please report the number of outfalls discharging into it and, if applicable, any impairments.

For Massachusetts list of impaired waters click here: [Massachusetts 2010 List of Impaired: Waters http://www.mass.gov/dep/water/resources/10list6.pdf](http://www.mass.gov/dep/water/resources/10list6.pdf)

For New Hampshire list of impaired waters click here: [New Hampshire Final 303(d) Materials: http://des.nh.gov/organization/divisions/water/wmb/swqa/2010/index.htm](http://des.nh.gov/organization/divisions/water/wmb/swqa/2010/index.htm)

Source of pollutants column should be completed with a preliminary source evaluation of pollutants for discharges to impaired waterbodies (see above 303(d) lists) without an approved TMDL in accordance with Section 2.2.2a of the permit

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Pollutant list (select one at a time to add)	Click impairment at left to add, or at right to remove	Pollutant(s) causing impairment, if applicable (select one at a time to remove)
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	

		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total)	Add/Remove	

		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	
		Chlorophyll-a Dissolved oxygen saturation Escherichia coli Mercury Nitrogen (Total) Oxygen, Dissolved	Add/Remove	

Click to lengthen table

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

Identify the Best Management Practices (BMPs) that will be employed to address each of the six Minimum Control Measures (MCMs). For municipalities/organizations whose MS4 discharges into a receiving water with an approved Total Maximum Daily Load (TMDL) and applicable waste lod allocation (WLA), identify any additional BMPs employed to specifically support the achievement of the WLA in the TMDL section at the end of Part III.

For each MCM list each existing or proposed BMP by category and provide a brief description, responsible parties/departments, measurable goals and the year the BMP will be employed (Public education and outreach BMPs also requires a target audience). **Use the drop-down menus in each table or enter your own text to override the drop down menu**

MCM 1: Public Education and Outreach

BMP Media/Category (enter your own text to override the drop down menu)	**BMP Description**	**Targeted Audience**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal**	**Beginning Year of BMP implementation**
		Residents			
		Businesses, Institutions and Commercial Facilities			
		Developers (construction)			
		Industrial Facilities			
		Residents			
		Businesses, Institutions and Commercial Facilities			
		Developers (construction)			
		Industrial Facilities			

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

MCM 2: Public Involvement and Participation

BMP Categorization	Brief BMP Description (enter your own text to override the drop down menu)	Responsible Department/ Parties	Additional Description/ Measurable Goal	Beginning Year of BMP implementation
Public Review	SWMP Review			
Public Participation				

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

MCM 3: Illicit Discharge Detection and Elimination (IDDE)

BMP Categorization (enter your own text to override the drop down menu)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)
SSO inventory			Develop SSO inventory within 1 year of effective date of permit
Storm sewer system map			Update map within 2 years of effective date of permit and complete full system map 10 years after effective date of permit
Written IDDE program development			Complete within 1.5 years of the effective date of permit
Implement IDDE Program			Implement catchment investigations according to program and permit conditions
Employee Training			Train annually
Conduct dry weather screening			Conduct in accordance with outfall screening procedure and permit conditions
Conduct wet weather screening			Conduct in accordance with outfall screening procedure and permit conditions

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

MCM 4: Construction Site Stormwater Runoff Control

BMP Categorization (enter your own text to override the drop down menu or entered text)	BMP Description	Responsible Department/ Parties (enter your own text to override the drop down menu)	Measurable Goal (all text can be overwritten)	Beginning Year of BMP implementation
Site inspection and enforcement of Erosion and Sediment Control (ESC) measures	Complete written procedures of site inspections and enforcement procedures		Complete by the end of Year 1	
Site plan review	Complete written procedures of site plan review and begin implementation		Complete by the end of Year 1	
Erosion and Sediment Control	Adoption of requirements for construction operators to implement a sediment and erosion control program			
Waste Control	Adoption of requirements to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes.			

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

MCM 5: Post-Construction Stormwater Management in New Development and Redevelopment

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/ Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP implementation**
As-built plans for on-site stormwater control	The procedures to require submission of as-built drawings and ensure long term operation and maintenance will be a part of the SWMP.		Require submission of as-built plans for completed projects	
Inventory and priority ranking of MS4-owned properties that may be retrofitted with BMPs	Conduct detailed inventory of MS4 owned properties and rank for retrofit potential		Complete 4 years after permit effective date	
Allow green infrastructure	Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist		Complete 4 years after permit effective date	
Street design and parking lot guidelines	Develop a report assessing requirements that affect the creation of impervious cover. The assessment will help determine if changes to design standards for streets and parking lots can be modified to support low impact design options.		Complete 4 years after permit effective date	
Ensure any stormwater controls or management practices for new development and redevelopment will prevent or minimize impacts to water quality.	Adoption, amendment or modification of a regulatory mechanism to meet permit requirements		Complete 2 years after permit effective date	

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

MCM 6: Municipal Good Housekeeping and Pollution Prevention

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/ Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP implementation**
Create written O&M procedures for parks and open spaces, buildings and facilities, and vehicles and equipment			Complete 2 years after permit effective date	
Inventory all permittee-owned parks and open spaces, buildings and facilities (including their storm drains), and vehicles and equipment			Complete 2 years after permit effective date	
Establish and implement program for repair and rehabilitation of MS4 infrastructure			Complete 2 years after permit effective date	
Stormwater Pollution Prevention Plan (SWPPP) for maintenance garages, transfer stations and other waste-handling facilities			Complete 2 years after permit effective date	
Catch Basin Cleaning				
Street Sweeping Program				
Road Salt use optimization program				

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part III: Stormwater Management Program Summary

Actions for meeting Total Maximum Daily Load (TMDL) Requirements

Use the drop-down menus to select the best categorization of your BMP and responsible party. If no options are applicable, or more than one, **enter your own text to override drop-down menus.**

Applicable TMDL	**Action Description**	**Responsible Department/ Parties** (enter your own text to override the drop down menu)

Use the drop-down menus to select the Pollutant causing the water quality limitation and enter the waterbody ID(s) experiencing excursions above water quality standards for that pollutant. Choose the action description from the dropdown menu and indicate the responsible party. If no options are applicable, or more than one, **enter your own text to override drop-down menus.**

Actions for meeting Requirements Related to water Quality Limited Waters

Part III: Stormwater Management Program Summary

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Pollutant	**Waterbody ID(s)**	**Action Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part IV: Notes and additional information

Use the space below to provide any additional information about your MS4 program

Click to add text

Notice of Intent (NOI) for coverage under Small MS4 General Permit (continued)

Part V: Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name:

Title:

Signature Field

Date:

NOI Submission

Please submit the form electronically via email using the "submit by Email" button below or send in a CD with your completed NOI. You may also print and submit via mail at the address below if you choose not to submit electronically. Outfall map required in Part I of the NOI (if applicable) can be submitted electronically as an email attachment OR as a paper copy.
Permittees that choose to submit their NOI electronically by email or by mailing a CD with the completed NOI form to EPA, will be able to download a partially filled Year 1 Annual Report at a later date from EPA.

Submit by Email

Submit by email using this button. Or, send an email with attachments to: stormwater.reports@epa.gov

Save

Save NOI for your records

EPA Submittal Address:

United States Environmental Protection Agency
5 Post Office Square - Suite 100
Mail Code - OEP06-1
Boston, Massachusetts 02109-3912
ATTN: Newton Tedder

State Submittal Address

Massachusetts Department of Environmental Protection
One Winter Street - 5th Floor
Boston, MA 02108
ATTN: Fred Civian

APPENDIX F

Requirements for Discharges to Impaired Waters with an Approved TMDL

Table of Contents

A. Requirements for Discharges to Impaired Waters with an Approved MassDEP In State TMDL

I. Charles River Watershed Phosphorus TMDL Requirements

On October 17, 2007, EPA approved the *Final TMDL for Nutrients in the Lower Charles River Basin* (Lower Charles TMDL)[1] and on June 10, 2011 EPA approved the *Total Maximum Daily Load for Nutrients in the Upper/Middle Charles River* (Upper/Middle Charles TMDL)[2]. The following phosphorus reduction requirements address phosphorus in MS4 discharges.

1. To address the discharge of phosphorus from its MS4, the permittee shall develop a Phosphorus Control Plan (PCP) designed to reduce the amount of phosphorus in stormwater (SW) discharges from its MS4 to the Charles River and its tributaries. The PCP shall be completed in phases and the permittee shall add it as an attachment to its written SWMP upon completion and report in annual reports pursuant to part 4.4 of the Permit on its progress toward achieving its Phosphorus Reduction Requirement. The PCP shall be developed and fully implemented as soon as possible but no later than 20 years after the permit effective date in accordance with the phases and schedule outlined below. Each Phase shall contain the elements required of each phase as described in parts a.through c below. The timing of each phase over 20 years from the permit effective date is:

1-5 years after permit effective date	5-10 years after permit effective date	10-15 years after permit effective date	15-20 years after permit effective date
Create Phase 1 Plan	Implement Phase 1 Plan		
	Create Phase 2 Plan	Implement Phase 2 Plan	
		Create Phase 3 Plan	Implement Phase 3 Plan

a. Phase 1

1) The permittee shall complete a written Phase 1 plan of the PCP five years after the permit effective date and fully implement the Phase 1 plan of the PCP as soon as possible but no longer than 10 years after the permit effective date.
2) The Phase 1 plan of the PCP shall contain the following elements and has the following required milestones:

Item Number	Phase 1 of the PCP Component and Milestones	Completion Date
1-1	Legal analysis	2 years after permit effective date

[1] Massachusetts Department of Environmental Protection. 2007. *Final TMDL for Nutrients in the Lower Charles River Basin*. CN 301.1

[2] Massachusetts Department of Environmental Protection. 2011. *Total Maximum Daily Load for Nutrients in the Upper/Middle Charles River Basin, Massachusetts*. CN 272.0

1-2	Funding source assessment.	3 years after permit effective date
1-3	Define scope of PCP (PCP Area) Baseline Phosphorus Load and Phosphorus Reduction Requirement and Allowable Phosphorus Load	4 years after permit effective date
1-4	Description of Phase 1 planned nonstructural controls	5 years after permit effective date
1-5	Description of Phase 1 planned structural controls	5 years after permit effective date
1-6	Description of Operation and Maintenance program for structural controls	5 years after permit effective date
1-7	Phase 1 implementation schedule	5 years after permit effective date
1-8	Estimated cost for implementing Phase 1 of the PCP	5 years after permit effective date
1-9	Complete Written Phase 1 PCP	5 years after permit effective date
1-10	Full implementation of nonstructural controls	6 years after permit effective date
1-11	Performance Evaluation	6, and 7 years after permit effective date
1-12	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the PCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.80 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.80)$	8 years after permit effective date
1-13	Performance Evaluation	9 years after permit effective date
1-14	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the PCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.75	10 years after permit effective date

	$P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.75)$	

Table F-1:Phase 1 of the PCP components and Milestones

3) Description of Phase 1 PCP Components

Legal Analysis- The permittee shall develop and implement an analysis that identifies existing regulatory mechanisms available to the MS4 such as by-laws and ordinances, and describes any changes to regulatory mechanisms that may be necessary to effectively implement the entire PCP. This may include the creation or amendment of financial and regulatory authorities. The permittee shall adopt necessary regulatory changes by the end of the permit term.

Funding source assessment – The permittee shall describe known and anticipated funding mechanisms (e.g. general funding, enterprise funding, stormwater utilities) that will be used to fund PCP implementation. The permittee shall describe the steps it will take to implement its funding plan. This may include but is not limited to conceptual development, outreach to affected parties, and development of legal authorities.

Scope of the PCP, Baseline Phosphorus Load (P_{base}), Phosphorus Reduction Requirement (P_{RR}) and Allowable Phosphorus Load (P_{allow}) - The permittee shall indicate the area in which it plans to implement the PCP. The permittee must choose one of the following: (1) to implement its PCP in the entire area within its jurisdiction (for municipalities this would be the municipal boundary) within the Charles River Watershed; or (2) to implement its PCP only in the urbanized area portion of the permittee's jurisdiction within the Charles River Watershed. The implementation area selected by the permittee is known as the "PCP Area" for that permittee. Table F-2[3] and Table F-3[4] list the permittees subject to phosphorus reduction requirements along with the estimated Baseline Phosphorous Loads in mass/yr, the calculated Allowable Stormwater Phosphorus Load in mass/yr, the Stormwater Phosphorus Reduction Requirement in mass/yr and the respective percent reductions necessary. The two tables contain different reduction requirements for each permittee based on the PCP Area they choose (see above). If the permittee chooses to implement the PCP in its entire jurisdiction, the permittee may demonstrate compliance with the Phosphorus Reduction Requirement and Allowable Phosphorus Load requirements applicable to it through structural and non-structural controls on discharges that occur outside the regulated area. If the permittee chooses to implement the PCP in its regulated area only, the permittee must demonstrate compliance with the Phosphorus Reduction Requirement and Allowable Phosphorus Load requirements applicable to it through structural

[3] The estimated Baseline Phosphorus Load, Allowable Phosphorus Load, Phosphorus Reduction Requirement and percent reductions presented in Table F-2 apply to the entire watershed land area that drains to the Charles River and its tributaries within the permittee's jurisdiction.

[4] The estimated Baseline Phosphorus Load, Allowable Phosphorus Load, Phosphorus Reduction Requirement and percent reductions presented in Table F-3 apply only to the urbanized area portion of the permittee's jurisdiction that drains to the Charles River or its tributaries.

and non-structural controls on discharges that occur within the regulated area only.

The permittee shall select the Baseline Phosphorus Load, Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load that corresponds to the PCP Area selected. The selected Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load will be used to determine compliance with PCP milestones of this Phase and Phase 2 and Phase 3. If the permittee chooses to implement its PCP in all areas within its jurisdiction within the Charles River Watershed, then the permittee shall use Table F-2 to determine the Baseline Phosphorus Load, Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load for its PCP Area. If the permittee chooses to implement its PCP only within the regulated area within the Charles River Watershed, then the permittee shall use Table F-3 to determine the Baseline Phosphorus Load, Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load for its PCP Area.

The Permittee may submit more accurate land use data from 2005, which is the year chosen as the baseline land use for the purposes of permit compliance, for EPA to recalculate baseline phosphorus stormwater loads for use in future permit reissuances. Updated land use maps, land areas, characteristics, and MS4 area and catchment delineations shall be submitted to EPA along with the year 4 annual report in electronic GIS data layer form for consideration for future permit requirements[5]. Until such a time as future permit requirements reflect information submitted in the year 4 annual report, the permittee shall use the Baseline Phosphorus Load, Stormwater Phosphorus Reduction Requirement and Allowable Phosphorus Load Table F-2 (if its PCP Area is the permittee's entire jurisdiction) or Table F-3 (if its PCP Area is the regulated area only) to calculate compliance with milestones for Phase 1, 2, and 3 of the PCP.

Description of Phase 1 planned non-structural controls – The permittee shall describe the non-structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-1. The description of non-structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation in units of mass/yr. Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2 to Appendix F.

Description of Phase 1 planned structural controls – The permittee shall develop a priority ranking of areas and infrastructure within the municipality for potential implementation of structural phosphorus controls during Phase 1. The ranking shall be developed through the use of available

[5] This submission is optional and needs only be done if the permittee has more accurate land use information from 2005 than information provided by MassGIS (http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/datalayers/lus2005.html, retrieved 10/1/2013) or the permittee has updated MS4 drainage area characteristics and the permittee would like to update the Baseline Phosphorus Load.

screening and monitoring results collected during the permit term either by the permittee or another entity and the mapping required pursuant to part 2.3.4.6 of the Permit. The permittee shall also include in this priority ranking a detailed assessment of site suitability for potential phosphorus control measures based on soil types and other factors. The permittee shall coordinate this activity with the requirements of part 2.3.6.8.b of the Permit. A description and the results of this priority ranking shall be included in Phase 1 of the PCP. The permittee shall describe the structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-1. The description of structural controls shall include the planned and existing measures, the areas where the measures will be implemented or are currently implemented, and the annual phosphorus reductions in units of mass/yr that are expected to result from their implementation. Structural measures to be implemented by a third party may be included in a municipal PCP. Annual phosphorus reductions from structural BMPs shall be calculated consistent with Attachment 3 to Appendix F.

Description of Operation and Maintenance (O&M) Program for all planned and existing structural BMPs – The permittee shall establish an Operation and Maintenance Program for all structural BMPs being claimed for phosphorus reduction credit as part of Phase 1 of the PCP. This includes BMPs implemented to date as well as BMPs to be implemented during Phase 1 of the PCP. The Operation and Maintenance Program shall become part of the PCP and include: (1) inspection and maintenance schedule for each BMP according to BMP design or manufacturer specification and (2) program or department responsible for BMP maintenance.

Phase 1 Implementation Schedule – A schedule for implementation of all planned Phase 1 BMPs, including, as appropriate: obtaining funding, training, purchasing, construction, inspections, monitoring, operation and maintenance activities, and other assessment and evaluation components of implementation. Implementation of planned BMPs must begin upon completion of the Phase 1 Plan, and all non-structural BMPs shall be fully implemented within six years of the permit effective date. Structural BMPs shall be designed and constructed to ensure the permittee will comply with the 8 and 10 year phosphorus load milestones established in Table F-1. The Phase 1 plan shall be fully implemented as soon as possible, but no later than 10 years after the effective date of permit.

Estimated cost for implementing Phase 1 of the PCP – The permittee shall estimate the cost of implementing the Phase 1 non-structural and structural controls and associated Operation and Maintenance Program. This cost estimate can be used to assess the validity of the funding source assessment completed by year 3 after the permit effective date and to update funding sources as necessary to complete Phase 1.

Complete written Phase 1 Plan – The permittee must complete the written Phase 1 Plan of the PCP no later than 5 years after the permit effective date. The complete Phase 1 Plan shall include Phase 1 PCP item numbers 1-1 through 1-7 in Table F-1. The permittee shall make the Phase 1 Plan available to the public for public comment during Phase 1 Plan development. EPA encourages the permittee to post the Phase I Plan online to facilitate public involvement.

Performance Evaluation –The permittee shall evaluate the effectiveness of the PCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs[6] and tracking increases resulting from development. Phosphorus reductions shall be calculated consistent with Attachment 2 to Appendix F (non-structural BMP performance) and Attachment 3 to Appendix F (structural BMP performance) for all BMPs implemented to date. Phosphorus export increases since 2005 due to development shall be calculated consistent with Attachment 1 to Appendix F. Phosphorus loading increases and reductions in unit of mass/yr shall be added or subtracted from the applicable Baseline Phosphorus Load given in Table F-2 or Table F-3 depending on the Scope of PCP chosen to estimate the yearly phosphorous export rate from the PCP Area. The permittee shall also include all information required in part I.2 of this Appendix in each performance evaluation. Performance evaluations will be included as part of each permittee's annual report as required by part 4.4 of the Permit.

Community Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed				
Community	**Baseline Phosphorus Load, kg/yr**	**Stormwater Phosphorus Load Reduction Requirement kg/yr**	**Allowable Phosphorus Load, kg/yr**	**Stormwater Percent Reduction in Phosphorus Load (%)**
Arlington	106	57	49	53%
Ashland	67	23	44	34%
Bellingham	947	331	616	35%
Belmont	202	86	116	42%
Brookline	1,635	789	846	48 %
Cambridge	512	263	249	51%
Dedham	805	325	480	40%
Dover	831	137	694	17%
Foxborough	2	0	2	0%
Franklin	2,344	818	1,526	35%

[6] In meeting its phosphorus reduction requirements a permittee may quantify phosphorus reductions by actions undertaken by another entity, except where those actions are credited to MassDOT or another permittee identified in Appendix F Table F-2 or F-3.

Community Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed				
Community	**Baseline Phosphorus Load, kg/yr**	**Stormwater Phosphorus Load Reduction Requirement kg/yr**	**Allowable Phosphorus Load, kg/yr**	**Stormwater Percent Reduction in Phosphorus Load (%)**
Holliston	1,543	395	1,148	26%
Hopedale	107	37	70	35%
Hopkinton	292	66	226	22%
Lexington	530	194	336	37%
Lincoln	593	101	492	17%
Medfield	955	277	678	29%
Medway	1,063	314	749	30%
Mendon	29	9	20	31%
Milford	1,611	663	948	41%
Millis	969	248	721	26%
Natick	1,108	385	723	35%
Needham	1,772	796	976	45%
Newton	3,884	1,941	1,943	50%
Norfolk	1,004	232	772	23%
Somerville	646	331	315	51%
Sherborn	846	131	715	16%
Walpole	159	28	131	18%
Waltham	2,901	1,461	1,400	50%
Watertown	1,127	582	545	52%
Wayland	46	15	31	33%
Wellesley	1,431	661	770	46%
Weston	1,174	281	893	24%
Westwood	376	114	262	30%
Wrentham	618	171	447	28%
Mass-DCR	421	91	330	22%

Table F-2: Baseline Phosphorus Load, Phosphorus Reduction Requirement, Allowable Phosphorus Load and Percent Reduction in Phosphorus Load from Charles River Watershed. For use when PCP Area is chosen to be the entire community within the Charles River Watershed.

Urbanized Area Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed				
Community	**Baseline Watershed Phosphorus Load, kg/yr**	**Stormwater Phosphorus Load Reduction Requirement, kg/yr**	**Allowable Phosphorus Load, kg/yr**	**Stormwater Percent Reduction in Phosphorus Load (%)**
Arlington	106	57	49	53%
Ashland	67	23	44	34%
Bellingham	801	291	510	36%
Belmont	202	86	116	42%
Brookline	1,635	789	846	48 %
Cambridge	512	263	249	51%
Dedham	805	325	480	40%
Dover	282	54	228	19%
Foxborough	2	0	2	0%
Franklin	2,312	813	1,499	35%
Holliston	1,359	369	990	27%
Hopedale	107	37	70	35%
Hopkinton	280	65	215	23%
Lexington	525	193	332	37%
Lincoln	366	63	303	17%
Medfield	827	267	560	33%
Medway	1,037	305	732	29%
Mendon	10	5	5	50%
Milford	1,486	653	833	44%
Millis	501	159	342	32%
Natick	994	359	635	36%
Needham	1,771	795	976	45%
Newton	3,884	1,941	1,943	50%
Norfolk	1,001	231	770	23%
Somerville	646	331	315	51%
Sherborn	203	38	165	19%
Walpole	159	28	131	18%
Waltham	2,901	1,461	1,440	50%
Watertown	1,127	582	545	52%
Wayland	46	15	31	33%
Wellesley	1,431	661	770	46%

Urbanized Area Annual Stormwater Phosphorus Load Reduction by Permittee, Charles River Watershed				
Community	**Baseline Watershed Phosphorus Load, kg/yr**	**Stormwater Phosphorus Load Reduction Requirement, kg/yr**	**Allowable Phosphorus Load, kg/yr**	**Stormwater Percent Reduction in Phosphorus Load (%)**
Weston	1,174	281	893	24%
Westwood	346	108	238	31%
Wrentham	556	159	397	29%
Mass DCR	396	89	307	22%

Table F-3: Baseline Phosphorus Load, Phosphorus Reduction Requirement, Allowable Phosphorus Load and Percent Reduction in Phosphorus Load from Charles River Watershed. For use when PCP Area is chosen to be only the urbanized area portion of a permittee's jurisdiction within the Charles River Watershed.

b. Phase 2

1) The permittee shall complete the Phase 2 Plan of the PCP 10 years after the permit effective date and fully implement the Phase 2 plan of the PCP as soon as possible but no longer than 15 years after the permit effective date.
2) The Phase 2 plan of the PCP shall be added to the Phase 1 Plan and contain the following elements and has the following required milestones:

Item Number	Phase 2 of the PCP Component and Milestones	Completion Date
2-1	Update Legal analysis	As necessary
2-2	Description of Phase 2 planned nonstructural controls	10 years after permit effective date
2-3	Description of Phase 2 planned structural controls	10 years after permit effective date
2-4	Updated description of Operation and Maintenance Program	10 years after permit effective date
2-5	Phase 2 implementation schedule	10 years after permit effective date
2-6	Estimated cost for implementing Phase 2 of the PCP	10 years after permit effective date

2-7	Complete written Phase 2 Plan	10 years after permit effective date
2-8	Performance Evaluation.	11, and 12 years after permit effective date
2-9	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the PCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.65 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.65)$	13 years after permit effective date
2-10	Performance Evaluation	14 years after permit effective date
2-11	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the PCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.50 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.50)$	15 years after permit effective date

Table F-4: Phase 2 of the PCP components and Milestones

3) Description of Phase 2 PCP Components

Updated Legal Analysis- The permittee shall update the legal analysis completed during Phase 1 of the PCP as necessary to include any new or augmented bylaws, ordinances or funding mechanisms the permittee has deemed necessary to implement the PCP. The permittee shall use experience gained during Phase 1 to inform the updated legal analysis. The permittee shall adopt necessary regulatory changes as soon as possible to implement the Phase 2 Plan.

Description of Phase 2 planned non-structural controls – The permittee shall describe the non-structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-4. The description of non-structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation in units of mass/yr. Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2 to Appendix F.

Description of planned Phase 2 structural controls – The permittee shall develop a priority ranking of areas and infrastructure within the municipality for potential implementation of phosphorus control practices during Phase 2. The ranking shall build upon the ranking developed for Phase 1. The permittee shall describe the structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-4. The description of structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions in units of mass/yr that are expected to result from their implementation. Structural measures to be implemented by a third party[7] may be included in a municipal PCP. Annual phosphorus reductions from structural BMPs shall be calculated consistent with Attachment 3 to Appendix F.

Updated description of Operation and Maintenance (O&M) Program for all planned and existing structural BMPs – The permittee shall establish an Operation and Maintenance Program for all structural BMPs being claimed for phosphorus reduction credit as part of Phase 1 and 2 of the PCP. This includes BMPs implemented to date as well as BMPs to be implemented during Phase 2 of the PCP. The Operation and Maintenance Program shall become part of the PCP and include: (1) inspection and maintenance schedule for each BMP according to BMP design or manufacturer specification and (2) program or department responsible for BMP maintenance.

Phase 2 Implementation Schedule – A schedule for implementation of all planned Phase 2 BMPs, including, as appropriate: funding, training, purchasing, construction, inspections, monitoring, O&M activities and other assessment and evaluation components of implementation. Implementation of planned BMPs must begin upon completion of the Phase 2 Plan. Structural BMPs shall be designed and constructed to ensure the permittee will comply with the 13 and 15 year milestones established in Table F-4. The Phase 2 plan shall be fully implemented as soon as possible, but no later than 15 years after the effective date of permit.

Estimated cost for implementing Phase 2 of the PCP – The permittee shall estimate the cost of implementing the Phase 2 non-structural and structural controls and associated Operation and Maintenance Program. This cost estimate can be used to plan for the full implementation of Phase 2.

Complete written Phase 2 Plan – The permittee must complete a written Phase 2 Plan of the PCP no later than 10 years after the permit effective date. The complete Phase 2 Plan shall include Phase 2 PCP item numbers 2-1 through 2-6 in Table F-4. The permittee shall make the Phase 2 Plan available to the public for public comment during Phase 2 plan development. EPA encourages the permittee to post the Phase 2 Plan online to facilitate public involvement.

[7] See footnote 6

Performance Evaluation – The permittee shall evaluate the effectiveness of the PCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs[8] and tracking increases resulting from development. Phosphorus reductions shall be calculated consistent with Attachment 2 to Appendix F (non-structural BMP performance) and Attachment 3 to Appendix F (structural BMP performance) for all BMPs implemented to date. Phosphorus export increases due to development shall be calculated consistent with Attachment 1 to Appendix F. Phosphorus loading increases and reductions in unit of mass/yr shall be added or subtracted from the applicable Baseline Phosphorus Load given in Table F-2 or Table F-3 depending on the Scope of PCP chosen to estimate the yearly phosphorous export rate from the PCP Area. The permittee shall also include all information required in part I.2 of this Appendix in each performance evaluation. Performance evaluations will be included as part of each permittee's annual report as required by part 4.4 of the Permit.

c. Phase 3

1) The permittee shall complete the Phase 3 Plan of the PCP 15 years after the permit effective date and fully implement the Phase 3 plan of the PCP as soon as possible but no longer than 20 years after the permit effective date.
2) The Phase 3 plan of the PCP shall be added to the Phase 1 Plan and the Phase 2 Plan to create the comprehensive PCP and contain the following elements and has the following required milestones:

Item Number	Phase 3 of the PCP Component and Milestones	Completion Date
3-1	Update Legal analysis	As necessary
3-2	Description of Phase 3 planned nonstructural controls	15 years after permit effective date
3-3	Description of Phase 3 planned structural controls	15 years after permit effective date
3-4	Updated description of Operation and Maintenance (O&M) Program	15 years after permit effective date
3-5	Phase 3 implementation schedule	15 years after permit effective date
3-6	Estimated cost for implementing Phase 3 of the PCP	15 years after permit effective date
3-7	Complete written Phase 3 Plan	15 years after permit effective date

[8] See footnote 9

3-8	Performance Evaluation.	16, and 17 years after permit effective date
3-9	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the PCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.30 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.30)$	18 years after permit effective date
3-10	Performance Evaluation	19 years after permit effective date
3-11	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the PCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load (P_{allow}) $P_{exp} \leq P_{allow}$	20 years after permit effective date

Table F-5:Phase 3 of the PCP components and Milestones

3) Description of Phase 3 PCP Components

Updated Legal Analysis- The permittee shall update the legal analysis completed during Phase 1 and Phase 2 of the PCP as necessary to include any new or augmented bylaws, ordinances or funding mechanisms the permittee has deemed necessary to implement the PCP. The permittee shall use experience gained during Phase 1 and Phase 2 to inform the updated legal analysis. The permittee shall adopt necessary regulatory changes as soon as possible to implement the Phase 3 Plan.

Description of Phase 3 planned non-structural controls – The permittee shall describe the non-structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-5. The description of non-structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation in units of mass/yr. Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2 to Appendix F.

Description of planned Phase 3 structural controls – The permittee shall develop a priority ranking of areas and infrastructure within the municipality for potential implementation of phosphorus control practices during Phase 3. The ranking shall build upon the ranking developed for

Phase 1 and 2. The permittee shall describe the structural stormwater control measures necessary to support achievement of the phosphorus export milestones in Table F-5. The description of structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions in units of mass/yr that are expected to result from their implementation. Structural measures to be implemented by a third party may be included in a municipal PCP. Annual phosphorus reduction from structural BMPs shall be calculated consistent with Attachment 3 to Appendix F.

Updated description of Operation and Maintenance (O&M) Program for all planned and existing structural BMPs – The permittee shall establish an Operation and Maintenance Program for all structural BMPs being claimed for phosphorus reduction credit as part of Phase 1, 2 and 3 of the PCP. This includes BMPs implemented to date as well as BMPs to be implemented during Phase 3 of the PCP. The Operation and Maintenance Program shall become part of the PCP and include: (1) inspection and maintenance schedule for each BMP according to BMP design or manufacturer specification and (2) program or department responsible for BMP maintenance.

Phase 3 Implementation Schedule – A schedule for implementation of all planned Phase 3 BMPs, including, as appropriate: funding, training, purchasing, construction, inspections, monitoring, O&M activities and other assessment and evaluation components of implementation. Implementation of planned BMPs must begin upon completion of the Phase 3 Plan. Structural BMPs shall be designed and constructed to ensure the permittee will comply with the 18 and 20 year milestones established in Table F-5. The Phase 3 plan shall be fully implemented as soon as possible, but no later than 20 years after the effective date of permit.

Estimated cost for implementing Phase 3 of the PCP – The permittee shall estimate the cost of implementing the Phase 3 non-structural and structural controls and associated Operation and Maintenance Program. This cost estimate can be used to plan for the full implementation of Phase 3.

Complete written Phase 3 Plan – The permittee must complete the written Phase 3 Plan of the PCP no later than 15 years after the permit effective date. The complete Phase 3 Plan shall include Phase 3 PCP item numbers 3-1 through 3-6 in Table F-5. The permittee shall make the Phase 3 Plan available to the public for public comment during Phase 3 Plan development. EPA encourages the permittee to post the Phase 3 Plan online to facilitate public involvement.

Performance Evaluation – The permittee shall evaluate the effectiveness of the PCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs[9] and tracking increases resulting from development. Phosphorus reductions shall be calculated consistent with Attachment 2 to Appendix F (non-structural BMP

[9] See footnote 9

performance) and Attachment 3 to Appendix F (structural BMP performance) for all BMPs implemented to date. Phosphorus export increases due to development shall be calculated consistent with Attachment 1 to Appendix F. Phosphorus loading increases and reductions in unit of mass/yr shall be added or subtracted from the applicable Baseline Phosphorus Load given in Table F-2 or Table F-3 depending on the Scope of PCP chosen to estimate the yearly phosphorous export rate from the PCP Area. The permittee shall also include all information required in part I.2 of this Appendix in each performance evaluation. Performance evaluations will be included as part of each permittee's annual report as required by part 4.4 of the Permit.

2. Reporting

Beginning 1 year after the permit effective date, the permittee shall include a progress report in each annual report on the planning and implementation of the PCP.

Beginning five (5) years after the permit effective date, the permittee shall include the following in each annual report submitted pursuant to part 4.4 of the Permit:

a. All non-structural control measures implemented during the reporting year along with the phosphorus reduction in mass/yr (P_{NSred}) calculated consistent with Attachment 2 to Appendix F
b. Structural controls implemented during the reporting year and all previous years including:
    a. Location information of structural BMPs (GPS coordinates or street address)
    b. Phosphorus reduction from all structural BMPs implemented to date in mass/yr (P_{Sred}) calculated consistent with Attachment 3 to Appendix F
    c. Date of last completed maintenance and inspection for each Structural control
c. Phosphorus load increases due to development over the previous reporting period and incurred since 2005 (P_{DEVinc}) calculated consistent with Attachment 1 to Appendix F.
d. Estimated yearly phosphorus export rate (P_{exp}) from the PCP Area calculated using Equation 2. Equation 2 calculates the yearly phosphorus export rate by subtracting yearly phosphorus reductions through implemented nonstructural controls and structural controls to date from the Baseline Phosphorus Load and adding loading increases incurred through development to date. This equation shall be used to demonstrate compliance with the phosphorus reduction milestones required as part of each phase of the PCP.

$$P_{exp}\left(\frac{mass}{yr}\right) = P_{base}\left(\frac{mass}{yr}\right) - \left(P_{Sred}\left(\frac{mass}{yr}\right) + P_{NSred}\left(\frac{mass}{yr}\right)\right) + P_{DEVinc}\left(\frac{mass}{yr}\right)$$

Equation 1. Equation used to calculate yearly phosphorus export rate from the chosen PCP Area. P_{exp}=Current phosphorus export rate from the PCP Area in mass/year. P_{base}=baseline phosphorus export rate from LPCP Area in mass/year. P_{Sred}= yearly phosphorus reduction from implemented structural controls in the PCP Area in mass/year. P_{NSred}= yearly phosphorus reduction from implemented non-structural controls in the PCP Area in mass/year. P_{DEVinc}= yearly phosphorus increase resulting from development since 2005 in the PCP Area in mass/year.

e. Certification that all structural BMPs are being inspected and maintained according to the O&M program specified as part of the PCP. The certification statement shall be:

I certify under penalty of law that all source control and treatment Best Management Practices being claimed for phosphorus reduction credit have been inspected, maintained and repaired in accordance with manufacturer or design specification. I certify that, to the best of my knowledge, all Best Management Practices being claimed for a phosphorus reduction credit are performing as originally designed.

f. Certification that all municipally owned and maintained turf grass areas are being managed in accordance with Massachusetts Regulation 331 CMR 31 pertaining to proper use of fertilizers on turf grasses (see http://www.mass.gov/courts/docs/lawlib/300-399cmr/330cmr31.pdf).

3. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part A.I.1. as follows.
   a. The permittee is relieved of its additional requirements as of the date when the following conditions are met:
      i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of phosphorus are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
   b. When the criteria in Appendix F part A.I.3.a. are met, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part A.I.1 as of that date and the permittee shall comply with the following:
      i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part A.I.1 to date to reduce phosphorus in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
      ii. The permittee shall continue to implement all requirements of Appendix F part A.I.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications, and the reporting requirements of Appendix F part I.2. remain in place.

II. Lake and Pond Phosphorus TMDL Requirements

Between 1999 and 2010 EPA has approved 13 Lake TMDLs[10] completed by MassDEP covering 78 lakes and ponds within the Commonwealth of Massachusetts. Any permittee (traditional or non-traditional) that discharges to a waterbody segment in Table F-6 is subject to the requirements of this part.

1. Permittees that operate regulated MS4s (traditional and non-traditional) that discharge to the identified impaired waters or their tributaries must reduce phosphorus discharges to support achievement of phosphorus load reductions identified in the TMDLs. To address phosphorus, all permittees with a phosphorus reduction requirement greater than 0% shall develop a Lake Phosphorus Control Plan (LPCP) designed to reduce the amount of phosphorus in stormwater discharges from its MS4 to the impaired waterbody or its tributaries in accordance with the phosphorus load reduction requirements set forth in Table F-6 below. Permittees discharging to waterbodies in Table F-6 with an associated 0% Phosphorus Required Percent Reduction are subject to Appendix F part II.2.f and are relieved of the requirements of Appendix F part II.1.i through Appendix F part II.2.e Table F-6 identifies the primary municipalities[11] located within the watershed of the respective lake or pond and the percent phosphorus reductions necessary from urban stormwater sources. Any permittee (traditional or non-traditional) that discharges to a lake or pond listed in Table F-6 or its tributaries is subject to the same phosphorus percent reduction requirements associated with that lake or pond.

Primary Municipality	Waterbody Name	Required Percent Reduction
Auburn	Leesville Pond	31%
	Auburn Pond	24%
	Eddy Pond	0%
	Pondville Pond	8%
	Stoneville Pond	3%
Charlton	Buffumville Lake	28%
	Dresser Hill Pond	17%
	Gore Pond	14%
	Granite Reservoir	11%
	Jones Pond	13%
	Pierpoint Meadow Pond	27%
	Pikes Pond	38%
Dudley	Gore Pond	14%

[10] Final TMDLs for lakes and ponds in the Northern Blackstone River Watershed, Chicopee Basin, Connecticut Basin, French Basin, Millers Basin and Bare Hill Pond, Flint Pond, Indian Lake, Lake Boon, Leesville Pond, Salisbury Pond, White Island Pond, Quaboag Pond and Quacumquasit Pond can be found here: http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html

[11] Primary municipalities indicate the municipality in which the majority of the lake or pond is located but does not necessarily indicate each municipality that has urbanized area that discharges to the lake or pond or its tributaries.

Primary Municipality	Waterbody Name	Required Percent Reduction
	Larner Pond	55%
	New Pond	56%
	Pierpoint Meadow Pond	27%
	Shepherd Pond	25%
	Tobins Pond	62%
	Wallis Pond	54%
Gardner	Hilchey Pond	27%
	Parker Pond	47%
	Bents Pond	52%
	Ramsdall Pond	49%
Grafton	Flint Pond/Lake Quinsigamond	59%
Granby	Aldrich Lake East	0%
Hadley	Lake Warner	24%
Harvard	Bare Hill Pond	2%
Hudson	Lake Boon	28%
Leicester	Smiths Pond	30%
	Southwick Pond	64%
	Cedar Meadow Pond	17%
	Dutton Pond	23%
	Greenville Pond	14%
	Rochdale Pond	8%
Ludlow	Minechoag Pond	48%
Millbury	Brierly Pond	14%
	Dorothy Pond	1%
	Howe Reservoir	48%
Oxford	Buffumville Lake	28%
	Hudson Pond	37%
	Lowes Pond	51%
	McKinstry Pond	79%
	Robinson Pond	8%
	Texas Pond	21%
Shrewsbury	Flint Pond/Lake Quinsigamond	49%
	Jordan Pond	60%
	Mill Pond	43%
	Newton Pond	19%
	Shirley Street Pond	30%
Spencer	Quaboag Pond	29%

Primary Municipality	Waterbody Name	Required Percent Reduction
	Quacumquasit Pond	2%
	Jones Pond	13%
	Sugden Reservoir	31%
Springfield	Loon Pond	10%
	Long Pond	56%
	Mona Lake	57%
Stow	Lake Boon	28%
Templeton	Brazell Pond	62%
	Depot Pond	50%
	Bourn-Hadley Pond	49%
	Greenwood Pond 2	56%
Wilbraham	Spectacle Pond	45%
Winchendon	Lake Denison	22%
	Stoddard Pond	24%
	Whitney Pond	16%
	Whites Mill Pond	21%

Table F-6: Phosphorus impaired Lakes or Ponds subject to a TMDL along with primary municipality and required percent reduction of phosphorus from urban stormwater sources

i. The LPCP shall be implemented in accordance with the following schedule and contain the following elements:

a. LPCP Implementation Schedule – The permittee shall complete its LPCP and fully implement all of the control measures in its LPCP as soon as possible but no later than 15 years after the effective date of the permit.

b. The LPCP shall be implemented in accordance with the following schedule and contain the following elements:

Number	LPCP Component and Milestones	Completion Date
1	Legal Analysis	2 years after permit effective date
2	Funding source assessment	3 years after permit effective date
3	Define LPCP scope (LPCP Area)	4 years after permit effective date
4	Calculate Baseline Phosphorus, Allowable Phosphorus Load and Phosphorus Reduction Requirement	4 years after permit effective date

5	Description of planned nonstructural and structural controls	5 years after permit effective date
6	Description of Operation and Maintenance (O&M) Program	5 years after permit effective date
7	Implementation schedule	5 years after permit effective date
8	Cost and Funding Source Assessment	5 years after permit effective date
9	Complete written LPCP	5 years after permit effective date
10	Full implementation of nonstructural controls.	6 years after permit effective date
11	Performance Evaluation.	6 and 7 years after permit effective date
12	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the LPCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.80 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.80)$	8 years after permit effective date
13	Performance Evaluation	9 years after permit effective date
14	1. Performance Evaluation. 2. Update LPCP 3. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the LPCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.60 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.60)$ OR that the permittee has reduced their phosphorus export rate by 30kg/year (whichever is greater, unless full Phosphorus Reduction Requirement has been met)	10years after permit effective date
15	Performance Evaluation	11 and 12 years after permit effective date
16	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the LPCP Area in mass/yr is equal to or less than the applicable Allowable	13years after permit effective date

	Phosphorus Load(P_{allow}) plus the applicable Phosphorus Reduction Requirement (P_{RR}) multiplied by 0.30 $P_{exp} \leq P_{allow} + (P_{RR}\ X\ 0.30)$	
17	Performance Evaluation	14 years after permit effective date
18	1. Performance Evaluation. 2. Full implementation of all structural controls used to demonstrate that the total phosphorus export rate (P_{exp}) from the LPCP Area in mass/yr is equal to or less than the applicable Allowable Phosphorus Load(P_{allow}) $P_{exp} \leq P_{allow}$	15years after permit effective date

Table F-7: LPCP components and milestones

c. Description of LPCP Components:

Legal Analysis- The permittee shall develop and implement an analysis that identifies existing regulatory mechanisms available to the MS4 such as by-laws and ordinances and describes any changes to these regulatory mechanisms that may be necessary to effectively implement the LPCP. This may include the creation or amendment of financial and regulatory authorities. The permittee shall adopt necessary regulatory changes by the end of the permit term.

Scope of the LPCP (LPCP Area) - The permittee shall indicate the area in which the permittee plans to implement the LPCP, this area is known as the "LPCP Area". The permittee must choose one of the following: 1) to implement its LPCP in the entire area within its jurisdiction discharging to the impaired waterbody (for a municipality this would be the municipal boundary) or 2) to implement its LPCP in only the urbanized area portion of its jurisdiction discharging to the impaired waterbody. If the permittee chooses to implement the LPCP in its entire jurisdiction discharging to the impaired waterbody, the permittee may demonstrate compliance with the Phosphorus Reduction Requirement and Allowable Phosphorus Load requirements applicable to it through structural and non-structural controls on discharges that occur both inside and outside the urbanized area. If the permittee chooses to implement the LPCP in its urbanized area only discharging to the impaired waterbody, the permittee must demonstrate compliance with the Phosphorus Reduction Requirement and Allowable Phosphorus Load requirements applicable to it through structural and non-structural controls on discharges that occur within the urbanized area only.

Calculate Baseline Phosphorus Load (P_{base}), Phosphorus Reduction Requirement (P_{RR}) and Allowable Phosphorus Load (P_{allow}) –Permittees shall calculate their numerical Allowable Phosphorus Load and Phosphorus Reduction Requirement in mass/yr by first estimating their Baseline Phosphorus Load in mass/yr from its LPCP Area consistent with the methodology in Attachment 1 to Appendix F, the baseline shall only be estimated using land use phosphorus export coefficients in Attachment 1 to Appendix F and not account for phosphorus reductions resulting from implemented structural BMPs completed to date. Table F-6 contains the percent phosphorus reduction required from urban stormwater consistent with the TMDL of each impaired waterbody. The permittee shall apply the applicable required percent reduction in Table F-6 to the calculated Baseline Phosphorus Load to obtain the permittee specific Allowable Phosphorus Load. The Allowable Phosphorus Load shall then be subtracted from the Baseline Phosphorus Load to obtain the permittee specific Phosphorus Reduction Requirement in mass/yr.

Description of planned non-structural controls – The permittee shall describe the non-structural stormwater control measures to be implemented to support the achievement of the milestones in Table F-7. The description of non-structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions that are expected to result from their implementation. Annual phosphorus reduction from non-structural BMPs shall be calculated consistent with Attachment 2 to Appendix F. The permittee shall update the description of planned non-structural controls as needed to support the achievement of the milestones in Table F-7, including an update in the updated written LPCP 10 years after the permit effective date.

Description of planned structural controls – The permittee shall develop a priority ranking of areas and infrastructure within the municipality for potential implementation of phosphorus control practices. The ranking shall be developed through the use of available screening and monitoring results collected during the permit term either by the permittee or another entity and the mapping required pursuant to part 2.3.4.6 of the Permit. The permittee shall also include in this prioritization a detailed assessment of site suitability for potential phosphorus control measures based on soil types and other factors. The permittee shall coordinate this activity with the requirements of part 2.3.6.8.b of the Permit. A description and the result of this priority ranking shall be included in the LPCP. The permittee shall describe the structural stormwater control measures necessary to support achievement of the milestones in Table F-7. The description of structural controls shall include the planned measures, the areas where the measures will be implemented, and the annual phosphorus reductions in units of mass/yr that are expected to result from their implementation. Structural measures to be implemented by a third party may be included in the LPCP. Annual phosphorus reduction from structural BMPs shall be calculated consistent with Attachment 3 to Appendix F. The permittee shall update the description of planned structural controls as needed to support the achievement of the milestones in Table F-7, including an update in the updated written LPCP 10 years after the permit effective date.

Description of Operation and Maintenance (O&M) Program for all planned and existing structural BMPs – The permittee shall establish an Operation and Maintenance Program for all structural BMPs being claimed for phosphorus reduction credit as part of Phase 1 and 2 of the PCP. This includes BMPs implemented to date as well as BMPs to be implemented during Phase 2 of the PCP. The Operation and Maintenance Program shall become part of the PCP and include: (1) inspection and maintenance schedule for each BMP according to BMP design or manufacturer specification and (2) program or department responsible for BMP maintenance.

Implementation Schedule – An initial schedule for implementing the BMPs, including, as appropriate: funding, training, purchasing, construction, inspections, monitoring, O&M and other assessment and evaluation components of implementation. Implementation of planned BMPs must begin upon completion of the LPCP, and all non-structural BMPs shall be fully implemented within six years of the permit effective date. Where planned structural BMP retrofits or major drainage infrastructure projects are expected to take additional time to construct, the permittee shall within four years of the effective date of the permit have a schedule for completion of construction consistent with the reduction requirements in Table F-7. The permittee shall complete the implementation of its LPCP as soon as possible or at a minimum in accordance with the milestones set forth in Table F-7. The implementation schedule shall be updated as needed to support the achievement of the milestones in Table F-7, including an update in the updated written LPCP 10 years after the permit effective date.

Cost and funding source assessment – The permittee shall estimate the cost for implementing its LPCP and describe known and anticipated funding mechanisms. The permittee shall describe the steps it will take to implement its funding plan. This may include but is not limited to conceptual development, outreach to affected parties, and development of legal authorities.

Complete written LPCP – The permittee must complete the written LPCP 5 years after permit effective date. The complete LPCP shall include item numbers 1-8 in Table F-7. The permittee shall make the LPCP available to the public for public comment during the LPCP development. EPA encourages the permittee to post the LPCP online to facilitate public involvement. The LPCP shall be updated as needed with an update 10 years after the permit effective date at a minimum to reflect changes in BMP implementation to support achievement of the phosphorus export milestones in Table F-7. The updated LPCP shall build upon the original LPCP and include additional or new BMPs the permittee will use to support the achievement of the milestones in Table F-7.

Performance Evaluation – The permittee shall evaluate the effectiveness of the LPCP by tracking the phosphorus reductions achieved through implementation of structural and non-structural BMPs[12] and tracking increases in phosphorus loading from the LPCP Area beginning six years after the effective date of the permit. Phosphorus reductions shall be calculated consistent with Attachment 2 (non-structural BMP performance), Attachment 3 (structural BMP performance) and Attachment 1 (reductions through land use change), to Appendix F for all BMPs implemented to date[13]. Phosphorus load increases resulting from development shall be calculated consistent with Attachment 1 to Appendix F. Phosphorus

[12] In meeting its phosphorus reduction requirements a permittee may quantify phosphorus reductions by actions undertaken by another entity, except where those actions are credited to MassDOT or another permittee identified in Appendix F Table F-7

[13] Annual phosphorus reductions from structural BMPs installed in the LPCP Area prior to the effective date of this permit shall be calculated consistent with Attachment 3 to Appendix F. Phosphorus Reduction Credit for previously installed BMPs will only be given if the Permittee demonstrates that the BMP is performing up to design specifications and certifies that the BMP is properly maintained and inspected according to manufacturer design or specifications. This certification shall be part of the annual performance evaluation during the year credit is claimed for the previously installed BMP.

loading increases and reductions in units of mass/yr shall be added or subtracted from the calculated Baseline Phosphorus Load to estimate the yearly phosphorous export rate from the LPCP Area in mass/yr. The permittee shall also include all information required in part II.2 of this Appendix in each performance evaluation.

2. Reporting

Beginning 1 year after the permit effective date, the permittee shall include a progress report in each annual report on the planning and implementation of the LPCP.

Beginning five (5) years after the permit effective date, the permittee shall include the following in each annual report submitted pursuant to part 4.4 of the Permit:

a. All non-structural control measures implemented during the reporting year along with the phosphorus reduction in mass/yr (P_{NSred}) calculated consistent with Attachment 2 to Appendix F
b. Structural controls implemented during the reporting year and all previous years including:
    a. Location information of structural BMPs (GPS coordinates or street address)
    b. Phosphorus reduction from all structural BMPs implemented to date in mass/yr (P_{Sred}) calculated consistent with Attachment 3 to Appendix F
    c. Date of last completed maintenance for each Structural control
c. Phosphorus load increases due to development over the previous reporting period and incurred to date (P_{DEVinc}) calculated consistent with Attachment 1 to Appendix F.
d. Estimated yearly phosphorus export rate (P_{exp}) from the LPCP Area calculated using Equation 2. Equation2 calculates the yearly phosphorus export rate by subtracting yearly phosphorus reductions through implemented nonstructural controls and structural controls to date from the Baseline Phosphorus Load and adding loading increases incurred through development to date. This equation shall be used to demonstrate compliance with the phosphorus reduction milestones required as part of each phase of the LPCP.

$$P_{exp}\left(\frac{mass}{yr}\right) = P_{base}\left(\frac{mass}{yr}\right) - \left(P_{Sred}\left(\frac{mass}{yr}\right) + P_{NSred}\left(\frac{mass}{yr}\right)\right) + P_{DEVinc}\left(\frac{mass}{yr}\right)$$

Equation 2. Equation used to calculate yearly phosphorus export rate from the chosen LPCP Area. P_{exp}=Current phosphorus export rate from the LPCP Area in mass/year. P_{base}=baseline phosphorus export rate from LPCP Area in mass/year. P_{Sred}= yearly phosphorus reduction from implemented structural controls in the LPCP Area in mass/year. P_{NSred}= yearly phosphorus reduction from implemented non-structural controls in the LPCP Area in mass/year. Area in mass/year. P_{DEVinc}= yearly phosphorus increase resulting from development since the year baseline loading was calculated in the LPCP Area in mass/year.

e. Certification that all structural BMPs are being inspected and maintained according to the O&M program specified as part of the PCP. The certification statement shall be:

I certify under penalty of law that all source control and treatment Best Management Practices being claimed for phosphorus reduction credit have been inspected, maintained and repaired in accordance with manufacturer or design specification. I certify that, to the best of my knowledge, all Best Management

Practices being claimed for a phosphorus reduction credit are performing as originally designed.

f. Certification that all municipally owned and maintained turf grass areas are being managed in accordance with Massachusetts Regulation 331 CMR 31 pertaining to proper use of fertilizers on turf grasses (see http://www.mass.gov/courts/docs/lawlib/300-399cmr/330cmr31.pdf).

3. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part A.II.1. as follows:
   a. The permittee is relieved of its additional requirements as of the date when the following conditions are met:
      i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of phosphorus are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
   b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any additional remaining requirements of Appendix F part A.II.1 as of that date and the permittee shall comply with the following:
      i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part A.II.1 to date to reduce phosphorus in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
      ii. The permittee shall continue to implement all requirements of Appendix F part A.I.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications, and the reporting requirements of Appendix F part A.II.2. remain in place.

III. Bacteria and Pathogen TMDL Requirements

There are currently approved 16 approved bacteria (fecal coliform bacteria) or mixed pathogen (fecal coliform, E. coli, and/or enterococcus bacteria) TMDLs for certain waterbodies in Massachusetts.[14] Any permittee (traditional or non-traditional) that discharges to a waterbody segment in Table F-8 is subject to the requirements of this part.

1. Traditional and non-traditional MS4s operating in the municipalities listed in Table F-8 and/or that discharge to a waterbody listed on Table F-8 shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below:

   a. Enhanced BMPs

      i. Enhancement of BMPs required by part 2.3 of the permit that shall be implemented during this permit term:

         1. part 2.3.3. Public Education: The permittee shall supplement its Residential program with an annual message encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee or its agents shall disseminate educational materials to dog owners at the time of issuance or renewal of a dog license, or other appropriate time. Education materials shall describe the detrimental impacts of improper management of pet waste, requirements for waste collection and disposal, and penalties for non-compliance. The permittee shall also provide information to owners of septic systems about proper maintenance in any catchment that discharges to a water body impaired for bacteria or pathogens. All public education messages can be combined with requirements of Appendix H part I, II and III as well as Appendix F part A.IV, A.V, B.I, B.II and B.III where appropriate.

         2. part 2.3.4 Illicit Discharge: Catchments draining to any waterbody impaired for bacteria or pathogens shall be designated either Problem Catchments or HIGH priority in implementation of the IDDE program.

Primary Municipality	Segment ID	Waterbody Name	Indicator Organism
Abington	MA62-09	Beaver Brook	Escherichia Coli (E. Coli)
Abington	MA62-33	Shumatuscacant River	Escherichia Coli (E. Coli)
Acushnet	MA95-31	Acushnet River	Escherichia Coli (E. Coli)
Acushnet	MA95-32	Acushnet River	Escherichia Coli (E. Coli)
Acushnet	MA95-33	Acushnet River	Fecal Coliform

[14] Final bacteria or pathogen TMDLs can be found here: http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html

Andover	MA83-04	Rogers Brook	Fecal Coliform
Andover	MA83-15	Unnamed Tributary	Fecal Coliform
Andover	MA83-18	Shawsheen River	Fecal Coliform
Andover	MA83-19	Shawsheen River	Fecal Coliform
Avon	MA62-07	Trout Brook	Escherichia Coli (E. Coli)
Barnstable	MA96-01	Barnstable Harbor	Fecal Coliform
Barnstable	MA96-02	Bumps River	Fecal Coliform
Barnstable	MA96-04	Centerville River	Fecal Coliform
Barnstable	MA96-05	Hyannis Harbor	Fecal Coliform
Barnstable	MA96-06	Maraspin Creek	Fecal Coliform
Barnstable	MA96-07	Prince Cove	Fecal Coliform
Barnstable	MA96-08	Shoestring Bay	Fecal Coliform
Barnstable	MA96-36	Lewis Bay	Fecal Coliform
Barnstable	MA96-37	Mill Creek	Fecal Coliform
Barnstable	MA96-63	Cotuit Bay	Fecal Coliform
Barnstable	MA96-64	Seapuit River	Fecal Coliform
Barnstable	MA96-66	North Bay	Fecal Coliform
Barnstable	MA96-81	Snows Creek	Fecal Coliform
Barnstable	MA96-82	Hyannis Inner Harbor	Fecal Coliform
Barnstable	MA96-92	Santuit River	Fecal Coliform
Barnstable	MA96-93	Halls Creek	Fecal Coliform
Barnstable	MA96-94	Stewarts Creek	Fecal Coliform
Bedford	MA83-01	Shawsheen River	Fecal Coliform
Bedford	MA83-05	Elm Brook	Fecal Coliform
Bedford	MA83-06	Vine Brook	Fecal Coliform
Bedford	MA83-08	Shawsheen River	Fecal Coliform
Bedford	MA83-10	Kiln Brook	Fecal Coliform
Bedford	MA83-14	Spring Brook	Fecal Coliform
Bedford	MA83-17	Shawsheen River	Fecal Coliform
Bellingham	MA72-03	Charles River	Pathogens
Bellingham	MA72-04	Charles River	Pathogens
Belmont	MA72-28	Beaver Brook	Pathogens
Berkley	MA62-02	Taunton River	Fecal Coliform
Berkley	MA62-03	Taunton River	Fecal Coliform
Berkley	MA62-20	Assonet River	Fecal Coliform
Beverly	MA93-08	Bass River	Fecal Coliform
Beverly	MA93-09	Danvers River	Fecal Coliform
Beverly	MA93-20	Beverly Harbor	Fecal Coliform
Beverly	MA93-25	Salem Sound	Fecal Coliform
Billerica	MA83-14	Spring Brook	Fecal Coliform
Billerica	MA83-17	Shawsheen River	Fecal Coliform

Billerica	MA83-18	Shawsheen River	Fecal Coliform
Bourne	MA95-01	Buttermilk Bay	Fecal Coliform
Bourne	MA95-14	Cape Cod Canal	Fecal Coliform
Bourne	MA95-15	Phinneys Harbor	Fecal Coliform
Bourne	MA95-16	Pocasset River	Fecal Coliform
Bourne	MA95-17	Pocasset Harbor	Fecal Coliform
Bourne	MA95-18	Red Brook Harbor	Fecal Coliform
Bourne	MA95-47	Back River	Fecal Coliform
Bourne	MA95-48	Eel Pond	Fecal Coliform
Brewster	MA96-09	Quivett Creek	Fecal Coliform
Brewster	MA96-27	Namskaket Creek	Fecal Coliform
Bridgewater	MA62-32	Matfield River	Escherichia Coli (E. Coli)
Brockton	MA62-05	Salisbury Plain River	Escherichia Coli (E. Coli)
Brockton	MA62-06	Salisbury Plain River	Escherichia Coli (E. Coli)
Brockton	MA62-07	Trout Brook	Escherichia Coli (E. Coli)
Brockton	MA62-08	Salisbury Brook	Escherichia Coli (E. Coli)
Brockton	MA62-09	Beaver Brook	Escherichia Coli (E. Coli)
Brookline	MA72-11	Muddy River	Pathogens
Burlington	MA83-06	Vine Brook	Fecal Coliform
Burlington	MA83-11	Long Meadow Brook	Fecal Coliform
Burlington	MA83-13	Sandy Brook	Fecal Coliform
Cambridge	MA72-36	Charles River	Pathogens
Cambridge	MA72-38	Charles River	Pathogens
Canton	MA73-01	Neponset River	Fecal Coliform
Canton	MA73-01	Neponset River	Escherichia Coli (E. Coli)
Canton	MA73-02	Neponset River	Fecal Coliform
Canton	MA73-05	East Branch	Fecal Coliform
Canton	MA73-20	Beaver Meadow Brook	Fecal Coliform
Canton	MA73-22	Pequid Brook	Fecal Coliform
Canton	MA73-25	Pecunit Brook	Escherichia Coli (E. Coli)
Canton	MA73-27	Ponkapog Brook	Fecal Coliform
Chatham	MA96-11	Stage Harbor	Fecal Coliform
Chatham	MA96-41	Mill Creek	Fecal Coliform
Chatham	MA96-42	Taylors Pond	Fecal Coliform
Chatham	MA96-43	Harding Beach Pond	Fecal Coliform
Chatham	MA96-44	Bucks Creek	Fecal Coliform
Chatham	MA96-45	Oyster Pond	Fecal Coliform
Chatham	MA96-46	Oyster Pond River	Fecal Coliform
Chatham	MA96-49	Frost Fish Creek	Pathogens
Chatham	MA96-50	Ryder Cove	Fecal Coliform
Chatham	MA96-51	Muddy Creek	Pathogens

Chatham	MA96-79	Cockle Cove Creek	Fecal Coliform
Chatham	MA96-79	Cockle Cove Creek	Enterococcus Bacteria
Cohasset	MA94-01	Cohasset Harbor	Fecal Coliform
Cohasset	MA94-19	The Gulf	Fecal Coliform
Cohasset	MA94-20	Little Harbor	Fecal Coliform
Cohasset	MA94-32	Cohasset Cove	Fecal Coliform
Concord	MA83-05	Elm Brook	Fecal Coliform
Danvers	MA93-01	Waters River	Fecal Coliform
Danvers	MA93-02	Crane Brook	Escherichia Coli (E. Coli)
Danvers	MA93-04	Porter River	Fecal Coliform
Danvers	MA93-09	Danvers River	Fecal Coliform
Danvers	MA93-36	Frost Fish Brook	Escherichia Coli (E. Coli)
Danvers	MA93-41	Crane River	Fecal Coliform
Dartmouth	MA95-13	Buttonwood Brook	Escherichia Coli (E. Coli)
Dartmouth	MA95-34	Slocums River	Fecal Coliform
Dartmouth	MA95-38	Clarks Cove	Fecal Coliform
Dartmouth	MA95-39	Apponagansett Bay	Fecal Coliform
Dartmouth	MA95-40	East Branch Westport River	Escherichia Coli (E. Coli)
Dartmouth	MA95-62	Buzzards Bay	Fecal Coliform
Dedham	MA72-07	Charles River	Pathogens
Dedham	MA72-21	Rock Meadow Brook	Pathogens
Dedham	MA73-02	Neponset River	Fecal Coliform
Dennis	MA96-09	Quivett Creek	Fecal Coliform
Dennis	MA96-12	Bass River	Fecal Coliform
Dennis	MA96-13	Sesuit Creek	Fecal Coliform
Dennis	MA96-14	Swan Pond River	Fecal Coliform
Dennis	MA96-35	Chase Garden Creek	Fecal Coliform
Dighton	MA62-02	Taunton River	Fecal Coliform
Dighton	MA62-03	Taunton River	Fecal Coliform
Dighton	MA62-50	Broad Cove	Fecal Coliform
Dighton	MA62-51	Muddy Cove Brook	Fecal Coliform
Dighton	MA62-55	Segreganset River	Fecal Coliform
Dighton	MA62-56	Three Mile River	Escherichia Coli (E. Coli)
Dighton	MA62-57	Three Mile River	Fecal Coliform
Dover	MA72-05	Charles River	Pathogens
Dover	MA72-06	Charles River	Pathogens
Duxbury	MA94-15	Duxbury Bay	Fecal Coliform
Duxbury	MA94-30	Bluefish River	Fecal Coliform
East Bridgewater	MA62-06	Salisbury Plain River	Escherichia Coli (E. Coli)
East Bridgewater	MA62-09	Beaver Brook	Escherichia Coli (E. Coli)
East Bridgewater	MA62-32	Matfield River	Escherichia Coli (E. Coli)

East Bridgewater	MA62-33	Shumatuscacant River	Escherichia Coli (E. Coli)
East Bridgewater	MA62-38	Meadow Brook	Escherichia Coli (E. Coli)
Eastham	MA96-15	Boat Meadow River	Fecal Coliform
Eastham	MA96-16	Rock Harbor Creek	Fecal Coliform
Eastham	MA96-34	Wellfleet Harbor	Fecal Coliform
Eastham	MA96-68	Town Cove	Fecal Coliform
Essex	MA93-11	Essex River	Fecal Coliform
Essex	MA93-16	Essex Bay	Fecal Coliform
Essex	MA93-45	Alewife Brook	Escherichia Coli (E. Coli)
Essex	MA93-46	Alewife Brook	Fecal Coliform
Everett	MA93-51	Unnamed Tributary	Enterococcus Bacteria
Fairhaven	MA95-33	Acushnet River	Fecal Coliform
Fairhaven	MA95-42	New Bedford Inner Harbor	Fecal Coliform
Fairhaven	MA95-62	Buzzards Bay	Fecal Coliform
Fairhaven	MA95-63	Outer New Bedford Harbor	Fecal Coliform
Fairhaven	MA95-64	Little Bay	Fecal Coliform
Fairhaven	MA95-65	Nasketucket Bay	Fecal Coliform
Fall River	MA61-06	Mount Hope Bay	Fecal Coliform
Fall River	MA62-04	Taunton River	Fecal Coliform
Falmouth	MA95-20	Wild Harbor	Fecal Coliform
Falmouth	MA95-21	Herring Brook	Fecal Coliform
Falmouth	MA95-22	West Falmouth Harbor	Fecal Coliform
Falmouth	MA95-23	Great Sippewisset Creek	Fecal Coliform
Falmouth	MA95-24	Little Sippewisset Marsh	Fecal Coliform
Falmouth	MA95-25	Quissett Harbor	Fecal Coliform
Falmouth	MA95-46	Harbor Head	Fecal Coliform
Falmouth	MA96-17	Falmouth Inner Harbor	Fecal Coliform
Falmouth	MA96-18	Great Harbor	Fecal Coliform
Falmouth	MA96-19	Little Harbor	Fecal Coliform
Falmouth	MA96-20	Quashnet River	Fecal Coliform
Falmouth	MA96-21	Waquoit Bay	Fecal Coliform
Falmouth	MA96-53	Perch Pond	Fecal Coliform
Falmouth	MA96-54	Great Pond	Fecal Coliform
Falmouth	MA96-55	Green Pond	Fecal Coliform
Falmouth	MA96-56	Little Pond	Fecal Coliform
Falmouth	MA96-57	Bournes Pond	Fecal Coliform
Falmouth	MA96-58	Hamblin Pond	Fecal Coliform
Falmouth	MA96-62	Oyster Pond	Fecal Coliform
Foxborough	MA62-39	Rumford River	Escherichia Coli (E. Coli)
Foxborough	MA62-47	Wading River	Escherichia Coli (E. Coli)
Foxborough	MA73-01	Neponset River	Fecal Coliform

Foxborough	MA73-01	Neponset River	Escherichia Coli (E. Coli)
Franklin	MA72-04	Charles River	Pathogens
Freetown	MA62-04	Taunton River	Fecal Coliform
Freetown	MA62-20	Assonet River	Fecal Coliform
Gloucester	MA93-12	Annisquam River	Fecal Coliform
Gloucester	MA93-16	Essex Bay	Fecal Coliform
Gloucester	MA93-18	Gloucester Harbor	Fecal Coliform
Gloucester	MA93-28	Mill River	Fecal Coliform
Hanover	MA94-05	North River	Fecal Coliform
Hanover	MA94-21	Drinkwater River	Escherichia Coli (E. Coli)
Hanover	MA94-24	Iron Mine Brook	Escherichia Coli (E. Coli)
Hanover	MA94-27	Third Herring Brook	Escherichia Coli (E. Coli)
Hanson	MA62-33	Shumatuscacant River	Escherichia Coli (E. Coli)
Harwich	MA96-22	Herring River	Fecal Coliform
Harwich	MA96-23	Saquatucket Harbor	Fecal Coliform
Harwich	MA96-51	Muddy Creek	Pathogens
Holliston	MA72-16	Bogastow Brook	Pathogens
Hopedale	MA72-03	Charles River	Pathogens
Hopkinton	MA72-01	Charles River	Pathogens
Ipswich	MA93-16	Essex Bay	Fecal Coliform
Kingston	MA94-14	Jones River	Fecal Coliform
Kingston	MA94-15	Duxbury Bay	Fecal Coliform
Lawrence	MA83-19	Shawsheen River	Fecal Coliform
Lexington	MA72-28	Beaver Brook	Pathogens
Lexington	MA83-06	Vine Brook	Fecal Coliform
Lexington	MA83-10	Kiln Brook	Fecal Coliform
Lincoln	MA83-05	Elm Brook	Fecal Coliform
Lincoln	MA83-08	Shawsheen River	Fecal Coliform
Lynn	MA93-24	Nahant Bay	Fecal Coliform
Lynn	MA93-44	Saugus River	Fecal Coliform
Lynn	MA93-52	Lynn Harbor	Fecal Coliform
Lynnfield	MA93-30	Beaverdam Brook	Escherichia Coli (E. Coli)
Lynnfield	MA93-32	Hawkes Brook	Escherichia Coli (E. Coli)
Lynnfield	MA93-34	Saugus River	Escherichia Coli (E. Coli)
Lynnfield	MA93-35	Saugus River	Escherichia Coli (E. Coli)
Malden	MA93-51	Unnamed Tributary	Enterococcus Bacteria
Manchester	MA93-19	Manchester Harbor	Fecal Coliform
Manchester	MA93-25	Salem Sound	Fecal Coliform
Manchester	MA93-29	Cat Brook	Escherichia Coli (E. Coli)
Manchester	MA93-47	Causeway Brook	Escherichia Coli (E. Coli)
Mansfield	MA62-39	Rumford River	Escherichia Coli (E. Coli)

Mansfield	MA62-47	Wading River	Escherichia Coli (E. Coli)
Mansfield	MA62-49	Wading River	Escherichia Coli (E. Coli)
Marblehead	MA93-21	Salem Harbor	Fecal Coliform
Marblehead	MA93-22	Marblehead Harbor	Fecal Coliform
Marblehead	MA93-25	Salem Sound	Fecal Coliform
Marion	MA95-05	Weweantic River	Fecal Coliform
Marion	MA95-07	Sippican River	Fecal Coliform
Marion	MA95-08	Sippican Harbor	Fecal Coliform
Marion	MA95-09	Aucoot Cove	Fecal Coliform
Marion	MA95-56	Hammett Cove	Fecal Coliform
Marshfield	MA94-05	North River	Fecal Coliform
Marshfield	MA94-06	North River	Fecal Coliform
Marshfield	MA94-09	South River	Fecal Coliform
Marshfield	MA94-11	Green Harbor	Fecal Coliform
Mashpee	MA96-08	Shoestring Bay	Fecal Coliform
Mashpee	MA96-21	Waquoit Bay	Fecal Coliform
Mashpee	MA96-24	Mashpee River	Fecal Coliform
Mashpee	MA96-39	Popponesset Creek	Fecal Coliform
Mashpee	MA96-58	Hamblin Pond	Fecal Coliform
Mashpee	MA96-61	Little River	Fecal Coliform
Mashpee	MA96-92	Santuit River	Fecal Coliform
Mattapoisett	MA95-09	Aucoot Cove	Fecal Coliform
Mattapoisett	MA95-10	Hiller Cove	Fecal Coliform
Mattapoisett	MA95-35	Mattapoisett Harbor	Fecal Coliform
Mattapoisett	MA95-60	Mattapoisett River	Fecal Coliform
Mattapoisett	MA95-61	Eel Pond	Fecal Coliform
Mattapoisett	MA95-65	Nasketucket Bay	Fecal Coliform
Medfield	MA72-05	Charles River	Pathogens
Medfield	MA72-10	Stop River	Pathogens
Medfield	MA73-09	Mine Brook	Fecal Coliform
Medway	MA72-04	Charles River	Pathogens
Medway	MA72-05	Charles River	Pathogens
Melrose	MA93-48	Bennetts Pond Brook	Escherichia Coli (E. Coli)
Mendon	MA72-03	Charles River	Pathogens
Milford	MA72-01	Charles River	Pathogens
Millis	MA72-05	Charles River	Pathogens
Millis	MA72-16	Bogastow Brook	Pathogens
Milton	MA73-02	Neponset River	Fecal Coliform
Milton	MA73-03	Neponset River	Fecal Coliform
Milton	MA73-04	Neponset River	Fecal Coliform
Milton	MA73-26	Unquity Brook	Fecal Coliform

Milton	MA73-29	Pine Tree Brook	Fecal Coliform
Milton	MA73-30	Gulliver Creek	Fecal Coliform
Nahant	MA93-24	Nahant Bay	Fecal Coliform
Nahant	MA93-52	Lynn Harbor	Fecal Coliform
Nahant	MA93-53	Lynn Harbor	Fecal Coliform
Natick	MA72-05	Charles River	Pathogens
Natick	MA72-06	Charles River	Pathogens
Needham	MA72-06	Charles River	Pathogens
Needham	MA72-07	Charles River	Pathogens
Needham	MA72-18	Fuller Brook	Pathogens
Needham	MA72-21	Rock Meadow Brook	Pathogens
Needham	MA72-25	Rosemary Brook	Pathogens
New Bedford	MA95-13	Buttonwood Brook	Escherichia Coli (E. Coli)
New Bedford	MA95-33	Acushnet River	Fecal Coliform
New Bedford	MA95-38	Clarks Cove	Fecal Coliform
New Bedford	MA95-42	New Bedford Inner Harbor	Fecal Coliform
New Bedford	MA95-63	Outer New Bedford Harbor	Fecal Coliform
Newton	MA72-07	Charles River	Pathogens
Newton	MA72-23	Sawmill Brook	Pathogens
Newton	MA72-24	South Meadow Brook	Pathogens
Newton	MA72-29	Cheese Cake Brook	Pathogens
Newton	MA72-36	Charles River	Pathogens
Norfolk	MA72-05	Charles River	Pathogens
Norfolk	MA72-10	Stop River	Pathogens
North Andover	MA83-19	Shawsheen River	Fecal Coliform
Norton	MA62-49	Wading River	Escherichia Coli (E. Coli)
Norton	MA62-56	Three Mile River	Escherichia Coli (E. Coli)
Norwell	MA94-05	North River	Fecal Coliform
Norwell	MA94-27	Third Herring Brook	Escherichia Coli (E. Coli)
Norwell	MA94-31	Second Herring Brook	Fecal Coliform
Norwood	MA73-01	Neponset River	Fecal Coliform
Norwood	MA73-01	Neponset River	Escherichia Coli (E. Coli)
Norwood	MA73-02	Neponset River	Fecal Coliform
Norwood	MA73-15	Germany Brook	Fecal Coliform
Norwood	MA73-16	Hawes Brook	Fecal Coliform
Norwood	MA73-17	Traphole Brook	Fecal Coliform
Norwood	MA73-24	Purgatory Brook	Fecal Coliform
Norwood	MA73-33	Unnamed Tributary	Escherichia Coli (E. Coli)
Orleans	MA96-16	Rock Harbor Creek	Fecal Coliform
Orleans	MA96-26	Little Namskaket Creek	Fecal Coliform
Orleans	MA96-27	Namskaket Creek	Fecal Coliform

Orleans	MA96-68	Town Cove	Fecal Coliform
Orleans	MA96-72	Paw Wah Pond	Fecal Coliform
Orleans	MA96-73	Pochet Neck	Fecal Coliform
Orleans	MA96-76	The River	Fecal Coliform
Orleans	MA96-78	Little Pleasant Bay	Fecal Coliform
Peabody	MA93-01	Waters River	Fecal Coliform
Peabody	MA93-05	Goldthwait Brook	Escherichia Coli (E. Coli)
Peabody	MA93-39	Proctor Brook	Escherichia Coli (E. Coli)
Pembroke	MA94-05	North River	Fecal Coliform
Plymouth	MA94-15	Duxbury Bay	Fecal Coliform
Plymouth	MA94-16	Plymouth Harbor	Fecal Coliform
Plymouth	MA94-34	Ellisville Harbor	Fecal Coliform
Raynham	MA62-02	Taunton River	Fecal Coliform
Rehoboth	MA53-03	Palmer River	Pathogens
Rehoboth	MA53-04	Palmer River	Pathogens
Rehoboth	MA53-05	Palmer River	Pathogens
Rehoboth	MA53-07	Palmer River - West Branch	Pathogens
Rehoboth	MA53-08	Palmer River - East Branch	Pathogens
Rehoboth	MA53-09	Rumney Marsh Brook	Pathogens
Rehoboth	MA53-10	Beaver Dam Brook	Pathogens
Rehoboth	MA53-11	Bad Luck Brook	Pathogens
Rehoboth	MA53-12	Fullers Brook	Pathogens
Rehoboth	MA53-13	Clear Run Brook	Pathogens
Rehoboth	MA53-14	Torrey Creek	Pathogens
Rehoboth	MA53-15	Old Swamp Brook	Pathogens
Rehoboth	MA53-16	Rocky Run	Pathogens
Revere	MA93-15	Pines River	Fecal Coliform
Revere	MA93-44	Saugus River	Fecal Coliform
Revere	MA93-51	Unnamed Tributary	Enterococcus Bacteria
Revere	MA93-52	Lynn Harbor	Fecal Coliform
Revere	MA93-53	Lynn Harbor	Fecal Coliform
Rockland	MA94-03	French Stream	Escherichia Coli (E. Coli)
Rockport	MA93-17	Rockport Harbor	Fecal Coliform
Salem	MA93-09	Danvers River	Fecal Coliform
Salem	MA93-20	Beverly Harbor	Fecal Coliform
Salem	MA93-21	Salem Harbor	Fecal Coliform
Salem	MA93-25	Salem Sound	Fecal Coliform
Salem	MA93-39	Proctor Brook	Escherichia Coli (E. Coli)
Salem	MA93-40	Proctor Brook	Enterococcus Bacteria
Salem	MA93-42	North River	Fecal Coliform
Sandwich	MA95-14	Cape Cod Canal	Fecal Coliform

Sandwich	MA96-30	Scorton Creek	Fecal Coliform
Sandwich	MA96-84	Old Harbor Creek	Fecal Coliform
Sandwich	MA96-85	Mill Creek	Fecal Coliform
Sandwich	MA96-86	Dock Creek	Fecal Coliform
Sandwich	MA96-87	Springhill Creek	Fecal Coliform
Saugus	MA93-15	Pines River	Fecal Coliform
Saugus	MA93-33	Hawkes Brook	Escherichia Coli (E. Coli)
Saugus	MA93-35	Saugus River	Escherichia Coli (E. Coli)
Saugus	MA93-43	Saugus River	Fecal Coliform
Saugus	MA93-44	Saugus River	Fecal Coliform
Saugus	MA93-48	Bennetts Pond Brook	Escherichia Coli (E. Coli)
Saugus	MA93-49	Shute Brook	Fecal Coliform
Saugus	MA93-50	Shute Brook	Escherichia Coli (E. Coli)
Scituate	MA94-01	Cohasset Harbor	Fecal Coliform
Scituate	MA94-02	Scituate Harbor	Fecal Coliform
Scituate	MA94-05	North River	Fecal Coliform
Scituate	MA94-06	North River	Fecal Coliform
Scituate	MA94-07	Herring River	Fecal Coliform
Scituate	MA94-09	South River	Fecal Coliform
Scituate	MA94-19	The Gulf	Fecal Coliform
Scituate	MA94-32	Cohasset Cove	Fecal Coliform
Scituate	MA94-33	Musquashcut Pond	Fecal Coliform
Seekonk	MA53-01	Runnins River	Fecal Coliform
Seekonk	MA53-12	Fullers Brook	Pathogens
Seekonk	MA53-13	Clear Run Brook	Pathogens
Seekonk	MA53-14	Torrey Creek	Pathogens
Sharon	MA62-39	Rumford River	Escherichia Coli (E. Coli)
Sharon	MA73-17	Traphole Brook	Fecal Coliform
Sharon	MA73-31	Unnamed Tributary	Fecal Coliform
Sherborn	MA72-05	Charles River	Pathogens
Somerset	MA61-01	Lee River	Fecal Coliform
Somerset	MA61-02	Lee River	Fecal Coliform
Somerset	MA61-06	Mount Hope Bay	Fecal Coliform
Somerset	MA62-03	Taunton River	Fecal Coliform
Somerset	MA62-04	Taunton River	Fecal Coliform
Somerset	MA62-50	Broad Cove	Fecal Coliform
Stoughton	MA73-20	Beaver Meadow Brook	Fecal Coliform
Stoughton	MA73-32	Unnamed Tributary	Escherichia Coli (E. Coli)
Swampscott	MA93-24	Nahant Bay	Fecal Coliform
Swansea	MA53-03	Palmer River	Pathogens
Swansea	MA53-06	Warren River Pond	Fecal Coliform

Swansea	MA53-16	Rocky Run	Pathogens
Swansea	MA61-01	Lee River	Fecal Coliform
Swansea	MA61-02	Lee River	Fecal Coliform
Swansea	MA61-04	Cole River	Fecal Coliform
Swansea	MA61-07	Mount Hope Bay	Fecal Coliform
Swansea	MA61-08	Kickemuit River	Pathogens
Taunton	MA62-02	Taunton River	Fecal Coliform
Taunton	MA62-56	Three Mile River	Escherichia Coli (E. Coli)
Taunton	MA62-57	Three Mile River	Fecal Coliform
Tewksbury	MA83-07	Strong Water Brook	Fecal Coliform
Tewksbury	MA83-15	Unnamed Tributary	Fecal Coliform
Tewksbury	MA83-18	Shawsheen River	Fecal Coliform
Wakefield	MA93-31	Mill River	Escherichia Coli (E. Coli)
Wakefield	MA93-34	Saugus River	Escherichia Coli (E. Coli)
Wakefield	MA93-35	Saugus River	Escherichia Coli (E. Coli)
Walpole	MA72-10	Stop River	Pathogens
Walpole	MA73-01	Neponset River	Fecal Coliform
Walpole	MA73-01	Neponset River	Escherichia Coli (E. Coli)
Walpole	MA73-06	School Meadow Brook	Fecal Coliform
Walpole	MA73-09	Mine Brook	Fecal Coliform
Walpole	MA73-17	Traphole Brook	Fecal Coliform
Waltham	MA72-07	Charles River	Pathogens
Waltham	MA72-28	Beaver Brook	Pathogens
Wareham	MA95-01	Buttermilk Bay	Fecal Coliform
Wareham	MA95-02	Onset Bay	Fecal Coliform
Wareham	MA95-03	Wareham River	Fecal Coliform
Wareham	MA95-05	Weweantic River	Fecal Coliform
Wareham	MA95-07	Sippican River	Fecal Coliform
Wareham	MA95-29	Agawam River	Fecal Coliform
Wareham	MA95-49	Broad Marsh River	Fecal Coliform
Wareham	MA95-50	Wankinco River	Fecal Coliform
Wareham	MA95-51	Crooked River	Fecal Coliform
Wareham	MA95-52	Cedar Island Creek	Fecal Coliform
Wareham	MA95-53	Beaverdam Creek	Fecal Coliform
Watertown	MA72-07	Charles River	Pathogens
Watertown	MA72-30	Unnamed Tributary	Pathogens
Watertown	MA72-32	Unnamed Tributary	Pathogens
Watertown	MA72-36	Charles River	Pathogens
Wellesley	MA72-06	Charles River	Pathogens
Wellesley	MA72-07	Charles River	Pathogens
Wellesley	MA72-18	Fuller Brook	Pathogens

Wellesley	MA72-25	Rosemary Brook	Pathogens
Wellfleet	MA96-32	Duck Creek	Fecal Coliform
Wellfleet	MA96-33	Herring River	Fecal Coliform
Wellfleet	MA96-34	Wellfleet Harbor	Fecal Coliform
West Bridgewater	MA62-06	Salisbury Plain River	Escherichia Coli (E. Coli)
Weston	MA72-07	Charles River	Pathogens
Westport	MA95-37	West Branch Westport River	Fecal Coliform
Westport	MA95-40	East Branch Westport River	Escherichia Coli (E. Coli)
Westport	MA95-41	East Branch Westport River	Fecal Coliform
Westport	MA95-44	Snell Creek	Escherichia Coli (E. Coli)
Westport	MA95-45	Snell Creek	Escherichia Coli (E. Coli)
Westport	MA95-54	Westport River	Fecal Coliform
Westport	MA95-58	Bread And Cheese Brook	Escherichia Coli (E. Coli)
Westport	MA95-59	Snell Creek	Fecal Coliform
Westwood	MA72-21	Rock Meadow Brook	Pathogens
Westwood	MA73-02	Neponset River	Fecal Coliform
Westwood	MA73-15	Germany Brook	Fecal Coliform
Westwood	MA73-24	Purgatory Brook	Fecal Coliform
Westwood	MA73-25	Pecunit Brook	Escherichia Coli (E. Coli)
Westwood	MA73-27	Ponkapog Brook	Fecal Coliform
Whitman	MA62-09	Beaver Brook	Escherichia Coli (E. Coli)
Whitman	MA62-33	Shumatuscacant River	Escherichia Coli (E. Coli)
Whitman	MA62-38	Meadow Brook	Escherichia Coli (E. Coli)
Wilmington	MA83-18	Shawsheen River	Fecal Coliform
Winthrop	MA93-53	Lynn Harbor	Fecal Coliform
Yarmouth	MA96-12	Bass River	Fecal Coliform
Yarmouth	MA96-35	Chase Garden Creek	Fecal Coliform
Yarmouth	MA96-36	Lewis Bay	Fecal Coliform
Yarmouth	MA96-37	Mill Creek	Fecal Coliform
Yarmouth	MA96-38	Parkers River	Fecal Coliform
Yarmouth	MA96-80	Mill Creek	Fecal Coliform
Yarmouth	MA96-82	Hyannis Inner Harbor	Fecal Coliform

Table F-8: Bacteria or pathogens impaired waterbody names and segment IDs along with primary municipality and indicator organism identified by the applicable TMDL. The term primary municipality indicates the municipality in which the majority of the segment is located, but does not necessarily indicate each municipality that has regulated discharges to the waterbody segment.

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part A.III.1. as follows:
    a. The permittee is relieved of additional requirements as of the date when the following conditions are met:
        i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable to the receiving water

that indicates that no additional stormwater controls for bacteria/pathogens are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL

b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any additional remaining requirements of Appendix F part A.III.1 as of that date and the permittee shall comply with the following:
    i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part A.III.1 to date to reduce bacteria/pathogens in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
    ii. The permittee shall continue to implement all requirements of Appendix F part A.III.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

IV. Cape Cod Nitrogen TMDL Requirements

There are 19 approved TMDLs for nitrogen for various watersheds, ponds and bays on Cape Cod.[15] The following measuress are needed to ensure that current nitrogen loads from MS4 stormwater discharged into the impaired waterbodies do not increase.

1. The operators of traditional and non-traditional MS4s located in municipalities listed in Table F-9 or any other MS4 (traditional and non-traditional) that discharges to any waterbody listed in Table F-9 or their tributaries shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below:

    a. Enhanced BMPs

        i. Enhancement of BMPs required by part 2.3 of the permit that shall be implemented during this permit term:

            1. part 2.3.2, Public education and outreach: The permittee shall supplement its Residential and Business/Commercial/Institution program with annual timed messages on specific topics. The permittee shall distribute an annual message in the spring (April/May) timeframe that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release fertilizers. The permittee shall distribute an annual message in the summer (June/July) timeframe encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee shall distribute an annual message in the Fall (August/September/October) timeframe encouraging the proper disposal of leaf litter. The permittee shall deliver an annual message on each of these topics, unless the permittee determines that one or more of these issues is not a significant contributor of nitrogen to discharges from the MS4 and the permittee retains documentation of this finding in the SWMP. All public education messages can be combined with requirements of Appendix H part I, II and III as well as Appendix F part A.III, A.V, B.I, B.II and B.III where appropriate.

            2. part 2.3.6, Stormwater Management in New Development and Redevelopment: the requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for nitrogen removal; retrofit inventory and priority ranking under 2.3.6.1.b shall include consideration of BMPs to reduce nitrogen discharges.

[15] Final nitrogen TMDLs for Cape Cod can be found here: http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html

3. part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: establish requirements for use of slow release fertilizers on permittee owned property currently using fertilizer, in addition to reducing and managing fertilizer use as provided in in part 2.3.7.1; establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increased street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two (2) times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall).

Municipality	Waterbody Name
Barnstable	Centerville River
Barnstable	Popponesset Bay
Barnstable	Shoestring Bay
Barnstable	Cotuit Bay
Barnstable	North Bay
Barnstable	Prince Cove
Barnstable	West Bay
Barnstable	Hyannis Inner Harbor
Barnstable	Lewis Bay
Bourne	Phinneys Harbor
Chatham	Crows Pond
Chatham	Bucks Creek
Chatham	Harding Beach Pond
Chatham	Mill Creek
Chatham	Mill Pond
Chatham	Oyster Pond
Chatham	Oyster Pond River
Chatham	Stage Harbor
Chatham	Taylors Pond
Chatham	Frost Fish Creek
Chatham	Ryder Cove
Falmouth	Bournes Pond
Falmouth	Great Pond
Falmouth	Green Pond
Falmouth	Perch Pond
Falmouth	Little Pond
Falmouth	Oyster Pond
Falmouth	Quashnet River
Falmouth	Inner West Falmouth Harbor

Municipality	Waterbody Name
Falmouth	West Falmouth Harbor
Falmouth	Snug Harbor
Falmouth	Harbor Head
Harwich	Muddy Creek - Lower
Harwich	Muddy Creek - Upper
Harwich	Round Cove
Mashpee	Mashpee River
Mashpee	Great River
Mashpee	Hamblin Pond
Mashpee	Jehu Pond
Mashpee	Little River
Orleans	Areys Pond
Orleans	Little Pleasant Bay
Orleans	Namequoit River
Orleans	Paw Wah Pond
Orleans	Pleasant Bay
Orleans	Pochet Neck
Orleans	Quanset Pond
Yarmouth	Mill Creek
Yarmouth	Hyannis Inner Harbor
Yarmouth	Lewis Bay

Table F-9: Waterbodies subject to a Cape Cod nitrogen TMDL and the primary municipalities

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part A.IV.1. applicable to it when in compliance with this part.
    a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
        i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of nitrogen are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
    b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part A.IV.1 as of that date and the permittee shall comply with the following:
        i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part A.IV.1 to date to reduce nitrogen in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
        ii. The permittee shall continue to implement all requirements of Appendix F part A.IV.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing

implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

V. Assabet River Phosphorus TMDL Requirements

On September 23, 2004 EPA approved the *Assabet River Total Maximum Daily Load for Total Phosphorus*[16]. The following measures are needed to ensure that current phosphorus loads from MS4 stormwater discharged directly or indirectly via tributaries into the Assabet River do not increase.

1. The operators of traditional and non-traditional MS4s located in municipalities listed in Table F-10 within the Assabet River Watershed shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below:

   a. Enhanced BMPs

      i. Enhancement of BMPs required by part 2.3 of the permit that shall be implemented during this permit term:

         1. part 2.3.2, Public education and outreach: The permittee shall supplement its Residential and Business/Commercial/Institution program with annual timed messages on specific topics. The permittee shall distribute an annual message in the spring (March/April) timeframe that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release and phosphorous-free fertilizers. The permittee shall distribute an annual message in the summer (June/July) timeframe encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee shall distribute an annual message in the fall (August/September/October) timeframe encouraging the proper disposal of leaf litter. The permittee shall deliver an annual message on each of these topics, unless the permittee determines that one or more of these issues is not a significant contributor of phosphorous to discharges from the MS4 and the permittee retains documentation of this finding in the SWMP. All public education messages can be combined with requirements of Appendix H part I, II and III as well as Appendix F part A.III, A.IV, B.I, B.II and B.III where appropriate.

         2. part 2.3.6, Stormwater Management in New Development and Redevelopment: the requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for phosphorus removal; retrofit inventory and priority ranking under 2.3.6.1.b shall include consideration of BMPs that infiltrate stormwater where feasible.

         3. part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: Establish program to properly

[16] Massachusetts Department of Environmental Protection, 2004. *Assabet River Total Maximum Daily Load for Total Phosphorus.* CN 201.0

manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increased street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall).

Municipality
Acton
Berlin
Bolton
Boxborough
Boylston
Carlisle
Clinton
Concord
Grafton
Harvard
Hudson
Littleton
Marlborough
Maynard
Northborough
Shrewsbury
Stow
Westborough
Westford

Table F-10: Municipalities located in the Assabet River Watershed

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part A.V.1. as follows.
    a. The permittee is relieved of its additional requirements as of the date when following conditions are met:
        i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of phosphorus are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
    b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part A.V.1 as of that date and the permittee shall comply with the following:
        i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part A.V.1 to

date to reduce phosphorus in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs

ii. The permittee shall continue to implement all requirements of Appendix F part A.V.1 required to be implemented prior to the date of the newly approved TMDL including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

B. Requirements for Discharges to Impaired Waters with an Approved Out of State TMDL

I. Nitrogen TMDL Requirements

Discharges from MS4s in Massachusetts to waters that are tributaries to the Long Island Sound, which has an approved TMDL for nitrogen[17], are subject to the requirements of this part.

1. The operators of traditional and non-traditional MS4s located in municipalities listed in Table F-11 shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below:

   a. Enhanced BMPs

      i. Enhancement of BMPs required by part 2.3 of the permit that shall be implemented during this permit term:

         1. part 2.3.2, Public education and outreach: The permittee shall supplement its Residential and Business/Commercial/Institution program with annual timed messages on specific topics. The permittee shall distribute an annual message in the spring (April/May) timeframe that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release fertilizers. The permittee shall distribute an annual message in the summer (June/July) timeframe encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee shall distribute an annual message in the Fall (August/September/October) timeframe encouraging the proper disposal of leaf litter. The permittee shall deliver an annual message on each of these topics, unless the permittee determines that one or more of these issues is not a significant contributor of nitrogen to discharges from the MS4 and the permittee retains documentation of this finding in the SWMP. All public education messages can be combined with requirements of Appendix H part I, II and III as well as Appendix F part A.III, A.IV, A.V, B.II and B.III where appropriate.

         2. part 2.3.6, Stormwater Management in New Development and Redevelopment: the requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for nitrogen removal; retrofit inventory and priority ranking under 2.3.6.1.b shall include consideration of BMPs to reduce nitrogen discharges.

         3. part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: establish requirements for use of

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[17] Connecticut Department of Environmental Protection. 2000. *A Total Maximum Daily Load Analysis to Achieve Water Quality Standards for Dissolved Oxygen in Long Island Sound*

slow release fertilizers on permittee owned property currently using fertilizer, in addition to reducing and managing fertilizer use as provided in in part 2.3.7.1; establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increased street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two (2) times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall).

b. Nitrogen Source Identification Report

i. Within four years of the permit effective date the permittee shall complete a Nitrogen Source Identification Report. The report shall include the following elements:

1. Calculation of total urbanized area within the permittee's jurisdiction that is within the Connecticut River Watershed, the Housatonic River Watershed, or the Thames River Watershed, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6,
2. All screening and monitoring results pursuant to part 2.3.4.7.d., targeting the receiving water segment(s)
3. Impervious area and DCIA for the target catchment
4. Identification, delineation and prioritization of potential catchments with high nitrogen loading
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during re-development

ii. The final Nitrogen Source Identification Report shall be submitted to EPA as part of the year 4 annual report.

c. Structural BMPs

i. Within five years of the permit effective date, the permittee shall evaluate all properties identified as presenting retrofit opportunities or areas for structural BMP installation under permit part 2.3.6.d.ii. or identified in the Nitrogen Source Identification Report. The evaluation shall include:

1. The next planned infrastructure, resurfacing or redevelopment activity planned for the property (if applicable) OR planned retrofit date;
2. The estimated cost of redevelopment or retrofit BMPs; and
3. The engineering and regulatory feasibility of redevelopment or retrofit BMPs.

ii. The permittee shall provide a listing of planned structural BMPs and a plan and schedule for implementation in the year 5 annual report. The permittee shall plan and install a minimum of one structural BMP as a demonstration project within six years of the permit effective date. The demonstration project shall be installed targeting a catchment with high nitrogen load potential. The permittee shall install the remainder of the structural BMPs in accordance with the plan and schedule provided in the year 5 annual report.

iii. Any structural BMPs listed in Table 4-3 of Attachment 1 to Appendix H installed in the urbanized area by the permittee or its agents shall be tracked and the permittee shall estimate the nitrogen removal by the BMP consistent with Attachment 1 to Appendix H. The permittee shall document the BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated nitrogen removed in mass per year by the BMP in each annual report.

Adams	North Adams
Agawam	Northampton
Amherst	Oxford
Ashburnham	Palmer
Ashby	Paxton
Auburn	Pelham
Belchertown	Pittsfield
Charlton	Richmond
Cheshire	Russell
Chicopee	Rutland
Dalton	South Hadley
Douglas	Southampton
Dudley	Southbridge
East Longmeadow	Southwick
Easthampton	Spencer
Gardner	Springfield
Granby	Sturbridge
Hadley	Sutton
Hampden	Templeton
Hatfield	Ware
Hinsdale	Webster
Holyoke	West Springfield
Lanesborough	Westfield
Leicester	Westhampton
Lenox	Westminster
Longmeadow	Wilbraham
Ludlow	Williamsburg
Millbury	Winchendon

Monson	

Table F-11: Massachusetts municipalities in which MS4 discharges are within the Connecticut River Watershed, the Housatonic River Watershed, or the Thames River Watershed.

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part B.I.1. as follows:
   a. The permittee is relieved of its additional requirements as of the date when the following conditions are met:
      i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of nitrogen are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
   b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part B.I.1 as of that date and the permittee shall comply with the following:
      i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part B.I.1 to date to reduce nitrogen in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
      ii. The permittee shall continue to implement all requirements of Appendix F part B.I.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

II. Phosphorus TMDL Requirements

There are currently eight approved phosphorus TMDLs for certain waterbody segments in Rhode Island that identify urban stormwater discharges in Massachusetts as sources that are contributing phosphorus to the impaired segments. The TMDLs include the Kickemuit Reservoir, Upper Kikemuit River, Kickemuit River, Ten Mile River, Central Pond, Turner Reservoir, Lower Ten Mile River, and Omega Pond TMDLs[18]. Table F-12 lists municipalities in Massachusetts identified in the TMDLs as containing MS4s contributing phosphorus to the impaired waterbody segments in Rhode Island, the impaired receiving water, and the approved TMDL name. Any permittee (traditional or non-traditional) that operates an MS4 in a municipality listed in Table F-12 and that discharges to a waterbody or tributary of a waterbody listed on Table F-12 is subject to the requirements of this part.

1. The operators of traditional and non-traditional MS4s located in municipalities listed in Table F-12 and that discharge to a waterbody or a tributary of a waterbody identified on Table F-12 shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below:

    a. Enhanced BMPs

        i. Enhancement of BMPs required by part 2.3 of the permit that shall be implemented during this permit term:

            1. part 2.3.2, Public education and outreach: The permittee shall supplement its Residential and Business/Commercial/Institution program with annual timed messages on specific topics. The permittee shall distribute an annual message in the spring (March/April) timeframe that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release and phosphorous-free fertilizers. The permittee shall distribute an annual message in the summer (June/July) timeframe encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee shall distribute an annual message in the fall (August/September/October) timeframe encouraging the proper disposal of leaf litter. The permittee shall deliver an annual message on each of these topics, unless the permittee determines that one or more of these issues is not a significant contributor of phosphorous to discharges from the MS4 and the permittee retains documentation of this finding in the SWMP. All public education messages can be combined with requirements of Appendix H part I, II and III as well as Appendix F part A.III, A.IV, A.V, B.I, and B.III where appropriate.

            2. part 2.3.6, Stormwater Management in New Development and Redevelopment: the requirement for

[18] See http://www.dem.ri.gov/programs/benviron/water/quality/rest/reports.htm for all RI TMDL documents. (retrieved 6/30/2014)

adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for phosphorus removal; retrofit inventory and priority ranking under 2.3.6.1.b shall include consideration of BMPs that infiltrate stormwater where feasible.

3. part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: Establish program to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increased street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall).

b. Phosphorus Source Identification Report

i. Within four years of the permit effective date the permittee shall complete a Phosphorus Source Identification Report. The report shall include the following elements:

1. Calculation of total urbanized area draining to the water quality limited receiving water segments or their tributaries, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6,
2. All screening and monitoring results pursuant to part 2.3.4.7.d., targeting the receiving water segment(s)
3. Impervious area and DCIA for the target catchment
4. Identification, delineation and prioritization of potential catchments with high phosphorus loading
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during re development, including the removal of impervious area of permittee owned properties

ii. The phosphorus source identification report shall be submitted to EPA as part of the year 4 annual report.

c. Structural BMPs

i. Within five years of the permit effective date, the permittee shall evaluate all permittee owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under permit part 2.3.6.d.ii or identified in the Phosphorus Source Identification Report that are within the drainage area of the water quality limited water or its tributaries. The evaluation shall include:

1. The next planned infrastructure, resurfacing or redevelopment activity planned for the property (if applicable) OR planned retrofit date;
2. The estimated cost of redevelopment or retrofit BMPs; and
3. The engineering and regulatory feasibility of redevelopment or retrofit BMPs.

ii. The permittee shall provide a listing of planned structural BMPs and a plan and schedule for implementation in the year 5 annual report. The permittee shall plan and install a minimum of one structural BMP as a demonstration project within the drainage area of the water quality limited water or its tributaries within six years of the permit effective date. The demonstration project shall be installed targeting a catchment with high phosphorus load potential. The permittee shall install the remainder of the structural BMPs in accordance with the plan and schedule provided in the year 5 annual report.

iii. Any structural BMPs installed in the urbanized area by the permittee or its agents shall be tracked and the permittee shall estimate the phosphorus removal by the BMP consistent with Attachment 3 to Appendix F. The permittee shall document the BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated phosphorus removed in mass per year by the BMP in each annual report.

Municipality	Receiving Water	TMDL Name
Attleboro	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Omega Pond and Turner Reservoir	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
North Attleborough	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Omega Pond and Turner Reservoir	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Plainville	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Omega Pond and Turner Reservoir	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Rehoboth	Upper Kikemuit River, Kickemuit River, Kickemuit Reservoir	Fecal Coliform and Total Phosphorus TMDLs:

Municipality	Receiving Water	TMDL Name
		Kickemuit Reservoir, Rhode Island (RI0007034L-01) Upper Kickemuit River (RI 0007034R-01) Kickemuit River (MA 61-08_2004)
Seekonk	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Omega Pond and Turner Reservoir	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Swansea	Upper Kikemuit River, Kickemuit River, Kickemuit Reservoir	Fecal Coliform and Total Phosphorus TMDLs: Kickemuit Reservoir, Rhode Island (RI0007034L-01) Upper Kickemuit River (RI 0007034R-01) Kickemuit River (MA 61-08_2004)

Table F-12: Municipalities in Massachusetts identified in the TMDLs as containing MS4s contributing phosphorus to the impaired waterbody segments in Rhode Island, the impaired receiving water, and the approved TMDL name.

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part B.II.1. as follows:
    a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
        i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of phosphorus are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
    b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part B.II.1 as of that date and the permittee shall comply with the following:
        i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part B.II.1 to date to reduce phosphorus in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
        ii. The permittee shall continue to implement all requirements of Appendix F part B.II.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

III. Bacteria and Pathogen TMDL Requirements

There are currently six approved bacteria (fecal coliform bacteria) or pathogen (fecal coliform and/or enterococcus bacteria) TMDLs for certain waterbody segments in Rhode Island that identify urban stormwater discharges in Massachusetts as sources that are contributing bacteria or pathogens to the impaired segments. The TMDLs include the Kickemuit Reservoir, Upper Kikemuit River, Ten Mile River, Lower Ten Mile River and Omega Pond TMDLs[19] Table F-13 lists municipalities in Massachusetts identified in the TMDLs as containing MS4s contributing bacteria or pathogens to the impaired waterbody segments in Rhode Island,, the impaired receiving water, and the approved TMDL name. Any permittee (traditional or non-traditional) that operates an MS4 in a municipality listed in Table F-13 and that discharges to a waterbody or a tributary of a waterbody listed on Table F-13 is subject to the requirements of this part.

1) Traditional and non-traditional MS4s operating in the municipalities identified in Table F-13 and that discharge to a waterbody or a tributary of a waterbody identified on Table F-13 shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below::

    a. Enhanced BMPs

        i. Enhancement of BMPs required by part 2.3 of the permit that shall be implemented during this permit term:

            1. part 2.3.3. Public Education: The permittee shall supplement its Residential program with an annual message encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee or its agents shall disseminate educational materials to dog owners at the time of issuance or renewal of a dog license, or other appropriate time. Education materials shall describe the detrimental impacts of improper management of pet waste, requirements for waste collection and disposal, and penalties for non-compliance. The permittee shall also provide information to owners of septic systems about proper maintenance in any catchment that discharges to a water body impaired for bacteria or pathogens. All public education messages can be combined with requirements of Appendix H part I, II and III as well as Appendix F part A.III, A.IV, A.V, B.I, and B.II where appropriate.

            2. part 2.3.4 Illicit Discharge: Catchments draining to any waterbody impaired for bacteria or pathogens shall be designated either Problem Catchments or HIGH priority in implementation of the IDDE program.

[19] See http://www.dem.ri.gov/programs/benviron/water/quality/rest/reports.htm for all RI TMDL documents. (retrieved 6/30/2014)

Municipality	Receiving Water	TMDL Name
Attleboro	Upper Ten Mile River, Lower Ten Mile River, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
North Attleborough	Upper Ten Mile River, Lower Ten Mile River, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Plainville	Upper Ten Mile River, Lower Ten Mile River, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Rehoboth	Upper Kikemuit River, Kickemuit Reservoir	Fecal Coliform and Total Phosphorus TMDLs: Kickemuit Reservoir, Rhode Island (RI0007034L-01) Upper Kickemuit River (RI 0007034R-01) Kickemuit River (MA 61-08_2004)
Seekonk	Upper Ten Mile River, Lower Ten Mile River, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed

Table F-13: Municipalities in Massachusetts identified in the TMDLs as containing MS4s contributing bacteria or pathogens to the impaired waterbody segments in Rhode Island,, the impaired receiving water, and the approved TMDL name

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part B.III.1. applicable to it when in compliance with this part.
   a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
      i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of bacteria/pathogens are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL
   b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part B.III.1 as of that date and the permittee shall comply with the following:
      i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part B.III.1 to date to reduce bacteria/pathogens in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
      ii. The permittee shall continue to implement all requirements of Appendix F part B.III.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation

of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

IV. Metals TMDL Requirements

There are currently five approved metals TMDL for a waterbody segment in Rhode Island that that identifies urban stormwater discharges in Massachusetts as sources that are contributing metals (Cadmium, Lead, Aluminum, Iron) to the impaired segment. The TMDLs include the Upper Ten Mile River, Lower Ten Mile River, Central Pond, Turner Reservoir and Omega Pond TMDLs.[20] Table F-14 lists municipalities in Massachusetts identified in the TMDLs as containing MS4s contributing metals to the impaired waterbody segments in Rhode Island, the impaired receiving water, the approved TMDL name, and the pollutant of concern. Any permittee (traditional or non-traditional) that operates an MS4 in a municipality listed in Table F-14 and the discharge is to a waterbody or tributary of a waterbody listed on Table F-14 is subject to the requirements of this part.

1) Traditional and non-traditional MS4s operating in the municipalities identified in Table F-14 and that discharge to a waterbody or a tributary of a waterbody identified on Table F-14 shall identify and implement BMPs designed to reduce metals discharges from its MS4. To address metals discharges, each permittee shall comply with the following BMPs in addition to the requirements of part 2.3 of the Permit, as described below:

    a. Enhanced BMPs

        i. The permittee remains subject to the requirements of part 2.3. of the permit and shall include the following enhancements to the BMPs required by part 2.3 of the permit:

            1. part 2.3.6, Stormwater Management in New Development and Redevelopment: stormwater management systems designed on commercial and industrial land use area draining to the water quality limited waterbody shall incorporate designs that allow for shutdown and containment where appropriate to isolate the system in the event of an emergency spill or other unexpected event. EPA also encourages the permittee to require any stormwater management system designed to infiltrate stormwater on commercial or industrial sites to provide the level of pollutant removal equal to or greater than the level of pollutant removal provided through the use of biofiltration of the same volume of runoff to be infiltrated, prior to infiltration.

            2. part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: increased street sweeping frequency of all municipal owned streets and parking lots to a schedule determined by the permittee to target areas with potential for high pollutant loads. This may include, but is not limited to, increased street sweeping frequency in commercial areas and high density residential areas, or

[20] See http://www.dem.ri.gov/programs/benviron/water/quality/rest/reports.htm for all RI TMDL documents. (retrieved 6/30/2014)

drainage areas with a large amount of impervious area. Prioritize inspection and maintenance for catch basins to ensure that no sump shall be more than 50 percent full. Clean catch basins more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings. Each annual report shall include the street sweeping schedule determined by the permittee to target high pollutant loads.

Municipality	Receiving Water	TMDL Name
Attleboro	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Turner Reservoir, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
North Attleborough	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Turner Reservoir, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Plainville	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Turner Reservoir, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed
Seekonk	Upper Ten Mile River, Lower Ten Mile River, Central Pond, Turner Reservoir, Omega Pond	Total Maximum Daily Load Analysis For The Ten Mile River Watershed

Table F-14: Municipalities in Massachusetts identified in the TMDLs as containing MS4s contributing metals to the impaired waterbody segments in Rhode Island, the impaired receiving water, the approved TMDL name, and the pollutant of concern.

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix F part B.IV.1. applicable to it when in compliance with this part.
    a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
        i. The applicable TMDL has been modified, revised or withdrawn and EPA has approved a new TMDL applicable for the receiving water that indicates that no additional stormwater controls for the control of metals (Cadmium, Lead, Aluminum, Iron) are necessary for the permittee's discharge based on wasteload allocations in the newly approved TMDL

b. In such a case, the permittee shall document the date of the approved TMDL in its SWMP and is relieved of any remaining requirements of Appendix F part B.IV.1 as of that date and the permittee shall comply with the following:
   i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix F part B.IV.1 to date to reduce metals (Cadmium, Lead, Aluminum, Iron) in their discharges including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
   ii. The permittee shall continue to implement all requirements of Appendix F part B.IV.1 required to be implemented prior to the date of the newly approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

C. Requirements for Discharges to Impaired Waters with a Regional TMDL

I. The "Northeast Regional Mercury TMDL (2007)"

The Northeast Regional Mercury TMDL does not specify a wasteload allocation or other requirements either individually or categorically for the MS4 discharges and specifies that load reductions are to be achieved through reduction in atmospheric deposition sources. No requirements related to this TMDL are imposed on MS4 discharges under this part. However, if the permittee becomes aware, or EPA or MassDEP determines, that an MS4 discharge is causing or contributing to such impairment to an extent that cannot be explained by atmospheric deposition (e.g. chemical spill, acid landfill leachate or other sources), the permittee shall comply with the requirements of part 2.1.1.d and 2.3.4 of the permit.

ATTACHMENT 1 TO APPENDIX F

Method to Calculate Baseline Phosphorus Load (Baseline), Phosphorus Reduction Requirements and Phosphorus load increases due to development (P_{DEVinc})

The methods and annual phosphorus load export rates presented in Attachments 1, 2 and 3 are for the purpose of measuring load reductions for various stormwater BMPs treating runoff from different site conditions (i.e. impervious or pervious) and land uses (e.g. commercial, industrial, residential). The estimates of annual phosphorus load and load reductions due to BMPs are intended for use by the permittee to measure compliance with its Phosphorus Reduction Requirement under the permit.

This attachment provides the method to calculate a baseline phosphorus load discharging in stormwater for the impaired municipalities subject to Lakes and Ponds TMDL. A complete list of municipalities subject to these TMDLs is presented in Appendix F, Table F-6. This method shall be used to calculate the following annual phosphorus loads:

1) Baseline Phosphorus Load for Permittees
2) Phosphorus Reduction Requirement

This attachment also provides the method to calculate stormwater phosphorus load increases due to development for the municipalities subject to the Charles River TMDL requirements and the Lakes & Ponds TMDL requirements:

3) Phosphorus Load Increases due to Development

The **Baseline Phosphorus Load** is a measure of the annual phosphorus load discharging in stormwater from the impervious and pervious areas of the impaired Lake Phosphorus Control Plan (LPCP) Area.

The **Baseline Phosphorus Pounds Reduction** referred to as the permittee's **Phosphorus Reduction Requirement** represents the required reduction in annual phosphorus load in stormwater to meet the WLA for the impaired watershed. The percent phosphorus reduction for each watershed (identified in Appendix F, Table F-6) is applied to the Baseline Phosphorus Load to calculate the Phosphorus Pounds Reduction.

The **Phosphorus load increases due to development (P_{DEVinc})** is the stormwater phosphorus load increases due to development over the previous reporting period and incurred to date. Increases in stormwater phosphorus load from development will increase the permittee's baseline phosphorus load and therefore, the phosphorus reduction requirement.

Examples are provided to illustrate use of the methods. Table 1-1 below provides annual composite phosphorus load export rates (PLERs) by land use category for the Baseline Load and Phosphorus Reduction Requirement calculations. The permittee shall select the land use category that most closely represents the actual use of the watershed. For watersheds with institutional type uses, such as government properties, hospitals, and schools, the permittee shall use the commercial land use category for the purpose of calculating phosphorus loads. Table 1-2 provides annual PLERs by land use category for impervious and pervious areas. The permittee shall select the land use category that most closely represents the actual use of the watershed. For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value. If the HSG is not known, assume HSG C conditions for the phosphorus load export rate. For watersheds with institutional type uses, such as government properties, hospitals, and schools, the permittee shall use the commercial/industrial land use category for the purpose of calculating phosphorus loads. Table 1-3 provides a crosswalk table of land use codes between Tables 1-1 and 1-2 and the codes used by MassGIS.

The composite PLERs in Table 1-1 to be used for calculating Baseline Phosphorus Load are based on the specified directly connected impervious area (DCIA). If the permittee determines through mapping and site investigations that the overall DCIA for the collective area for each land use category is different than the corresponding values in Table 1-1, then the permittee is encouraged to submit this information in its annual report and request EPA to recalculate the composite PLERs for the permittees to use in refining the Baseline Phosphorus Load calculation for the LPCP.
(1) Baseline Phosphorus Load: The permittee shall calculate the **Baseline Phosphorus Load** by the following procedure:

1) Determine the total area (acre) associated with the impaired watershed;

2) Sort the total area associated with the watershed into land use categories;

3) Calculate the annual phosphorus load associated with each land use category by multiplying the total area of land use by the appropriate land use-based composite phosphorus load export rate provided in Table 1-1; and

4) Determine the Baseline Phosphorus Load by summing the land use loads.

Example 1-1 to determine Baseline Phosphorus Load:
Watershed A is 18.0 acres, with 11.0 acres of industrial area (e.g. access drives, buildings, and parking lots), 3.0 acres of medium-density residential and 4.0 acres of unmanaged wooded area.

The **Baseline Phosphorus Load** = (Baseline P Load $_{IND}$) + (Baseline P Load $_{MDR}$) + (Baseline P Load $_{FOR}$)

Where:
Baseline P Load $_{IND}$ = (TA$_{IND}$) x (PLER for industrial use (Table 1-1))
= 11.0 acre x 1.27 lbs/acre/year
= 14.0 lbs P/year

Baseline P Load $_{MDR}$ = (TA$_{MDR}$) x (PLER for medium density residential (Table 1-1))
= 3.0 acre x 0.49 lbs/acre/year
= 1.5 lbs P/year

Baseline P Load $_{FOR}$ = (TA$_{FOR}$) x (PLER for forest (Table 1-1))
= 4.0 acre x 0.12 lbs/acre/year
= 0.5 lbs P/year

Baseline Phosphorus Load = 14.0 lbs P/year + 1.5 lbs P/year + 0.5 lbs P/year
= **16.0 lbs P/year**

(2) Baseline Phosphorus Pounds Reduction (Phosphorus Reduction Requirement): The Baselines Phosphorus Reduction requirement is the amount of reduction in annual phosphorus load (in pounds) that the permittee is required to achieve in the Watershed. The permittee shall calculate the **Phosphorus Reduction Requirement** by multiplying the **Baseline Phosphorus Load** by the applicable percent phosphorus reduction for that watershed specified in Table F-6 (Appendix F).

Example 1-2 to determine Watershed Phosphorus Reduction Requirement:
Table F-6 identifies Watershed A's percent phosphorus reduction as 45%; therefore the Watershed Phosphorus Reduction Requirement is:

Phosphorus Reduction Requirement = (Baseline Phosphorus Load) x (0.45)
= (16.0 lbs P/year) x (0.45)
= **7.2 lbs P/year**

(3) Phosphorus load increases due to development (P_{DEVinc}): To estimate the increases in stormwater phosphorus load due to development in the Watershed (either PCP or LPCP Area), the permittee will use the following procedure:

1) Determine the total area of development by land use category and calculate the baseline load from that area using the composite PLERs in Table 1-1;

2) Distribute the total development area into impervious and pervious subareas by land use category;

3) Calculate the phosphorus load due to development (P_{DEV}) for each land use-based impervious and pervious subarea by multiplying the subarea by the appropriate phosphorus load export rate provided in Table 1-2; and

4) Determine the phosphorus load increase (P_{DEVinc}) by subtracting the baseline phosphorus load from the increased phosphorus load due to development.

Note: If structural BMPs are installed as part of new development, the P_{DEVinc} will be reduced by the amount of BMP load treated by that BMP as calculated in Attachment 3.

Example 1-3 to determine Phosphorus Load Increases: For the same 15.11 acre Watershed A as specified in Example 1-1, a permittee has tracked development in the LPCP Area in the last year that resulted in 1.5 acres of medium density residential area and 0.5 acres of forest land being converted to high density residential impervious area as detailed below. The undeveloped MDR area is pervious area, HSG C soil and the undeveloped forest area is pervious, HSG B soil.

Land Use Category	Baseline Area (acres)	P export rate (lbs P/acre/yr)*	Baseline area unchanged (acres)	P export rate (lbs P/acre/yr)**	Developed Area converted to HDR IA (acres)	P export rate (lbs P/acre/yr)**
Industrial	11.0	1.27	No change	--	No change	--
MDR	3.0	0.49	1.5	0.21	1.5	2.32

Forest	4.0	0.12	3.5	0.12	0.5	2.32

*From Table 1-1; ** From Table 1-2

The phosphorus load increase is calculated as:

Baseline Load = (Baseline P Load $_{IND}$) +
(Baseline P Load $_{MDR}$) +
(Baseline P Load $_{FOR}$)
= **16.0 lb/year** (determined in Example 1-1)

P_{DEV} = $(TA_{IND} \times PLER_{IND})+(IA_{HDR} \times PLER_{HDR})+(PA_{MDR} \times PLER_{MDR})+(PA_{FOR} \times PLER_{For})$
= (11.0 acres * 1.27) + (2.0 acres * 2.32) + (1.5 acres * 0.21) + (3.5 * 0.12)
= **19.0 lbs P/year**

P_{DEVinc} = P_{DEV} – Baseline Load
= 19.0 – 16.0
= **3.0 lbs/year**

Table 1-1. Annual composite phosphorus load export rates

Land Cover	Representative DCIA, %	Composite PLERs, lb/ac/yr	Composite PLERs, kg/ha/yr
Commercial	**57**	**1.13**	**1.27**
Industrial	**67**	**1.27**	**1.42**
High Density Residential	**36**	**1.04**	**1.16**
Medium Density Residential	**16**	**0.49**	**0.55**
Low Density Residential	**11**	**0.30**	**0.34**
Freeway	**44**	**0.73**	**0.82**
Open Space	**8**	**0.26**	**0.29**
Agriculture	**0.4**	**0.45**	**0.50**
Forest	**0.1**	**0.12**	**0.13**

Table 1-2: Proposed average annual distinct P Load export rates for use in estimating P Load reduction credits the MA MS4 Permit

Phosphorus Source Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78	2.0
	Pervious	See* DevPERV	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	2.6
	Pervious	See* DevPERV	See* DevPERV
Medium -Density Residential (MDR)	Directly connected impervious	1.96	2.2
	Pervious	See* DevPERV	See* DevPERV
Low Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34	1.5
	Pervious	See* DevPERV	See* DevPERV
Forest (For)	Directly connected impervious	1.52	1.7
	Pervious	0.13	0.13
Open Land (Open)	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52	1.7
	Pervious	0.45	0.5
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group A	Pervious	0.03	0.03
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group B	Pervious	0.12	0.13
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C	Pervious	0.21	0.24
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C/D	Pervious	0.29	0.33
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group D	Pervious	0.37	0.41

Table 1-3: Crosswalk of MassGIS land-use categories to land-use groups for P Load Calculations

Mass GIS Land Use LU_CODE	Description	Land Use group for calculating P Load - 2013/14 MA MS4
1	Crop Land	Agriculture
2	Pasture (active)	Agriculture
3	Forest	Forest
4	Wetland	Forest
5	Mining	Industrial
6	Open Land includes inactive pasture	open land
7	Participation Recreation	open land
8	spectator recreation	open land
9	Water Based Recreation	open land
10	Multi-Family Residential	High Density Residential
11	High Density Residential	High Density Residential
12	Medium Density Residential	Medium Density Residential
13	Low Density Residential	Low Density Residential
14	Saltwater Wetland	Water
15	Commercial	Commercial
16	Industrial	Industrial
17	Urban Open	open land
18	Transportation	Highway
19	Waste Disposal	Industrial
20	Water	Water
23	cranberry bog	Agriculture
24	Powerline	open land
25	Saltwater Sandy Beach	open land
26	Golf Course	Agriculture
29	Marina	Commercial
31	Urban Public	Commercial
34	Cemetery	open land
35	Orchard	Forest
36	Nursery	Agriculture
37	Forested Wetland	Forest
38	Very Low Density residential	Low Density Residential
39	Junkyards	Industrial
40	Brush land/Successional	Forest

ATTACHMENT 2 TO APPENDIX F

Phosphorus Reduction Credits for Selected Enhanced Non-Structural BMPs

The permittee shall use the following methods to calculate phosphorus load reduction credits for the following enhanced non-structural control practices implemented in the Watershed:

1) Enhanced Sweeping Program;
2) Catch Basin Cleaning;
   and
3) Organic Waste and Leaf Litter Collection program

The methods include the use of default phosphorus reduction factors that EPA has determined are acceptable for calculating phosphorus load reduction credits for these practices.

The methods and annual phosphorus load export rates presented in this attachment are for the purpose of counting load reductions for various BMPs treating storm water runoff from varying site conditions (i.e., impervious or pervious surfaces) and different land uses (e.g. industrial and commercial) within the impaired watershed. Table 2-1 below provides annual phosphorus load export rates by land use category for impervious and pervious areas. The estimates of annual phosphorus load and load reductions resulting from BMP implementation are intended for use by the permittee to measure compliance with its Phosphorus Reduction Requirement under the permit.

Examples are provided to illustrate use of the methods. In calculating phosphorus export rates, the permittee shall select the land use category that most closely represents the actual use for the area in question. For watersheds with institutional type uses, such as government properties, hospitals, and schools, the permittee shall use the commercial land use category for the purpose of calculating phosphorus loads. Table 2-2 provides a crosswalk table of land use codes between land use groups in Table 2-1 and the codes used by Mass GIS. For pervious areas, permittees should use the appropriate value for the hydrologic soil group (HSG) if known, otherwise, assume HSG C conditions.

<u>Alternative Methods and/or Phosphorus Reduction Factors</u>: A permittee may propose alternative methods and/or phosphorus reduction factors for calculating phosphorus load reduction credits for these non-structural practices. EPA will consider alternative methods and/or phosphorus reduction factors, provided that the permittee submits adequate supporting documentation to EPA. At a minimum, supporting documentation shall consist of a description of the proposed method, the technical basis of the method, identification of alternative phosphorus reduction factors, supporting calculations, and identification of references and sources of information that support the use of the alternative method and/or factors in the Watershed. If EPA determines that the alternative methods and/or factors are not adequately supported, EPA will notify the permittee and the permittee may receive no phosphorus reduction credit other than a reduction credit calculated by the permittee following the methods in this attachment for the identified practices.

Table 2-1: Proposed average annual distinct P Load export rates for use in estimating P Load reduction credits in the MA MS4 Permit

Phosphorus Source Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78	2.0
	Pervious	See* DevPERV	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	2.6
	Pervious	See* DevPERV	See* DevPERV
Medium -Density Residential (MDR)	Directly connected impervious	1.96	2.2
	Pervious	See* DevPERV	See* DevPERV
Low Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34	1.5
	Pervious	See* DevPERV	See* DevPERV
Forest (For)	Directly connected impervious	1.52	1.7
	Pervious	0.13	0.13
Open Land (Open)	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52	1.7
	Pervious	0.45	0.5
*Developed Land Pervious (DevPERV) – HSG A	Pervious	0.03	0.03
*Developed Land Pervious (DevPERV) – HSG B	Pervious	0.12	0.13
*Developed Land Pervious (DevPERV) – HSG C	Pervious	0.21	0.24
*Developed Land Pervious (DevPERV) – HSG C/D	Pervious	0.29	0.33
*Developed Land Pervious (DevPERV) – HSG D	Pervious	0.37	0.41

Notes:

- For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value from this table. If the HSG is not known, assume HSG C conditions for the phosphorus load export rate.
- Agriculture includes row crops. Actively managed hay fields and pasture lands. Institutional land uses such as government properties, hospitals and schools are to be included in the commercial and industrial land use grouping for the purpose of calculating phosphorus loading.
- Impervious surfaces within the forest land use category are typically roadways adjacent to forested pervious areas.

Table 2-2: Crosswalk of Mass GIS land use categories to land use groups for P load calculations

Mass GIS Land Use LU_CODE	Description	Land Use group for calculating P Load - 2013/14 MA MS4
1	Crop Land	Agriculture
2	Pasture (active)	Agriculture
3	Forest	Forest
4	Wetland	Forest
5	Mining	Industrial
6	Open Land includes inactive pasture	open land
7	Participation Recreation	open land
8	spectator recreation	open land
9	Water Based Recreation	open land
10	Multi-Family Residential	High Density Residential
11	High Density Residential	High Density Residential
12	Medium Density Residential	Medium Density Residential
13	Low Density Residential	Low Density Residential
14	Saltwater Wetland	Water
15	Commercial	Commercial
16	Industrial	Industrial
17	Urban Open	open land
18	Transportation	Highway
19	Waste Disposal	Industrial
20	Water	Water
23	cranberry bog	Agriculture
24	Powerline	open land
25	Saltwater Sandy Beach	open land
26	Golf Course	Agriculture
29	Marina	Commercial
31	Urban Public	Commercial
34	Cemetery	open land
35	Orchard	Forest
36	Nursery	Agriculture
37	Forested Wetland	Forest
38	Very Low Density residential	Low Density Residential
39	Junkyards	Industrial
40	Brush land/Successional	Forest

(1) <u>Enhanced Sweeping Program</u>: The permittee may earn a phosphorus reduction credit for conducting an enhanced sweeping program of impervious surfaces. Table 2-2 below outlines the default phosphorus removal factors for enhanced sweeping programs. The credit shall be calculated by using the following equation:

$$\text{Credit}_{\text{sweeping}} = \text{IA}_{\text{swept}} \times \text{PLE}_{\text{IC-land use}} \times \text{PRF}_{\text{sweeping}} \times \text{AF} \qquad \textbf{(Equation 2-1)}$$

<u>Where:</u>

$\text{Credit}_{\text{sweeping}}$ = Amount of phosphorus load removed by enhanced sweeping program (lb/year)

IA_{swept} = Area of impervious surface that is swept under the enhanced sweeping program (acres)

$\text{PLE}_{\text{IC-land use}}$ = Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre/yr) (see Table 2-1)

$\text{PRF}_{\text{sweeping}}$ = Phosphorus Reduction Factor for sweeping based on sweeper type and frequency (see Table 2-3).

AF = Annual Frequency of sweeping. For example, if sweeping does not occur in Dec/Jan/Feb, the AF would be 9 mo./12 mo. = 0.75. For year-round sweeping, AF=1.0[1]

As an alternative, the permittee may apply a credible sweeping model of the Watershed and perform continuous simulations reflecting build-up and wash-off of phosphorus using long-term local rainfall data.

Table 2-3: Phosphorus reduction efficiency factors ($\text{PRF}_{\text{sweeping}}$) for sweeping impervious areas

Frequency[1]	Sweeper Technology	$\text{PRF}_{\text{sweeping}}$
2/year (spring and fall)[2]	Mechanical Broom	0.01
2/year (spring and fall)[2]	Vacuum Assisted	0.02
2/year (spring and fall)[2]	High-Efficiency Regenerative Air-Vacuum	0.02
Monthly	Mechanical Broom	0.03
Monthly	Vacuum Assisted	0.04
Monthly	High Efficiency Regenerative Air-Vacuum	0.08
Weekly	Mechanical Broom	0.05
Weekly	Vacuum Assisted	0.08
Weekly	High Efficiency Regenerative Air-Vacuum	0.10

[1] For full credit for monthly and weekly frequency, sweeping must be conducted year round. Otherwise, the credit should be adjusted proportionally based on the duration of the sweeping season (using AF factor).

[2] In order to earn credit for semi-annual sweeping the sweeping must occur in the spring following snow-melt and road sand applications to impervious surfaces and in the fall after leaf-fall and prior to the onset to the snow season.

Example 2-1: Calculation of enhanced sweeping program credit (Credit $_{sweeping}$): A permittee proposes to implement an enhanced sweeping program and perform weekly sweeping from March 1 – December 1 (9 months) in their Watershed, using a vacuum assisted sweeper on 20.3 acres of parking lots and roadways in a high-density residential area of the Watershed. For this site the needed information is:

IA $_{swept}$	= 20.3 acres
PLE $_{IC\text{-}HDR}$	= 2.32 lb/acre/yr (from Table 2-1)
PRF $_{sweeping}$	= 0.08 (from Table 2-3)
AF	= (9 months / 12 months) = 0.75

Substitution into equation 2-1 yields a Credit $_{sweeping}$ of 3.2 pounds of phosphorus removed per year.

Credit $_{sweeping}$ = IA $_{swept}$ x PLE $_{land\ use}$ x PRF $_{sweeping}$ x AF
= 20.3 acres x 2.32 lbs/acre/yr x 0.08 x 0.75
= 2.8 lbs/yr

<u>(2) Catch Basin Cleaning:</u> The permittee may earn a phosphorus reduction credit, Credit $_{CB}$, by removing accumulated materials from catch basins (i.e., catch basin cleaning) in the Watershed such that a minimum sump storage capacity of 50% is maintained throughout the year. The credit shall be calculated by using the following equation:

Credit $_{CB}$ = IA$_{CB}$ x PLE $_{IC\text{-}land\ use}$ x PRF$_{CB}$ **(Equation 2-2)**

<u>Where:</u>

Credit $_{CB}$	=	Amount of phosphorus load removed by catch basin cleaning (lb/year)
IA $_{CB}$	=	Impervious drainage area to catch basins (acres)
PLE $_{IC\text{-}and\ use}$	=	Phosphorus Load Export Rate for impervious cover and specified land use (lb/acre/yr) (see Table 2-1)
PRF $_{CB}$	=	Phosphorus Reduction Factor for catch basin cleaning (see Table 2-4)

Table 2-4: Phosphorus reduction efficiency factor (PRF $_{CB}$) for semi-annual catch basin cleaning

Frequency	Practice	PRF $_{CB}$
Semi-annual	Catch Basin Cleaning	0.02

Example 2-2: Calculation for catch basin cleaning credit (Credit $_{CB}$):
A permittee proposes to clean catch basins in their Watershed (i.e., remove accumulated sediments and contaminants captured in the catch basins) that drain runoff from 15.3 acres of medium-density residential impervious area. For this site the needed information is:

IA_{CB} = 15.3 acre
$PLE_{IC\text{-}MDR}$ = 1.96 lbs/acre/yr (from Table 2-1)
PRF_{CB} = 0.02 (from Table 2-4)

Substitution into equation 2-2 yields a Credit $_{CB}$ of 0.6 pounds of phosphorus removed per year:

$$\text{Credit}_{CB} = IA_{CB} \times PLE_{IC\text{-}MDR} \times PRF_{CB}$$
$$= 15.3 \text{ acre} \times 1.96 \text{ lbs/acre/yr} \times 0.02$$
$$\mathbf{= 0.6\ lbs/yr}$$

(3) Enhanced Organic Waste and Leaf Litter Collection program: The permittee may earn a phosphorus reduction credit by performing regular gathering, removal and disposal of landscaping wastes, organic debris, and leaf litter from impervious surfaces from which runoff discharges to the TMDL waterbody or its tributaries. In order to earn this credit (Credit $_{\text{leaf litter}}$), the permittee must gather and remove all landscaping wastes, organic debris, and leaf litter from impervious roadways and parking lots at least once per week during the period of September 1 to December 1 of each year. Credit can only be earned for those impervious surfaces that are cleared of organic materials in accordance with the description above. The gathering and removal shall occur immediately following any landscaping activities in the Watershed and at additional times when necessary to achieve a weekly cleaning frequency. The permittee must ensure that the disposal of these materials will not contribute pollutants to any surface water discharges. The permittee may use an enhanced sweeping program (e.g., weekly frequency) as part of earning this credit provided that the sweeping is effective at removing leaf litter and organic materials. The Credit $_{\text{leaf litter}}$ shall be determined by the following equation:

$$\text{Credit}_{\text{leaf litter}} = (\text{Watershed Area}) \times (PLE_{IC\text{-land use}}) \times (0.05) \qquad \textbf{(Equation 2-3)}$$

Where:

Credit $_{\text{leaf litter}}$ = Amount of phosphorus load reduction credit for organic waste and leaf litter collection program (lb/year)
Watershed Area = All impervious area (acre) from which runoff discharges to the TMDL waterbody or its tributaries in the Watershed
$PLE_{IC\text{-land use}}$ = Phosphorus Load Export Rate for impervious cover and specified land use (lbs/acre/yr) (see Table 2-1)
0.05 = 5% phosphorus reduction factor for organic waste and leaf litter collection program in the Watershed

Example 2-3: Calculation for organic waste and leaf litter collection program credit ($Credit_{leaf\ litter}$): A permittee proposes to implement an organic waste and leaf litter collection program by sweeping the parking lots and access drives at a minimum of once per week using a mechanical broom sweeper for the period of September 1 to December 1 over 12.5 acres of impervious roadways and parking lots in an industrial/commercial area of the Watershed. Also, the permittee will ensure that organic materials are removed from impervious areas immediately following all landscaping activities at the site. For this site the needed information to calculate the $Credit_{leaf\ litter}$ is:

Watershed Area = 12.5 acres; and
$PLE_{IC\text{-}commercial}$ = 1.78 lbs/acre/yr (from Table 2-1)

Substitution into equation 2-4 yields a $Credit_{leaf\ litter}$ of 1.1 pounds of phosphorus removed per year:

$Credit_{leaf\ litter}$ = (12.5 acre) x (1.78 lbs/acre/yr) x (0.05)
= 1.1 lbs/yr

The permittee also may earn a phosphorus reduction credit for enhanced sweeping of roads and parking lot areas (i.e., $Credit_{sweeping}$) for the three months of use. Using equation 2-1, $Credit_{sweeping}$ is:

$Credit_{sweeping} = IA_{swept} \times PLE_{IC\text{-}land\ use} \times PRF_{sweeping} \times AF$ **(Equation 2-1)**
IA_{swept} = 12.5 acre
$PLE_{IC\text{-}commercial}$ = 1.78 lbs/acre/yr (from Table 2-1)
$PRF_{sweeping}$ = 0.05 (from Table 2-3)
AF = 3 mo./12 mo. = 0.25

Substitution into equation 2-1 yields a $Credit_{sweeping}$ of 0.28 pounds of phosphorus removed per year.

$Credit_{sweeping} = IA_{swept} \times PLE_{IC\text{-}commercial} \times PRF_{sweeping} \times AF$
= 12.5 acre x 1.78 lbs/acre/yr x 0.05 x 0.25
= 0.3 lbs/yr

ATTACHMENT 3 TO APPENDIX F

Methods to Calculate Phosphorus Load Reductions for Structural Stormwater Best Management Practices

List of Tables:

List of Figures:

Methods to Calculate Phosphorus Load Reductions for Structural Stormwater Best Management Practices in the Watershed

This attachment provides methods to determine design storage volume capacities and to calculate phosphorus load reductions for the following structural Best Management Practices (structural BMPs) for a Watershed:

1) Infiltration Trench;
2) Infiltration Basin or other surface infiltration practice;
3) Bio-filtration Practice;
4) Gravel Wetland System;
5) Porous Pavement;
6) Wet Pond or wet detention basin;
7) Dry Pond or detention basin; and
8) Dry Water Quality Swale/ Grass Swale.

Additionally, this attachment provides methods to design and quantify associated phosphorus load reduction credits for the following four types of semi-structural/non-structural BMPs

9) Impervious Area Disconnection through Storage (e.g., rain barrels, cisterns, etc);
10) Impervious Area Disconnection;
11) Conversions of Impervious Area to Permeable Pervious Area; and
12) Soil Amendments to Enhance Permeability of Pervious Areas.

Methods and examples are provided in this Attachment to calculate phosphorus load reductions for structural BMPs for the four following purposes:

1) To determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious;
2) To determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area is 100% impervious;
3) To determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces; and
4) To determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area has impervious and pervious surfaces.

Examples are also provided for estimating phosphorus load reductions associated with the four semi-structural/non-structural BMPs.

Also, this attachment provides the methodology for calculating the annual stormwater phosphorus load that will be delivered to BMPs for treatment (BMP Load) and to be used for quantifying phosphorus load reduction credits. The methods and annual phosphorus export load rates presented in this attachment are for the purpose of counting load reductions for various BMPs treating storm water runoff from varying site conditions (i.e., impervious or pervious surfaces) and different land uses (e.g. commercial and industrial). The estimates of annual phosphorus load and load reductions by BMPs are to demonstrate compliance with the permittee's Phosphorus Reduction Requirement under the permit.

Structural BMP performance credits: For each structural BMP type identified above (BMPs 1-8), long-term cumulative performance information is provided to calculate phosphorus load reductions or to determine needed design storage volumes to achieve a specified reduction target (e.g., 65% phosphorus load reduction). The performance information is expressed as cumulative phosphorus load removed (% removed) depending on the physical storage capacity of the structural BMP (expressed as inches of runoff from impervious area) and is provided at the end of this Attachment (see Tables 3-1 through 3-18 and performance curves Figures 3-1 through 3-17). Multiple tables and performance curves are provided for the infiltration practices to represent cumulative phosphorus load reduction performance for six infiltration rates (IR), 0.17, 0.27, 0.53, 1.02, 2.41, and 8.27 inches/hour. These infiltration rates represent the saturated hydraulic conductivity of the soils. The permittee may use the performance curves provided in this attachment to interpolate phosphorus load removal reductions for field measured infiltration rates that are different than the infiltration rates used to develop the performance curves. Otherwise, the permittee shall use the performance curve for the IR that is nearest, but less than, the field measured rate. Physical storage capacity equals the total physical storage volume of the control structure to contain water at any instant in time. Typically, this storage capacity is comprised of the surface ponding storage volume prior to overflow and subsurface storage volumes in storage units and pore spaces of coarse filter media. Table 3-30 provides the formulae to calculate physical storage capacities for the structural control types for using the performance curves.

Semi-Structural/Non-structural BMP performance credits: For each semi-structural/non-structural BMP type identified above (BMPs 9-12), long-term cumulative performance information is provided to calculate phosphorus load reductions or to determine needed design specifications to achieve a desired reduction target (e.g., 50% phosphorus load reduction). The performance information is expressed as cumulative runoff volume reduction (% removed) depending on the design specifics and actual field conditions. Cumulative percent runoff volume reduction is being used to estimate the cumulative phosphorus load reduction credit for these BMPs. To represent a wide range of potential conditions for implementing these types of BMPs, numerous performance tables and curves have been developed to reflect a wide range of potential conditions and designs such as varying storage volumes (expressed in terms of varying ratios of storage volume to impervious area (0.1 to 2.0 inches)); varying ratios of impervious source area to receiving pervious area based on hydrologic soil groups (HSGs) A, B, C and D (8:1, 6:1, 4:1, 2: 1 and 1:1); and varying discharge time periods for temporary storage (1, 2 or 3 days) . The default credits are provided at the end of this Attachment (see Tables 3-19 through 3-26 and performance curves Figures 3-18 through 3-38).

EPA will consider phosphorus load reductions calculated using the methods provided below to be valid for the purpose of complying with the terms of this permit for BMPs that have not been explicitly modeled if the desired BMP has functionality that is similar to one of the simulated BMP types. Please note that only the surface infiltration and the infiltration trench BMP types were simulated to direct storm water runoff into the ground (i.e., infiltration). All of the other simulated BMPs represent practices that have either under-drains or impermeable liners and therefore, are not hydraulically connected to the sub-surface soils (i.e., no infiltration). Following are some simple guidelines for selecting the BMP type and/or determining whether the results of any of the BMP types provided are appropriate for another BMP of interest.

Infiltration Trench is a practice that provides temporary storage of runoff using the void spaces within the soil/sand/gravel mixture that is used to backfill the trench for subsequent infiltration into the surrounding sub-soils. Performance results for the infiltration trench can be used for all subsurface infiltration practices including systems that include pipes and/or chambers that provide temporary storage. Also, the results for this BMP type can be used for bio-retention systems that rely on infiltration when the majority of the temporary storage capacity is provided in the void spaces of the soil filter media and porous pavements that allow infiltration to occur.

Surface Infiltration represents a practice that provides temporary surface storage of runoff (e.g., ponding) for subsequent infiltration into the ground. Appropriate practices for use of the surface infiltration performance estimates include infiltration basins, infiltration swales, rain gardens and bio-retention systems that rely on infiltration and provide the majority of storage capacity through surface-ponding. If an infiltration system includes both surface storage through ponding and a lessor storage volume within the void spaces of a coarse filter media, then the physical storage volume capacity used to determine the long-term cumulative phosphorus removal efficiency from the infiltration basin performance curves would be equal to the sum of the surface storage volume and the void space storage volume. General design specifications for various surface infiltration systems are provided in the most recent version of *the Massachusetts Stormwater Handbook, Volume 2/Chapter2* (http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/v2c2.pdf).

Bio-filtration is a practice that provides temporary storage of runoff for filtering through an engineered soil media. The storage capacity is typically made of void spaces in the filter media and temporary ponding at the surface of the practice. Once the runoff has passed through the filter media it is collected by an under-drain pipe for discharge. The performance curve for this control practice assumes zero infiltration. If a filtration system has subsurface soils that are suitable for infiltration, then user should use the either performance curves for the infiltration trench or the infiltration basin depending on the predominance of storage volume made up by free standing storage or void space storage. Depending on the design of the filter media manufactured or packaged bio-filter systems such as tree box filters may be suitable for using the bio-filtration performance results. Design specifications for bio-filtration systems are provided in the most recent version of *the Massachusetts Stormwater Handbook, Volume 2/Chapter2* (http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/v2c2.pdf).

Gravel Wetland performance results should be used for practices that have been designed in accordance or share similar features with the design specifications for gravel wetland systems provided in the most recent version of *the Massachusetts Stormwater Handbook, Volume 2/Chapter2* (http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/v2c2.pdf).

Porous Pavement performance results represent systems with an impermeable under-liner and an under-drain. *If porous pavement systems do not have an impermeable under-liner so that filtered runoff can infiltrate into sub-soils then the performance results for an infiltration trench may be used for these systems.* Design specifications for porous pavement systems are provided in the most recent version of *the Massachusetts Stormwater Handbook, Volume 2/Chapter2* (http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/v2c2.pdf).

Extended Dry Detention Pond performance results should only be used for practices that have been designed in accordance with the design specifications for extended dry detention ponds provided in the most recent version of *the Massachusetts Stormwater Handbook, Volume 2/Chapter2* (http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/v2c2.pdf)

Dry Water Quality Swale/ Grass Swale performance results should only be used for practices that have been designed in accordance with the design specifications for a water quality dry swale provided in the most recent version of *the Massachusetts Stormwater Handbook, Volume 2/Chapter2* (http://www.mass.gov/eea/docs/dep/water/laws/i-thru-z/v2c2.pdf)

Impervious Area Disconnection using Storage (e.g., rain barrels, cistern, etc) performance results are for collecting runoff volumes from impervious areas such as roof tops, providing temporary storage of runoff volume using rain barrels, cisterns or other storage containers, and discharging stored volume to adjacent permeable pervious surfaces over an extended period of time.

Impervious Area Disconnection performance results are for diverting runoff volumes from impervious areas such as roadways, parking lots and roof tops, and discharging it to adjacent vegetated permeable surfaces that are of sufficient size with adequate soils to receive the runoff without causing negative impacts to adjacent down-gradient properties. Careful consideration must be given to the ratio of impervious area to the pervious area that will receive the discharge. Also, devices such as level spreaders to disperse the discharge and provide sheet flow should be employed whenever needed to increase recharge and avoid flow concentration and short circuiting through the pervious area. Soil testing is needed to classify the permeability of the receiving pervious area in terms of HSG.

Conversion of Impervious Area to Permeable Pervious Area phosphorus load reduction credits are for replacing existing impervious surfaces (such as traditional pavements and buildings with roof tops) with permeable surfaces. To be eligible for credit, it is essential that the area previously covered with impervious surface be restored to provide natural or enhanced hydrologic functioning so that the surface is permeable. Sub-soils beneath pavements are typically highly compacted and will require reworking to loosen the soil and the possible addition of soil amendments to restore permeability. Soil testing is needed to classify the permeability (in terms of HSG) of the restored pervious area.

Soil Amendments to Increase Permeability of Pervious Areas performance results are for the practice of improving the permeability of pervious areas through incorporation of soil amendments, tilling and establishing dense vegetation. This practice may be used to compliment other practices such as impervious area disconnection to improve overall performance and increase reduction credits earned. Soil testing is needed to classify the permeability (in terms of HSG) of the restored pervious area.

Alternative Methods:

A permittee may propose alternative long-term cumulative performance information or alternative methods to calculate phosphorus load reductions for the structural BMPs identified above or for other structural BMPs not identified in this Attachment.

EPA will consider alternative long-term cumulative performance information and alternative methods to calculate phosphorus load reductions for structural BMPs provided that the permittee provides EPA with adequate supporting documentation. At a minimum, the supporting documentation shall include:

1) Results of continuous BMP model simulations representing the structural BMP, using a verified BMP model and representative long-term (i.e., 10 years) climatic data including hourly rainfall data;
2) Supporting calculations and model documentation that justify use of the model, model input parameters, and the resulting cumulative phosphorus load reduction estimate;
3) If pollutant removal performance data are available for the specific BMP, model calibration results should be provided; and
4) Identification of references and sources of information that support the use of the alternative information and method.

If EPA determines that the long-term cumulative phosphorus load reductions developed based on alternative information are not adequately supported, EPA will notify the permittee in writing, and the permittee may receive no phosphorus reduction credit other than a reduction credit calculated by the permittee using the default phosphorus reduction factors provided in this attachment for the identified practices. The permittee is required to submit to EPA valid phosphorus load reductions for structural BMPs in the watershed in accordance with the submission schedule requirements specified in the permit and Appendix F.

Method to Calculate Annual Phosphorus Load Delivered to BMPs (BMP Load)

The **BMP Load** is the annual phosphorus load from the drainage area to each proposed or existing BMP used by permittee to claim credit against its stormwater phosphorus load reduction requirement (i.e., Phosphorus Reduction Requirement). The BMP Load is the starting point from which the permittee calculates the reduction in phosphorus load achieved by each existing and proposed BMP.

Examples are provided to illustrate use of the methods. Table 3-1 below provides annual phosphorus load export rates (PLERs) by land use category for impervious and pervious areas. The permittee shall select the land use category that most closely represents the actual use of the watershed. For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value. If the HSG is not known, assume HSG C conditions for the phosphorus load export rate. For watersheds with institutional type uses, such as government properties, hospitals, and schools, the permittee shall use the commercial/industrial land use category for the purpose of calculating phosphorus loads. Table 3-2 provides a crosswalk table of land use codes between land use groups in Table 3-1 and the codes used by MassGIS.

BMP Load: To estimate the annual phosphorus load reduction that a storm water BMP can achieve, it is first necessary to estimate the amount of annual phosphorus load that the BMP will receive or treat (BMP Load).
For a given BMP:

1) Determine the total drainage area to the BMP;

2) Distribute the total drainage area into impervious and pervious subareas by land use category as defined by Tables 3-1 and 3-2;

3) Calculate the phosphorus load for each land use-based impervious and pervious subarea by multiplying the subarea by the appropriate phosphorus load export rate provided in Table 3-1; and

4) Determine the total annual phosphorus load to the BMP by summing the calculated impervious and pervious subarea phosphorus loads.

Example 3-1 to determine phosphorus load to a proposed BMP: A permittee is proposing a surface stormwater infiltration system that will treat runoff from an industrial site with an area of 12.87 acres (5.21 hectares) and is made up of 10.13 acres of impervious cover (e.g., roadways, parking areas and rooftops), 1.85 acres of landscaped pervious area and 0.89 acres of wooded area both with HSG C soils. The drainage area information for the proposed BMP is:

BMP Subarea ID	Land Use Category	Cover Type	Area (acres)	P export rate (lb/acre/yr)*
1	Industrial	impervious	10.13	1.78
2	Landscaped (HSG C)	pervious	1.85	0.21
3	Forest (HSG C)	pervious	0.89	0.12

*From Table 3-1

The phosphorus load to the proposed BMP (BMP Load) is calculated as:

BMP Load = $(IA_{Ind} \text{ x } PLER_{Ind}) + (PA_{Ind} \text{ x } PLER_{Ind}) + (PA_{FOREST} \text{ x } PLER_{For})$
= (10.13 x 1.78) + (1.85 x 0.21) + (0.89 x 0.12)
= 18.53 lbs P/year

Table 3-1: Average annual distinct phosphorus load (P Load) export rates for use in estimating phosphorus load reduction credits the MA MS4 Permit

Phosphorus Source Category by Land Use	Land Surface Cover	P Load Export Rate, lbs/acre/year	P Load Export Rate, kg/ha/yr
Commercial (Com) and Industrial (Ind)	Directly connected impervious	1.78	2.0
	Pervious	See* DevPERV	See* DevPERV
Multi-Family (MFR) and High-Density Residential (HDR)	Directly connected impervious	2.32	2.6
	Pervious	See* DevPERV	See* DevPERV
Medium -Density Residential (MDR)	Directly connected impervious	1.96	2.2
	Pervious	See* DevPERV	See* DevPERV
Low Density Residential (LDR) - "Rural"	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Highway (HWY)	Directly connected impervious	1.34	1.5
	Pervious	See* DevPERV	See* DevPERV
Forest (For)	Directly connected impervious	1.52	1.7
	Pervious	0.13	0.13
Open Land (Open)	Directly connected impervious	1.52	1.7
	Pervious	See* DevPERV	See* DevPERV
Agriculture (Ag)	Directly connected impervious	1.52	1.7
	Pervious	0.45	0.5
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group A	Pervious	0.03	0.03
*Developed Land Pervious (DevPERV)- Hydrologic Soil Group B	Pervious	0.12	0.13
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C	Pervious	0.21	0.24
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group C/D	Pervious	0.29	0.33
*Developed Land Pervious (DevPERV) - Hydrologic Soil Group D	Pervious	0.37	0.41

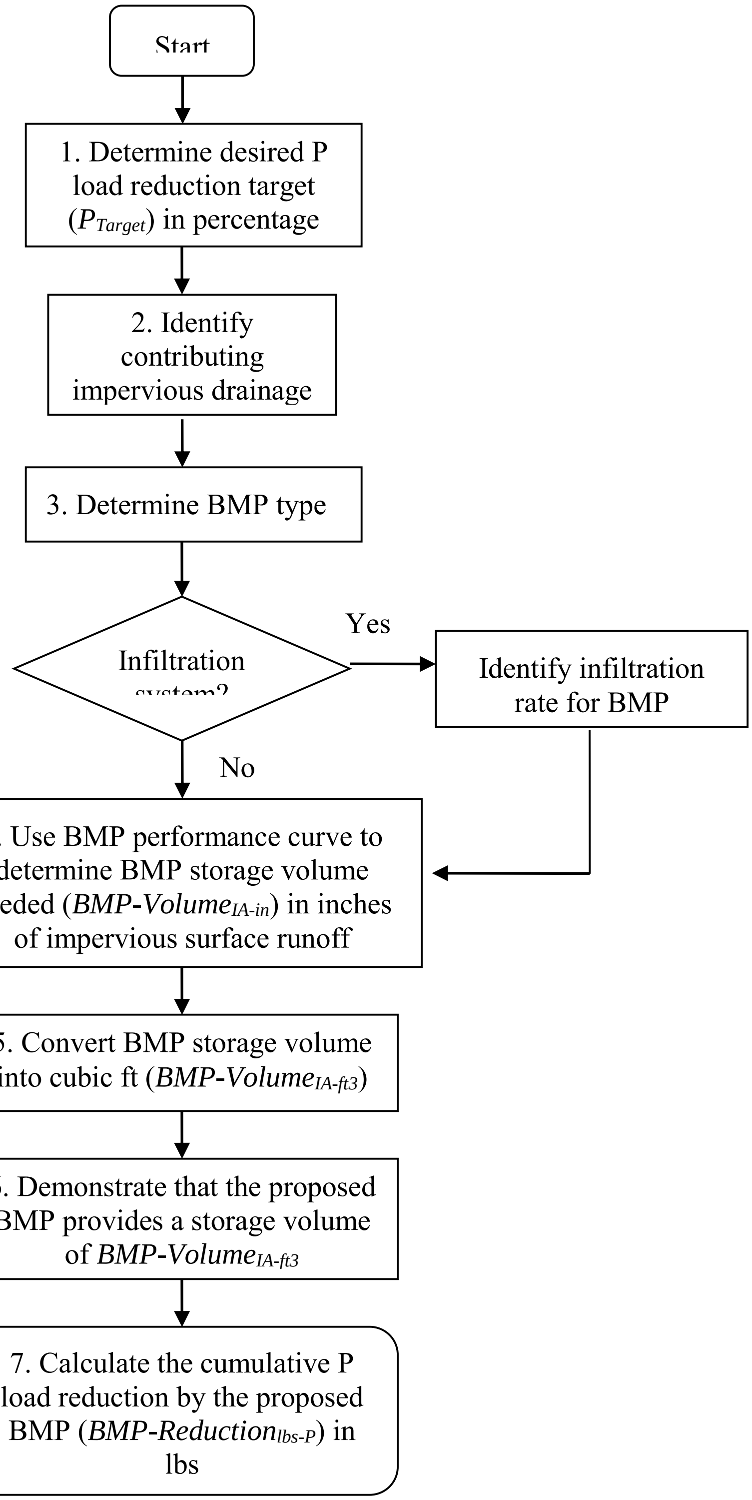
Table 3- 2: MassGIS land-use categories with associated land-use groups for phosphorus load calculations

Mass GIS Land Use LU_CODE	Description	Land Use group for calculating P Load - 2013/14 MA MS4
1	Crop Land	Agriculture
2	Pasture (active)	Agriculture
3	Forest	Forest
4	Wetland	Forest
5	Mining	Industrial
6	Open Land includes inactive pasture	open land
7	Participation Recreation	open land
8	spectator recreation	open land
9	Water Based Recreation	open land
10	Multi-Family Residential	High Density Residential
11	High Density Residential	High Density Residential
12	Medium Density Residential	Medium Density Residential
13	Low Density Residential	Low Density Residential
14	Saltwater Wetland	Water
15	Commercial	Commercial
16	Industrial	Industrial
17	Urban Open	open land
18	Transportation	Highway
19	Waste Disposal	Industrial
20	Water	Water
23	cranberry bog	Agriculture
24	Powerline	open land
25	Saltwater Sandy Beach	open land
26	Golf Course	Agriculture
29	Marina	Commercial
31	Urban Public	Commercial
34	Cemetery	open land
35	Orchard	Forest
36	Nursery	Agriculture
37	Forested Wetland	Forest
38	Very Low Density residential	Low Density Residential
39	Junkyards	Industrial
40	Brush land/Successional	Forest

(1) Method to determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious:

Appendix F Attachment 3

Flow Chart 1 illustrates the steps to determine the design volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area is 100% impervious.



Flow Chart 1: Method to determine BMP design volume to achieve a known phosphorous load reduction when contributing drainage area is 100% impervious.

1) Determine the desired cumulative phosphorus load reduction target (P_{target}) in percentage for the structural BMP;

2) Determine the contributing impervious drainage area (IA) in acres to the structural BMP;

3) Determine the structural BMP type (e.g., infiltration trench, gravel wetland). For infiltration systems, determine the appropriate infiltration rate for the location of the BMP in the Watershed;

4) Using the cumulative phosphorus removal performance curve for the selected structural BMP (Figures 3-1 through 3-18), determine the storage volume for the BMP (BMP-Volume $_{IA\text{-}in}$), in inches of runoff, needed to treat runoff from the contributing IA to achieve the reduction target;

5) Calculate the corresponding BMP storage volume in cubic feet (BMP-Volume $_{IA\text{-}ft^3}$) using BMP-Volume $_{IA\text{-}in}$ determined from step 4 and equation 3-1:

   BMP-Volume $_{IA\text{-}ft^3}$ = IA (acre) x BMP-Volume $_{IA\text{-}in}$ x 3630 ft^3/ac-in **(Equation 3-1)**

6) Provide supporting calculations using the dimensions and specifications of the proposed structural BMP showing that the necessary storage volume, BMP-Volume $_{IA\text{-}ft^3}$, determined from step 5 will be provided to achieve the P_{Target}; and

7) Calculate the cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs\text{-}P}$) for the structural BMP using the BMP Load (as calculated from the procedure in Attachment 1 to Appendix F) and P_{target} by using equation 3-2:

   BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P_{target} /100) **(Equation 3-2)**

Example 3-2 to determine design volume of a structural BMP with a 100% impervious drainage area to achieve a known phosphorus load reduction target:

A permittee is considering a surface infiltration practice to capture and treat runoff from 2.57 acres (1.04 ha) of commercial impervious area that will achieve a 70% reduction in annual phosphorus load. The infiltration practice would be located adjacent to the impervious area. The permittee has measured an infiltration rate (IR) of 0.39 inches per hour (in/hr) in the vicinity of the proposed infiltration practice. Determine the:

A) Design storage volume needed for an surface infiltration practice to achieve a 70% reduction in annual phosphorus load from the contributing drainage area (BMP-Volume $_{IA\text{-}ft^3}$); and
B) Cumulative phosphorus reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{lbs\text{-}P}$)

Solution:

1) Contributing impervious drainages area (IA) = 2.57 acres

BMP type is a surface infiltration practice (i.e., basin) with an infiltration rate (IR) of 0.39 in/hr

Solution continued:

3) Phosphorus load reduction target (P_{target}) = 70%

4) The performance curve for the infiltration basin (i.e., surface infiltration practice), Figure 3-8, IR = 0.27 in/hr is used to determine the design storage volume of the BMP (BMP-Volume $_{IA\text{-}in}$) needed to treat runoff from the contributing IA and achieve a P_{target} = 70%. The curve for an infiltration rate of 0.27 in/hr is chosen because 0.27 in/hr is the nearest simulated IR that is less than the field measured IR of 0.39 in/hr. From Figure 3-8, the BMP-Volume $_{IA\text{-}in}$ for a P_{target} = 70% is 0.36 in.

5) The BMP-Volume $_{IA\text{-}in}$ is converted to cubic feet (BMP-Volume $_{IA\text{-}ft^3}$) using Equation 3-1:

BMP-Volume $_{IA\text{-}ft^3}$ = IA (acre) x BMP-Volume $_{IA\text{-}in}$ x 3,630 ft^3/acre-in
BMP-Volume $_{IA\text{-}ft^3}$ = 2.57 acre x 0.36 in x 3,630 ft^3/acre-in
= **3,359 ft^3**

6) A narrow trapezoidal infiltration basin with the following characteristics is proposed to achieve the P_{Target} of 70%:

Length (ft)	Design Depth (ft)	Side Slopes	Bottom area (ft^2)	Pond surface area (ft^2)	Design Storage Volume (ft^3)
355	1.25	3:1	1,387	4,059	3,404

The volume of the proposed infiltration practice, 3,404 ft^3, exceeds the BMP-Volume $_{IA\text{-}ft^3}$ needed, 3,359 ft^3 and is sufficient to achieve the P Target of 70%.

7) The cumulative phosphorus load reduction in pounds of phosphorus for the infiltration practice (BMP-Reduction $_{lbs\text{-}P}$) is calculated using Equation 3-2. The BMP Load is first determined using the method described above.

BMP Load = IA x impervious cover phosphorus export loading rate for commercial use (see Table 3-1)
= 2.57 acres x 1.78 lbs/acre/yr
= 4.58 lbs/yr

BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P_{target} /100)
BMP-Reduction $_{lbs\text{-}P}$ = 4.58 lbs/yr x (70/100)
= **3.21 lbs/yr**

Alternate Solution: Alternatively, the permittee could determine the design storage volume needed for an IR = 0.39 in/hr by performing interpolation of the results from the surface infiltration performance curves for IR = 0.27 in/hr and IR = 0.52 in/hr as follows (replacing steps 3 and 4 on the previous page):

Alternate solution continued:

Using the performance curves for the infiltration basin (i.e., surface infiltration practice), Figures 3-8, IR = 0.27 in/hr and 3-9, IR = 0.52 in/hr, interpolate between the curves to determine the design storage volume of the BMP (BMP-Volume $_{IA\text{-}in}$) needed to treat runoff from the contributing IA and achieve a P $_{target}$ = 70%.

First calculate the interpolation adjustment factor (IAF) to interpolate between the infiltration basin performance curves for infiltration rates of 0.27 and 0.52 in/hr:

$$IAF = (0.39 - 0.27)/\ (0.52 - 0.27) = 0.48$$

From the two performance curves, develop the following table to estimate the general magnitude of the needed storage volume for an infiltration swale with an IR = 0.39 in/hr and a P $_{target}$ of 70%.

Table Example 3-1-1: Interpolation Table for determining design storage volume of infiltration basin with IR = 0.39 in/hr and a phosphorus load reduction target of 70%

BMP Storage Volume	% Phosphorus Load Reduction IR = 0.27 in/hr ($PR_{IR=0.27}$)	% Phosphorus Load Reduction IR = 0.52 in/hr ($PR_{IR=0.52}$)	Interpolated % Phosphorus Load Reduction IR = 0.39 in/hr ($PR_{IR=0.39}$) **$PR_{IR=0.39}$= IAF($PR_{IR=0.52}$ – $PR_{IR=0.27}$) + $PR_{IR=0.27}$**
0.3	64%	67%	65%
0.4	74%	77%	75%
0.5	79%	82%	80%

As indicated from Table Example 3-1, the BMP-Volume $_{IA\text{-}in}$ for $PR_{IR=0.39}$ of 70% is between 0.3 and 0.4 inches and can be determined by interpolation:

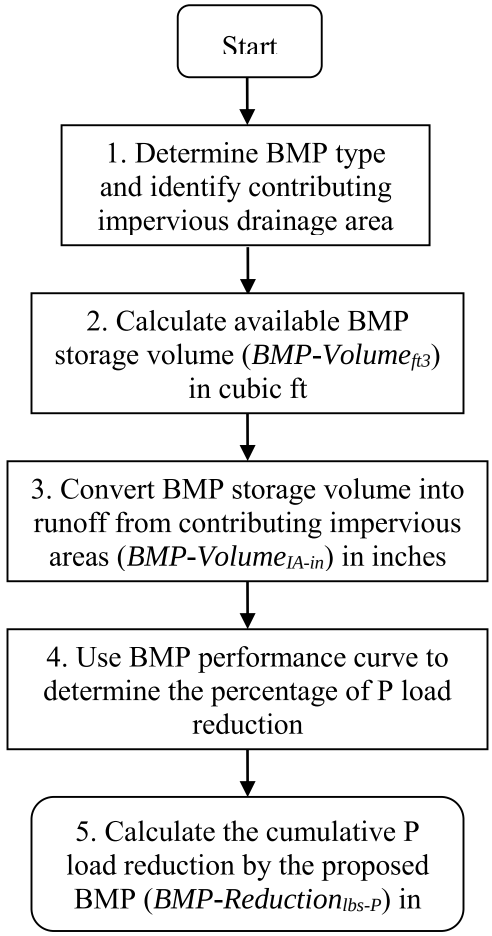
$$\text{BMP-Volume}_{IA\text{-}in} = (70\% - 65\%)/\ (75\% - 65\%) \times (0.4\text{ in} - 0.3\text{ in}) + 0.3\text{ in}$$
$$= 0.35\text{ inches}$$

5 alternative) Convert the resulting BMP-Volume $_{IA\text{-}in}$ to cubic feet (BMP-Volume $_{IA\text{-}ft^3}$) using equation 3-1:

$$\text{BMP-Volume}_{IA\text{-}ft^3} = 2.57\text{ acre} \times 0.35\text{ in} \times 3{,}630\text{ ft}^3/\text{acre-in}$$
$$\mathbf{= 3{,}265\ ft^3}$$

(2) Method to determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area is 100% impervious:

Flow Chart 2 illustrates the steps to determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area is 100% impervious.



Flow Chart 2: Method to determine the phosphorus load reduction for a BMP with a known design volume when contributing drainage area is 100% impervious.

1) Identify the structural BMP type and contributing impervious drainage area (IA);

2) Document the available storage volume (ft^3) of the structural BMP (BMP-Volume $_{ft}{}^3$) using the BMP dimensions and design specifications (e.g., maximum storage depth, filter media porosity);

3) Convert BMP-Volume $_{ft}{}^3$ into inches of runoff from the contributing impervious area (BMP-Volume $_{IA\text{-}in}$) using equation 3-3:

BMP-Volume $_{IA\text{-}in}$ = BMP-Volume $_{ft}{}^3$/ IA (acre) x 12 in/ft x 1 acre/43560 ft^2 **(Equation 3-3)**

4) Determine the % phosphorus load reduction for the structural BMP (BMP Reduction $_{\%\text{-}P}$) using the appropriate BMP performance curve (Figures 3-1 through 3-18) and the BMP-Volume $_{IA\text{-}in}$ calculated in step 3; and

5) Calculate the cumulative phosphorus load reduction in pounds of phosphorus for the structural BMP (BMP Reduction $_{\text{lbs-P}}$) using the BMP Load as calculated from the procedure described above and the percent phosphorus load reduction determined in step 4 by using equation 3-4:

BMP Reduction $_{\text{lbs-P}}$ = BMP Load x (BMP Reduction $_{\text{\%-P}}$/100) **(Equation 3-4)**

Example 3-2: Determine the phosphorus load reduction for a structural BMP with a known storage volume capacity when the contributing drainage area is 100% impervious:

A permittee is considering a bio-filtration system to treat runoff from 1.49 acres of high density residential (HDR) impervious area. Site constraints would limit the bio-filtration system to have a surface area of 1200 ft^2 and the system would have to be located next to the impervious drainage area to be treated. The design parameters for the bio-filtration system are presented in Table Example 3-2-1.

Table Example 3-2-1: Design parameters for bio-filtration system for Example 3-2

Components of representation	Parameters	Value
Ponding	Maximum depth	0.5 ft
	Surface area	1200 ft^2
	Vegetative parameter[a]	85-95%
Soil mix	Depth	2.5 ft
	Porosity	0.40
	Hydraulic conductivity	4 inches/hour
Gravel layer	Depth	0.67 ft
	Porosity	0.40
	Hydraulic conductivity	14 inches/hour
Orifice #1	Diameter	0.5 ft

[a] Refers to the percentage of surface covered with vegetation

Determine the:

A) Percent phosphorus load reduction (BMP Reduction $_{\text{\%-P}}$) for the specified bio-filtration system and contributing impervious drainage area; and

B) Cumulative phosphorus reduction in pounds that would be accomplished by the bio-filtration system (BMP-Reduction $_{\text{lbs-P}}$)

<u>Solution:</u>

1) The BMP is a bio-filtration system that will treat runoff from 1.49 acres of impervious area (IA = 1.49 acre);

2) The available storage volume capacity (ft^3) of the bio-filtraton system (BMP-Volume $_{\text{BMP-ft}^3}$) is determined using the surface area of the system, depth of ponding, and the porosity of the filter media:

BMP-Volume $_{\text{BMP-ft}^3}$ = (surface area x pond maximum depth) + ((soil mix depth + gravel layer depth)/12 in/ft) x surface area x gravel layer porosity)
= (1,200 ft^2 x 0.5 ft) + ((38/12) x 1,200 ft^2 x 0.4)
= 2,120 ft^3

Solution continued:

3) The available storage volume capacity of the bio-filtration system in inches of runoff from the contributing impervious area (BMP-Volume $_{IA\text{-}in}$) is calculated using equation 3-3:

BMP-Volume $_{IA\text{-}in}$ = (BMP-Volume $_{ft}{}^{3}$/ IA (acre) x 12 in/ft x 1 acre/43560 ft^2
BMP-Volume $_{IA\text{-}in}$ = (2120 ft^3/1.49 acre) x 12 in/ft x 1 acre/43560 ft^2
= 0.39 in

4) Using the bio-filtration performance curve shown in Figure 3-13, a **51%** phosphorus load reduction (BMP Reduction %-P) is determined for a bio-filtration system sized for 0.39 in of runoff from 1.49 acres of impervious area; and

5) Calculate the cumulative phosphorus load reduction in pounds of phosphorus for the bio-filtration system (BMP Reduction $_{lbs\text{-}P}$) using the BMP Load as calculated from the procedure described above and the BMP Reduction $_{\%\text{-}P}$ determined in step 4 by using equation 3-4. First, the BMP Load is determined as specified above:

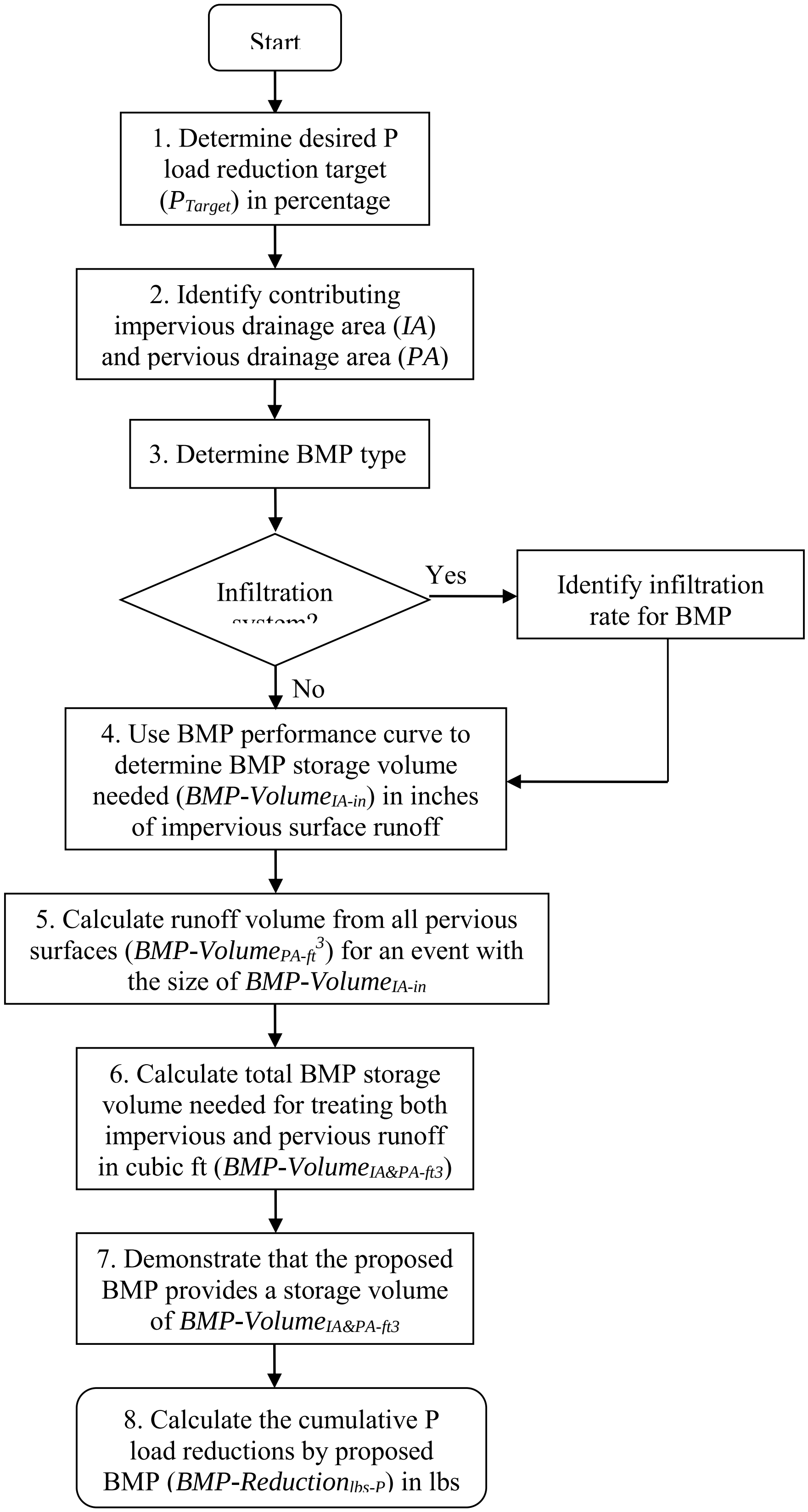
BMP Load = IA x impervious cover phosphorus export loading rate for HDR (see Table 3-1) = 1.49 acres x 2.32 lbs/acre/yr
= 3.46 lbs/yr

BMP Reduction $_{lbs\text{-}P}$ = BMP Load x (BMP Reduction $_{\%\text{-}P}$/100)
BMP Reduction $_{lbs\text{-}P}$ = 3.46 lbs/yr x (51/100)
= **1.76 lbs/yr**

(3) Method to determine the design storage volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces:

Flow Chart 3 illustrates the steps to determine the design storage volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces.

Appendix F Attachment 3



Flow Chart 3: Method to determine the design storage volume of a BMP to reach a known P load reduction when both impervious and pervious drainage areas are present.

1) Determine the desired cumulative phosphorus load reduction target (P_{target}) in percentage for the structural BMP;
2) Characterize the contributing drainage area to the structural BMP by identifying the following information for the impervious and pervious surfaces:
   Impervious area (IA) - Area (acre) and land use (e.g., commercial)

   Pervious area (PA) – Area (acre) and runoff depths based on hydrologic soil group (HSG) and rainfall depth. Table 3-3 provides values of runoff depth from pervious areas for various rainfall depths and HSGs. Soils are assigned to an HSG on the basis of their permeability. HSG A is the most permeable, and HSG D is the least permeable. HSG categories for pervious areas in the drainage area shall be estimated by consulting local soil surveys prepared by the National Resource Conservation Service (NRCS) or by a storm water professional evaluating soil testing results from the drainage area. If the HSG condition is not known, a HSG D soil condition should be assumed.

Table 3- 3: Developed Land Pervious Area Runoff Depths based on Precipitation depth and Hydrological Soil Groups (HSGs)

Developed Land Pervious Area Runoff Depths based on Precipitation depth and Hydrological Soil Groups					
Rainfall Depth, Inches	Runoff Depth, inches				
	Pervious HSG A	Pervious HSG B	Pervious HSG C	Pervious HSG C/D	Pervious HSG D
0.10	0.00	0.00	0.00	0.00	0.00
0.20	0.00	0.00	0.01	0.02	0.02
0.40	0.00	0.00	0.03	0.05	0.06
0.50	0.00	0.01	0.05	0.07	0.09
0.60	0.01	0.02	0.06	0.09	0.11
0.80	0.02	0.03	0.09	0.13	0.16
1.00	0.03	0.04	0.12	0.17	0.21
1.20	0.04	0.05	0.14	0.27	0.39
1.50	0.08	0.11	0.39	0.55	0.72
2.00	0.14	0.22	0.69	0.89	1.08

Notes: Runoff depths derived from combination of volumetric runoff coefficients from Table 5 of *Small Storm Hydrology and Why it is Important for the Design of Stormwater Control Practices*, (Pitt, 1999), and using the Stormwater Management Model (SWMM) in continuous model mode for hourly precipitation data for Boston, MA, 1998-2002.

3) Determine the structural BMP type (e.g., infiltration trench, gravel wetland). For infiltration systems, determine the appropriate infiltration rate for the location of the BMP in the Watershed;
4) Using the cumulative phosphorus removal performance curve for the selected structural BMP, determine the storage volume capacity of the BMP in inches needed to treat runoff from the contributing impervious area (BMP-Volume $_{IA\text{-}in}$);

5) Using Equation 3-5 below and the pervious area runoff depth information from Table 3-3-1, determine the total volume of runoff from the contributing pervious drainage area in cubic feet (BMP Volume $_{PA\text{-}ft^3}$) for a rainfall size equal to the sum of BMP Volume $_{IA\text{-}in}$, determined in step 4. The runoff volume for each distinct pervious area must be determined;

   BMP-Volume $_{PA\ ft^3}$ = $\sum$ (PA x (runoff depth) x 3,630 ft^3/acre-in) $_{(PA1,\dots PAn)}$ **(Equation 3-5)**
6) Using equation 3-6 below, calculate the BMP storage volume in cubic feet (BMP-Volume $_{IA\&PA\text{-}ft^3}$) needed to treat the runoff depth from the contributing impervious (IA) and pervious areas (PA);

   BMP-Volume $_{IA\&PA\text{-}ft^3}$ = BMP Volume $_{PA\text{-}ft^3}$ + (BMP Volume $_{IA\text{-}in}$ x IA (acre) x 3,630 ft^3/acre-in) **(Equation 3-6)**
7) Provide supporting calculations using the dimensions and specifications of the proposed structural BMP showing that the necessary storage volume determined in step 6, BMP-Volume $_{IA\&PA\text{-}ft^3}$, will be provided to achieve the P $_{Target}$; and
8) Calculate the cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs\text{-}P}$) for the structural BMP using the BMP Load (as calculated from the procedure in Attachment 1 to Appendix F) and the P $_{target}$ by using equation 3-2:

BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P $_{target}$ /100) **(Equation 3-2)**

<u>Example 3-3: Determine the design storage volume of a structural BMP to achieve a known phosphorus load reduction target when the contributing drainage area has impervious and pervious surfaces</u>

A permittee is considering a gravel wetland system to treat runoff from a high-density residential (HDR) site. The site is 7.50 acres of which 4.00 acres are impervious surfaces and 3.50 acres are pervious surfaces. The pervious area is made up of 2.5 acres of lawns in good condition surrounding cluster housing units and 1.00 acre of stable unmanaged woodland. Soils information indicates that all of the woodland and 0.50 acres of the lawn is hydrologic soil group (HSG) B and the other 2.00 acres of lawn are HSG C. The permittee wants to size the gravel wetland system to achieve a cumulative phosphorus load reduction (P $_{Target}$) of 55% from the entire 7.50 acres.

Determine the:

A) Design storage volume needed for a gravel wetland system to achieve a 55% reduction in annual phosphorus load from the contributing drainage area (BMP-Volume $_{IA\&PA\text{-}ft^3}$); and
B) Cumulative phosphorus reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{lbs\text{-}P}$)

Example 3-3 continued:
Solution:
1) The BMP type is gravel wetland system.

2) The phosphorus load reduction target (P_{Target}) = 55%.

3) Using the cumulative phosphorus removal performance curve for the gravel wetland system shown in Figure 3-14, the storage volume capacity in inches needed to treat runoff from the contributing impervious area (BMP Volume $_{IA\text{-}in}$) is 0.71 in;

Using equation 3-5 and the pervious runoff depth information from Table 3-3, the volume of runoff from the contributing pervious drainage area in cubic feet (BMP Volume $_{PA - ft^3}$) for a rainfall size equal to 0.71 in is summarized in Table Example 3-3-A. As indicated from Table 3-3, the runoff depth for a rainfall size equal to 0.71 inches is between 0.6 and 0.8 inches and can be determined by interpolation (example shown for runoff depth of HSG C):

$$\text{Runoff depth (HSG C)} = (0.71 - 0.6)/(0.8 - 0.6) \times (0.09 \text{ in} - 0.06 \text{ in}) + 0.06 \text{ in} = 0.07 \text{ inches}$$

Table Example 3-3-A: Runoff contributions from pervious areas for HDR site

ID	Type	Pervious Area (acre)	HSG	Runoff (in)	Runoff = (runoff) x PA (acre-in)	Runoff = Runoff (acre-in) x 3630 ft^3/acre-in (ft^3)
PA1	Grass	2.00	C	0.07	0.14	508
PA2	Grass	0.50	B	0.01	0.0	0.0
PA3	Woods	1.00	B	0.01	0.0	0.0
Total	-----	**3.50**	-----	-----	**0.14**	**508**

4) Using equation 3-6, determine the BMP storage volume in cubic feet (BMP-Volume $_{IA\&PA\text{-}ft^3}$) needed to treat 0.71 inches of runoff from the contributing impervious area (IA) and the runoff of 0.14 acre-in from the contributing pervious areas, determined in step 5 is:

$$\text{BMP Volume}_{IA\&PA\text{-}ft^3} = \text{BMP Volume}_{PA\ ac\text{-}in} + (\text{BMP Volume}_{IA\text{-}in} \times \text{IA (acre)}) \times 3{,}630\ ft^3/\text{acre-in})$$

$$\text{BMP Volume}_{IA\&PA\text{-}ft^3} = (508\ ft^3 + (0.71 \text{ in} \times 4.00 \text{ acre})) \times 3{,}630\ ft^3/\text{acre-in} = 10{,}817\ ft^3$$

5) Table Example 3-3-B provides design details for of a potential gravel wetland system

Solution continued:

Table Example 3-3-B: Design details for gravel wetland system

Gravel Wetland System Components	Design Detail	Depth (ft)	Surface Area (ft^2)	Volume (ft^3)
Sediment Forebay	**10% of Treatment Volume**			
Pond area	----	1.33	896	1,192
Wetland Cell #1	**45% of Treatment Volume**	---------------	-------------------	---------------
Pond area	----	2.00	1,914	3,828
Gravel layer	porosity = 0.4	2.00	1,914	1,531
Wetland Cell #2	**45% of Treatment Volume**	---------------	------------------	---------------
Pond area	----	2.00	1,914	3,828
Gravel layer	porosity = 0.4	2.00	1,914	1,531

The total design storage volume for the proposed gravel wetland system identified in Table Example 3-3-C is 11,910 ft^3. This volume is greater than 11,834 ft^3 ((BMP-Volume $_{IA\&PA\text{-}ft^3}$), calculated in step 6) and is therefore sufficient to achieve a P $_{Target}$ of 55%.

6) The cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs\text{-}P}$) for the proposed gravel wetland system is calculated by using equation 3-2 with the BMP Load and the P $_{target}$ = 55%.

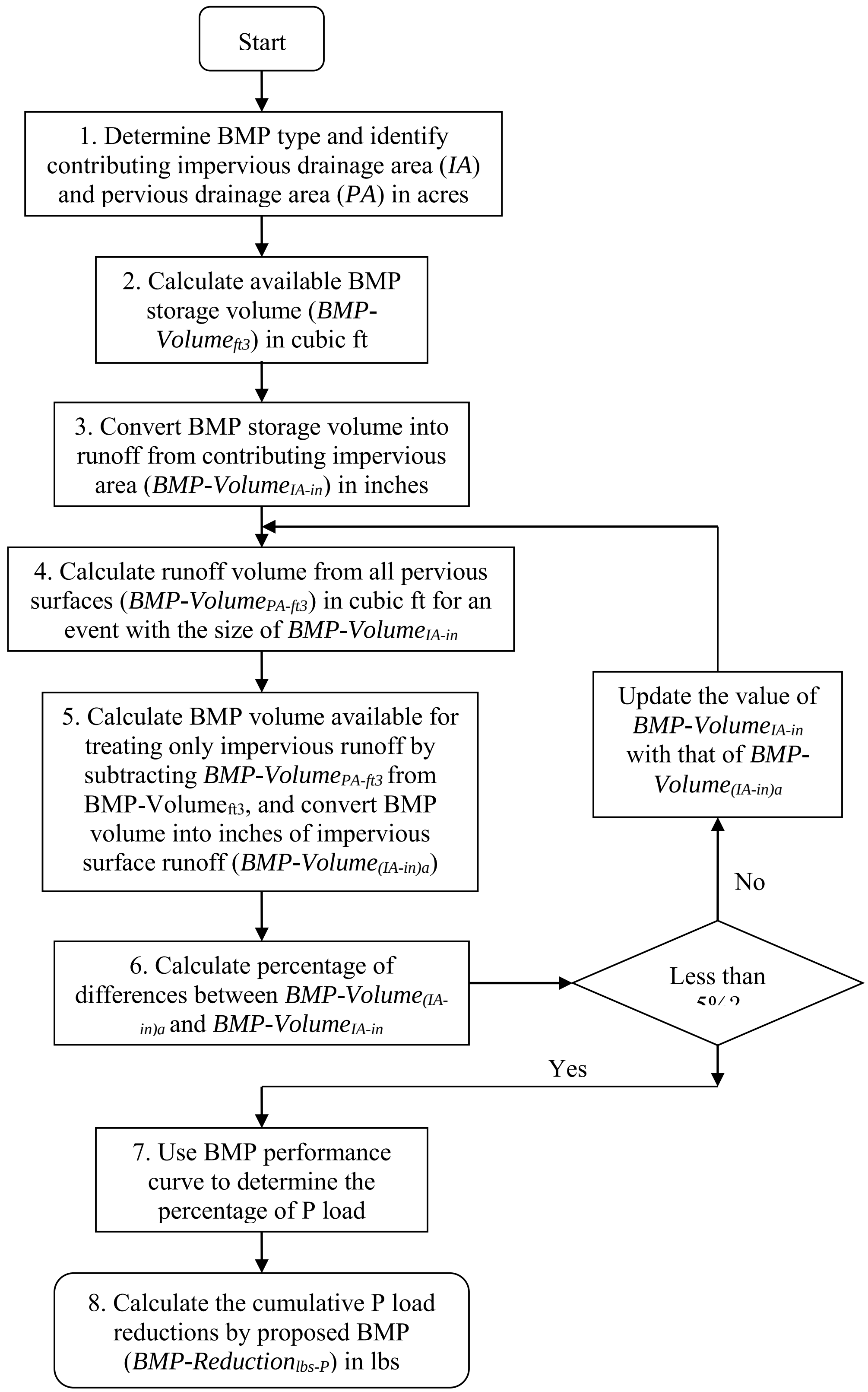
BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P $_{target}$ /100) (**Equation 3-2**)

Using Table 3-1, the BMP Load is calculated:
BMP Load = (IA x PLER $_{HDR}$) + (PA lawn $_{HSG\ B}$ x PLER $_{HSG\ B}$) + (PA lawn $_{HSG\ C}$ x PLER $_{HSG\ C}$) +(PA forest x PA PLER $_{For}$)
= (4.00 acre x 2.32 lbs/acre/yr) + (0.50 acres x 0.12 lbs/acre/yr) + (1.00 acre x 0.21 lbs/acre/yr) + (1.00 acres x 0.13)
= 9.68 lbs/yr
BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P $_{target}$ /100)
BMP-Reduction $_{lbs\text{-}P}$ = 9.68 lbs/yr x 55/100
= **5.32 lbs/yr**

<u>(4) Method to determine the phosphorus load reduction for a structural BMP with a known storage volume when the contributing drainage area has impervious and pervious surfaces:</u>

Flow Chart 4 illustrates the steps to determine the phosphorus load reduction for a structural BMP with a known storage volume when the contributing drainage area has impervious and pervious surfaces.

Appendix F Attachment 3



Flow Chart 4: Method to determine the phosphorus load reduction for a BMP with known storage volume when both pervious and impervious drainage areas are present.

1) Identify the type of structural BMP and characterize the contributing drainage area to the structural BMP by identifying the following information for the impervious and pervious surfaces:

Impervious area (IA) – Area (acre) and land use (e.g., commercial)

Pervious area (PA) – Area (acre) and runoff depth based on hydrologic soil group (HSG) and size of rainfall event. Table 3-3 provides values of runoff depth for various rainfall depths and HSGs. Soils are assigned to an HSG based on their permeability. HSG categories for pervious areas in the Watershed shall be estimated by consulting local soil surveys prepared by the National Resource Conservation Service (NRCS) or by a storm water professional evaluating soil testing results from the Watershed. If the HSG condition is not known, a HSG C/D soil condition should be assumed.

2) Determine the available storage volume (ft^3) of the structural BMP (BMP-Volume $_{ft^3}$) using the BMP dimensions and design specifications (e.g., maximum storage depth, filter media porosity);

3) To estimate the phosphorus load reduction of a BMP with a known storage volume capacity, it is first necessary to determine the portion of available BMP storage capacity (BMP-Volume $_{ft^3}$) that would treat the runoff volume generated from the contributing impervious area (IA) for a rainfall event with a depth of *i* inches (in). This will require knowing the corresponding amount of runoff volume that would be generated from the contributing pervious area (PA) for the same rainfall event (depth of *i* inches). Using equation 3-6a below, solve for the BMP capacity that would be available to treat runoff from the contributing imperious area for the unknown rainfall depth of *i* inches (see equation 3-6b):

$$\text{BMP-Volume}_{ft^3} = \text{BMP-Volume}_{(IA\text{-}ft^3)i} + \text{BMP-Volume}_{(PA\text{-}ft^3)i} \qquad \textbf{(Equation 3-6a)}$$

Where:

BMP-Volume $_{ft^3}$= the available storage volume of the BMP;

BMP-Volume $_{(IA\text{-}ft^3)i}$ = the available storage volume of the BMP that would fully treat runoff generated from the contributing impervious area for a rainfall event of size *i* inches; and

BMP-Volume $_{(PA\text{-}ft^3)i}$ = the available storage volume of the BMP that would fully treat runoff generated from the contributing pervious area for a rainfall event of size *i* inches

Solving for BMP-Volume $_{(IA\text{-}ft^3)i}$:

BMP-Volume $_{(IA\text{-}ft^3)i}$ = BMP-Volume $_{ft^3}$ - BMP-Volume $_{(PA\text{-}ft^3)i}$ **(Equation 3-6b)**

To determine BMP-Volume $_{(IA\text{-}ft^3)i}$, requires performing an iterative process of refining estimates of the rainfall depth used to calculate runoff volumes until the rainfall depth used results in the sum of runoff volumes from the contributing IA and PA equaling the available BMP storage capacity (BMP-Volume $_{ft^3}$). For the purpose of estimating BMP performance, it will be considered adequate when the IA runoff depth (in) is within 5% IA runoff depth used in the previous iteration.

For the first iteration (1), convert the BMP-Volume $_{ft^3}$ determined in step 2 into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)1}$) using equation 3-7a.

BMP-Volume $_{(IA\text{-}in)1}$ = (BMP-Volume$_{ft^3}$/ IA (acre)) x (12 in/ft /43,560 ft^2/acre) **(Equation 3-7a)**;

For iterations 2 through n (2…n), convert the BMP Volume $_{(IA\text{-}ft^3)2\ldots n}$, determined in step 5a below, into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)2\ldots n}$) using equation 3-7b.

BMP-Volume $_{(IA\text{-}in)2\ldots n}$ = (BMP-Volume $_{(IA\text{-}ft^3)2\ldots n}$ / IA (acre)) x (12 in/ft /43,560 ft^2/acre) **(Equation 3-7b)**;

4) For 1 to n iterations, use the pervious runoff depth information from Table 3-3 and equation 3-8 to determine the total volume of runoff (ft^3) from the contributing PA (BMP Volume $_{PA\text{-}ft^3}$) for a rainfall size equal to the sum of BMP-Volume $_{(IA\text{-}in)1}$, determined in step 3. The runoff volume for each distinct pervious area must be determined.

BMP Volume $_{(PA\text{-}ft^3)1\ldots n}$ = ∑ ((PA x (runoff depth$_{)\,(PA1,\,PA2..PAn)}$ x (3,630 ft^3/acre-in) **(Equation 3-8)**

5) For iteration 1, estimate the portion of BMP Volume that is available to treat runoff from only the IA by subtracting BMP-Volume $_{PA\text{-}ft^3}$, determined in step 4, from BMP-Volume $_{ft^3}$, determined in step 2, and convert to inches of runoff from IA (see equations 3-9a and 3-9b):

BMP-Volume $_{(IA\text{-}ft^3)2}$ = ((BMP-Volume$_{ft^3}$- BMP Volume $_{(PA\text{-}ft^3)1}$) **(Equation 3-9a)**

BMP-Volume $_{(IA\text{-}in)2}$ = (BMP-Volume $_{(IA\text{-}ft^3)2}$/IA (acre)) x (12 in/ft x 1 acre/43,560 ft^2) **(Equation 3-9b)**

If additional iterations (i.e., 2 through n) are needed, estimate the portion of BMP volume that is available to treat runoff from only the IA (BMP-Volume $_{(IA\text{-}in)3..n+1}$) by subtracting BMP Volume $_{(PA\text{-}ft^3)2..n}$, determined in step 4, from BMP Volume $_{(IA\text{-}ft^3)3..n+1}$, determined in step 5, and by converting to inches of runoff from IA using equation 3-9b):

6) For iteration a (an iteration between 1 and n+1), compare BMP Volume $_{(IA\text{-}in)a}$ to BMP Volume $_{(IA\text{-}in)a\text{-}1}$ determined from the previous iteration (a-1). If the difference in these values is greater than 5% of BMP Volume $_{(IA\text{-}in)a}$ then repeat steps 4 and 5, using BMP Volume $_{(IA\text{-}in)a}$ as the new starting value for the next iteration (a+1). If the difference is less than or equal to 5 % of BMP Volume $_{(IA\text{-}in)a}$ then the permittee may proceed to step 7;

7) Determine the % phosphorus load reduction for the structural BMP (BMP Reduction $_{\%\text{-}P}$) using the appropriate BMP performance curve and the BMP-Volume $_{(IA\text{-}in)n}$ calculated in the final iteration of step 5; and

8) Calculate the cumulative phosphorus load reduction in pounds of phosphorus for the structural BMP (BMP Reduction $_{lbs\text{-}P}$) using the BMP Load as calculated from the procedure in Attachment 1 to Appendix F and the percent phosphorus load reduction (BMP Reduction $_{\%\text{-}P}$) determined in step 7 by using equation 3-4:

BMP Reduction $_{lbs\text{-}P}$ = BMP Load x (BMP Reduction $_{\%\text{-}P}$/100) **(Equation 3-4)**

Example 3-4: Determine the phosphorus load reduction for a structural BMP with a known design volume when the contributing drainage area has impervious and pervious surfaces

A permittee is considering an infiltration basin to capture and treat runoff from a portion of the medium density residential area (MDR). The contributing drainage area is 16.55 acres and has 11.75 acres of impervious area and 4.8 acres of pervious area (PA) made up mostly of lawns and landscaped areas that is 80% HSG D and 20% HSG C. An infiltration basin with the following specifications can be placed at the down-gradient end of the contributing drainage area where soil testing results indicates an infiltration rate (IR) of 0.28 in/hr:

Table Example 3-4-A: Infiltration basin characteristics

Structure	Bottom area (acre)	Top surface area (acre)	Maximum pond depth (ft)	Design storage volume (ft^3)	Infiltration Rate (in/hr)
Infiltration basin	0.65	0.69	1.65	48,155	0.28

Determine the:

A) Percent phosphorus load reduction (BMP Reduction $_{\%\text{-}P}$) for the specified infiltration basin and the contributing impervious and pervious drainage area; and

B) Cumulative phosphorus reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{lbs\text{-}P}$)

Example continued:

Solution:

1) A surface infiltration basin is being considered. Information for the contributing impervious (IA) and pervious (PA) areas are summarized in Tables Example 3-4-A and Example 3-4-B, respectively.

Table Example 3-4-B: Impervious area characteristics

ID	Land use	Area (acre)
IA1	MDR	11.75

Table Example 3-4-C: Pervious area characteristics

ID	Area (acre)	Hydrologic Soil Group (HSG)
PA1	3.84	D
PA2	0.96	C

2) The available storage volume (ft^3) of the infiltration basin (BMP-Volume $_{ft}{}^3$) is determined from the design details and basin dimensions; BMP-Volume $_{ft}{}^3$ = 48,155 ft^3.

3) To determine what the BMP design storage volume is in terms of runoff depth (in) from IA, an iterative process is undertaken:

Solution Iteration 1

For the first iteration (1), the BMP-Volume$_{ft}{}^3$ is converted into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)1}$) using equation 3-5a.

BMP Volume $_{(IA\text{-}in)1}$ = (48,155 ft^2/ 11.75 acre) x (12 in/ft /43,560 ft^2/acre)
= 1.13 in

4-1) The total volume of runoff (ft^3) from the contributing PA (BMP Volume $_{PA\text{-}ft}{}^3$) for a rainfall size equal to the sum of BMP Volume $_{(IA\text{-}in)1}$ determined in step 3 is determined for each distinct pervious area identified in Table Example 3-4-B using the information from Table 3-3 and equation 3-5. Interpolation was used to determine runoff depths.

BMP Volume $_{(PA\text{-}ft^3)1}$ = ((3.84 acre x (0.33 in) + (0.96 acre x (0.13 in)) x 3,630 ft^3/acre-in
= 5052 ft^3

5-1) For iteration 1, the portion of BMP Volume that is available to treat runoff from only the IA is estimated by subtracting the BMP Volume $_{(PA\text{-}ft^3)1}$, determined in step 4-1, from BMP Volume$_{ft}{}^3$, determined in step 2, and converted to inches of runoff from IA:

BMP Volume $_{(IA\text{-}ft^3)\,2}$ = 48,155 ft^3 – 5052 ft^3
= 43,103 ft^3

BMP Volume $_{(IA\text{-}in)\,2}$ = (43,103 ft^3/11.75 acre) x (12 in/ft x 1 acre/43,560 ft^2)
= 1.01 in

Solution continued:

6-1) The % difference between BMP Volume $_{(IA\text{-}in)\,2}$, 1.01 in, and BMP Volume $_{(IA\text{-}in)1}$, 1.13 in is determined and found to be significantly greater than 5%:

% Difference = ((1.13 in – 1.01 in)/1.01 in) x 100
= 12%

Therefore, steps 4 through 6 are repeated starting with BMP Volume $_{(IA\text{-}in)\,2}$ = 1.01 in.

Solution Iteration 2

4-2) BMP-Volume $_{(PA\text{-}ft^3)2}$ = ((3.84 acre x 0.21 in) + (0.96 acre x 0.12 in)) x 3,630 ft^3/acre-in
= 3,358 ft^3

5-2) BMP-Volume $_{(IA\text{-}ft^3)\,3}$ = 48,155 ft^3 – 3,358 ft^3
= 44,797 ft^3

BMP-Volume $_{(IA\text{-}in)\,3}$ = (44,797 ft^3/11.75 acre) x (12 in/ft x 1 acre/43,560 ft^2)
= 1.05 in

6-2) % Difference = ((1.05 in – 1.01 in)/1.05 in) x 100
= 4%

The difference of 4% is acceptable.

7) The % phosphorus load reduction for the infiltration basin (BMP Reduction $_{\%\text{-}P}$) is determined by using the infiltration basin performance curve for an infiltration rate of 0.27 in/hr and the treatment volume (BMP-Volume $_{Net\ IA\text{-}in}$ = 1.05 in) calculated in step 5-2 and is **BMP Reduction $_{\%\text{-}P}$ = 93%**.

The performance curve for IR = 0.27 is used rather than interpolating between the performance curves for IR = 0.27 in/hr and 0.52 in/hr to estimate performance for IR = 0.28 in/hr. An evaluation of the performance curves for IR = 0.27 in/hr and IR = 0.52 in/hr for a design storage volume of 1.05 in indicate a small difference in estimated performance (BMP Reduction $_{\%\text{-}P}$ = 93% for IR = 0.27 in/hr and BMP Reduction $_{\%\text{-}P}$ = 95% for IR = 0.52 in/hr).

8) The cumulative phosphorus load reduction in pounds of phosphorus (BMP-Reduction $_{lbs\text{-}P}$) for the proposed infiltration basin is calculated by using equation 3-2 with the BMP Load and the P $_{target}$ of 93%.

BMP-Reduction $_{lbs\text{-}P}$ = BMP Load x (P $_{target}$ /100) **(Equation 3-2)**

Using Table 3-1, the BMP load is calculated:

BMP Load = (IA x impervious cover phosphorus export loading rate for industrial)
+ (PA $_{HSG\ D}$ x pervious cover phosphorus export loading rate for HSG D)
+ (PA $_{HSG\ C}$ x pervious cover phosphorus export loading rate for HSG C)

Solution continued:

= (11.75 acre x 1.96 lbs/acre/yr) + (3.84 acre x 0.37 lbs/acre/yr)
+ (0.96 acre x 0.21 lbs/acre/yr)
= 24.65 lbs/yr

BMP-Reduction $_{lbs-P}$ = 24.22 lbs/yr x 93/100 = **22.93 lbs/yr**

Example 3-5: Determine the phosphorus load reduction for disconnecting impervious area using storage with delayed release.

A commercial operation has an opportunity to divert runoff from 0.75 acres of impervious roof top to a 5000 gallon (668.4 ft^3) storage tank for temporary storage and subsequent release to 0.09 acres of pervious area (PA) with HSG C soils.
Determine the:

A) Percent phosphorus load reduction rates (BMP Reduction $_{\%-P}$) for the specified impervious area (IA) disconnection and storage system assuming release times of 1, 2 and 3 days for the stored volumes to discharge to the pervious area; and
B) Cumulative phosphorus reductions in pounds that would be accomplished by the system (BMP-Reduction $_{lbs-P}$) for the three storage release times, 1, 2 and 3 days.

Solution:

1. Determine the storage volume in units of inches of runoff depth from contributing impervious area:
   Storage Volume $_{IA-in}$ = (668.4 ft^3/(0.75 acre x 43.560 ft^2/acre)) x 12 inch/ft
   = 0.25 inches

2. Determine the ratio of the contributing impervious area to the receiving pervious area:
   IA:PA = 0.75 acres/0.09 acres
   = 8.3
3. Using Table 3-21 for a IA:PA ratio of 8:1, determine the phosphorus load reduction rates for a storage volume of 0.25 inches that discharges to HSG C with release rates of 1, 2 and 3 days: Using interpolation the reduction rates are shown in Table 3-5-A:

Table Example 3-5-A: Reduction Rates

Percent Phosphorus load reduction for IA disconnection with storage HSG C			
Storage Volume $_{IA-in}$	Storage release rate, days		
	1	2	3
0.25	39%	42%	43%

4. The cumulative phosphorus load reduction in pounds of phosphorus for the IA disconnection with storage (BMP-Reduction $_{lbs-P}$) is calculated using Equation 3-2. The BMP Load is first determined using the method described above.

Solution continued:

BMP Load = IA x phosphorus export loading rate for commercial IA (see Table 3-1)
= 0.75 acres x 1.78 lbs/acre/yr
= 1.34 lbs/yr

BMP Reduction $_{\text{lbs-P}}$ = BMP Load x (BMP Reduction $_{\text{\%-P}}$/100)

BMP Reduction $_{\text{lbs-P}}$ = 1.34 lbs/yr x (39/100)
= **0.53 lbs/yr**

Table Example 3-5-B presents the BMP Reduction $_{\text{lbs-P}}$ for each of the release rates:

Table Example 3-5-B: Reduction Load

Phosphorus load reduction for IA disconnection with storage HSG C, lbs			
Storage Volume $_{\text{IA-in}}$	Storage release rate, days		
	1	2	3
0.25	0.53	0.56	0.58

Example 3-6: Determine the phosphorus load reduction for disconnecting impervious area with and without soil augmentation in the receiving pervious area.

The same commercial property as in example 3-5 wants to evaluate disconnecting drainage from the 0.75 acre impervious roof top and discharging it directly to 0.09 acres of pervious area (PA) with HSG C. Also, the property has the opportunity to purchase a small adjoining area (0.06 acres), also HSG C,to increase the size of the receiving PA from 0.09 to 0.15 acres and to allow the property owner to avoid having to install a drainage structure to capture overflow runoff from the PA. The property owner has been informed that the existing PA soil can be tilled and augmented with soil amendments to support denser vegetative growth and improve hydrologic function to approximate HSG B.

Determine the:

A) Percent phosphorus load reduction rates (BMP Reduction $_{\text{\%-P}}$) for the specified impervious area (IA) disconnection to both the 0.09 and 0.15 acre receiving PAs with and without soil augmentation; and
B) Cumulative phosphorus reductions in pounds that would be accomplished by the IA disconnection for the various scenarios (BMP-Reduction $_{\text{lbs-P}}$).

Solution:

1. Determine the ratio of the contributing impervious area to the receiving pervious area:

IA:PA = 0.75 acres/0.09 acres
= 8.3

IA:PA = 0.75 acres/0.15 acres
= 5.0

Solution Continued:

2. Using Table 3-26 and Figure 3-40 for a IA:PA ratios of 8:1 and 5:1, respectively, determine the phosphorus load reduction rates for IA disconnections to HSG C and HSG B:

Table Example 3-6-A: Reduction Rates

Percent Phosphorus load reduction rates for IA disconnection		
Receiving PA	**IA:PA**	
	8:1	5:1
HSG C	7%	14%
HSG B (soil augmentation)	14%	22%

3. The cumulative phosphorus load reduction in pounds of phosphorus for the IA disconnection with storage (BMP-Reduction $_{\text{lbs-P}}$) is calculated using Equation 3-2. The BMP Load was calculated in example 3-5 and is 1.34 lbs/yr.

   BMP Reduction $_{\text{lbs-P}}$ = BMP Load x (BMP Reduction $_{\text{\%-P}}$/100)
   For PA of 0.09 acres HSG C the BMP Reduction $_{\text{lbs-P}}$ is calculated as follows:
   BMP Reduction $_{\text{lbs-P(0.09ac- HSG C)}}$ = 1.34 lbs/yr x (7/100)
   = **0.09 lbs/yr**
   Table Example 3-6-B presents the BMP Reduction $_{\text{lbs-P}}$ for each of the scenarios:

Table Example 3-6-B: Reduction

Pounds Phosphorus load reduction for IA disconnection, lbs/yr		
Receiving PA	**Area of Receiving PA, acres**	
	0.09	**0.15**
HSG C	0.09	0.19
HSG B (soil augmentation)	0.19	0.29

Example 3-7: Determine the phosphorus load reduction for converting impervious area to permeable/pervious area.

A municipality is planning upcoming road reconstruction work in medium density residential (MDR) neighborhoods and has identified an opportunity to convert impervious surfaces to permeable/pervious surfaces by narrowing the road width of 3.7 miles (mi) of roadway from 32 feet (ft) to 28 ft and eliminating 3.2 miles of 4 ft wide paved sidewalk (currently there are sidewalks on both sides of the roadways targeted for restoration). The newly created permeable/pervious area will be tilled and treated with soil amendments to support vegetated growth in order to restore hydrologic function to at least HSG B.

Determine the:

A) Percent phosphorus load reduction rate (BMP Reduction $_{\%\text{-P}}$) for the conversion of impervious area (IA) to permeable/pervious area (PA); and
B) Cumulative phosphorus reduction in pounds that would be accomplished by the project (BMP-Reduction $_{\text{lbs-P}}$).

Solution:

1. Determine the area of IA to be converted to PA:

   New PA = (((3.7 mi x 4 ft) + (3.2 mi x 4 ft)) x 5280 ft/mi)/43,560 ft^2/acre
   = 3.35 acres

2. Using Table 3-27, the phosphorus load reduction rate for converting IA to HSG B is 94.1%
3. The BMP Load is first determined using the method described above.

   BMP Load = IA x phosphorus export loading rate for MDR IA (see Table 3-1)
   = 3.35 acres x 1.96 lbs/acre/yr
   = 6.57 lbs/yr

4. The cumulative phosphorus load reduction in pounds of phosphorus for the IA conversion (BMP-Reduction $_{\text{lbs-P}}$) is calculated using Equation 3-2.

   BMP Reduction $_{\text{lbs-P}}$ = BMP Load x (BMP Reduction $_{\%\text{-P}}$/100)
   BMP Reduction $_{\text{lbs-P}}$ = 6.57 lbs/yr x (94.1/100)
   = 6.18 lbs/yr

Table 3- 4: Infiltration Trench (IR = 0.17 in/hr) BMP Performance Table

Infiltration Trench (IR = 0.17 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	14.7%	27.6%	48.6%	64.1%	74.9%	82.0%	91.6%	95.4%
Cumulative Phosphorus Load Reduction	18%	33%	57%	73%	83%	90%	97%	99%

Figure 3- 1: BMP Performance Curve: Infiltration Trench (infiltration rate = 0.17 in/hr)

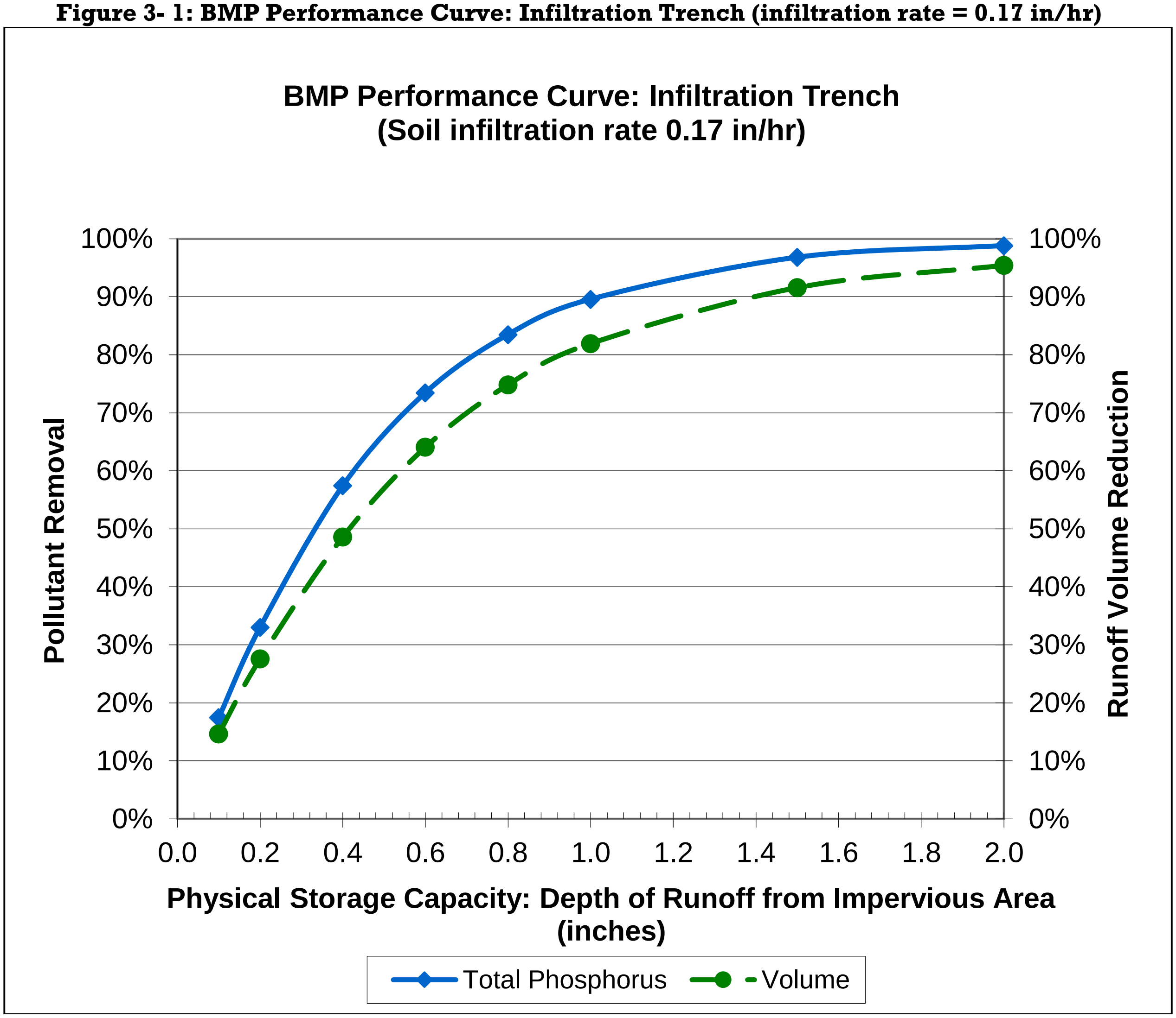


Table 3- 5: Infiltration Trench (IR = 0.27 in/hr) BMP Performance Table

Infiltration Trench (IR = 0.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	17.8%	32.5%	55.0%	70.0%	79.3%	85.2%	93.3%	96.3%
Cumulative Phosphorus Load Reduction	20%	37%	63%	78%	86%	92%	97%	99%

Figure 3- 2: BMP Performance Curve: Infiltration Trench (infiltration rate = 0.27 in/hr)

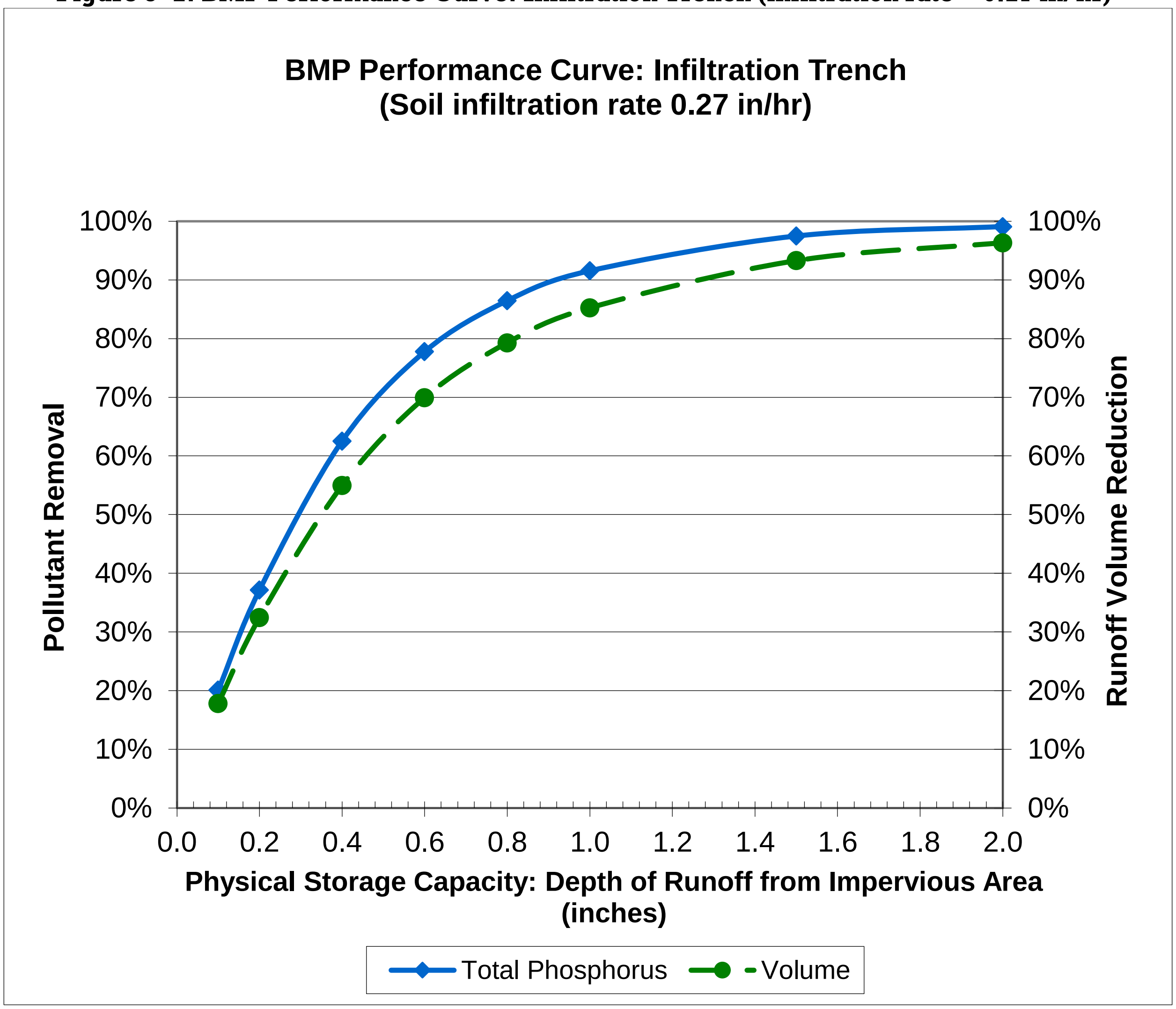


Table 3- 6: Infiltration Trench (IR = 0.52 in/hr) BMP Performance Table

Infiltration Trench (IR = 0.52 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	22.0%	38.5%	61.8%	75.7%	83.7%	88.8%	95.0%	97.2%
Cumulative Phosphorus Load Reduction	23%	42%	68%	82%	89%	94%	98%	99%

Figure 3- 3: BMP Performance Curve: Infiltration Trench (infiltration rate = 0.52 in/hr)

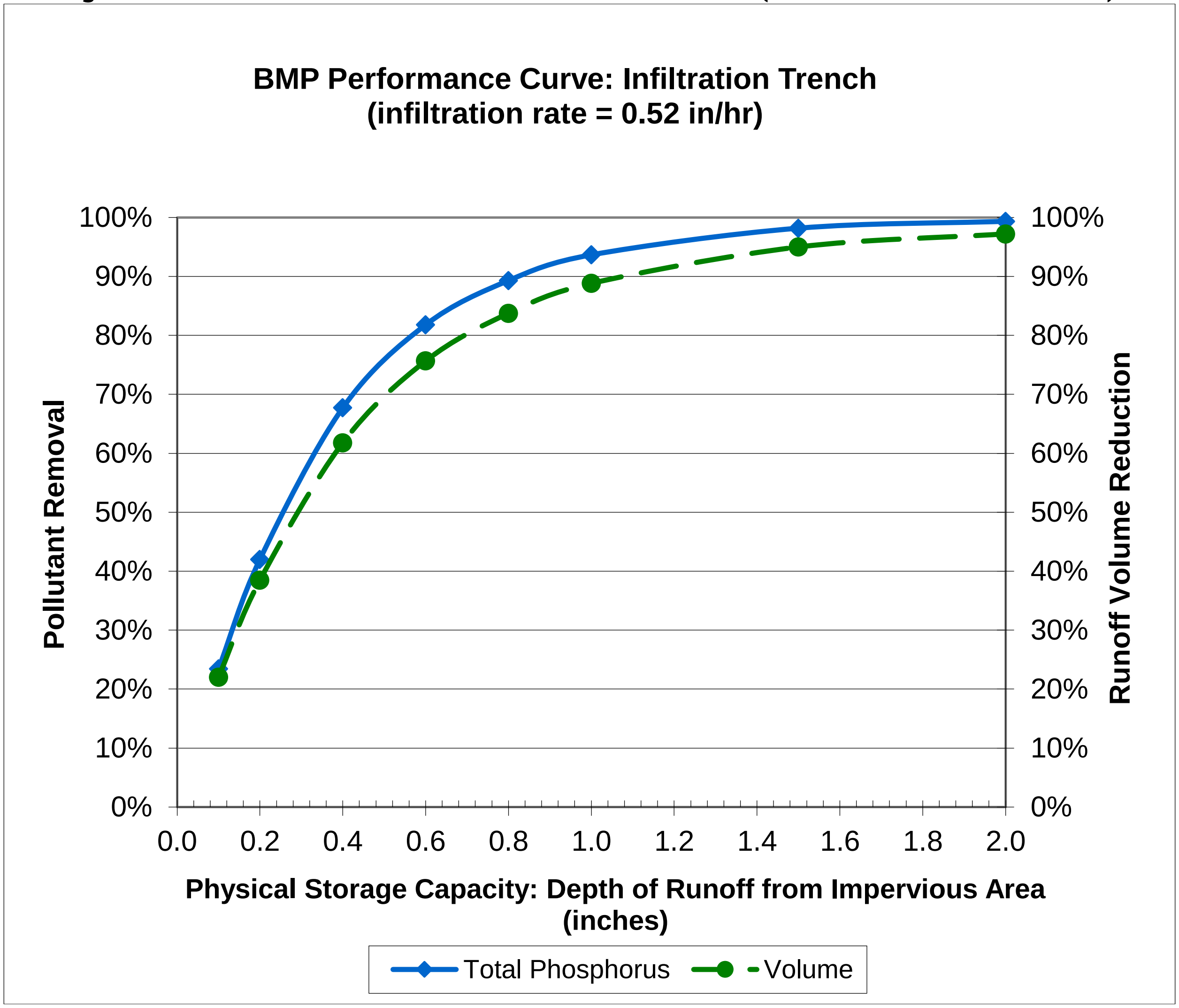


Table 3- 7: Infiltration Trench (IR = 1.02 in/hr) BMP Performance Table

Infiltration Trench (IR = 1.02 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	26.3%	44.6%	68.2%	81.0%	88.0%	92.1%	96.5%	98.3%
Cumulative Phosphorus Load Reduction	27%	47%	73%	86%	92%	96%	99%	100%

Figure 3- 4: BMP Performance Curve: Infiltration Trench (infiltration rate = 1.02 in/hr)

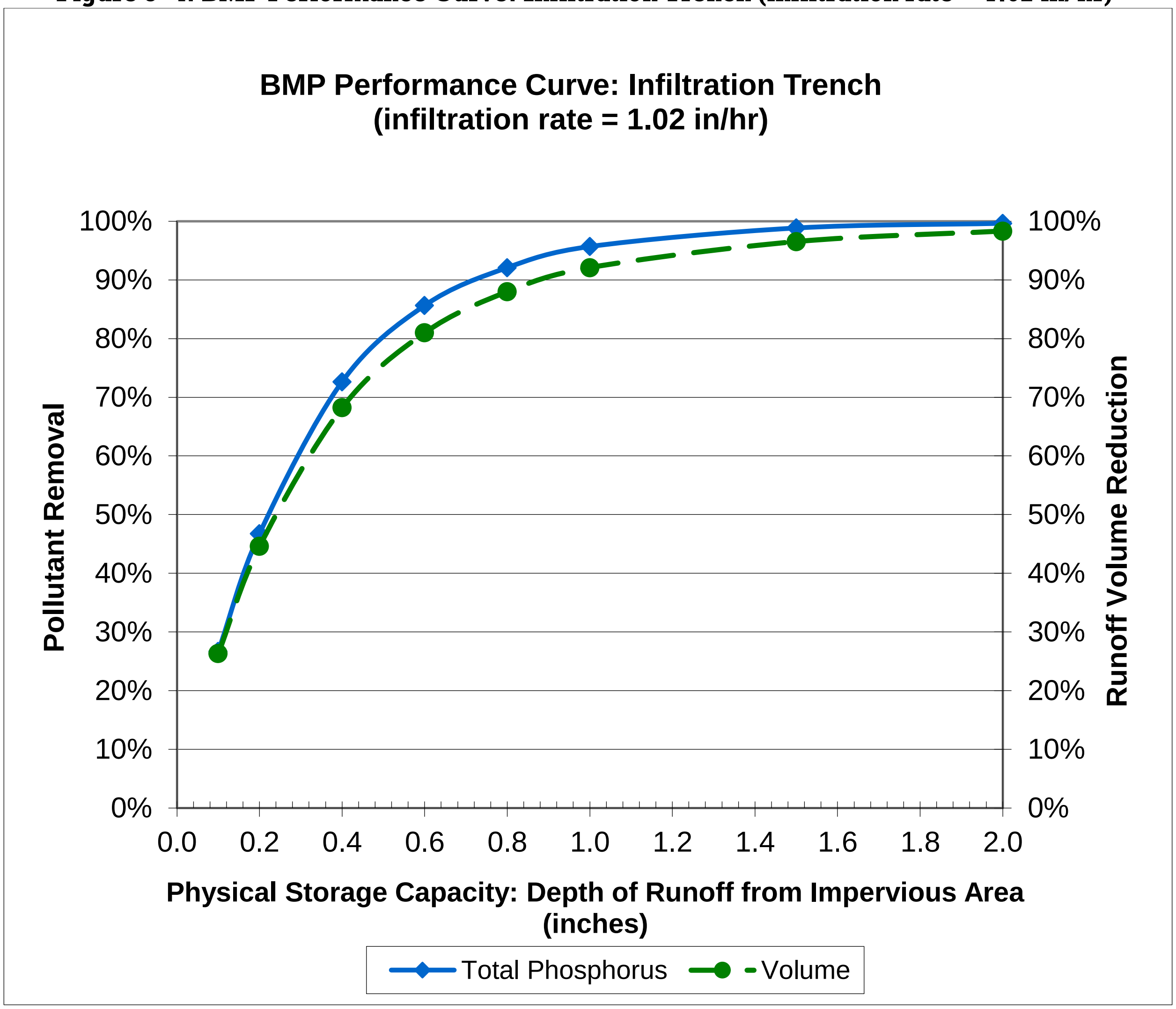


Table 3- 8: Infiltration Trench (IR = 2.41 in/hr) BMP Performance Table

Infiltration Trench (IR = 2.41 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	34.0%	54.7%	78.3%	88.4%	93.4%	96.0%	98.8%	99.8%
Cumulative Phosphorus Load Reduction	33%	55%	81%	91%	96%	98%	100%	100%

Figure 3- 5: BMP Performance Curve: Infiltration Trench (infiltration rate = 2.41 in/hr)

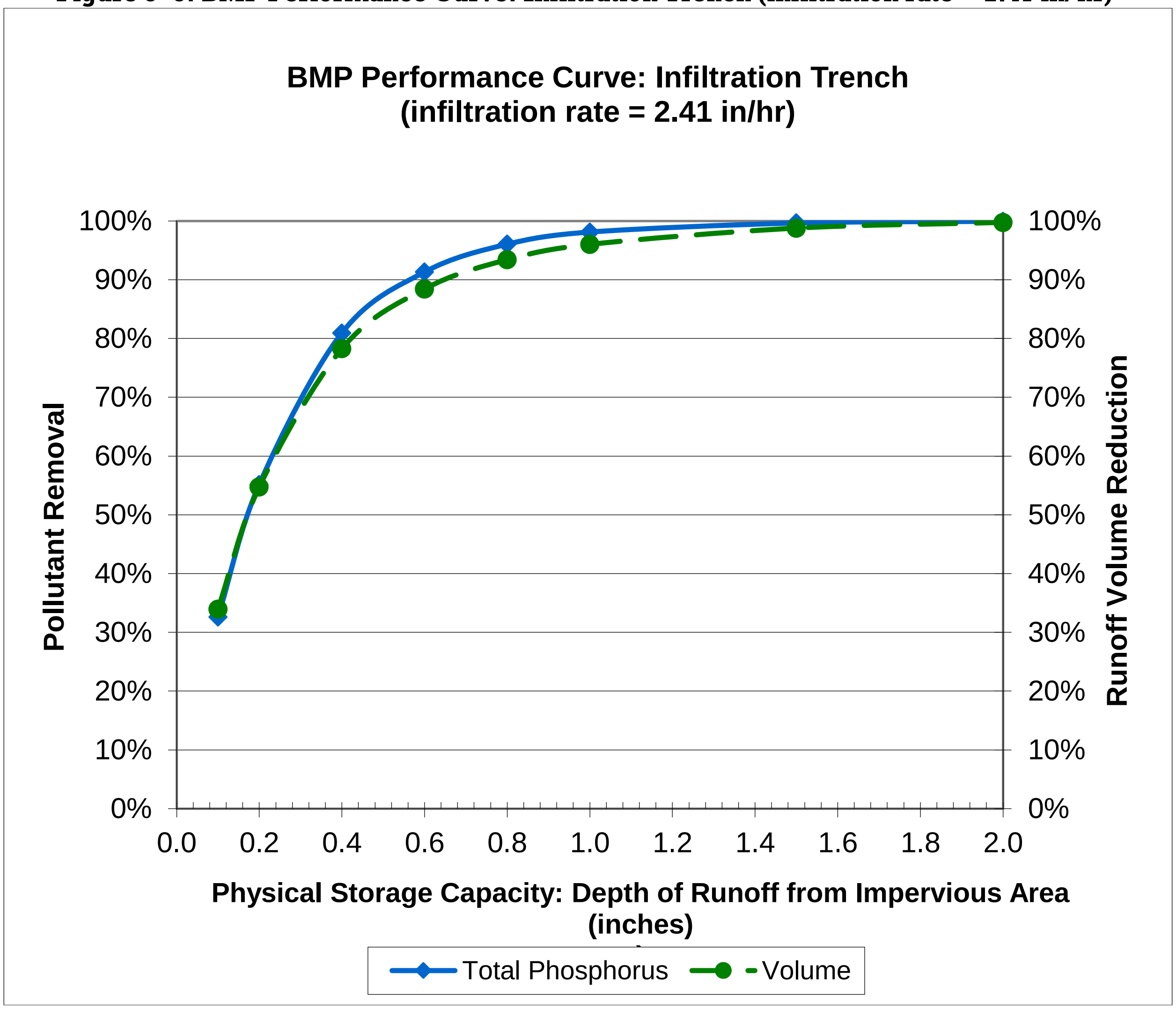


Table 3- 9: Infiltration Trench (8.27 in/hr) BMP Performance Table

Infiltration Trench (8.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	53.6%	76.1%	92.6%	97.2%	98.9%	99.5%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	50%	75%	94%	98%	99%	100%	100%	100%

Figure 3- 6: BMP Performance Curve: Infiltration Trench (infiltration rate = 8.27 in/hr)

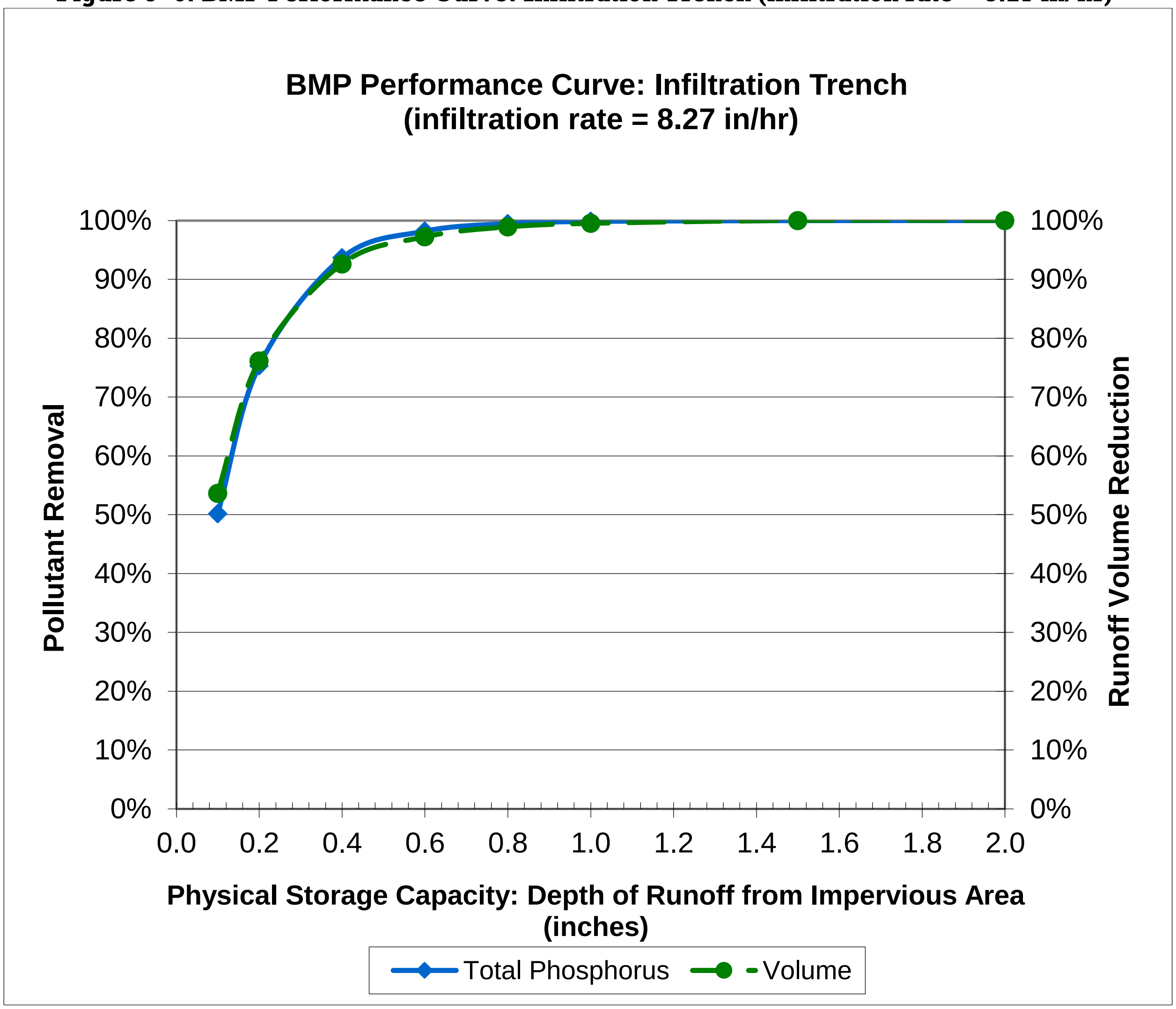


Table 3- 10: Infiltration Basin (0.17 in/hr) BMP Performance Table

Infiltration Basin (0.17 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	13.0%	24.6%	44.2%	59.5%	70.6%	78.1%	89.2%	93.9%
Cumulative Phosphorus Load Reduction	35%	52%	72%	82%	88%	92%	97%	99%

Figure 3- 7: BMP Performance Curve: Infiltration Basin (infiltration rate = 0.17 in/hr)

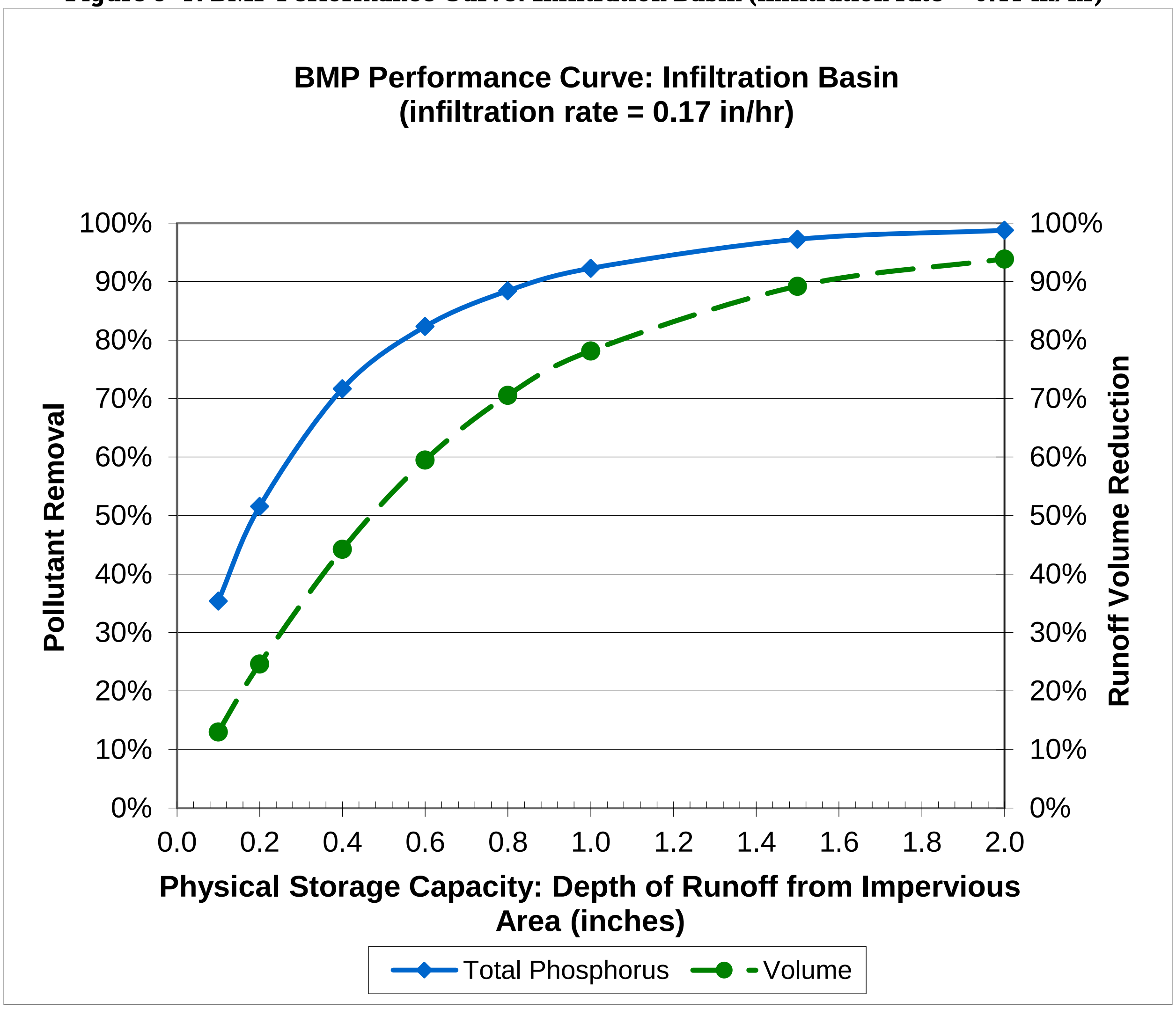


Table 3- 11: Infiltration Basin (0.27 in/hr) BMP Performance Table

Infiltration Basin (0.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	16.3%	29.8%	51.0%	66.0%	76.0%	82.4%	91.5%	95.2%
Cumulative Phosphorus Load Reduction	37%	54%	74 %	85%	90%	93%	98%	99%

Figure 3- 8: BMP Performance Curve: Infiltration Basin (infiltration rate = 0.27 in/hr)

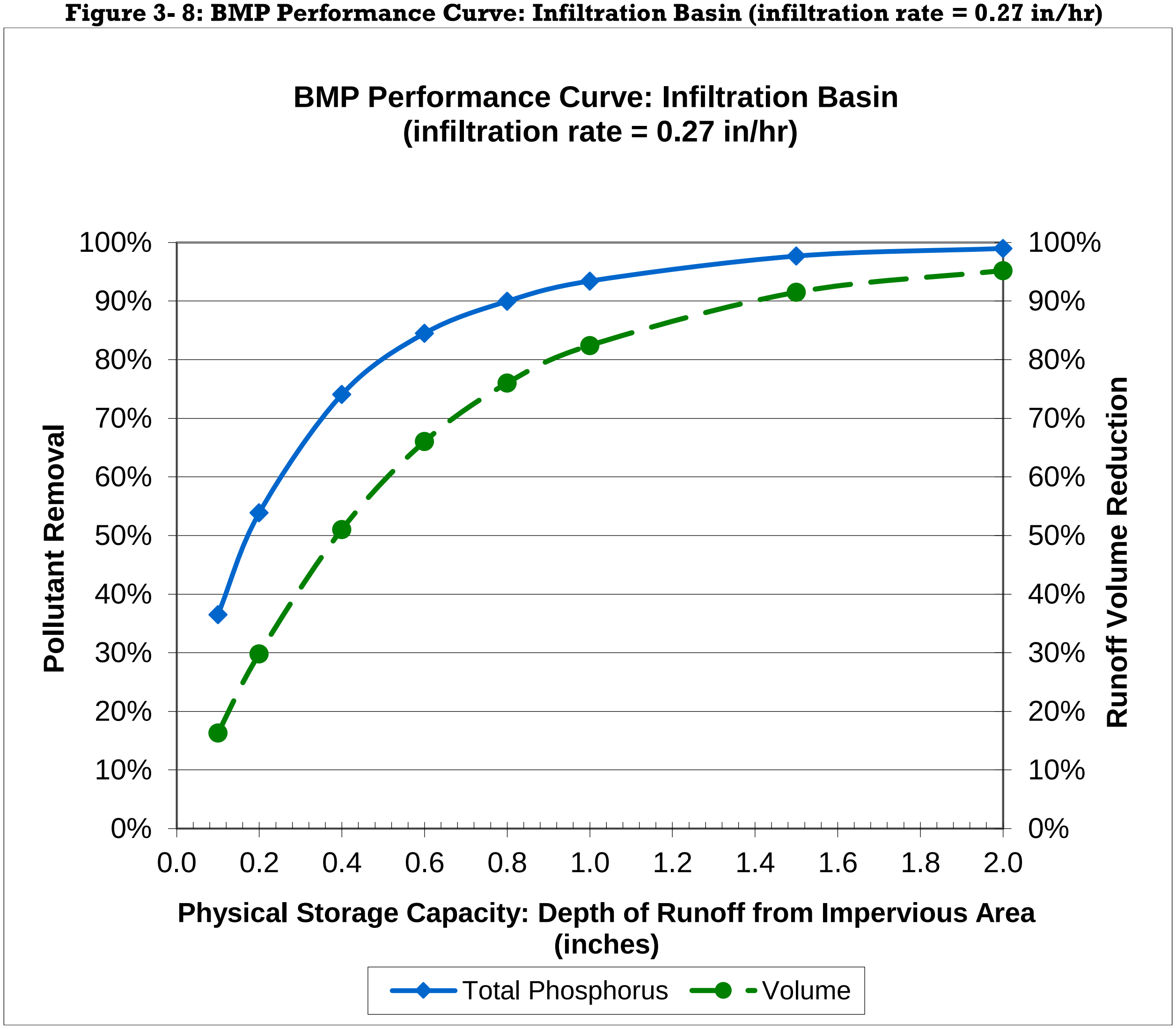


Table 3- 12: Infiltration Basin (0.52 in/hr) BMP Performance Table

Infiltration Basin (0.52 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	20.2%	35.6%	58.0%	72.6%	81.3%	86.9%	94.2%	96.7%
Cumulative Phosphorus Load Reduction	38%	56%	77%	87%	92%	95%	98%	99%

Figure 3- 9: BMP Performance Curve: Infiltration Basin (infiltration rate = 0.52 in/hr)

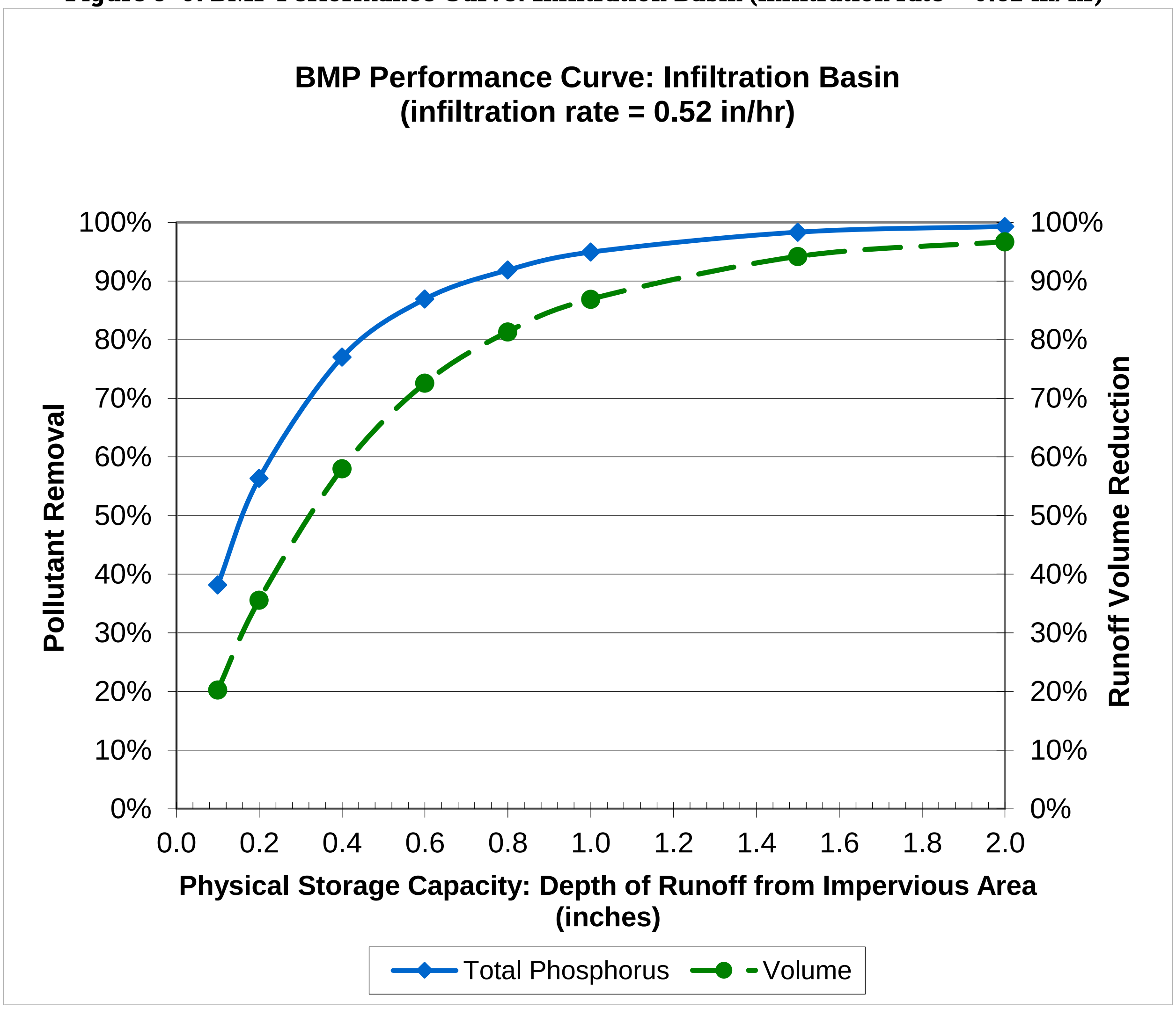


Table 3- 13: Infiltration Basin (1.02 in/hr) BMP Performance Table

Infiltration Basin (1.02 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	24.5%	42.0%	65.6%	79.4%	86.8%	91.3%	96.2%	98.1%
Cumulative Phosphorus Load Reduction	41%	60%	81%	90%	94%	97%	99%	100%

Figure 3- 10: BMP Performance Curve: Infiltration Basin (Soil infiltration rate = 1.02 in/hr)

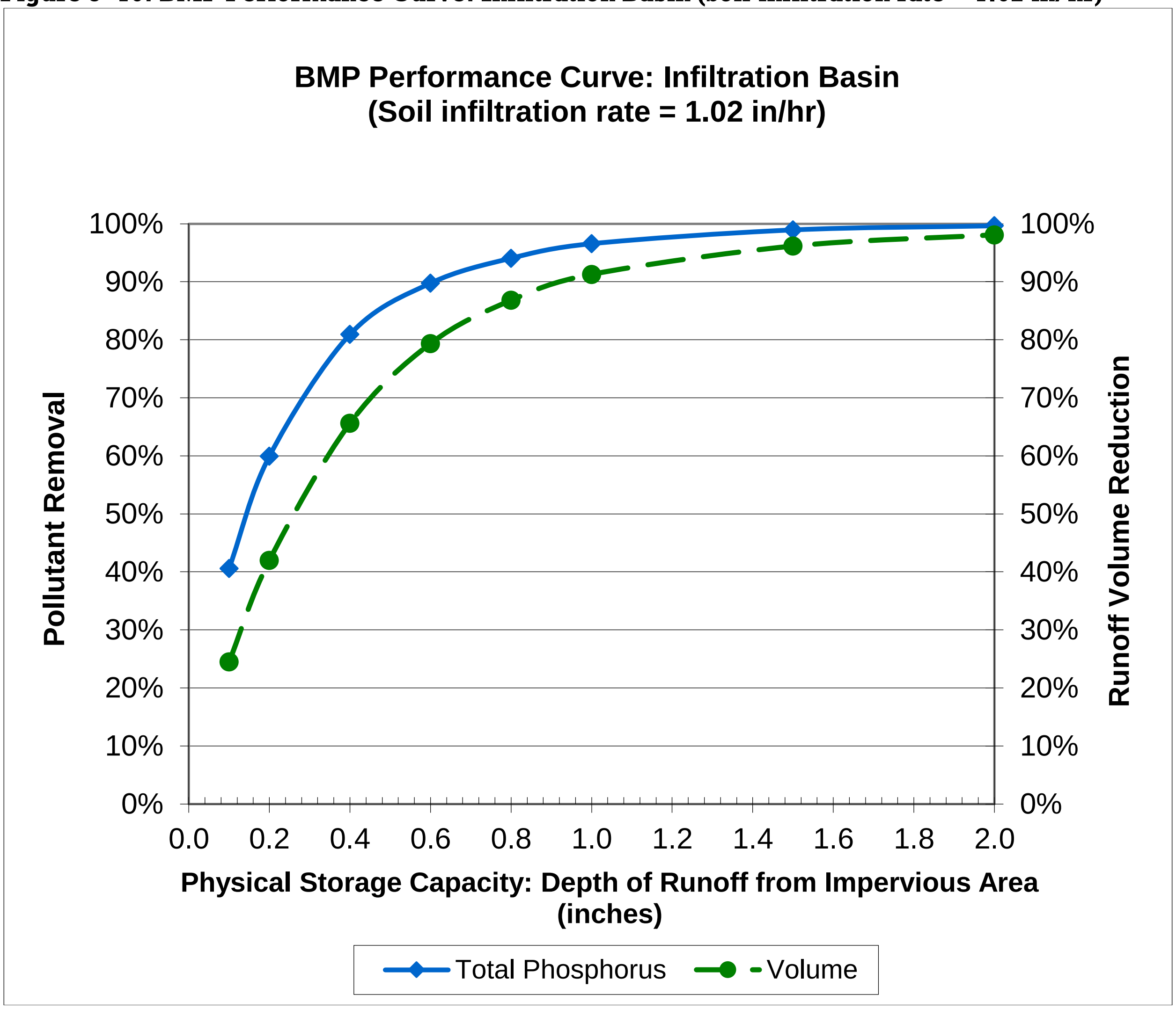


Table 3- 14: Infiltration Basin (2.41 in/hr) BMP Performance Table

Infiltration Basin (2.41 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	32.8%	53.8%	77.8%	88.4%	93.4%	96.0%	98.8%	99.8%
Cumulative Phosphorus Load Reduction	46%	67%	87%	94%	97%	98%	100%	100%

Figure 3- 11: BMP Performance Curve: Infiltration Basin (infiltration rate = 2.41 in/hr)

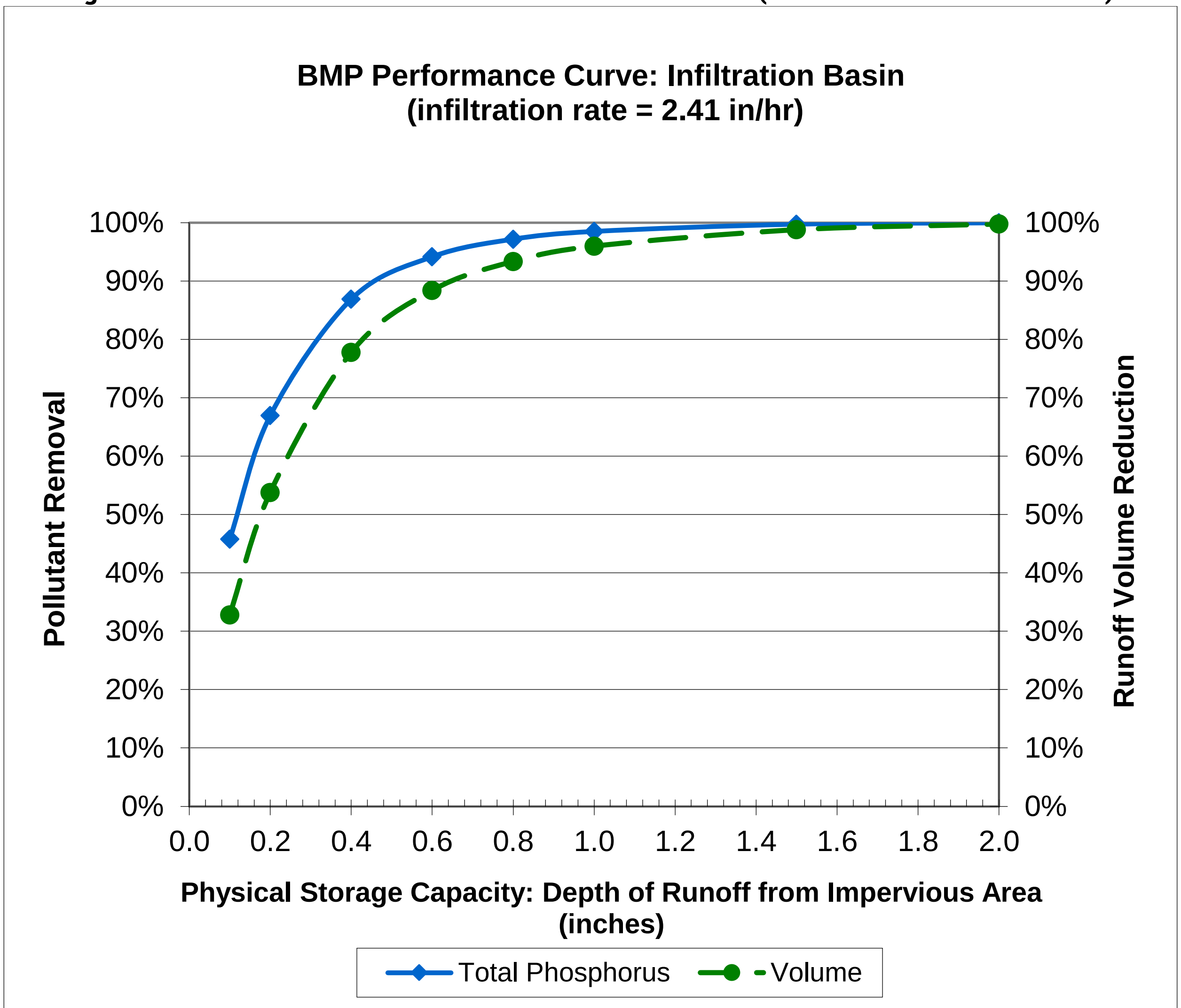


Table 3- 15: Infiltration Basin (8.27 in/hr) BMP Performance Table

Infiltration Basin (8.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	54.6%	77.2%	93.4%	97.5%	99.0%	99.6%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	59%	81%	96%	99%	100%	100%	100%	100%

Figure 3- 12: BMP Performance Curve: Infiltration Basin (infiltration rate = 8.27 in/hr)

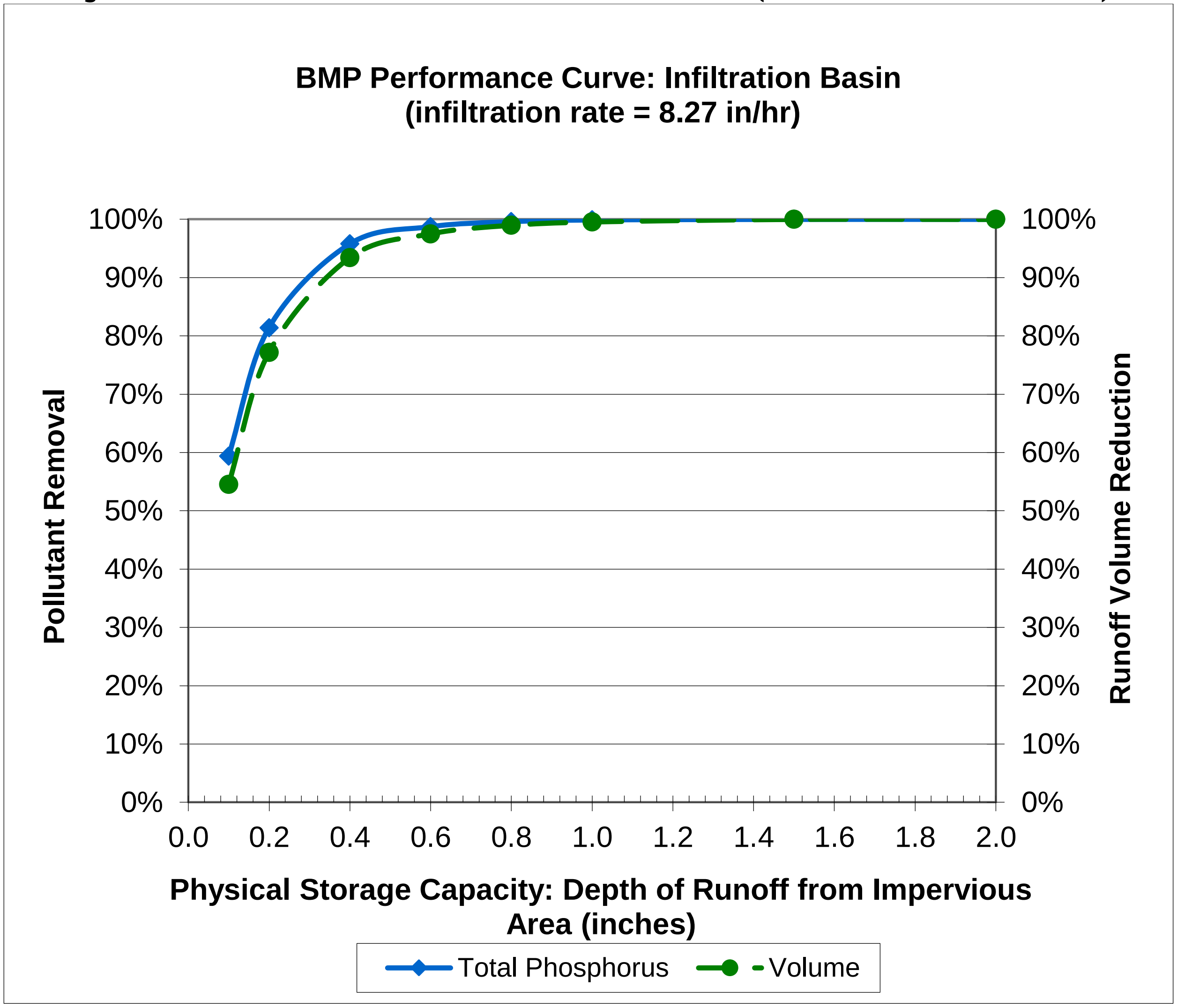


Table 3- 16: Biofiltration BMP Performance Table

Biofiltration BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	34%	53%	64%	71%	76%	84%	89%

Figure 3- 13: BMP Performance Curve: Biofiltration

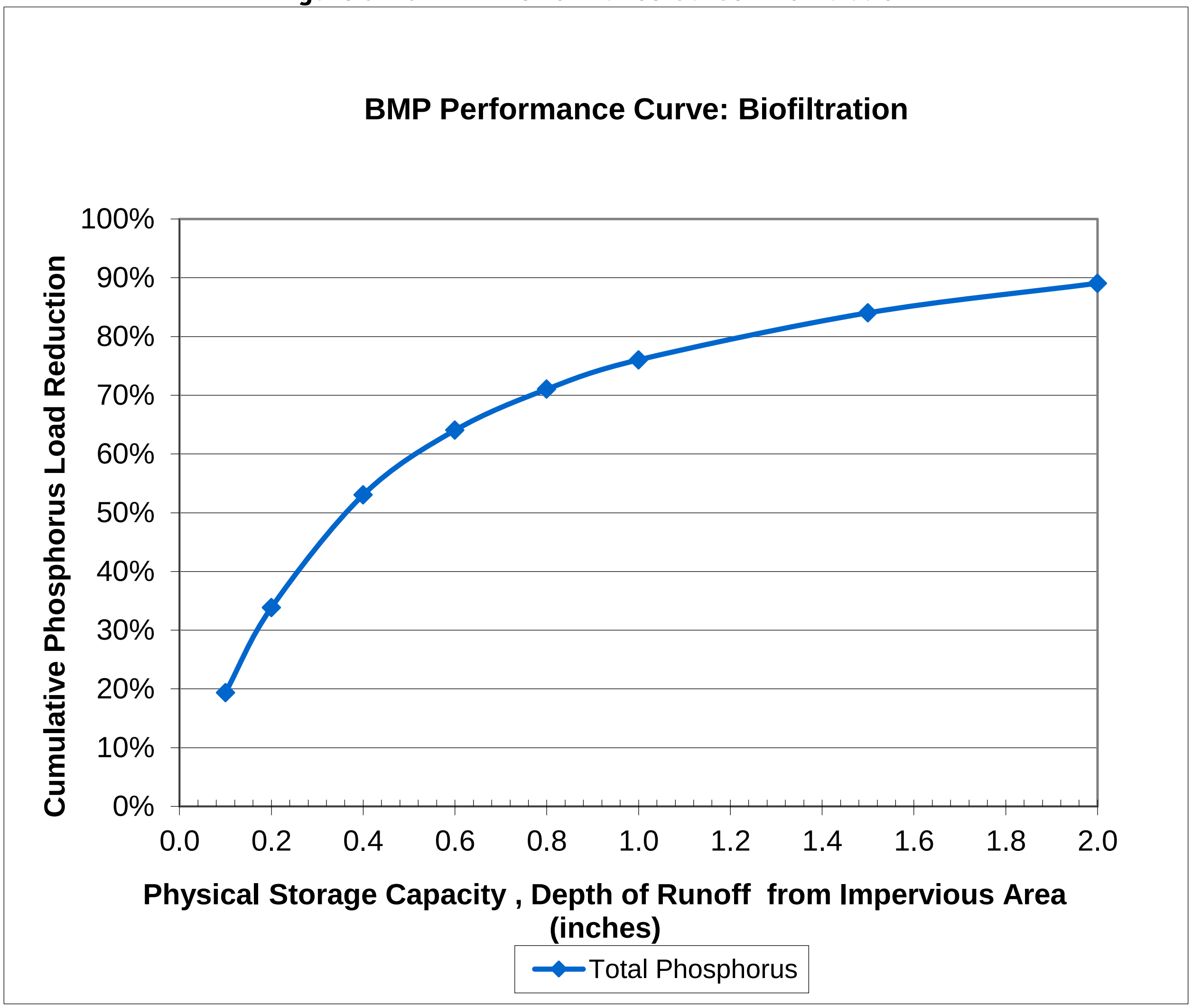


Table 3- 17: Gravel Wetland BMP Performance Table

Gravel Wetland BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	19%	26%	41%	51%	57%	61%	65%	66%

Figure 3- 14: BMP Performance Curve: Gravel Wetland

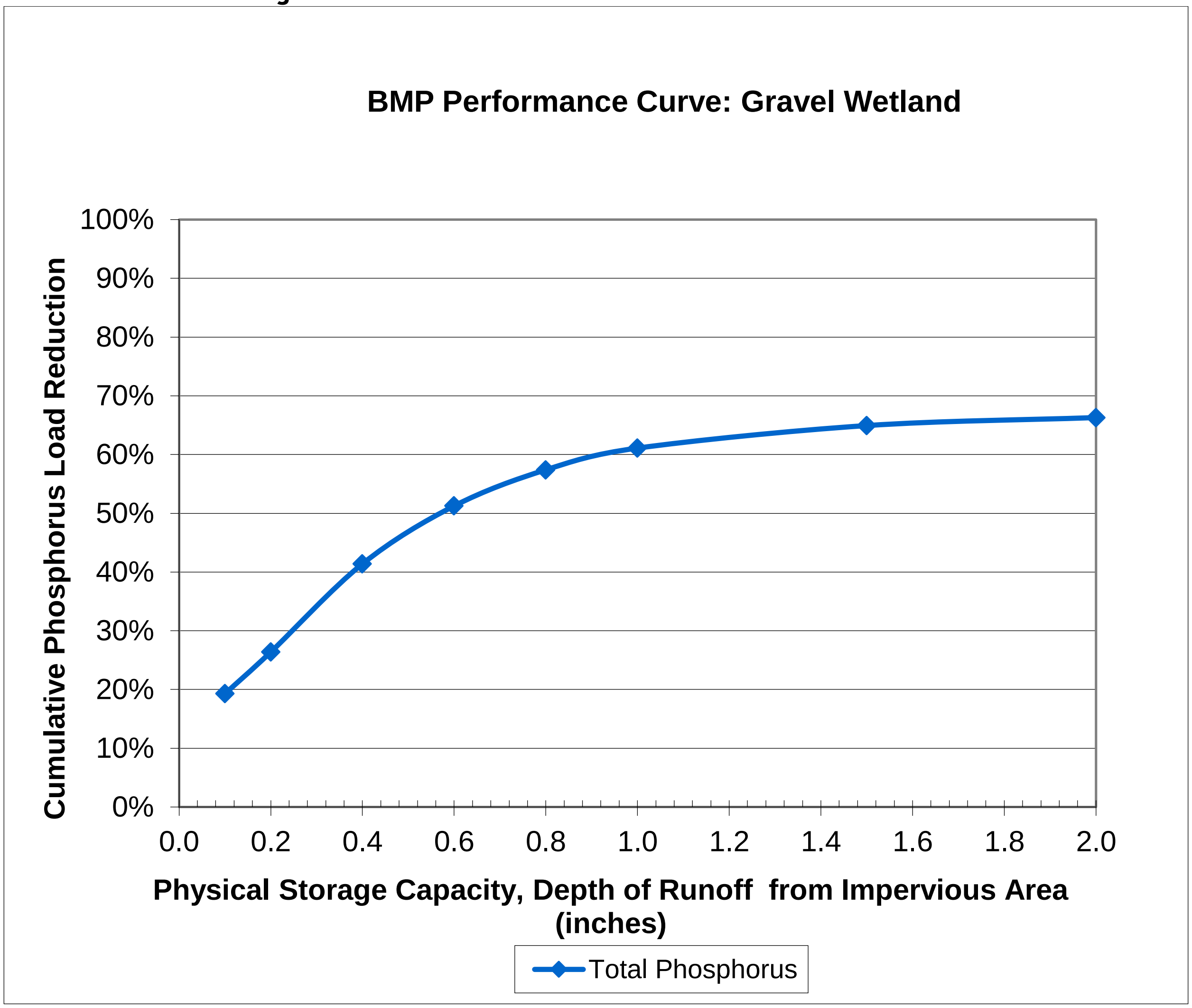


Table 3- 18: Porous Pavement BMP Performance Table

Porous Pavement BMP Performance Table: Long-Term Phosphorus Load Reduction				
BMP Capacity: Depth of Filter Course Area (inches)	12.0	18.0	24.0	32.0
Cumulative Phosphorus Load Reduction	62%	70%	75%	78%

Figure 3- 15: BMP Performance Curve: Porous Pavement

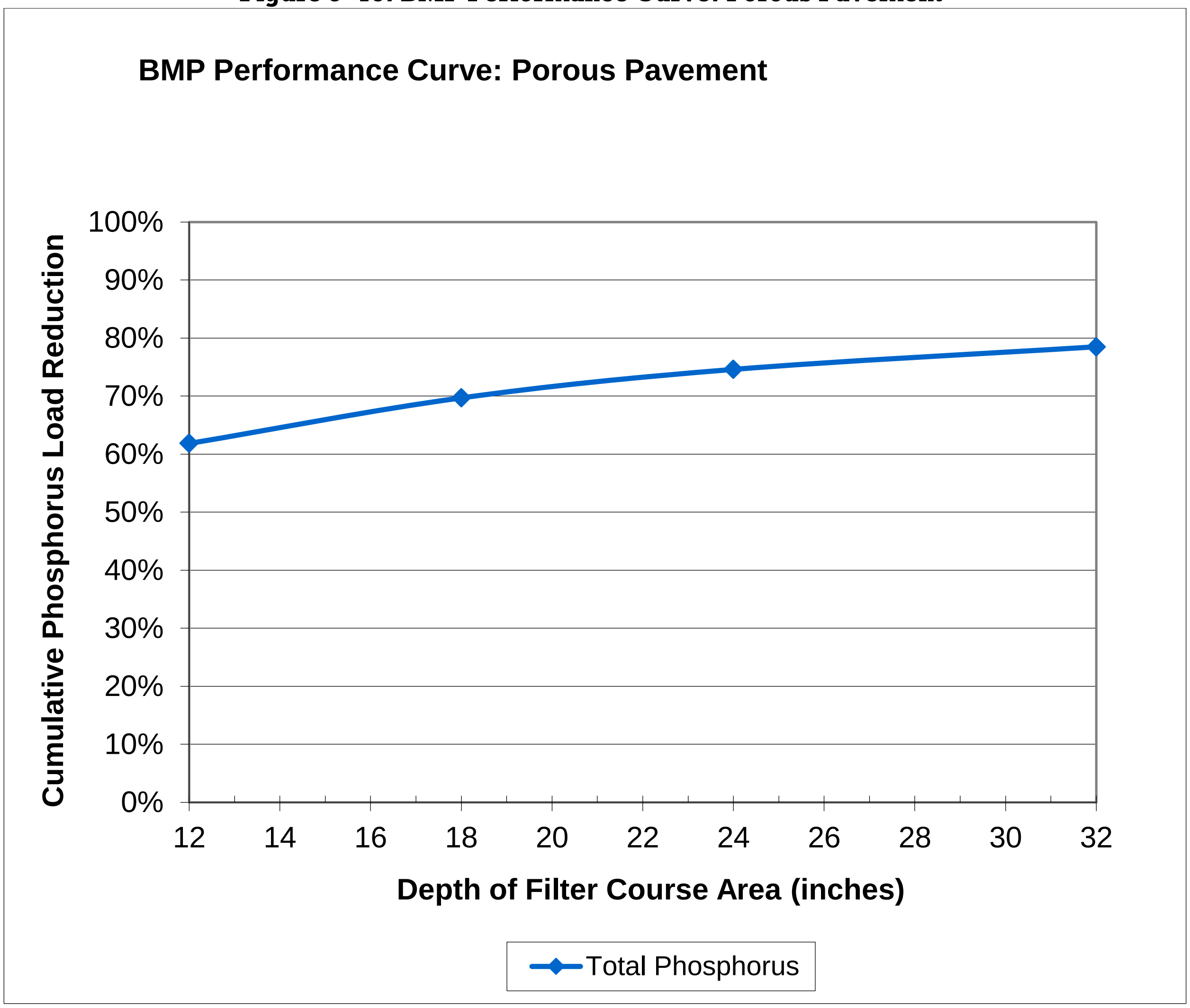


Table 3- 19: Wet Pond BMP Performance Table

Wet Pond BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	14%	25%	37%	44%	48%	53%	58%	63%

Table 3- 20: Dry Pond BMP Performance Table

Dry Pond BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	3%	6%	8%	9%	11%	12%	13%	14%

Figure 3- 16: BMP Performance Curve: Dry Pond

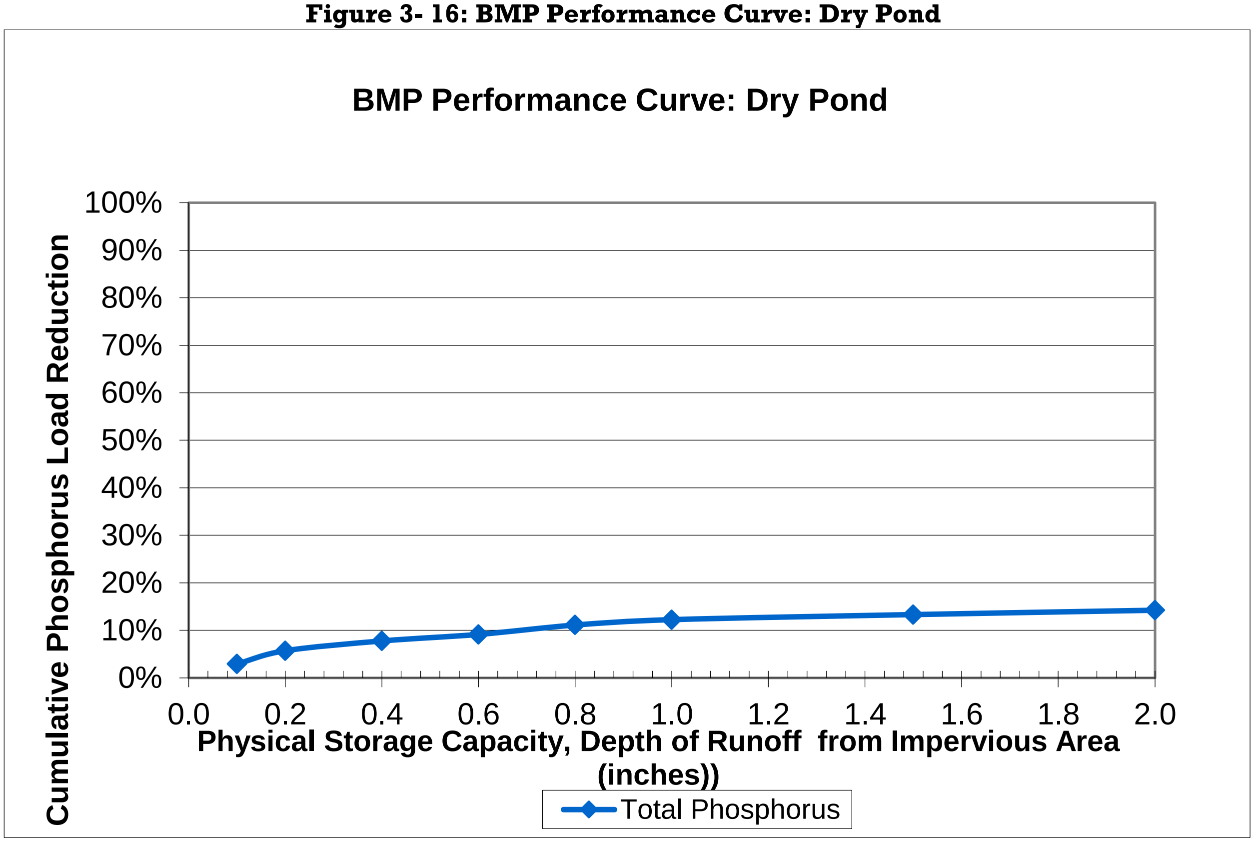


Table 3- 21: Grass Swale BMP Performance Table

Grass Swale BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Cumulative Phosphorus Load Reduction	2%	5%	9%	13%	17%	21%	29%	36%

Figure 3- 17: BMP Performance Curve: Grass Swale

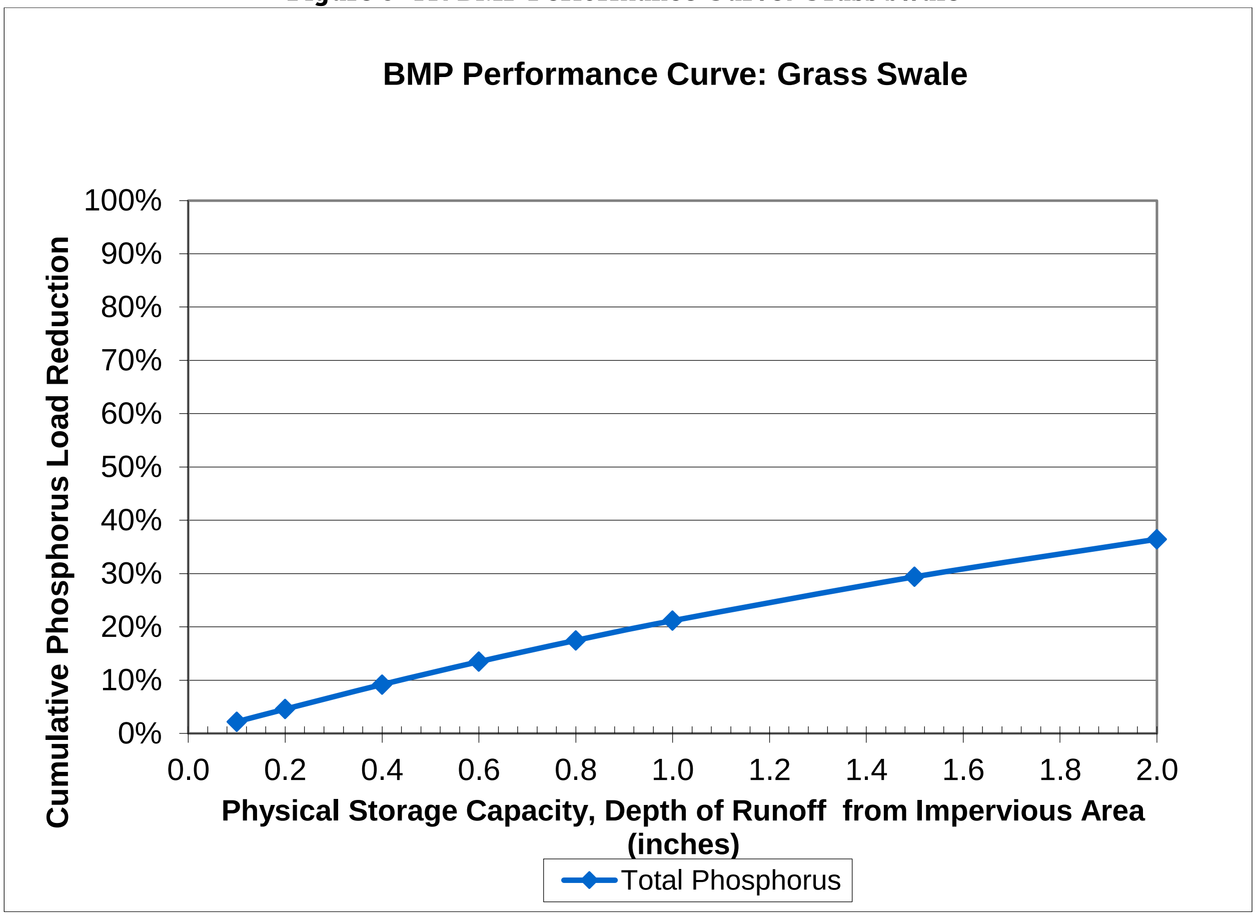


Table 3- 22: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1

Impervious Area Disconnection through Storage : Impervious Area to Pervious Area Ratio = 8:1												
Storage volume to impervious area ratio	Total Runoff Volume (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	22%	22%	21%
0.2 in	40%	38%	37%	40%	38%	37%	37%	38%	37%	24%	26%	27%
0.3 in	52%	50%	49%	52%	50%	49%	40%	46%	49%	24%	26%	27%
0.4 in	61%	59%	58%	59%	59%	58%	40%	48%	54%	24%	26%	27%
0.5 in	67%	66%	64%	62%	66%	64%	40%	48%	56%	24%	26%	27%
0.6 in	70%	71%	70%	62%	70%	70%	40%	48%	56%	24%	26%	27%
0.8 in	71%	78%	77%	62%	73%	77%	40%	48%	56%	24%	26%	27%
1.0 in	71%	80%	80%	62%	73%	79%	40%	48%	56%	24%	26%	27%
1.5 in	71%	81%	87%	62%	73%	81%	40%	48%	56%	24%	26%	27%
2.0 in	71%	81%	88%	62%	73%	81%	40%	48%	56%	24%	26%	27%

Figure 3- 18: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG A Soils

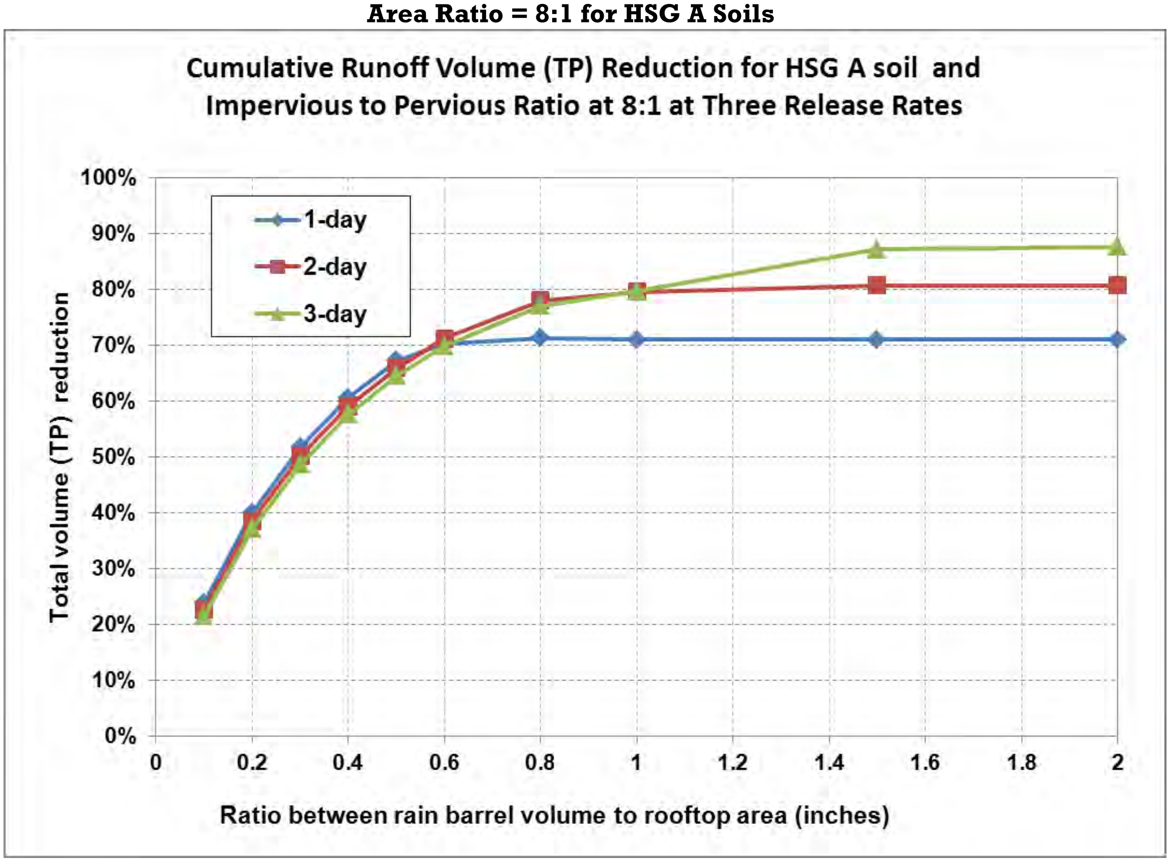


Figure 3- 19: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG B Soils

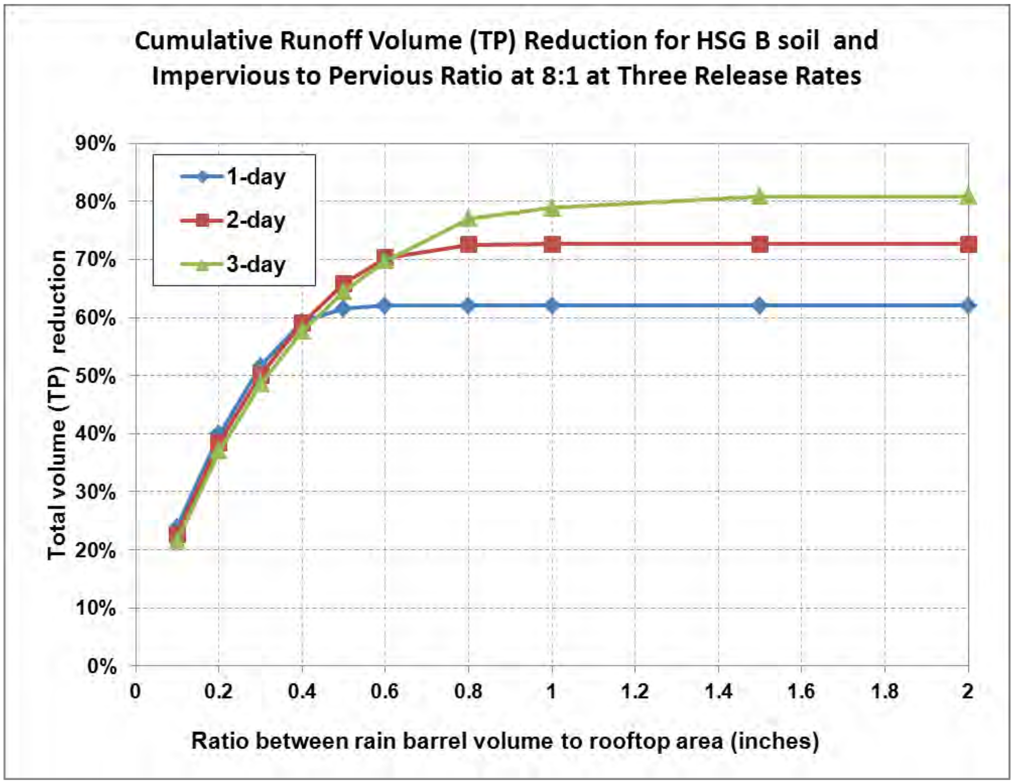


Figure 3- 20: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG C Soils

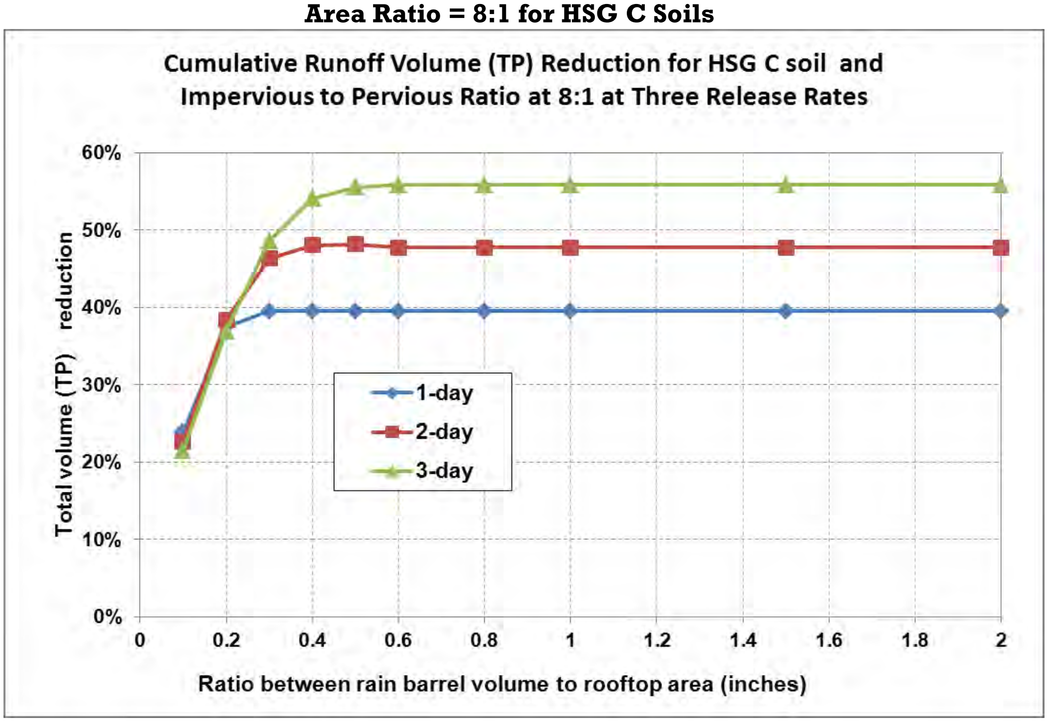


Figure 3- 21: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 8:1 for HSG D Soils

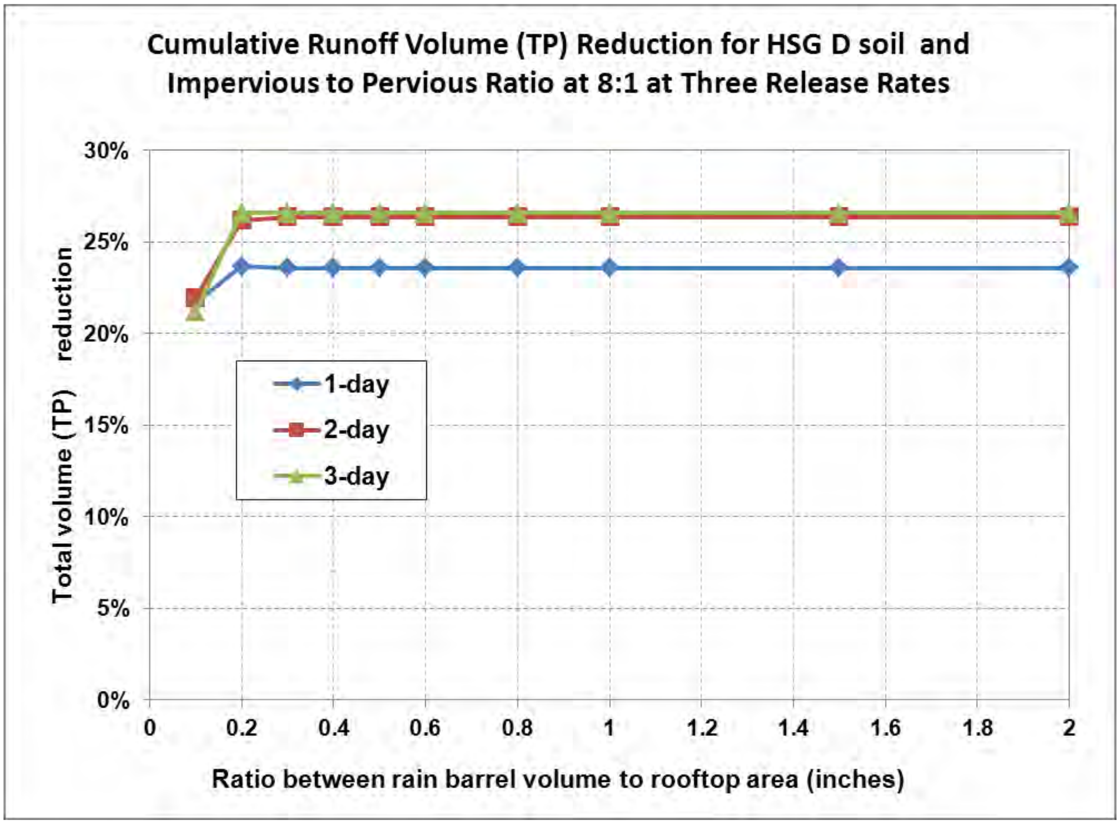


Table 3- 23: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1												
Rain barrel volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	23%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	28%	30%	33%
0.3 in	52%	50%	49%	52%	50%	49%	47%	50%	49%	29%	31%	34%
0.4 in	61%	59%	58%	61%	59%	58%	48%	55%	58%	29%	31%	34%
0.5 in	67%	66%	64%	67%	66%	64%	48%	57%	63%	29%	31%	34%
0.6 in	73%	71%	70%	70%	71%	70%	48%	57%	65%	29%	31%	34%
0.8 in	78%	78%	77%	71%	78%	77%	48%	57%	66%	29%	31%	34%
1.0 in	79%	81%	80%	71%	79%	80%	48%	57%	66%	29%	31%	34%
1.5 in	79%	87%	88%	71%	80%	87%	48%	57%	66%	29%	31%	34%
2.0 in	79%	87%	91%	71%	80%	87%	48%	57%	66%	29%	31%	34%

Figure 3- 22: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG A Soils

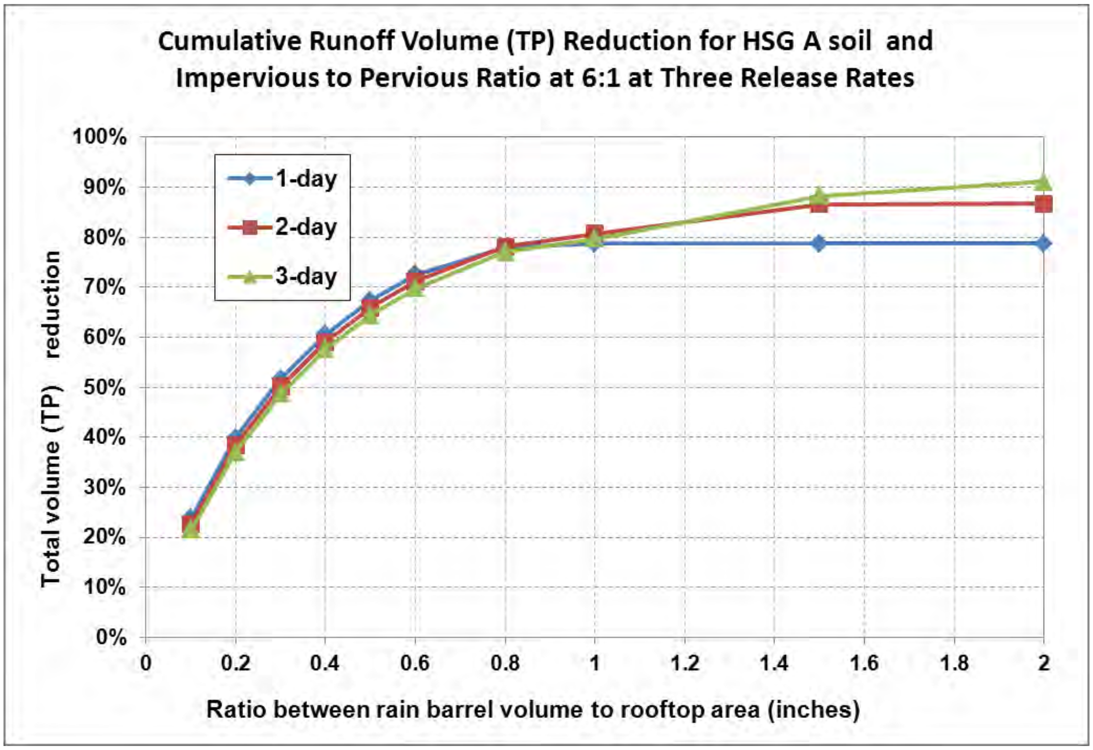


Figure 3- 23: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG B Soils

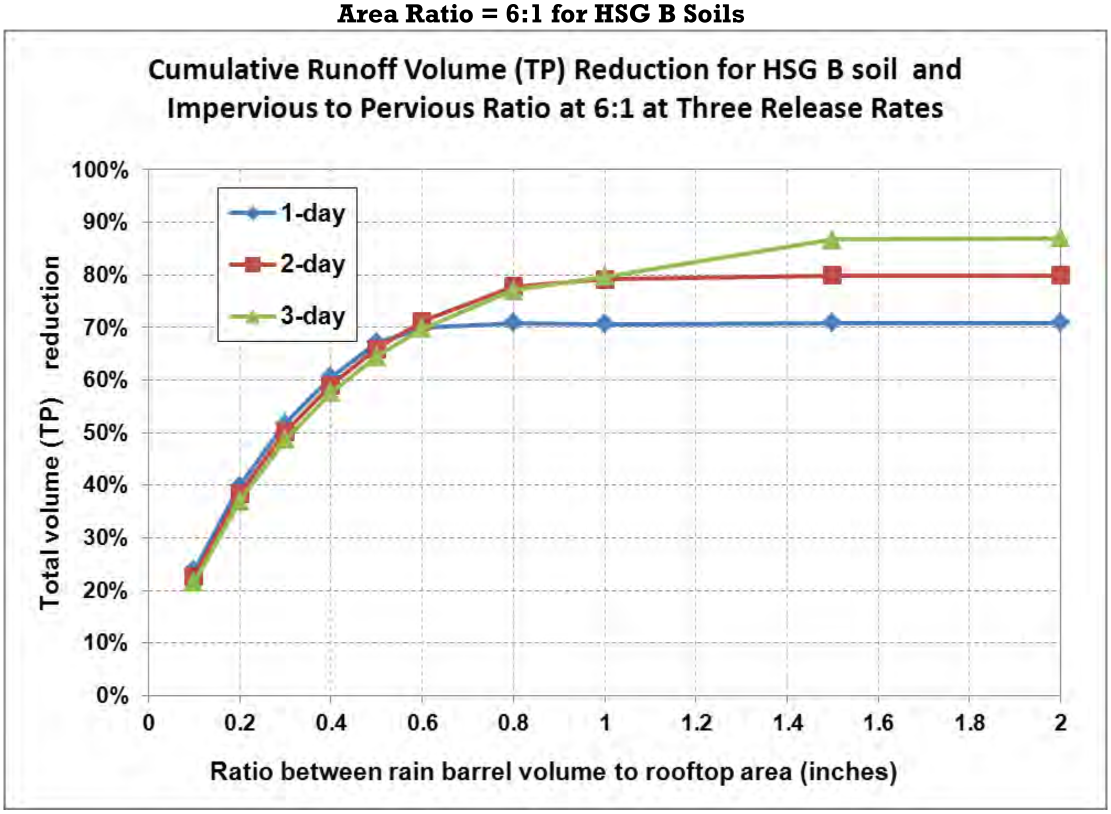


Figure 3- 24: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG C Soils

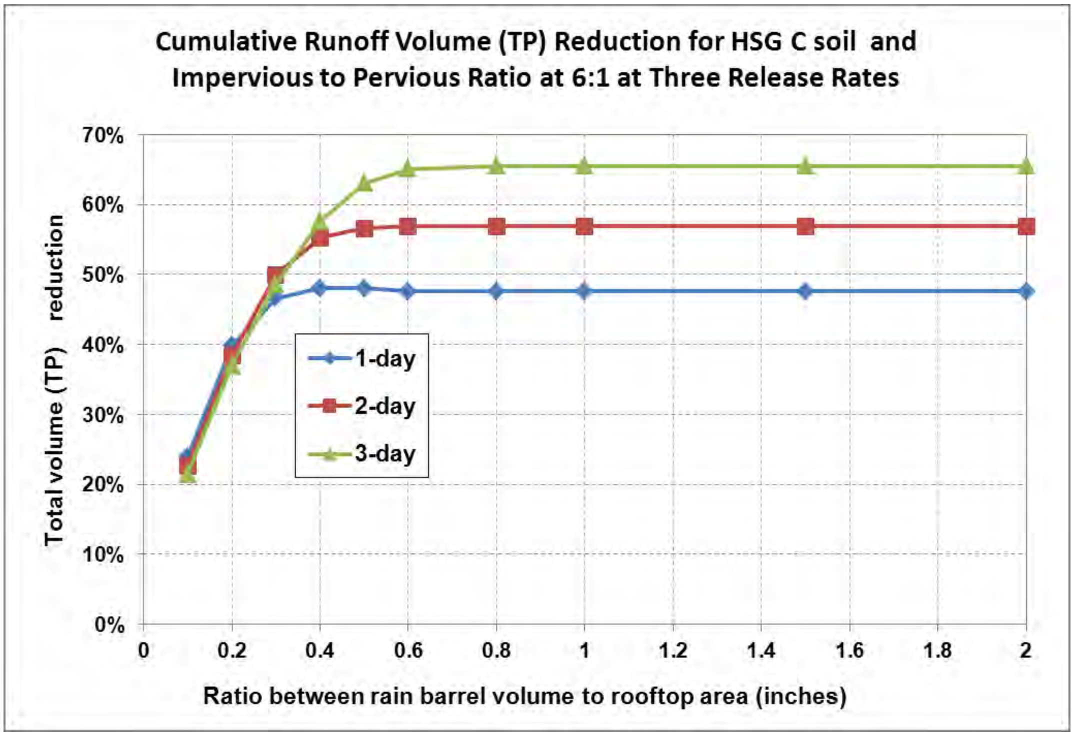


Figure 3- 25: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 6:1 for HSG D Soils

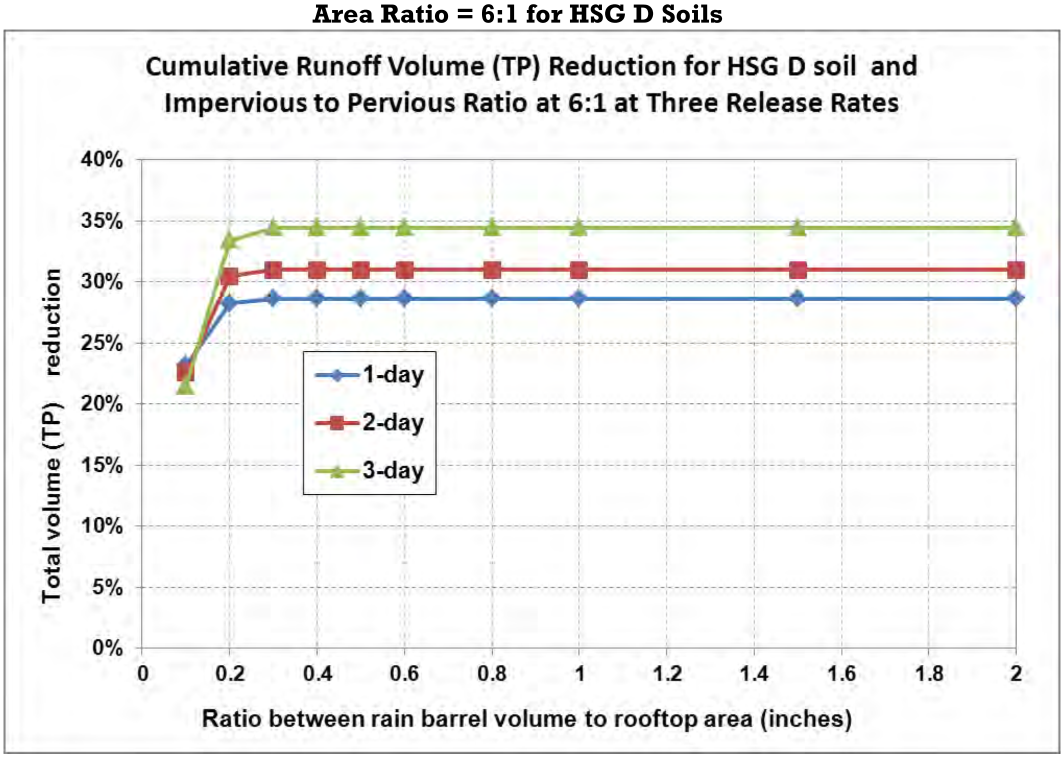


Table 3- 24: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1												
Storage volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	24%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	37%	37%	37%
0.3 in	52%	50%	49%	52%	50%	49%	52%	50%	49%	39%	42%	45%
0.4 in	61%	59%	58%	61%	59%	58%	58%	59%	58%	39%	42%	47%
0.5 in	67%	66%	64%	67%	66%	64%	60%	65%	64%	40%	42%	47%
0.6 in	73%	71%	70%	73%	71%	70%	61%	68%	70%	40%	42%	47%
0.8 in	79%	78%	77%	79%	78%	77%	61%	69%	75%	40%	42%	47%
1.0 in	82%	81%	80%	80%	81%	80%	61%	69%	76%	40%	42%	47%
1.5 in	87%	89%	88%	80%	87%	88%	61%	69%	76%	40%	42%	47%
2.0 in	87%	91%	91%	80%	88%	91%	61%	69%	76%	40%	42%	47%

Figure 3- 26: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG A Soils

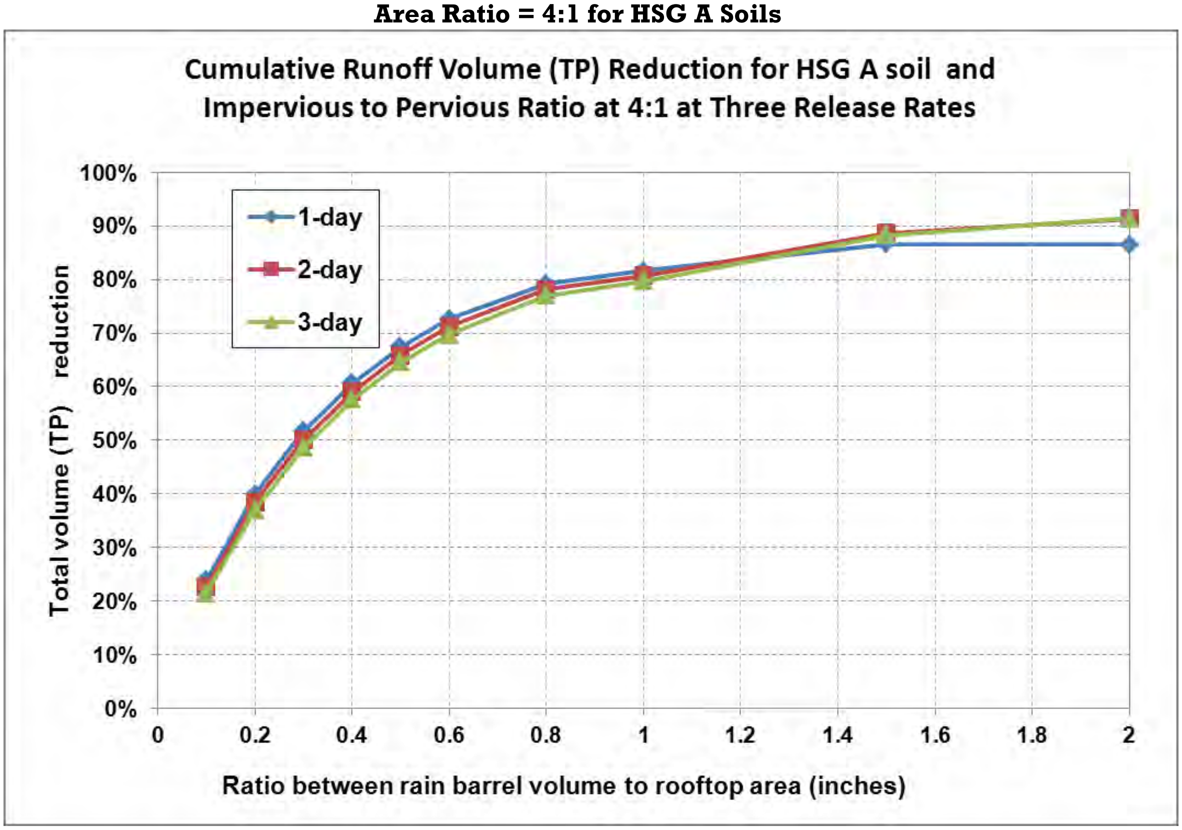


Figure 3- 27: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG B Soils

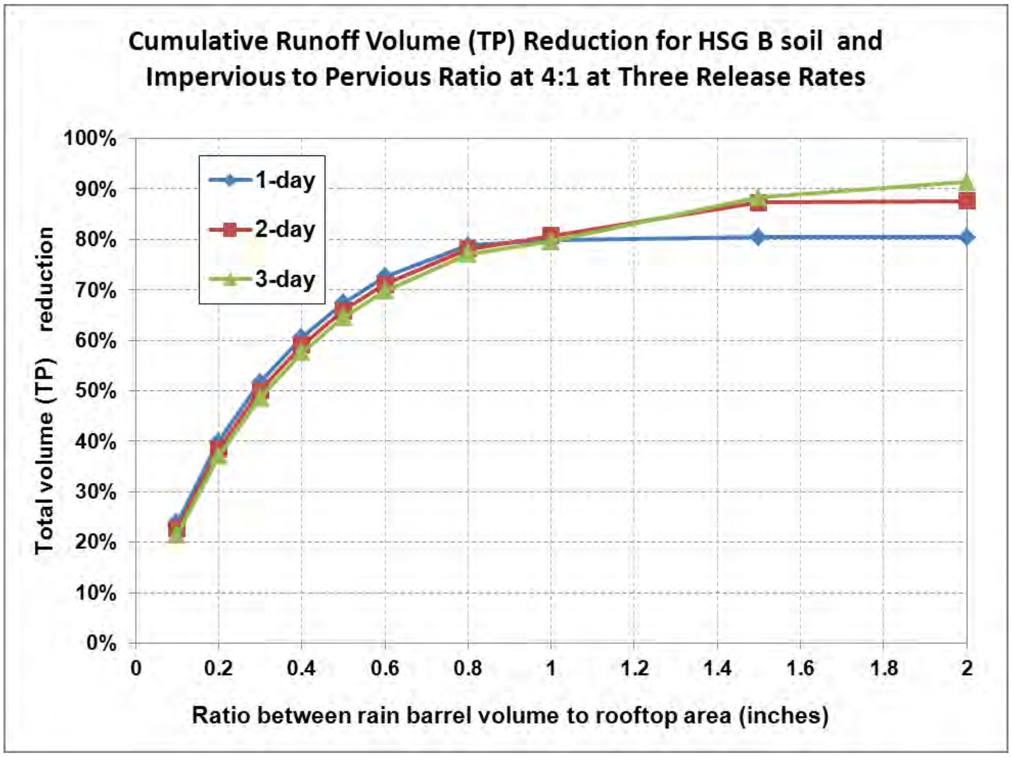


Figure 3- 28: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG C Soils

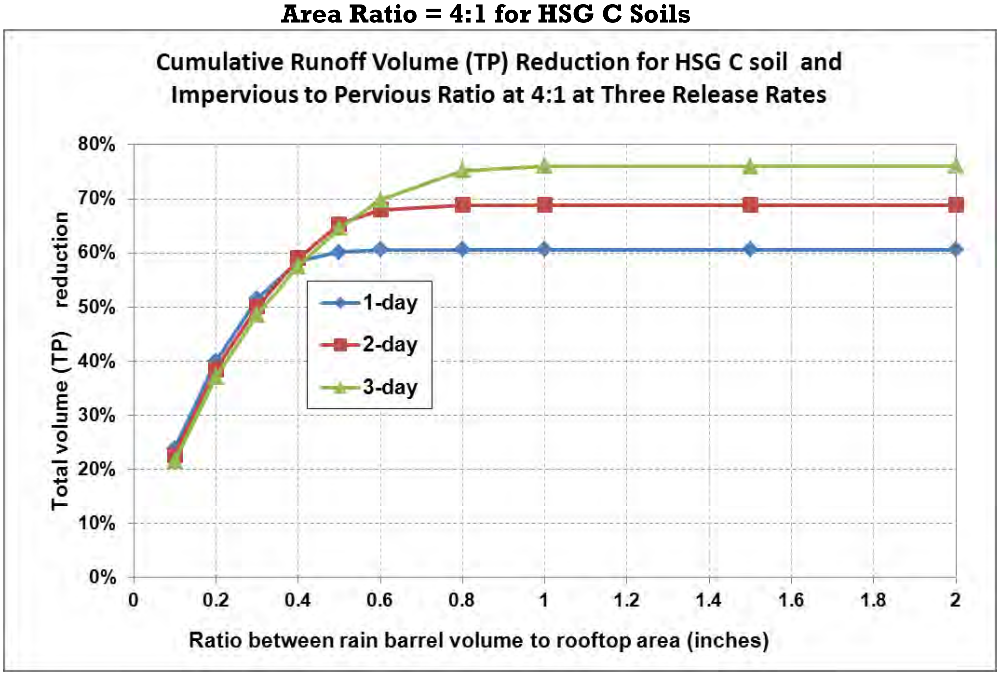


Figure 3- 29: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 4:1 for HSG D Soils

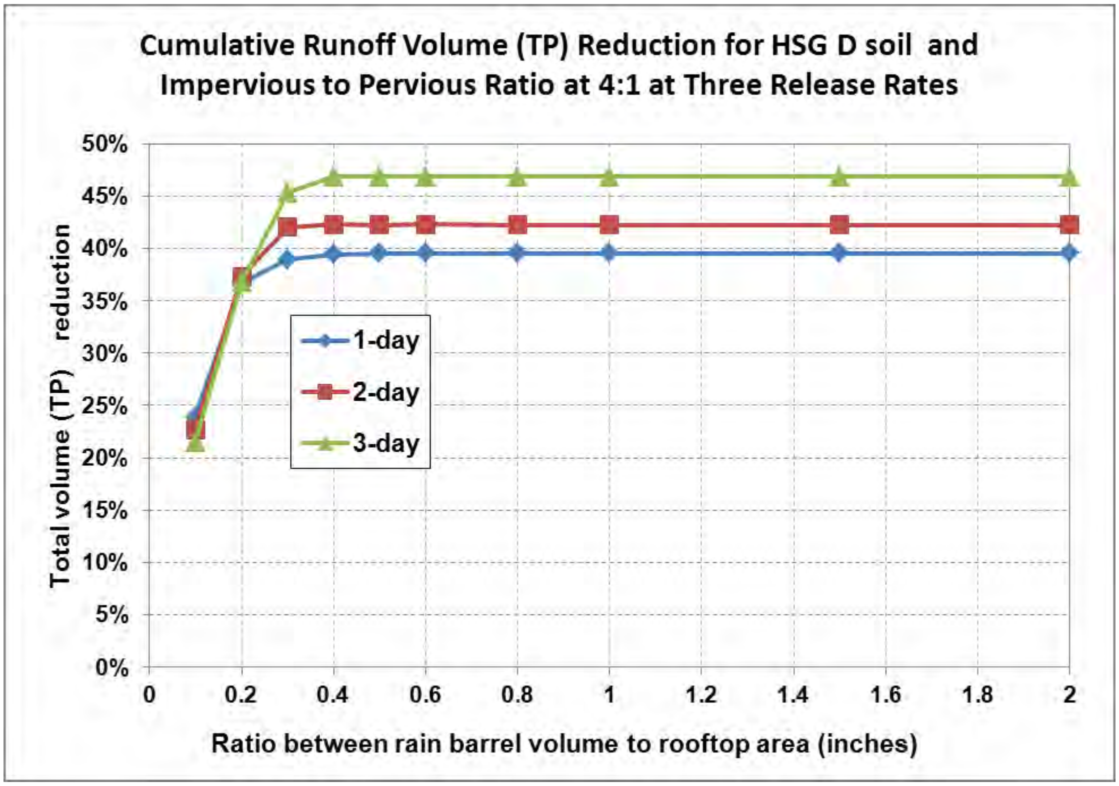


Table 3- 25: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 2:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 2:1												
Storage volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	24%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	40%	38%	37%
0.3 in	52%	50%	49%	52%	50%	49%	52%	50%	49%	51%	50%	49%
0.4 in	61%	59%	58%	61%	59%	58%	61%	59%	58%	57%	58%	57%
0.5 in	67%	66%	64%	67%	66%	64%	67%	66%	64%	59%	62%	63%
0.6 in	73%	71%	70%	73%	71%	70%	72%	71%	70%	59%	62%	67%
0.8 in	79%	78%	77%	79%	78%	77%	77%	78%	77%	59%	62%	67%
1.0 in	82%	81%	80%	82%	81%	80%	78%	81%	80%	59%	62%	67%
1.5 in	89%	89%	88%	89%	89%	88%	78%	84%	88%	59%	62%	67%
2.0 in	92%	92%	91%	91%	92%	91%	78%	84%	89%	59%	62%	67%

Figure 3- 30: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG A Soils

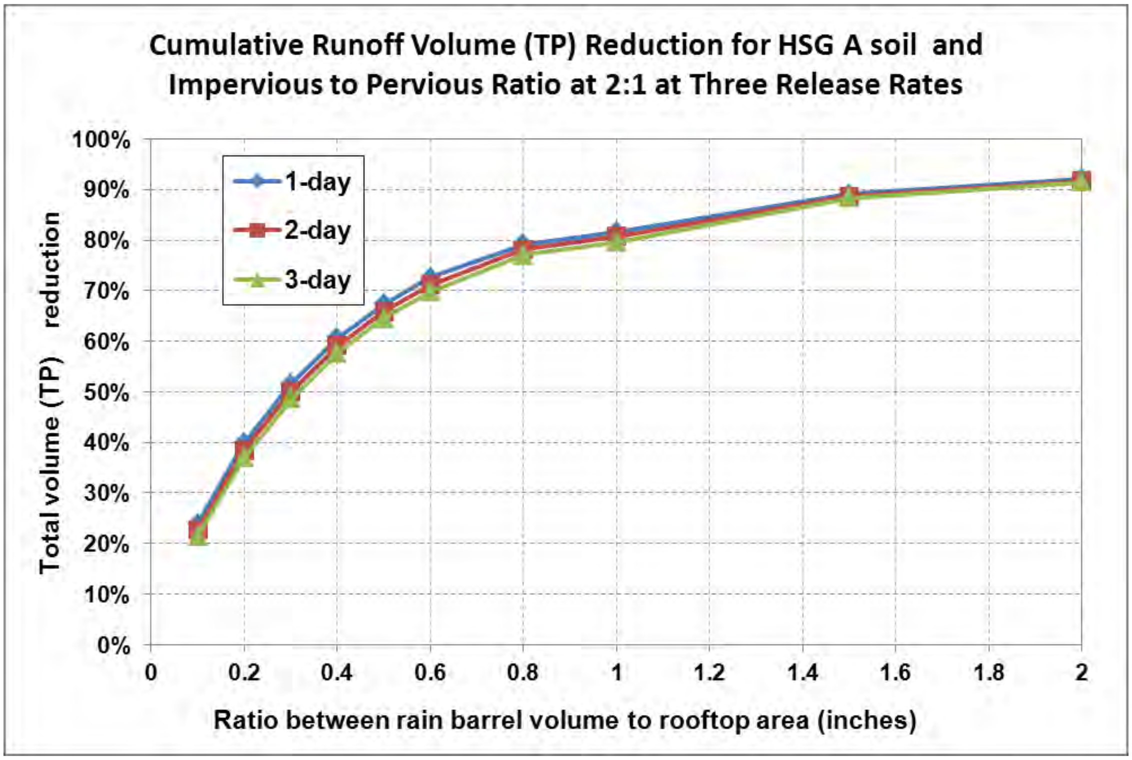


Figure 3- 31: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG B Soils

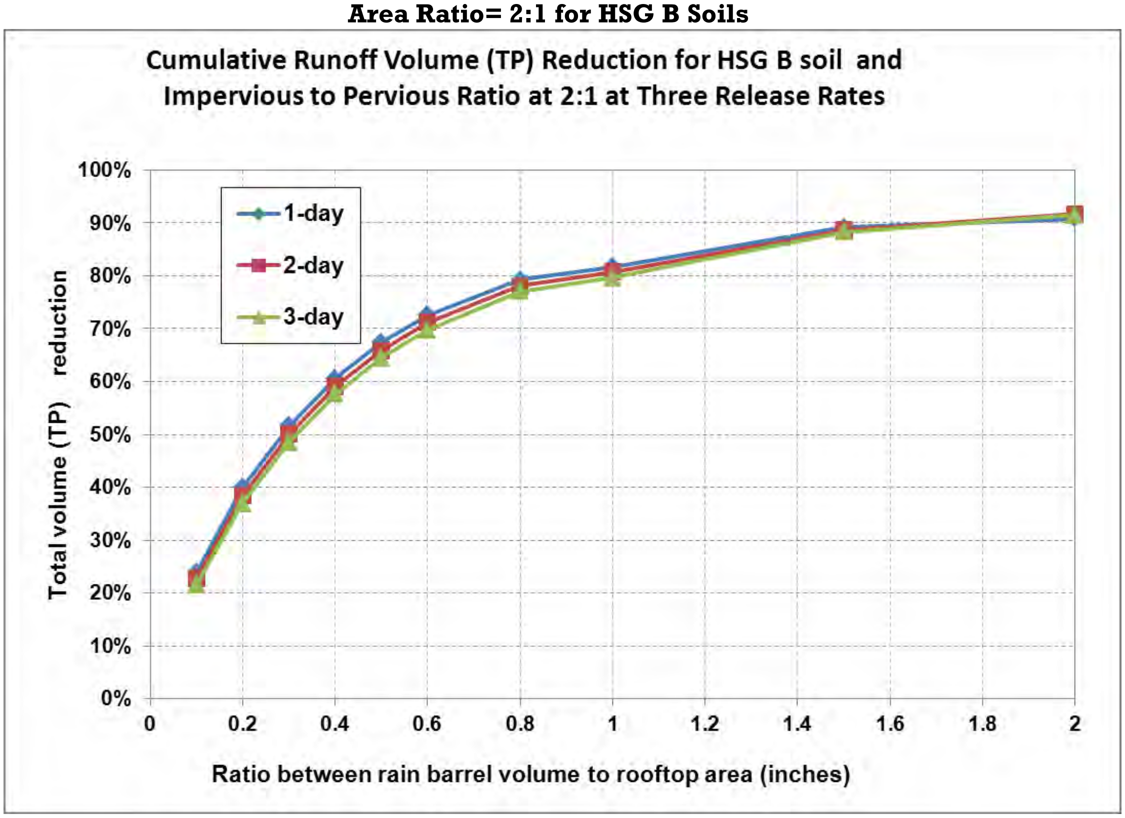


Figure 3- 32: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG C Soils

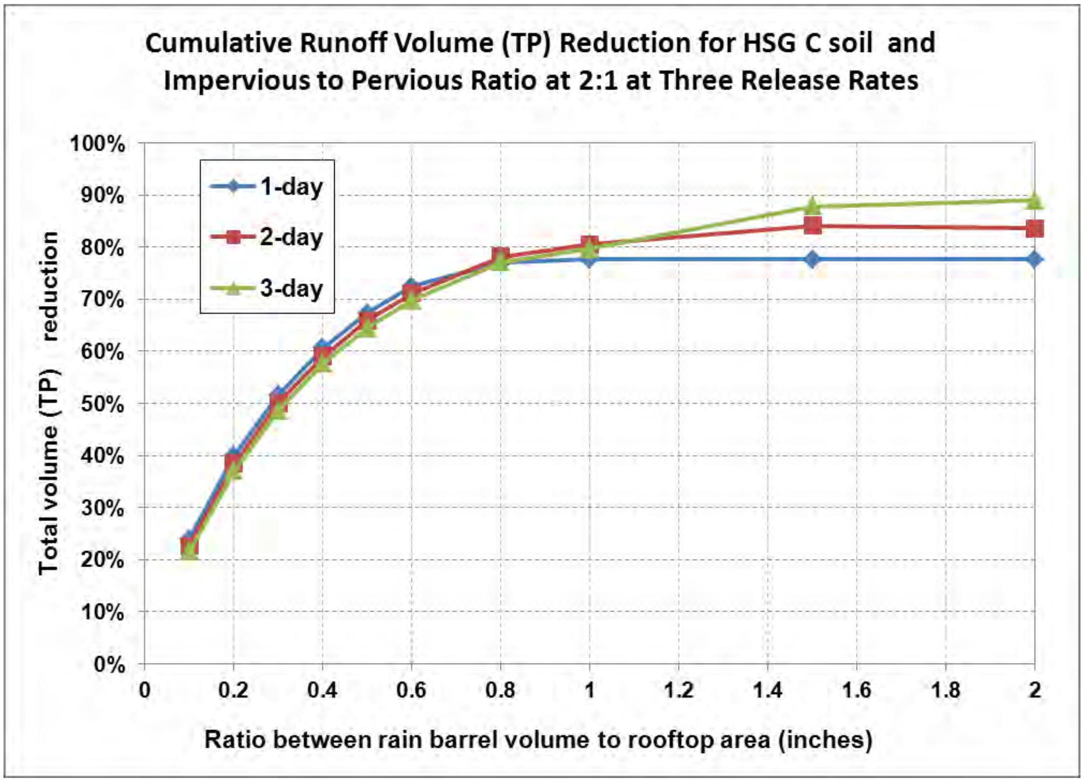


Figure 3- 33: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio= 2:1 for HSG D Soils

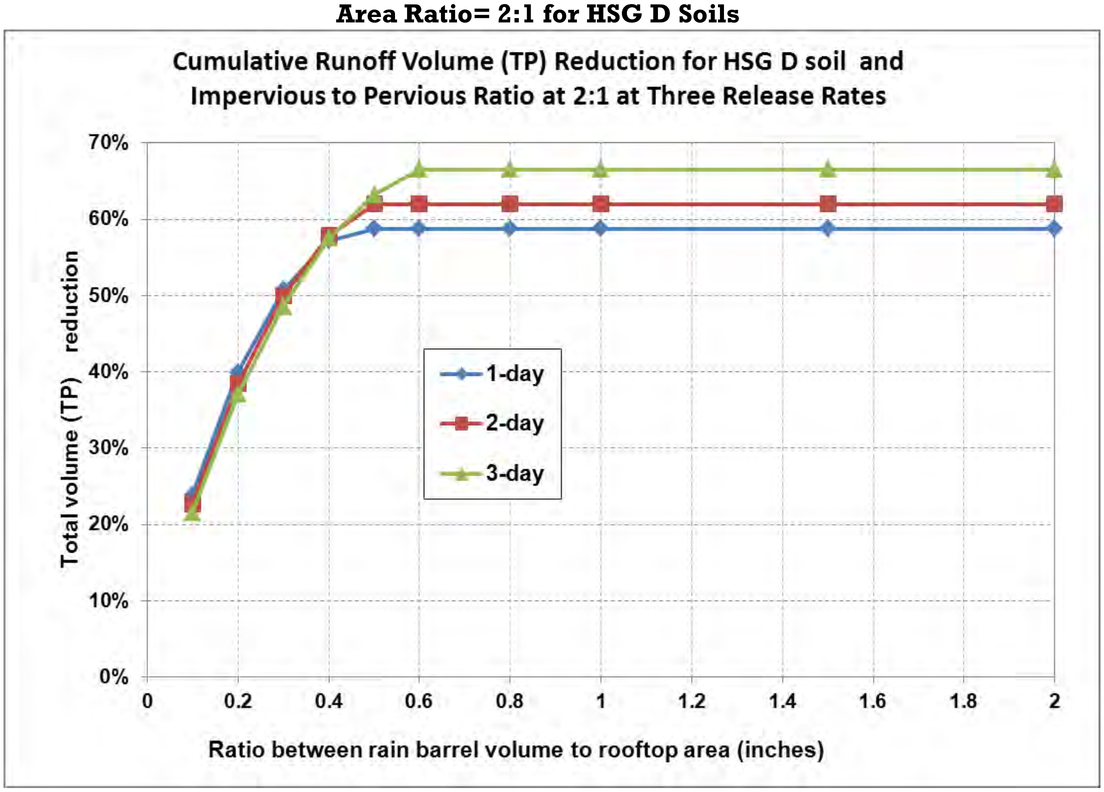


Table 3- 26: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1

Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1												
Storage volume to impervious area ratio	Total Runoff Volume and Phosphorus Load (TP) Reduction Percentages											
	HSG A			HSG B			HSG C			HSG D		
	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day	1-day	2-day	3-day
0.1 in	24%	23%	22%	24%	23%	22%	24%	23%	22%	24%	23%	22%
0.2 in	40%	38%	37%	40%	38%	37%	40%	38%	37%	40%	38%	37%
0.3 in	52%	50%	49%	52%	50%	49%	52%	50%	49%	52%	50%	49%
0.4 in	61%	59%	58%	61%	59%	58%	61%	59%	58%	61%	59%	58%
0.5 in	67%	66%	64%	67%	66%	64%	67%	66%	64%	67%	66%	64%
0.6 in	73%	71%	70%	73%	71%	70%	73%	71%	70%	72%	71%	70%
0.8 in	79%	78%	77%	79%	78%	77%	79%	78%	77%	78%	78%	77%
1.0 in	82%	81%	80%	82%	81%	80%	82%	81%	80%	79%	80%	80%
1.5 in	89%	89%	88%	89%	89%	88%	89%	89%	88%	80%	82%	86%
2.0 in	92%	92%	91%	92%	92%	91%	91%	92%	91%	80%	82%	86%

Figure 3- 34: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG A Soils

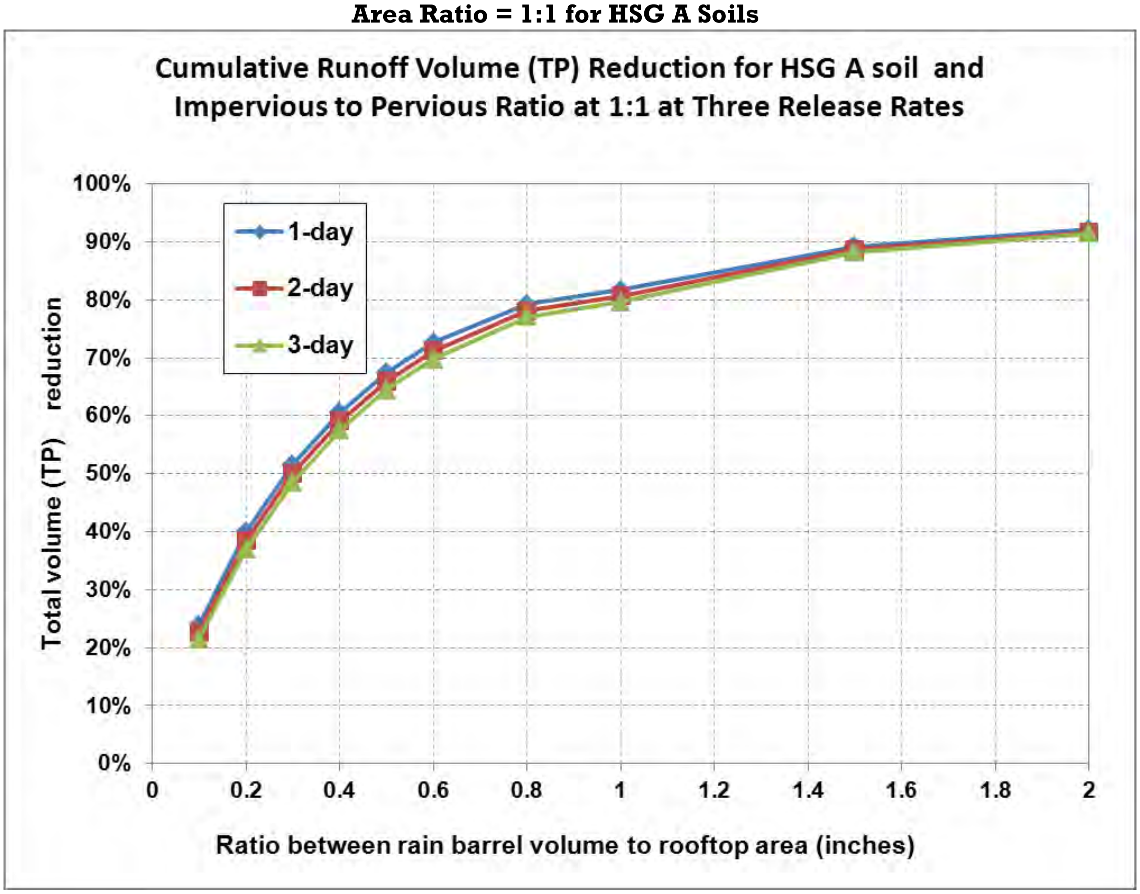


Figure 3- 35: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG B Soils

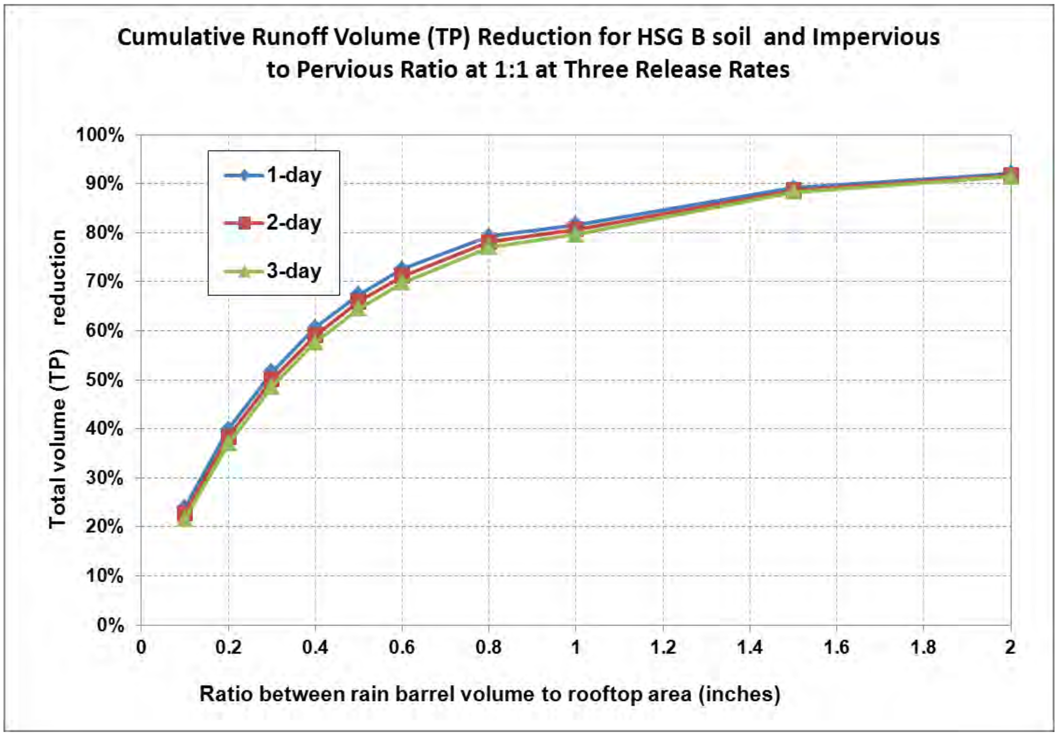


Figure 3- 36: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG C Soils

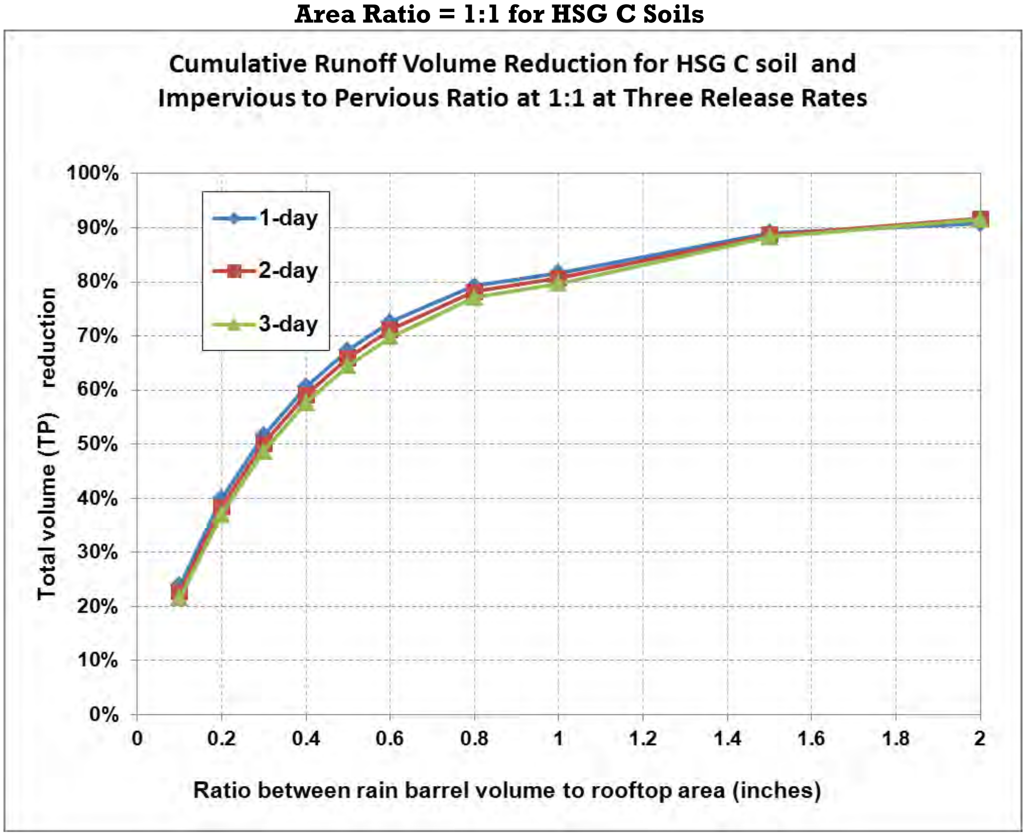


Figure 3- 37: Impervious Area Disconnection through Storage: Impervious Area to Pervious Area Ratio = 1:1 for HSG D Soils

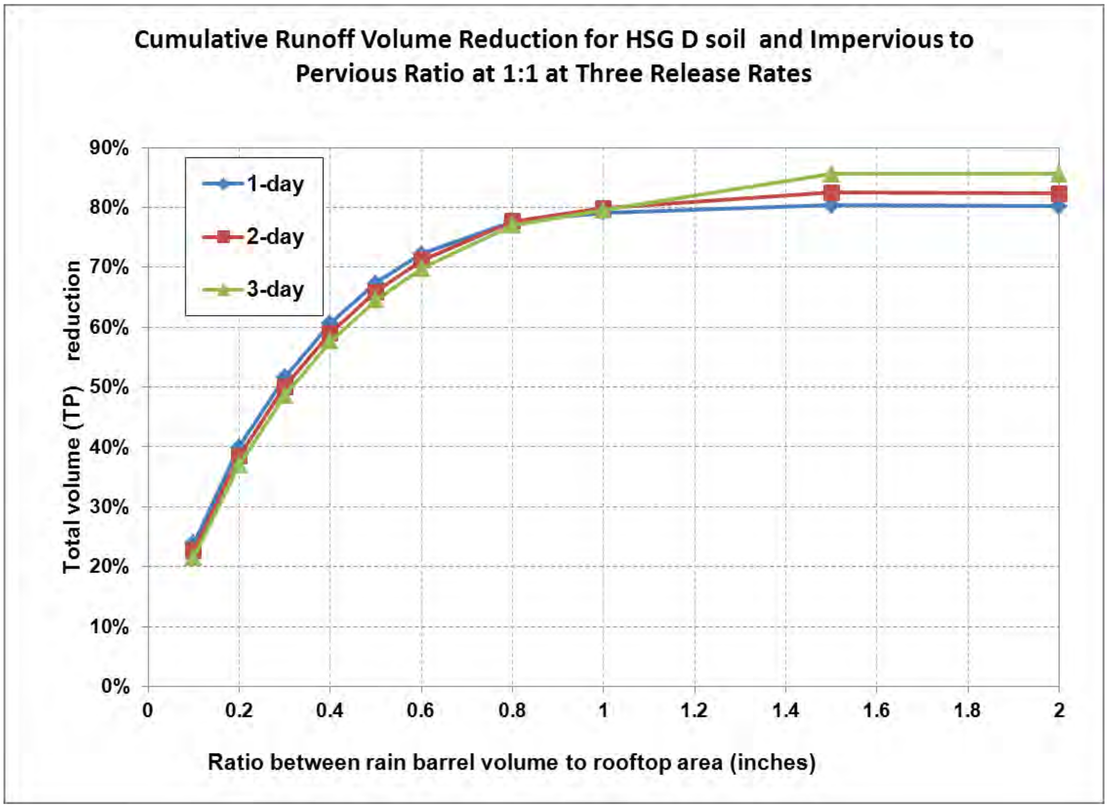


Table 3- 27: Impervious Area Disconnection Performance Table

Impervious area to pervious area ratio	Soil type of Receiving Pervious Area			
	HSG A	HSG B	HSG C	HSG D
8:1	30%	14%	7%	3%
6:1	37%	18%	11%	5%
4:1	48%	27%	17%	9%
2:1	64%	45%	33%	21%
1:1	74%	59%	49%	36%
1:2	82%	67%	60%	49%
1:4	85%	72%	67%	57%

Figure 3- 38: Impervious Area Disconnection Performance Curves

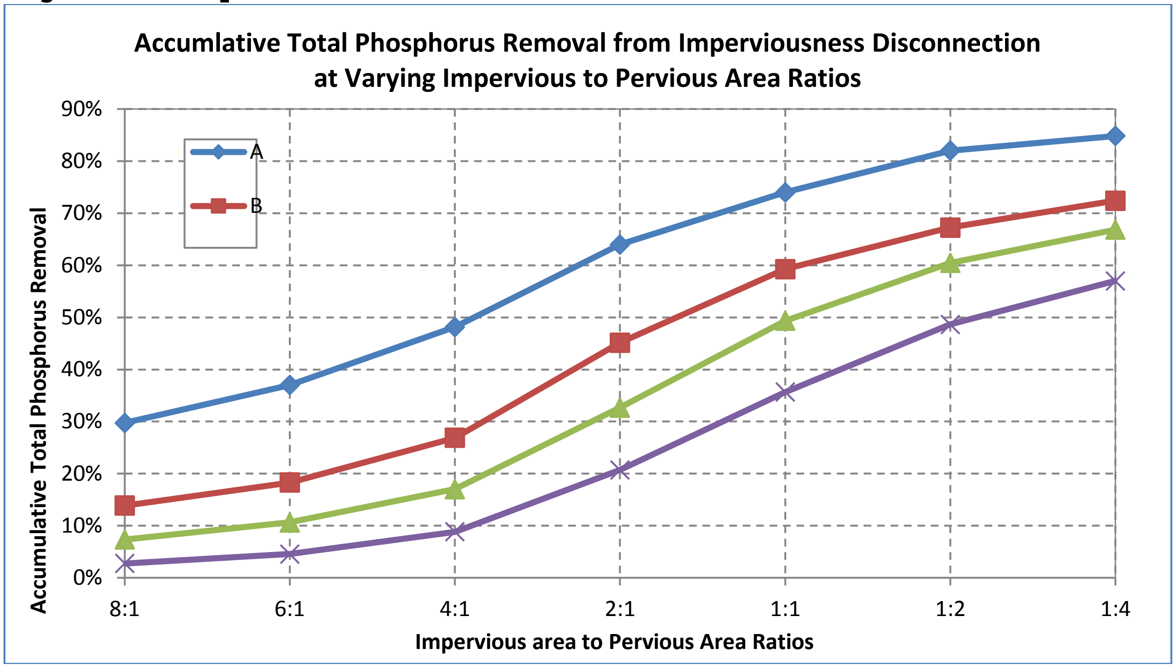


Table 3- 28: Performance Table for Conversion of Impervious Areas to Pervious Area based on Hydrological Soil Groups

Land-Use Group	Cumulative Reduction in Annual Stormwater Phosphorus Load				
	Conversion of impervious area to pervious area-HSG A	Conversion of impervious area to pervious area-HSG B	Conversion of impervious area to pervious area-HSG C	Conversion of impervious area to pervious area-HSG C/D	Conversion of impervious area to pervious area-HSG D
Commercial (Com) and Industrial (Ind)	98.5%	93.5%	88.0%	83.5%	79.5%
Multi-Family (MFR) and High-Density Residential (HDR)	98.8%	95.0%	90.8%	87.3%	84.2%
Medium -Density Residential (MDR)	98.6%	94.1%	89.1%	85.0%	81.4%
Low Density Residential (LDR) - "Rural"	98.2%	92.4%	85.9%	80.6%	75.9%
Highway (HWY)	98.0%	91.3%	84.0%	78.0%	72.7%
Forest (For)	98.2%	92.4%	85.9%	80.6%	75.9%
Open Land (Open)	98.2%	92.4%	85.9%	80.6%	75.9%
Agriculture (Ag)	70.6%	70.6%	70.6%	70.6%	70.6%

Table 3- 29: Performance Table for Conversion of Low Permeable Pervious Area to High Permeable Pervious Area based on Hydrological Soil Group

Land Cover	Cumulative Reduction in Annual SW Phosphorus Load from Pervious Area				
	Conversion of pervious area HSG D to pervious area-HSG A	Conversion of pervious area HSG D to pervious area-HSG B	Conversion of pervious area HSG D to pervious area-HSG C	Conversion of pervious area HSG C to pervious area-HSG A	Conversion of pervious area HSG C to pervious area-HSG B
Developed Pervious Land	92.7%	68.3%	41.5%	83.5%	79.5%

Table 3-30 Method for determining stormwater control design volume (DSV) (i.e., capacity) using Long-term cumulative performance curves

Stormwater Control Type	Description	Applicable Structural Stormwater Control Performance Curve	Equation for calculating Design Storage Capacity for Estimating Cumulative Reductions using Performances Curves
Infiltration Trench	Provides temporary storage of runoff using the void spaces within the soil/sand/gravel mixture that is used to backfill the trench for subsequent infiltration into the surrounding sub-soils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = void space volumes of gravel and sand layers DSV = $(L \times W \times D_{stone} \times n_{stone}) + (L \times W \times D_{sand} \times n_{sand})$
Subsurface Infiltration	Provides temporary storage of runoff using the combination of storage structures (e.g., galleys, chambers, pipes, etc.) and void spaces within the soil/sand/gravel mixture that is used to backfill the system for subsequent infiltration into the surrounding sub-soils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Water storage volume of storage units and void space volumes of backfill materials. Example for subsurface galleys backfilled with washed stone: DSV = $(L \times W \times D)_{galley} + (L \times W \times D_{stone} \times n_{stone})$
Surface Infiltration	Provides temporary storage of runoff through surface ponding storage structures (e.g., basin or swale) for subsequent infiltration into the underlying soils.	Infiltration Basin (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Water volume of storage structure before bypass. Example for linear trapezoidal vegetated swale DSV = $(L \times ((W_{bottom}+W_{top@Dmax})/2) \times D)$
Rain Garden/Bio-retention (no underdrains)	Provides temporary storage of runoff through surface ponding and possibly void spaces within the soil/sand/gravel mixture that is used to filter runoff prior to infiltration into underlying soils.	Infiltration Basin (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Ponding water storage volume and void space volumes of soil filter media. Example for raingarden : DSV = $(A_{pond} \times D_{pond}) + (A_{soil} \times D_{soil} \times n_{soil\ mix})$
Tree Filter (no underdrain)	Provides temporary storage of runoff through surface ponding and void spaces within the soil/sand/gravel mixture that is used to filter runoff prior to infiltration into underlying soils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = Ponding water storage volume and void space volumes of soil filter media. DSV = $(L \times W \times D_{ponding}) + (L \times W \times D_{soil} \times n_{soil\ mix})$
Bio-Filtration (w/underdrain)	Provides temporary storage of runoff for filtering through an engineered soil media. The storage capacity includes void spaces in the filter media and temporary ponding at the surface. After runoff has passed through the filter media it is collected by an under-drain pipe for discharge. Manufactured or packaged bio-filter systems such as tree box filters may be suitable for using the bio-filtration performance results.	Bio-filtration	DSV = Ponding water storage volume and void space volume of soil filter media. Example of a linear biofilter: DSV = $(L \times W \times D_{ponding}) + (L \times W \times D_{soil} \times n_{soil})$
Gravel Wetland	Based on design by the UNH Stormwater Center (UNHSC). Provides temporary surface ponding storage of runoff in a vegetated wetland cell that is eventually routed to an underlying saturated gravel internal storage reservoir (ISR) for nitrogen treatment. Outflow is controlled by an elevated orifice that has its invert elevation equal to the top of the ISR layer and provides a retention time of at least 24 hours.	Gravel Wetland	DSV = pretreatment volume + ponding volume + void space volume of gravel ISR. DSV = $(A_{pretreatment} \times D_{preTreatment}) + (A_{wetland} \times D_{ponding}) + (A_{ISR} \times D_{gravel} \times n_{gravel})$
Porous Pavement with subsurface infiltration	Provides filtering of runoff through a filter course and temporary storage of runoff within the void spaces of a subsurface gravel reservoir prior to infiltration into subsoils.	Infiltration Trench (6 infiltration rates: 0.17, 0.27, 0.52, 1.02, 2.41 and 8.27 inches per hour)	DSV = void space volumes of gravel layer DSV = $(L \times W \times D_{stone} \times n_{stone})$
Porous pavement w/ impermeable underliner w/underdrain	Provides filtering of runoff through a filter course and temporary storage of runoff within the void spaces prior to discharge by way of an underdrain.	Porous Pavement	Depth of Filter Course = D_{FC}
Wet Pond	Provides treatment of runoff through routing through permanent pool.	Wet Pond	DSV= Permanent pool volume prior to high flow bypass DSV=$A_{pond} \times D_{pond}$ (does not include pretreatment volume)
Extended Dry Detention Basin	Provides temporary detention storage for the design storage volume to drain in 24 hours through multiple out let controls.	Dry Pond	DSV= Ponding volume prior to high flow bypass DSV=$A_{pond} \times D_{pond}$ (does not include pretreatment volume)
Dry Water Quality Swale/Grass Swale	Based on MA design standards. Provides temporary surface ponding storage of runoff in an open vegetated channel through permeable check dams. Treatment is provided by filtering of runoff by vegetation and check dams and infiltration into subsurface soils.	Grass swale	DSV = Volume of swale at full design depth DSV=Lswale x Aswale

Definitions: DSV= Design Storage Volume = physical storage capacity to hold water; **VSV** = Void Space Volume; **L** = length, **W** = width, **D** = depth at design capacity before bypass, **n** = porosity fill material, **A**= average surface area for calculating volume; **Infiltration rate** = saturated soil hydraulic conductivity

Appendix G
Massachusetts Small MS4 Permit Monitoring Requirements
For Discharges into Impaired Waters – Parameters and Methods

Pollutant Causing Impairment	Monitoring Parameter	EPA or Approved Method No.
Aluminum	Aluminum, Total	200.7; 200.8; 200.9
Ammonia (Un-ionized)	Ammonia – Nitrogen	350.1
Arsenic	Arsenic, Total	200.7; 200.8; 200.9
Cadmium	Cadmium, Total	200.7; 200.8; 200.9
Chlordane	NMR	608; 625
Chloride	Chloride	300
Chromium (total)	Chromium, Total	200.7; 200.8; 200.9
Copper	Copper, Total	200.7; 200.8; 200.9
DDT	NMR	608; 625
DEHP (Di-sec-octyl phthalate)	NMR	---
Dioxin (including 2,3,7,8-TCDD)	NMR	613; 1613
Dioxin (2,3,7,8-Tetrachlorodibenzo-p-dioxin only)	NMR	613
Lead	Lead, Total	200.7; 200.8; 200.9
Mercury in Water Column	NMR unless potentially present such (e.g., salvage yards crushing vehicles with Hg switches)	200.7; 200.8; 200.9
Nitrogen (Total)	Nitrogen, Total	351.1/351.2 + 353.2
Pentachlorophenol (PCP)	NMR	---
Petroleum Hydrocarbons	Oil and Grease	1664
Phosphorus (Total)	Phosphorus, Total	365.1; 365.2; 365.3; SM 4500-P-E
Polychlorinated biphenyls	NMR	---
Polycyclic Aromatic Hydrocarbons (PAHs) (Aquatic Ecosystems)	PAHs	610; 1625
Sulfide-Hydrogen Sulfide	NMR	---
Mercury in Fish Tissue	NMR	---
PCB in Fish Tissue	NMR	---
Total Dissolved Solids	Total Dissolved Solids	160.1
Total Suspended Solids (TSS)	Total Suspended Solids	160.2, 180.1
Turbidity	Total Suspended Solids and Turbidity	160.2, 180.1
Secchi disk transparency	Total Suspended Solids	160.2
Sediment Screening Value (Exceedence)	Total Suspended Solids	160.2

Sedimentation/Siltation	Total Suspended Solids	160.2
Bottom Deposits	Total Suspended Solids	160.2
Color	NMR	---
pH, High	pH	150.2
pH, Low	pH	150.2
Taste and Odor	NMR	---
Temperature, water	NMR	---
Salinity	Specific Conductance	120.1
Enterococcus	Enterococcus	1106.1; 1600; Enterolert® 12 22.
Escherichia coli	E. coli	1103.1; 1603; Colilert® 12 16, Colilert-18® 12 15 16.; mColiBlue-24®17.
Fecal Coliform	Fecal Coliform	1680; 1681
Organic Enrichment (Sewage) Biological Indicators	Enterococcus (marine waters) or E. coli (freshwater)	1106.1; 1600
Debris/Floatables/Trash	NMR	or
Foam/Flocs/Scum/Oil Slicks	Contact MassDEP	1103.1; 1603
Oil and Grease	Oil and Grease	---
Chlorophyll-a	Total Phosphorus (freshwater)	---
	Total Nitrogen (marine waters)	1664
Nutrient/Eutrophication Biological Indicators	Total Phosphorus (freshwater)	365.1; 365.2; 365.3
	Total Nitrogen (marine waters)	351.1/351.2 + 353.2
Dissolved oxygen saturation / Oxygen, Dissolved	Dissolved Oxygen	365.1; 365.2; 365.3
	Temperature	351.1/351.2 + 353.2
	BOD_5	360.1; 360.2
	Total Phosphorus (freshwater)	SM-2550
	Total Nitrogen (marine waters)	SM-5210
Excess Algal Growth	Total Phosphorus (freshwater)	365.1; 365.2; 365.3
	Total Nitrogen (marine waters)	351.1/351.2 + 353.2
Aquatic Plants (Macrophytes)	NMR	---

Abnormal Fish deformities, erosions, lesions, tumors (DELTS)	NMR	---
Abnormal Fish Histology (Lesions)	NMR	---
Estuarine Bioassessments	Contact MassDEP	---
Fishes Bioassessments	Contact MassDEP	---
Aquatic Macroinvertebrate Bioassessments	Contact MassDEP	---
Combined Biota/Habitat Bioassessments	Contact MassDEP	---
Habitat Assessment (Streams)	Contact MassDEP	---
Lack of a coldwater assemblage	Contact MassDEP	---
Fish Kills	Contact MassDEP	---
Whole Effluent Toxicity (WET)	Contact MassDEP	---
Ambient Bioassays -- Chronic Aquatic Toxicity	Contact MassDEP	---
Sediment Bioassays -- Acute Toxicity Freshwater	Contact MassDEP	---
Sediment Bioassays -- Chronic Toxicity Freshwater	Contact MassDEP	---
Fish-Passage Barrier	NMR	---
Alteration in stream-side or littoral vegetative covers	NMR	---
Low flow alterations	NMR	---
Other flow regime alterations	NMR	---
Physical substrate habitat alterations	NMR	---
Other anthropogenic substrate alterations	NMR	---
Non-Native Aquatic Plants	NMR	---
Eurasian Water Milfoil, Myriophyllum spicatum	NMR	---
Zebra mussel, Dreissena polymorph	NMR	---
Other	Contact MassDEP	---

Notes:

NMR" indicates no monitoring required

"Total Phosphorus (freshwater)" indicates monitoring required for total phosphorus where stormwater discharges to a water body that is freshwater

"Total Nitrogen (marine water)" indicates monitoring required for total nitrogen where stormwater discharges to a water body that is a marine or estuarine water

APPENDIX H

Requirements Related to Discharges to Certain Water Quality Limited Waterbodies

Table of Contents

I. Discharges to water quality limited waterbodies and their tributaries where nitrogen is the cause of the impairment

1. Part 2.2.2.a.i. of the permit identifies the permittees subject to additional requirements to address nitrogen in their stormwater discharges because they discharge to waterbodies that are water quality limited due to nitrogen, or their tributaries, without an EPA approved TMDL. Permittees identified in part 2.2.2.a.i of the permit must identify and implement BMPs designed to reduce nitrogen discharges in the impaired catchment(s). To address nitrogen discharges each permittee shall comply with the following requirements:

   a. Additional or Enhanced BMPs

      i. The permittee remains subject to all the requirements of part 2.3. of the permit and shall include the following enhancements to the BMPs required by part 2.3 of the permit:

         1. Part 2.3.2, Public education and outreach: The permittee shall supplement its Residential and Business/Commercial/Institution program with annual timed messages on specific topics. The permittee shall distribute an annual message in the spring (April/May) timeframe that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release fertilizers. The permittee shall distribute an annual message in the summer (June/July) timeframe encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee shall distribute an annual message in the Fall (August/September/October) timeframe encouraging the proper disposal of leaf litter. The permittee shall deliver an annual

message on each of these topics, unless the permittee determines that one or more of these issues is not a significant contributor of nitrogen to discharges from the MS4 and the permittee retains documentation of this finding in the SWMP. All public education messages can be combined with requirements of Appendix H part II and III as well as Appendix F part A.III, A.IV, A.V, B.I, B.II and B.III where appropriate.

2. Part 2.3.6, Stormwater Management in New Development and Redevelopment: the requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for nitrogen removal; retrofit inventory and priority ranking under 2.3.6.1.b shall include consideration of BMPs to reduce nitrogen discharges.

3. Part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: establish requirements for use of slow release fertilizers on permittee owned property currently using fertilizer, in addition to reducing and managing fertilizer use as provided in 2.3.7.1; establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increase street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a minimum of two times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall).

b. Nitrogen Source Identification Report

i. Within four years of the permit effective date the permittee shall complete a Nitrogen Source Identification Report. The report shall include the following elements:

1. Calculation of total MS4 area draining to the water quality limited water segments or their tributaries, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6,
2. All screening and monitoring results pursuant to part 2.3.4.7.d., targeting the receiving water segment(s)
3. Impervious area and DCIA for the target catchment
4. Identification, delineation and prioritization of potential catchments with high nitrogen loading
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment

ii. The final Nitrogen Source Identification Report shall be submitted to EPA as part of the year 4 annual report.

c. Potential Structural BMPs

i. Within five years of the permit effective date, the permittee shall evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under permit part 2.3.6.d.ii. or identified in the Nitrogen Source Identification Report that are within the drainage area of the impaired water or its tributaries. The evaluation shall include:

1. The next planned infrastructure, resurfacing or redevelopment activity planned for the property (if applicable) OR planned retrofit date;
2. The estimated cost of redevelopment or retrofit BMPs; and
3. The engineering and regulatory feasibility of redevelopment or retrofit BMPs.

ii. The permittee shall provide a listing of planned structural BMPs and a plan and schedule for implementation in the year 5 annual report. The permittee shall plan and install a minimum of one structural BMP as a demonstration project within the drainage area of the water quality limited water or its tributaries within six years of the permit effective date. The demonstration project shall be installed targeting a catchment with high nitrogen load potential. The permittee shall install the remainder of the structural BMPs in accordance with the plan and schedule provided in the year 5 annual report.

iii. Any structural BMPs listed in Table 3 of Attachment 1 to Appendix H already existing or installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the nitrogen removal by the BMP consistent with Attachment 1 to Appendix H. The permittee shall document the BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated nitrogen removed in mass per year by the BMP in each annual report.

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix H part I.1. applicable to it when in compliance with this part.

   a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
      i. The receiving water and all downstream segments are determined to no longer be impaired due to nitrogen by MassDEP and EPA concurs with such determination.
      ii. An EPA approved TMDL for the receiving water or downstream receiving water indicates that no additional stormwater controls for the control of nitrogen are necessary for the permittee's discharge based on wasteload allocations as part of the approved TMDL.
   b. In such a case, the permittee shall document the date of the determination provided for in paragraph a. above or the approved TMDL date in its SWMP and is relieved of any additional requirements of Appendix H part I.1. as of the applicable date and the permittee shall comply with the following:

i. The permittee shall identify in its SWMP all activities that have been implemented in accordance with the requirements of Appendix H part I.1. as of the applicable date to reduce nitrogen in its discharges, including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs

ii. The permittee shall continue to implement all requirements of Appendix H part I.1. required to be done prior to the date of determination or the date of the approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

II. Discharges to water quality limited waterbodies and their tributaries where phosphorus is the cause of the impairment

1. Part 2.2.2.b.i. of the permit identifies the permittees subject to additional requirements to address phosphorus in their stormwater discharges because they discharge to waterbodies that are water quality limited due to phosphorus, or their tributaries, without an EPA approved TMDL. Permittees identified in part 2.2.2.b.i. of the permit must identify and implement BMPs designed to reduce phosphorus discharges in the impaired catchment(s). To address phosphorus discharges each permittee shall comply with the following requirements:

   a. Additional or Enhanced BMPs

      i. The permittee remains subject to the requirements of part 2.3. of the permit and shall include the following enhancements to the BMPs required by part 2.3 of the permit:

         1. Part 2.3.2, Public education and outreach: The permittee shall supplement its Residential and Business/Commercial/Institution program with annual timed messages on specific topics. The permittee shall distribute an annual message in the spring (March/April) timeframe that encourages the proper use and disposal of grass clippings and encourages the proper use of slow-release and phosphorous-free fertilizers. The permittee shall distribute an annual message in the summer (June/July) timeframe encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee shall distribute an annual message in the fall (August/September/October) timeframe encouraging the proper disposal of leaf litter. The permittee shall deliver an annual message on each of these topics, unless the permittee determines that one or more of these issues is not a significant contributor of phosphorous to discharges from the MS4 and the permittee retains documentation of this finding in the SWMP. All public education messages can be combined with requirements of Appendix H part I and III as well as Appendix F part A.III, A.IV, A.V, B.I, B.II and B.III where appropriate.

         2. Part 2.3.6, Stormwater Management in New Development and Redevelopment: the requirement for adoption/amendment of the permittee's ordinance or other regulatory mechanism shall include a requirement that new development and redevelopment stormwater management BMPs be optimized for phosphorus removal; retrofit inventory and priority ranking under 2.3.6.1.b shall include consideration of BMPs that infiltrate stormwater where feasible.

         3. Part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: Establish procedures to properly manage grass cuttings and leaf litter on permittee property, including prohibiting blowing organic waste materials onto adjacent impervious surfaces; increased street sweeping frequency of all municipal owned streets and parking lots subject to Permit part 2.3.7.a.iii.(c) to a

minimum of two times per year, once in the spring (following winter activities such as sanding) and at least once in the fall (Sept 1 – Dec 1; following leaf fall).

b. Phosphorus Source Identification Report

i. Within four years of the permit effective date the permittee shall complete a Phosphorus Source Identification Report. The report shall include the following elements:

1. Calculation of total MS4 area draining to the water quality limited receiving water segments or their tributaries, incorporating updated mapping of the MS4 and catchment delineations produced pursuant to part 2.3.4.6,
2. All screening and monitoring results pursuant to part 2.3.4.7.d., targeting the receiving water segment(s)
3. Impervious area and DCIA for the target catchment
4. Identification, delineation and prioritization of potential catchments with high phosphorus loading
5. Identification of potential retrofit opportunities or opportunities for the installation of structural BMPs during redevelopment, including the removal of impervious area

ii. The phosphorus source identification report shall be submitted to EPA as part of the year 4 annual report.

c. Potential Structural BMPs

i. Within five years of the permit effective date, the permittee shall evaluate all permittee-owned properties identified as presenting retrofit opportunities or areas for structural BMP installation under permit part 2.3.6.d.ii or identified in the Phosphorus Source Identification Report that are within the drainage area of the water quality limited water or its tributaries. The evaluation shall include:

1. The next planned infrastructure, resurfacing or redevelopment activity planned for the property (if applicable) OR planned retrofit date;
2. The estimated cost of redevelopment or retrofit BMPs; and
3. The engineering and regulatory feasibility of redevelopment or retrofit BMPs.

ii. The permittee shall provide a listing of planned structural BMPs and a plan and schedule for implementation in the year 5 annual report. The permittee shall plan and install a minimum of one structural BMP as a demonstration project within the drainage area of the water quality limited water or its tributaries within six years of the permit effective date. The demonstration project shall be installed targeting a catchment with high phosphorus load potential. The permittee shall install the remainder of the structural BMPs in accordance with the plan and schedule provided in the year 5 annual report.

iii. Any structural BMPs installed in the regulated area by the permittee or its agents shall be tracked and the permittee shall estimate the phosphorus removal by the BMP consistent with Attachment 3 to Appendix F. The permittee shall document the BMP type, total area treated by the BMP, the design storage volume of the BMP and the estimated phosphorus removed in mass per year by the BMP in each annual report.

2. At any time during the permit term the permittee may be relieved of additional requirements in Appendix H part II.1. applicable to it when in compliance with this part.

   a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
      i. The receiving water and all downstream segments are determined to no longer be impaired due to phosphorus by MassDEP and EPA concurs with such determination.
      ii. An EPA approved TMDL for the receiving water or downstream receiving water indicates that no additional stormwater controls for the control of phosphorus are necessary for the permittee's discharge based on wasteload allocations as part of the approved TMDL.
   b. In such a case, the permittee shall document the date of the determination provided for in paragraph a. above or the approved TMDL date in its SWMP and is relieved of any additional requirements of Appendix H part II.1. as of the applicable date and the permittee shall comply with the following:
      i. The permittee shall identify in its SWMP all activities that have been implemented in accordance with the requirements of Appendix H part II.1. as of the applicable date to reduce phosphorus in its discharges, including implementation schedules for non structural BMPs and any maintenance requirements for structural BMPs
      ii. The permittee shall continue to implement all requirements of Appendix H part II.1. required to be done prior to the date of determination or the date of the approved TMDL, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications.

III. Discharges to water quality limited waterbodies where bacteria or pathogens is the cause of the impairment

1. Consistent with part 2.2.2.c.i. of the permit, permittees that discharge to waterbodies that are water quality limited due to bacteria or pathogens, without an EPA approved TMDL, are subject to the following additional requirements to address bacteria or pathogens in their stormwater discharges.

2. Additional or Enhanced BMPs

   a. The permittee remains subject to the requirements of part 2.3. of the permit and shall include the following enhancements to the BMPs required by part 2.3 of the permit:

      i. Part 2.3.2. Public Education and outreach: The permittee shall supplement its Residential program with an annual message encouraging the proper management of pet waste, including noting any existing ordinances where appropriate. The permittee or its agents shall disseminate educational materials to dog owners at the time of issuance or renewal of a dog license, or other appropriate time. Education materials shall describe the detrimental impacts of improper management of pet waste, requirements for waste collection and disposal, and penalties for non-compliance. The permittee shall also provide information to owners of septic systems about proper maintenance in any catchment that discharges to a water body impaired for bacteria or pathogens. All public education messages can be combined with requirements of Appendix H part I and II as well as Appendix F part A.III, A.IV, A.V, B.I, B.II and B.III where appropriate.

      ii. Part 2.3.4 Illicit Discharge: The permittee shall implement the illicit discharge program required by this permit. Catchments draining to any waterbody impaired for bacteria or pathogens shall be designated either Problem Catchments or HIGH priority in implementation of the IDDE program.

3. At any time during the permit term the permittee may be relieved of additional requirements in Appendix H part III.2. applicable to it when in compliance with this part.

   a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
      i. The receiving water is determined to be no longer impaired due to bacteria or pathogens by MassDEP and EPA concurs with such a determination.
      ii. An EPA approved TMDL for the receiving water indicates that no additional stormwater controls are necessary for the control of bacteria or pathogens from the permittee's discharge based on wasteload allocations as part of the approved TMDL.
      iii. The permittee's discharge is determined to be below applicable water quality criteria[1] and EPA agrees with such a determination. The permittee shall submit data to EPA that accurately characterizes the concentration of bacteria or pathogens in their discharge. The characterization shall include water quality

[1] Applicable water quality criteria are the state standards that have been federally approved as of the effective date of this permit and are compiled by EPA at http://www.epa.gov/waterscience/standards/wqslibrary/

and flow data sufficient to accurately assess the concentration of bacteria or pathogens in all seasons during storm events of multiple sizes and for the duration of the storm events including the first flush, peak storm flow and return to baseflow.

b. In such a case, the permittee shall document the date of the determination, date of approved TMDL or date of EPA concurrence that the discharge meets water quality criteria in its SWMP and is relieved of any additional requirements of Appendix H part III.2. as of that date and the permittee shall comply with the following:
    i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix H part III.2. to date to reduce bacteria or pathogens in its discharges, including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs
    ii. The permittee shall continue to implement all requirements of Appendix H part III.3. required to be done prior to the date of determination date, date of approved TMDL, or date of EPA concurrence that the discharge meets water quality criteria, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications

IV. <u>Discharges to water quality limited waterbodies where chloride is the cause of the impairment</u>

1. Consistent with part 2.2.2.c.i. of the permit, permittees that discharge to waterbodies that are water quality limited due to chloride, without an EPA approved TMDL, are subject to the following additional requirements to address chloride in their stormwater discharges.

2. Permittees discharging to a waterbody listed as impaired due to chloride in categories 5 or 4b on the Massachusetts Integrated Report of waters listed pursuant to Clean Water Act sections 303(d) and 305(b) shall develop a Salt Reduction Plan that includes specific actions designed to achieve salt reduction on municipal roads and facilities, and on private facilities that discharge to its MS4 in the impaired catchment(s). The Salt Reduction Plan shall be completed within three years of the effective date of the permit and include the BMPs in part IV.4. below. The Salt Reduction Plan shall be fully implemented five years after the effective date of the permit.

3. Permittees that, during the permit term, become aware that their discharge is to a waterbody that is impaired due to chloride must update their Salt Reduction Plan within 60 days of becoming aware of the situation to include salt reduction practices targeted at lowering chloride in discharges to the impaired waterbody. If the permittee does not have a Salt Reduction Plan already in place, then the permittee shall complete a Salt Reduction Plan that includes the BMPs in part IV 4) below within 3 years of becoming aware of the situation and fully implement the Salt Reduction Plan within 5 years of becoming aware of the situation.

4. Additional or Enhanced BMPs

   a. For municipally maintained surfaces:

      i. Tracking of the types and amount of salt applied to all permittee owned and maintained surfaces and reporting of salt use beginning in the year of the completion of the Salt Reduction Plan in the permittee's annual reports;

      ii. Planned activities for salt reduction on municipally owned and maintained surfaces, which shall include but are not limited to the following unless the permittee determines one or more of the following is not applicable to its system and documents that determination as part of the Salt Reduction Plan:
         - Operational changes such as pre-wetting, pre-treating the salt stockpile, increasing plowing prior to de-icing, monitoring of road surface temperature, etc.;
         - Implementation of new or modified equipment providing pre-wetting capability, better calibration rates, or other capability for minimizing salt use;
         - Training for municipal staff and/or contractors engaged in winter maintenance activities;
         - Adoption of guidelines for application rates for roads and parking lots (see *Winter Parking Lot and Sidewalk Maintenance*

Manual (Revised edition June 2008) http://www.pca.state.mn.us/publications/parkinglotmanual.pdf; and the application guidelines on page 17 of *Minnesota Snow and Ice Control: Field Handbook for Snow Operators (September 2012)* http://www.mnltap.umn.edu/publications/handbooks/documents/snowice.pdf for examples);

- Regular calibration of spreading equipment;
- Designation of no-salt and/or low salt zones;
- Measures to prevent exposure of salt stockpiles (if any) to precipitation and runoff; and
- An estimate of the total tonnage of salt reduction expected by each activity.

b. For privately maintained facilities that discharge to the MS4:

i. Establish an ordinance, bylaw, or other regulatory mechanism requiring measures to prevent exposure of any salt stockpiles to precipitation and runoff at all commercial and industrial properties within the regulated area.

ii. Part 2.3.2. Public Education and Outreach: The permittee shall supplement its Commercial/Industrial education program with an annual message to private road salt applicators and commercial and industrial site owners on the proper storage and application rates of winter deicing material. The educational materials shall be disseminated in the November/December timeframe and shall describe steps that can be taken to minimize salt use and protect local waterbodies.

iii. Part 2.3.6, Stormwater Management in New Development and Redevelopment – establish procedures and requirements to minimize salt usage and require the use of salt alternatives where the permittee deems necessary.

c. The completed Salt Reduction Plan shall be submitted to EPA along with the annual report following the Salt Reduction Plan's completion. Each subsequent annual report shall include an update on Plan implementation progress, any updates to the Salt Reduction Plan deemed necessary by the permittee, as well as the types and amount of salt applied to all permittee owned and maintained surfaces.

5. At any time during the permit term the permittee may be relieved of additional requirements in Appendix H part IV as follows:

a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:

i. The receiving water is determined to be no longer impaired due to chloride by MassDEP and EPA concurs with such a determination.

ii. An EPA approved TMDL for the receiving water indicates that no additional stormwater controls are necessary for the control of chloride from the permittee's discharge based on wasteload allocations as part of the approved TMDL.

iii. The permittee's discharge is determined to be below applicable water quality criteria[2] and EPA agrees with such a determination. The permittee shall submit data to EPA that accurately characterizes the concentration of chloride in their discharge during the deicing season (November – March). The characterization shall include water quality and flow data sufficient to accurately assess the concentration of chloride in the deicing season during storm events of multiple sizes and for the duration of the storm events including the first flush, peak storm flow and return to baseflow and include samples collected during deicing activities.

b. In such a case, the permittee shall document the date of the determination, date of approved TMDL or date of EPA concurrence that the discharge meets water quality criteria in its SWMP and is relieved of any additional requirements of Appendix H part IV as of that date and the permittee shall comply with the following:

i. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix H part IV to date to reduce chloride in its discharges, including implementation schedules for non-structural BMPs

ii. The permittee shall continue to implement all requirements of Appendix H part IV required to be done by the date of determination date, date of approved TMDL, or date of EPA concurrence that the discharge meets water quality criteria, including ongoing implementation of identified non-structural BMPs

[2] Applicable water quality criteria are the state standards that have been federally approved as of the effective date of this permit and are compiled by EPA at http://www.epa.gov/waterscience/standards/wqslibrary/

V. <u>Discharges to water quality limited waterbodies and their tributaries where solids, oil and grease (hydrocarbons), or metals is the cause of the impairment</u>

1. Consistent with part 2.2.2.c.i. of the permit, permittees that discharge to waterbodies that are water quality limited due to solids, metals, or oil and grease (hydrocarbons), without an EPA approved TMDL, are subject to the following additional requirements to address solids, metals, or oil and grease (hydrocarbons) in their stormwater discharges.

2. Additional or Enhanced BMPs

   a. The permittee remains subject to the requirements of part 2.3. of the permit and shall include the following enhancements to the BMPs required by part 2.3 of the permit:

      i. Part 2.3.6, Stormwater Management in New Development and Redevelopment: stormwater management systems designed on commercial and industrial land use area draining to the water quality limited waterbody shall incorporate designs that allow for shutdown and containment where appropriate to isolate the system in the event of an emergency spill or other unexpected event. EPA also encourages the permittee to require any stormwater management system designed to infiltrate stormwater on commercial or industrial sites to provide the level of pollutant removal equal to or greater than the level of pollutant removal provided through the use of biofiltration of the same volume of runoff to be infiltrated, prior to infiltration.

      ii. Part 2.3.7, Good House Keeping and Pollution Prevention for Permittee Owned Operations: increased street sweeping frequency of all municipal owned streets and parking lots to a schedule determined by the permittee to target areas with potential for high pollutant loads. This may include, but is not limited to, increased street sweeping frequency in commercial areas and high density residential areas, or drainage areas with a large amount of impervious area. Prioritize inspection and maintenance for catch basins to ensure that no sump shall be more than 50 percent full. Clean catch basins more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings. Each annual report shall include the street sweeping schedule determined by the permittee to target high pollutant loads.

3. At any time during the permit term the permittee may be relieved of additional requirements in Appendix H part V.2. applicable to it when in compliance with this part.

   a. The permittee is relieved of its additional requirements as of the date when one of the following criteria are met:
      i. The receiving water is determined to be no longer impaired due to solids, metals, or oil and grease (hydrocarbons) by MassDEP and EPA concurs with such a determination.
      ii. An EPA approved TMDL for the receiving water indicates that no additional stormwater controls are necessary for the control of solids, metals, or oil and grease (hydrocarbons) from the permittee's discharge based on wasteload allocations as part of the approved TMDL.

iii. The permittee's discharge is determined to be below applicable water quality criteria and EPA agrees with such a determination[3]. The permittee shall submit data to EPA that accurately characterizes the concentration of bacteria or pathogens in their discharge. The characterization shall include water quality and flow data sufficient to accurately assess the concentration of bacteria or pathogens in all seasons during storm events of multiple sizes and for the duration of the storm events including the first flush, peak storm flow and return to baseflow.

b. In such a case, the permittee shall document the date of the determination, date of approved TMDL or date of EPA concurrence that the discharge meets water quality criteria in its SWMP and is relieved of any additional requirements of Appendix H part V.2. as of that date and the permittee shall comply with the following:

iv. The permittee shall identify in its SWMP all activities implemented in accordance with the requirements of Appendix H part V.2. to date to reduce solids, metals, or oil and grease (hydrocarbons) in its discharges, including implementation schedules for non-structural BMPs and any maintenance requirements for structural BMPs

v. The permittee shall continue to implement all requirements of Appendix H part V.3. required to be done by the date of determination date, date of approved TMDL, or date of EPA concurrence that the discharge meets water quality criteria, including ongoing implementation of identified non-structural BMPs and routine maintenance and replacement of all structural BMPs in accordance with manufacturer or design specifications

[3] Applicable water quality criteria are the state standards that have been federally approved as of the effective date of this permit and are compiled by EPA at http://www.epa.gov/waterscience/standards/wqslibrary/

ATTACHMENT 1 TO APPENDIX H

The estimates of nitrogen load reductions resulting from BMP installation are intended for informational purposes only and there is no associated permittee-specific required nitrogen load reduction in the Draft Permit. Nitrogen load reduction estimates calculated consistent with the methodologies below may be used by the permittee to comply with future permit requirements providing the EPA determines the calculated reductions are appropriate for demonstrating compliance with future permit requirements. This attachment provides the method and an example to calculate the BMP nitrogen load as well as methods to calculate nitrogen load reductions for structural BMPs in an impaired watershed.

BMP N Load:

The **BMP N Load** is the annual nitrogen load from the drainage area to each proposed or existing BMP used by permittee. This measure is used to estimate the amount of annual nitrogen load that the BMP will receive or treat (BMP N Load).

To calculate the BMP N Load for a given BMP:

1) Determine the total drainage area to the BMP and sort the total drainage area into two categories: total impervious area (IA) and total pervious area (PA);

2) Calculate the nitrogen load associated with impervious area ($N\ Load_{IA}$) and the pervious area ($N\ Load_{PA}$) by multiplying the IA and PA by the appropriate land use-based nitrogen load export rate provided in Table 1; and

3) Determine the total nitrogen load to the BMP by summing the calculated impervious and pervious subarea nitrogen loads.

Table 1: Annual nitrogen load export rates

Nitrogen Source Category by Land Use	Land Surface Cover	Nitrogen Load Export Rate, lbs/ac/yr	Nitrogen Load Export Rate, kg/ha/yr
All Impervious Cover	Impervious	14.1	15.8
*Developed Land Pervious (DevPERV)- HSG A	Pervious	0.3	0.3
*Developed Land Pervious (DevPERV)- HSG B	Pervious	1.2	1.3
*Developed Land Pervious (DevPERV) – HSG C	Pervious	2.4	2.7
*Developed Land Pervious (DevPERV) - HSG C/D	Pervious	3.0	3.4
*Developed Land Pervious (DevPERV) - HSG D	Pervious	3.7	4.1
Notes: For pervious areas, if the hydrologic soil group (HSG) is known, use the appropriate value from this table. If the HSG is not known, assume HSG C/D conditions for the nitrogen load export rate.			

<u>Example 1 to determine nitrogen load to a proposed BMP when the contributing drainage area is 100% impervious:</u> A permittee is proposing a storm water infiltration system that will treat runoff from 1.49 acres of impervious area.

Table 1-1: Design parameters for Bio-filtration w/ ISR systems for Example 1

Components of representation	Parameters	Value
Ponding	Maximum depth	0.33 ft
	Surface area	645 ft^2
Soil mix	Depth	2.0 ft
	Porosity	0.24
	Hydraulic conductivity	2.5 inches/hour
Stone Reservoir (ISR)	Depth	2.50 ft
	Porosity	0.42
	Hydraulic conductivity	500 inches/hour
ISR Volume: System Storage Volume	Ratio	0.56
Orifices	Diameter	12 in
		Installed 2.5 above impermeable soil layer

Determine:

A) Percent nitrogen load reduction (BMP Reduction $_{\%\text{-N}}$) for the specified bio-filtration w/ISR system and contributing impervious drainage area; and

B) Nitrogen reduction in pounds that would be accomplished by the bio-filtration w/ISR system (BMP-Reduction $_{\text{lbs-N}}$)

<u>Solution:</u>

1) The BMP is a bio-filtration w/ISR system that will treat runoff from 1.49 acres of impervious area (IA = 1.49 acre);

2) The available storage volume capacity (ft^3) of the bio-filtration w/ISR system (BMP-Volume $_{BMP\text{-}ft^3}$) is determined using the surface area of the system, depth of ponding, the porosity of the filter media and the porosity of the stone reservoir:

BMP-Volume $_{BMP\text{-}ft^3}$ =Surface area x (pond maximum depth + (soil mix depth x soil mix porosity) + stone reservoir depth x gravel layer porosity))
= 520 ft^2 x (0.33 ft + (2.0ft x 0.24) + (2.5 ft x 0.42))
= 1,200 ft^3

3) The available storage volume capacity of the bio-filtration w/ISR system in inches of runoff from the contributing impervious area (BMP-Volume $_{IA\text{-}in}$) is calculated using equation 1:

BMP-Volume $_{IA\text{-}in}$ = (BMP-Volume $_{ft^3}$/ IA (acre) x 12 in/ft x 1 acre/43560 ft^2 **(Equation 1)**

Example 1 Continued:

BMP-Volume $_{IA\text{-}in}$ = (1,200 ft^3/1.49 acre) x 12 in/ft x 1 acre/43560 ft^2
= 0.22 in

4) Using the Regional Performance Curve shown in Figure 1 for a bio-filtration w/ ISR system, a **61%** nitrogen load reduction (BMP Reduction %-N) is determined for a bio-filtration w/ ISR systems sized for 0.22 in of runoff from 1.49 acres of impervious area; and

5) Calculate the nitrogen load reduction in pounds of nitrogen for the bio-filtration w/ISR system (BMP Reduction $_{lbs\text{-}N}$) using the BMP Load calculation method shown above in Example 1 and the BMP Reduction $_{\%\text{-}N}$ determined in step 4 by using equation 2.

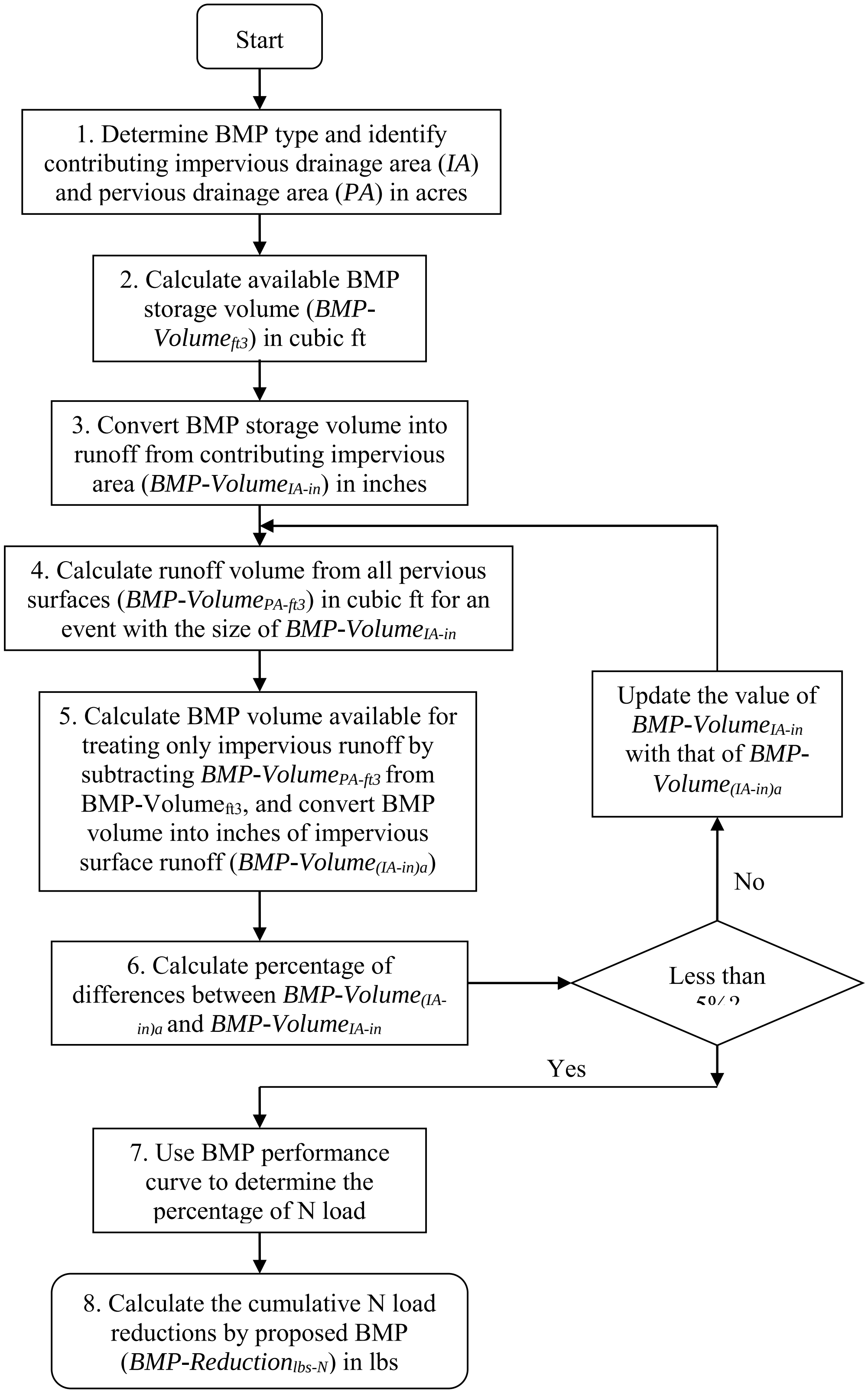
First, the BMP Load is determined as specified in Example 1:

BMP Load = IA (acre) x 14.1 lb/ac/yr
= 1.49 acres x 14.1 lbs/acre/yr
= 21.0 lbs/yr

BMP Reduction $_{lbs\text{-}N}$ = BMP Load x (BMP Reduction $_{\%\text{-}N}$/100) **(Equation 2)**

BMP Reduction $_{lbs\text{-}N}$ = 21 lbs/yr x (61/100)
= **12.8 lbs/yr**

Method to determine the nitrogen load reduction for a structural BMP with a known storage volume when the contributing drainage area has impervious and pervious surfaces



Flow Chart 2 (previous page). Method to determine the nitrogen load reduction for a BMP with known storage volume when both pervious and impervious drainage areas are present.

1) Identify the type of structural BMP and characterize the contributing drainage area to the structural BMP by identifying the following information for the impervious and pervious surfaces:

Impervious area (IA) – Area (acre) and export rate (Table 1)

Pervious area (PA) – Area (acre) and runoff depth based on hydrologic soil group (HSG) and size of rainfall event. Table 2 provides values of runoff depth for various rainfall depths and HSGs. Soils are assigned to an HSG based on their permeability. HSG categories for pervious areas in the Watershed shall be estimated by consulting local soil surveys prepared by the National Resource Conservation Service (NRCS) or by a storm water professional evaluating soil testing results from the Watershed. If the HSG condition is not known, a HSG D soil condition should be assumed.

Table 2: Developed Land Pervious Area Runoff Depths based on Precipitation depth and Hydrological Soil Groups (HSGs)

Rainfall Depth, Inches	Runoff Depth, inches		
	Pervious HSG A/B	Pervious HSG C	Pervious HSG D
0.10	0.00	0.00	0.00
0.20	0.00	0.01	0.02
0.40	0.00	0.03	0.06
0.50	0.00	0.05	0.09
0.60	0.01	0.06	0.11
0.80	0.02	0.09	0.16
1.00	0.03	0.12	0.21
1.20	0.04	0.14	0.39
1.50	0.11	0.39	0.72
2.00	0.24	0.69	1.08

Notes: Runoff depths derived from combination of volumetric runoff coefficients from Table 5 of *Small Storm Hydrology and Why it is Important for the Design of Stormwater Control Practices*, Pitt, 1999 and using the Stormwater Management Model (SWMM) in continuous model mode for hourly precipitation data for Boston, MA, 1998-2002.

2) Determine the available storage volume (ft^3) of the structural BMP (BMP-Volume $_{ft^3}$) using the BMP dimensions and design specifications (e.g., maximum storage depth, filter media porosity);

3) To estimate the nitrogen load reduction of a BMP with a known storage volume capacity, it is first necessary to determine the portion of available BMP storage capacity (BMP-Volume $_{ft^3}$) that would treat the runoff volume generated from the contributing impervious area (IA) for a rainfall event with a depth of *i* inches (in). This will require knowing the corresponding amount of runoff volume that would be generated from the contributing pervious area (PA) for the same rainfall event (depth of *i* inches). Using equation 3 below, solve for the BMP capacity that would be available to treat runoff from the contributing imperious area for the unknown rainfall depth of *i* inches (see equation 4):

BMP-Volume $_{ft^3}$ = BMP-Volume $_{(IA\text{-}ft^3)i}$ + BMP-Volume $_{(PA\text{-}ft^3)i}$ **(Equation 3)**

Where:

BMP-Volume $_{ft^3}$	= the available storage volume of the BMP
BMP-Volume $_{(IA\text{-}ft^3)i}$	= the available storage volume of the BMP that would fully treat runoff generated from the contributing impervious area for a rainfall event of size *i* inches
BMP-Volume $_{(PA\text{-}ft^3)i}$	= the available storage volume of the BMP that would fully treat runoff generated from the contributing pervious area for a rainfall event of size *i* inches

Solving for BMP-Volume $_{(IA\text{-}ft^3)i}$:

BMP-Volume $_{(IA\text{-}ft^3)i}$ = BMP-Volume $_{ft^3}$ - BMP-Volume $_{(PA\text{-}ft^3)i}$ **(Equation 4)**

To determine BMP-Volume $_{(IA\text{-}ft^3)i}$, requires performing an iterative process of refining estimates of the rainfall depth used to calculate runoff volumes until the rainfall depth used results in the sum of runoff volumes from the contributing IA and PA equaling the available BMP storage capacity (BMP-Volume $_{ft^3}$). For the purpose of estimating BMP performance, it will be considered adequate when the IA runoff depth (in) is within 5% IA runoff depth used in the previous iteration.

For the first iteration (1), convert the BMP-Volume $_{ft^3}$ determined in step 2 into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)1}$) using equation 5.

BMP-Volume $_{(IA\text{-}in)1}$ = (BMP-Volume$_{ft^3}$/ IA (acre)) x (12 in/ft /43,560 ft^2/acre) **(Equation 5)**;

For iterations 2 through n (2…n), convert the BMP Volume $_{(IA\text{-}ft^3)2...n}$, determined in step 5a below, into inches of runoff from the contributing impervious area (BMP Volume $_{(IA\text{-}in)2…n}$) using equation 6.

BMP-Volume $_{(IA\text{-}in)2...n}$ = (BMP-Volume $_{(IA\text{-}ft^3)2...n}$ / IA (acre)) x (12 in/ft /43,560 ft^2/acre) **(Equation 6)**;

4) For 1 to n iterations, use the pervious runoff depth information from Table 2 and equation 7 to determine the total volume of runoff (ft^3) from the contributing PA (BMP Volume

$_{PA\text{-}ft^3}$) for a rainfall size equal to the sum of BMP-Volume $_{(IA\text{-}in)1}$, determined in step 3. The runoff volume for each distinct pervious area must be determined.

BMP Volume $_{(PA\text{-}ft^3)1...n} = \sum$ ((PA x (runoff depth)$_{(PA1,\ PA2..PAn)}$ x (3,630 ft^3/acre-in) **(Equation 7)**

5) For iteration 1, estimate the portion of BMP Volume that is available to treat runoff from only the IA by subtracting BMP-Volume $_{PA\text{-}ft^3}$, determined in step 4, from BMP-Volume $_{ft^3}$, determined in step 2, and convert to inches of runoff from IA (see equations 8 and 9):

BMP-Volume $_{(IA\text{-}ft^3)2}$ = ((BMP-Volume$_{ft^3}$- BMP Volume $_{(PA\text{-}ft^3)1}$) **(Equation 8)**

BMP-Volume $_{(IA\text{-}in)2}$ = (BMP-Volume $_{(IA\text{-}ft^3)2}$/IA (acre)) x (12 in/ft x 1 acre/43,560 ft^2) **(Equation 9)**

If additional iterations (i.e., 2 through n) are needed, estimate the portion of BMP volume that is available to treat runoff from only the IA (BMP-Volume $_{(IA\text{-}in)3..n+1}$) by subtracting BMP Volume $_{(PA\text{-}ft^3)2..n}$, determined in step 4, from BMP Volume $_{(IA\text{-}ft^3)3..n+1}$, determined in step 5, and by converting to inches of runoff from IA using equation 9):

6) For iteration A (an iteration between 1 and n+1), compare BMP Volume $_{(IA\text{-}in)a}$ to BMP Volume $_{(IA\text{-}in)a\text{-}1}$ determined from the previous iteration (a-1). If the difference in these values is greater than 5% of BMP Volume $_{(IA\text{-}in)a}$ then repeat steps 4 and 5, using BMP Volume $_{(IA\text{-}in)a}$ as the new starting value for the next iteration (a+1). If the difference is less than or equal to 5 % of BMP Volume $_{(IA\text{-}in)a}$ then the permittee may proceed to step 7.

7) Determine the % nitrogen load reduction for the structural BMP (BMP Reduction $_{\%\text{-}N}$) using the appropriate BMP curve on Figure 1 or 2 and the BMP-Volume $_{(IA\text{-}in)n}$ calculated in the final iteration of step 5; and

8) Calculate the nitrogen load reduction in pounds of nitrogen for the structural BMP (BMP Reduction $_{lbs\text{-}N}$) using the BMP Load as calculated above in Example 1 and the percent nitrogen load reduction (BMP Reduction $_{\%\text{-}N}$) determined in step 7 by using equation 10:

BMP Reduction $_{lbs\text{-}N}$ = BMP Load x (BMP Reduction $_{\%\text{-}N}$/100) **(Equation 10)**

Example 2: Determine the nitrogen load reduction for a structural BMP with a known design volume when the contributing drainage area has impervious and pervious surfaces

A permittee is considering an infiltration basin to capture and treat runoff from a portion of the Watershed draining to the impaired waterbody. The contributing drainage area is 16.55 acres and is 71% impervious. The pervious drainage area (PA) is 80% HSG D and 20% HSG C. An infiltration basin with the following specifications can be placed at the down-gradient end of the contributing drainage area where soil testing results indicates an infiltration rate (IR) of 0.28 in/hr:

Example continued:

Structure	Bottom area (acre)	Top surface area (acre)	Maximum pond depth (ft)	Design storage volume (ft^3)	Infiltration Rate (in/hr)
Infiltration basin	0.65	0.69	1.65	48,155	0.28

Determine the:

A) Percent nitrogen load reduction (BMP Reduction $_{\%\text{-N}}$) for the specified infiltration basin and the contributing impervious and pervious drainage area; and

B) Nitrogen reduction in pounds that would be accomplished by the BMP (BMP-Reduction $_{\text{lbs-N}}$)

Solution:

1) A surface infiltration basin is being considered. Information for the contributing impervious (IA) and pervious (PA) areas are summarized in below.

Impervious area characteristics

ID	% Impervious	Area (acre)
IA1	100	11.75

Pervious area characteristics

ID	Area (acre)	Hydrologic Soil Group (HSG)
PA1	3.84	D
PA2	0.96	C

2) The available storage volume (ft^3) of the infiltration basin (BMP-Volume $_{ft^3}$) is determined from the design details and basin dimensions; BMP-Volume $_{ft^3}$ = 48,155 ft^3.

3) To determine what the BMP design storage volume is in terms of runoff depth (in) from IA, an iterative process is undertaken:

Solution Iteration 1

For the first iteration (1), the BMP-Volume$_{ft^3}$ is converted into inches of runoff from the contributing impervious area (BMP Volume $_{(\text{IA-in})1}$) using equation 5.

$$\text{BMP Volume}_{(\text{IA-in})1} = (48{,}155\ ft^2 / 11.75\ acre) \times (12\ in/ft\ /43{,}560\ ft^2/acre)$$
$$= 1.13\ in$$

Solution Continued:

4-1) The total volume of runoff (ft^3) from the contributing PA (BMP Volume $_{PA\text{-}ft^3}$) for a rainfall size equal to the sum of BMP Volume $_{(IA\text{-}in)1}$ determined in step 3 is determined

for each distinct pervious area using the information from Table 2 and equation 7. Interpolation was used to determine runoff depths.

BMP Volume $_{(PA\text{-}ft^3)1}$ = ((3.84 acre x (0.33 in) + (0.96 acre x (0.13 in)) x 3,630 ft^3/acre-in
= 5052 ft^3

5-1) For iteration 1, the portion of BMP Volume that is available to treat runoff from only the IA is estimated by subtracting the BMP Volume $_{(PA\text{-}ft^3)1}$, determined in step 4-1, from BMP Volume$_{ft^3}$, determined in step 2, and converted to inches of runoff from IA:

BMP Volume $_{(IA\text{-}ft^3)\,2}$ = 48,155 ft^3 – 5052 ft^3
= 43,103 ft^3
BMP Volume $_{(IA\text{-}in)\,2}$ = (43,103 ft^3/11.75 acre) x (12 in/ft x 1 acre/43,560 ft^2)
= 1.01 in

6-1) The % difference between BMP Volume $_{(IA\text{-}in)\,2}$, 1.01 in, and BMP Volume $_{(IA\text{-}in)1}$, 1.13 in is determined and found to be significantly greater than 5%:

% Difference = ((1.13 in – 1.01 in)/1.01 in) x 100
= 12%

Therefore, steps 4 through 6 are repeated starting with BMP Volume $_{(IA\text{-}in)\,2}$ = 1.01 in.

Solution Iteration 2

4-2) BMP-Volume $_{(PA\text{-}ft^3)2}$ = ((3.84 acre x 0.21 in) + (0.96 acre x 0.12 in)) x 3,630 ft^3/acre-in
= 3,358 ft^3

5-2) BMP-Volume $_{(IA\text{-}ft^3)\,3}$ = 48,155 ft^3 – 3,358 ft^3
= 44,797 ft^3

BMP-Volume $_{(IA\text{-}in)\,3}$ = (44,797 ft^3/11.75 acre) x (12 in/ft x 1 acre/43,560 ft^2)
= 1.05 in

6-2) % Difference = ((1.05 in – 1.01 in)/1.05 in) x 100
= 4%

The difference of 4% is acceptable.

Solution Continued:

7) The % nitrogen load reduction for the infiltration basin (BMP Reduction $_{\%\text{-N}}$) is determined by using the RR treatment curve in Figure 2 and the treatment volume (BMP-Volume $_{\text{Net IA-in}}$ = 1.05 in) calculated in step 5-2 and is **BMP Reduction $_{\%\text{-N}}$ = 56%**.

9) The nitrogen load reduction in pounds of nitrogen (BMP-Reduction $_{\text{lbs-N}}$) for the proposed infiltration basin is calculated by using equation 11 with the BMP Load (as determined by the procedure in Example 4-1) and the N $_{\text{target}}$ of 56%.

BMP-Reduction $_{\text{lbs-N}}$ = BMP N Load x (N $_{\text{target}}$ /100) **(Equation 11)**

Following example 1, the BMP load is calculated:

BMP N Load = (IA x impervious cover nitrogen export loading rate)
+ (PA$_{\text{HSG D}}$ x pervious cover nitrogen export loading rate, HSG D
+ (PA$_{\text{HSG C}}$ x pervious cover nitrogen export loading rate, HSG C)
= (16.55 acre x 15.4 lbs/acre/yr) + (3.84 acre x 3.7 lbs/acre/yr) +
(0.96 acre x 2.4 lbs/acre/yr)
= 271.4 lbs/yr

BMP-Reduction $_{\text{lbs-N}}$ = 275.13 lbs/yr x 56/100 = **152.0 lbs/yr**

Figure 1: Regional BMP Performance Curve for Annual Nitrogen Load Removal: System Design by the University of New Hampshire Stormwater Center (UNHSWC)

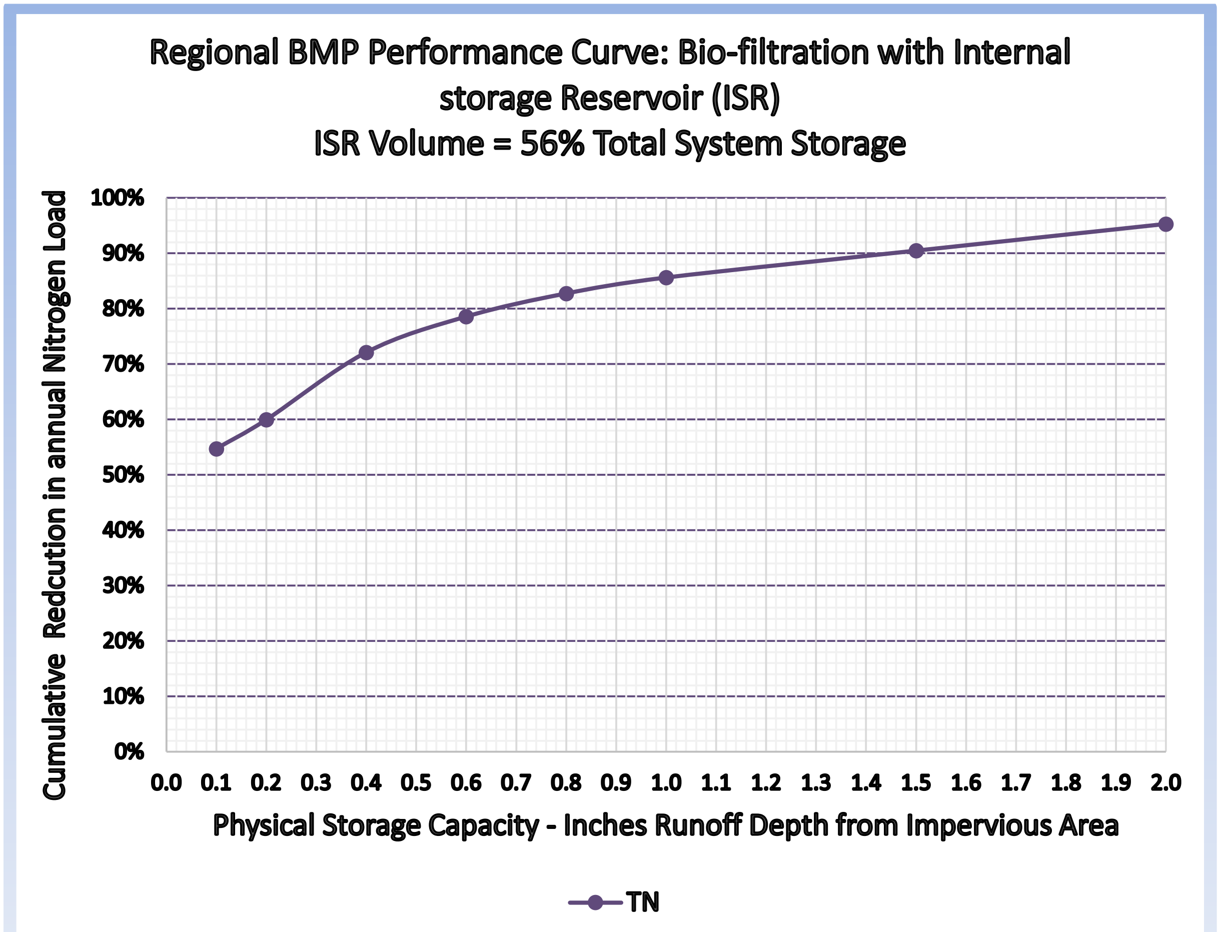
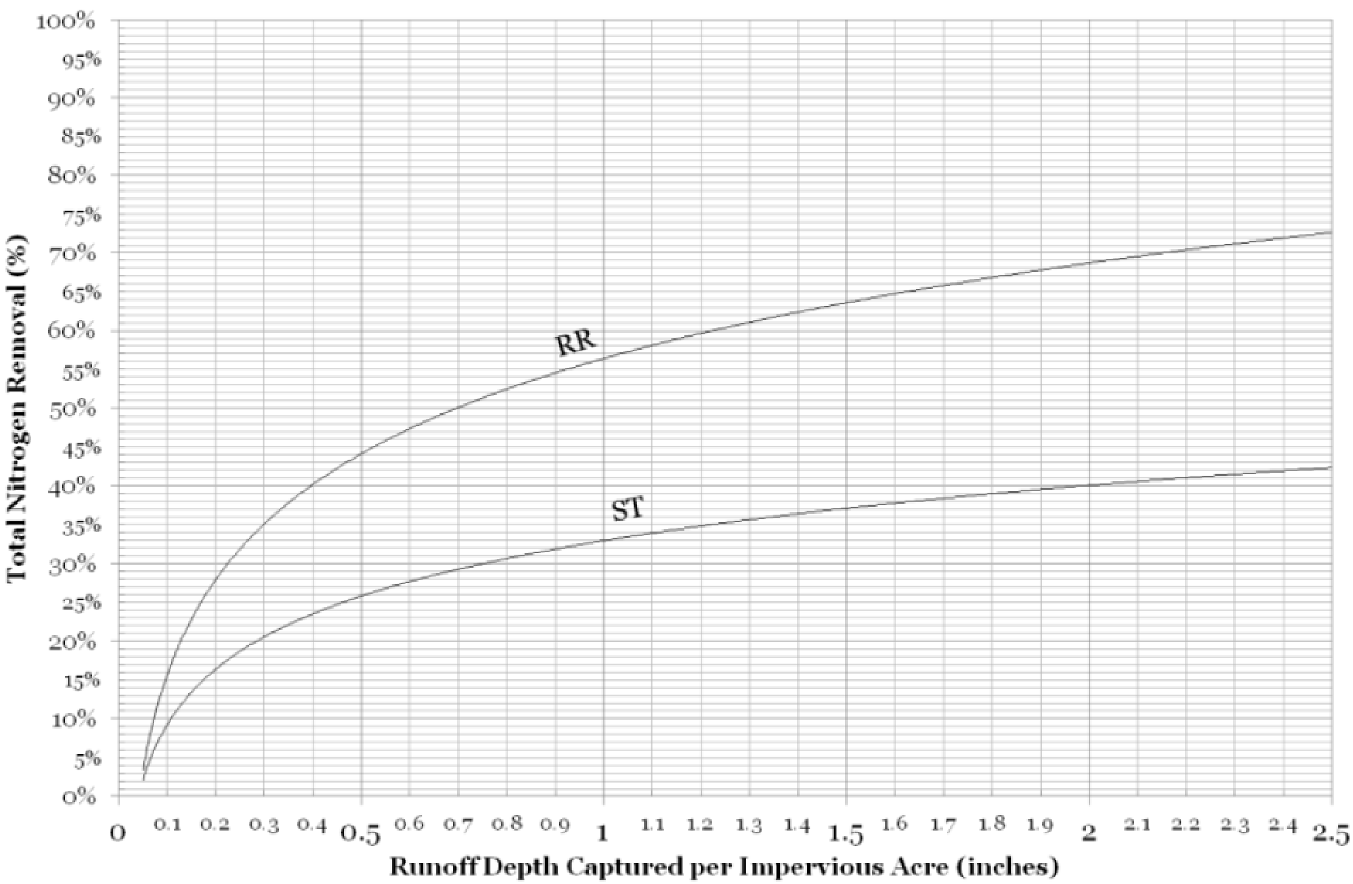


Table 3. Classification of BMP to Determine Nitrogen Reduction[1]

Structural BMP	Classification
Infiltration Trench	Runoff Reduction (RR)
Infiltration Basin or other surface infiltration practice	Runoff Reduction (RR)
Bioretention Practice	Runoff Reduction (RR)
Gravel Wetland System	Stormwater Treatment (ST)
Porous Pavement	Runoff Reduction (RR)
Wet Pond or wet detention basin	Stormwater Treatment (ST)
Dry Pond or detention basin	Runoff Reduction (RR)
Water Quality Swale	Runoff Reduction (RR)

[1]**Recommendations of the Expert Panel to Define Removal Rates for New State Stormwater Performance Standards**
http://chesapeakestormwater.net/wp-content/plugins/download-monitor/download.php?id=25, Retrieved 12/14/2012

Figure 2: Total Nitrogen Removal for RR and ST Practices



Adopted from: Final CBP Approved Expert Panel Report on Stormwater Retrofits
http://chesapeakestormwater.net/wp-content/plugins/download-monitor/download.php?id=25, Retrieved 12/14/2012

APPENDIX D

2016 MS4 Notice of Intent
Authorization to Discharge

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part I: General Conditions

General Information

Name of Municipality or Organization: City of Chelsea

State: MA

EPA NPDES Permit Number (if applicable): MAR041077

Primary MS4 Program Manager Contact Information

Name: Bertram Taverna

Title: Director, Chelsea DPW

Street Address Line 1: 500 Broadway

Street Address Line 2:

City: Chelsea

State: MA

Zip Code: 02150

Email: BTaverna@chelseama.gov

Phone Number: (617) 466-4200

Fax Number:

Other Information

Stormwater Management Program (SWMP) Location (web address or physical location, if already completed): To be updated and placed on City website in Permit Year 1 (2018-2019).

Eligibility Determination

Endangered Species Act (ESA) Determination Complete? Yes

Eligibility Criteria (check all that apply): ☒ A ☐ B ☐ C

National Historic Preservation Act (NHPA) Determination Complete? Yes

Eligibility Criteria (check all that apply): ☒ A ☐ B ☐ C

☑ Check the box if your municipality or organization was covered under the 2003 MS4 General Permit

MS4 Infrastructure (if covered under the 2003 permit)

Estimated Percent of Outfall Map Complete? *(Part II, III, IV or V, Subpart B.3.(a.) of 2003 permit)* 100%

If 100% of 2003 requirements not met, enter an estimated date of completion (MM/DD/YY):

Web address where MS4 map is published: A PDF of the City's Drainage Map, including all outfalls and receiving waters is attached.

If outfall map is unavailable on the internet an electronic or paper copy of the outfall map must be included with NOI submission (see section V for submission options)

Regulatory Authorities (if covered under the 2003 permit)

Illicit Discharge Detection and Elimination (IDDE) Authority Adopted? *(Part II, III, IV or V, Subpart B.3.(b.) of 2003 permit)* Yes

Effective Date or Estimated Date of Adoption (MM/DD/YY): 10/19/09

Construction/Erosion and Sediment Control (ESC) Authority Adopted? *(Part II,III,IV or V, Subpart B.4.(a.) of 2003 permit)* Yes

Effective Date or Estimated Date of Adoption (MM/DD/YY): 10/19/09

Post- Construction Stormwater Management Adopted? *(Part II, III, IV or V, Subpart B.5.(a.) of 2003 permit)* Yes

Effective Date or Estimated Date of Adoption (MM/DD/YY): 10/19/09

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part II: Summary of Receiving Waters

Please list the waterbodies to which your MS4 discharges. For each waterbody, please report the number of outfalls discharging into it and, if applicable, the segment ID and any impairments.

Massachusetts list of impaired waters: Massachusetts 2014 List of Impaired Waters- http://www.mass.gov/eea/docs/dep/water/resources/07v5/14list2.pdf

Waterbody that receives flow from the MS4 and segment ID if applicable	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/ DO Saturation	Nitrogen	Oil & Grease/ PAH	Phosphorus	Solids/ TSS/ Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
Chelsea River (MA71-06)	8	☐	☐	☒	☐	☒	☐	☒	☐	☐	(Debris/Floatables/Trash*), Ammonia (Un-ionized), Fecal Coliform, Other, PCB in Fish Tissue, Sediment Screening Value (Exceedence), Taste and Odor
Mystic River (MA71-03)	1	☐	☐	☒	☐	☒	☐	☐	☐	☐	Ammonia (un-ionized), Fecal Coliform, Foam/Flocs/Scum/Oil Slicks, other, PCB in Fish tissue, Sediment Screening Value (exceedence), Taste and odor
Mill Creek (MA71-08)	15	☐	☐	☐	☐	☐	☐	☐	☐	☐	Fecal Coliform, Other, PCB in Fish Tissue
Island End River	3	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Interconnection @ Second Street	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Interconnection @ Vale Street (In to Chelsea from Everett)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Interconnection @ Vale Street (CB North)(Into Chelsea from Everett)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Interconnection @ Vale Street (CB South)(Into Chelsea from Everett)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Interconnection @ Third Street(Into Chelsea from Everett)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Everett Interconnection @ Springvale (Into Chelsea from Everett)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Everett Interconnection @ Union (12 Silver Street) (Into Chelsea from Everett)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
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Click to lengthen table

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary

Identify the Best Management Practices (BMPs) that will be employed to address each of the six Minimum Control Measures (MCMs). For municipalities/organizations whose MS4 discharges into a receiving water with an approved Total Maximum Daily Load (TMDL) and an applicable waste load allocation (WLA), identify any additional BMPs employed to specifically support the achievement of the WLA in the TMDL section at the end of part III.

For each MCM, list each existing or proposed BMP by category and provide a brief description, responsible parties/departments, measurable goals, and the year the BMP will be employed (public education and outreach BMPs also requires a target audience). **Use the drop-down menus in each table or enter your own text to override the drop down menu.**

MCM 1: Public Education and Outreach

BMP Media/Category (enter your own text to override the drop down menu)	**BMP Description**	**Targeted Audience**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal**	**Beginning Year of BMP Implementation**
Meeting	Continue Partnership Program w/ Chelsea Greenspace & Mystic River Watershed Org.	Residents	DPW Operations	Conduct Public Forums on a yearly basis and track number of attendees.	FY2019
Web Page	Continue to update Stormwater page with stormwater runoff information and links to resources.	Residents	DPW Operations	Continue to maintain Stormwater Webpage http://www.chelseama.gov/Public_Documents/ChelseaMA_DPW/stormwater. Track number of visits to website.	FY2020
Brochures/Pamphlets	Distribute educational materials regarding good housekeeping practices, including equipment, inspection, waste disposal, dumpster maintenance, use and storage of de-icing materials, and parking lot sweeping.	Industrial Facilities	DPW Operations	Distribute brochure and maintain a list of all recipients.	FY2020

Brochures/Pamphlets	Distribute brochures to prospective developers and contractors outlining sediment and erosion control requirements during construction.	Developers (construction)	Planning Department	Make brochures available to developers in the Planning Department. Track number of brochures distributed. Verify that sediment and erosion control practices are being followed during site inspections.	FY2021
Brochures/Pamphlets	Provide stormwater educational pamphlets addressing lawn/grounds maintenance, use of salt/ de-icing materials, etc.	Businesses, Institutions and Commerc	DPW Operations	Distribute pamphlets to businesses, institutions and commercial facilities, and maintain a list of all recipients.	FY2021
Brochures/Pamphlets	Distribute information to industrial facilities on compliance with EPA's Multi-Sector General Permit.	Industrial Facilities	DPW Operations	Track number of industrial facilities reached.	FY2022
Brochures/Pamphlets	Make available to developers information on green infrastructure practices for construction projects.	Developers (construction)	Planning Department	Make brochures available to developers in the Planning Department. Track number of brochures distributed.	FY2022
Web Page	Update the City's website to include information on vehicle maintenance, fertilizer use, parking lot sweeping, ice removal optimization, and waste/material storage for local businesses.	Businesses, Institutions and Commercial Facilities	DPW Operations	Track number of visits to web site.	FY2023

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 2: Public Involvement and Participation

BMP Categorization	Brief BMP Description (enter your own text to override the drop down menu)	Responsible Department/Parties (enter your own text to override the drop down menu)	Additional Description/ Measurable Goal	Beginning Year of BMP Imple-mentation
Public Review	SWMP Review	Engineering	Allow annual review of stormwater management plan by posting of stormwater management plan on City website.	FY2019
Public Participation	Hold Coordination meetings	DPW Operations	Attend Mystic River Steering Committee meetings on a quarterly basis and continue coordination with Mystic River Watershed Association.	FY2019
Public Participation	Volunteer Water Quality Monitoring	DPW Operations	Continue relationship with Mystic River Watershed Association.	FY2019
Public Participation	Household haz. waste/used oil collection day	DPW Operations	Continue to hold Household Hazardous Waste Day in April at the Chelsea High School's Carter Street Parking Lot for Chelsea residents. Track amount and type of waste collected.	FY2019

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 3: Illicit Discharge Detection and Elimination (IDDE)

BMP Categorization (enter your own text to override the drop down menu)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
SSO inventory	Develop inventory of all SSOs that have occurred in the last 5 years in accordance with permit conditions.	DPW Operations	Complete within 1 year of effective date of permit, and report SSOs annually.	FY2019
Storm sewer system map	Continue to update storm/ drainage map annually during IDDE field investigations.	DPW Operations	Continue annual map updates as a result of IDDE field investigations.	FY2020
Written IDDE program	Update existing written IDDE plan as needed to satisfy all permit requirements.	Engineering	Complete update within 1 year of the effective date of permit and update as required thereafter.	FY2019
Implement IDDE program	Continue ongoing catchment investigations according to program and permit conditions.	Engineering	Complete 10 years after effective date of permit. Continue to track annually the number of illicit connections that are identified and removed.	FY2020
Employee training	Train employees on IDDE implementation.	DPW Operations	Train annually. Track number of employees trained.	FY2019
Conduct dry weather screening	Continue dry weather outfall screening and sampling procedures in accordance with permit conditions.	Engineering	Complete all dry weather screening and sampling within 3 years of permit effective date. Track number of outfalls that are screened.	FY2021
Conduct wet weather screening	Continue wet weather outfall screening and sampling procedures in accordance with permit conditions	Engineering	Complete all wet weather screening and sampling within 10 years of permit effective date. Continue to track number of outfalls that are screened and sampled annually.	FY2022

Ongoing screening	Conduct dry weather and wet weather screening (as necessary)	Engineering	Complete ongoing outfall screening upon completion of IDDE Program investigations.	FY2029
IDDE Ordinance/Bylaw	Continue to prohibit illicit discharges under the City's existing IDDE bylaw, and take enforcement actions as needed.	DPW Operations	Report the number of enforcement actions taken annually.	FY2019
Catchment Investigation Procedures	Develop written catchment investigation procedures as needed and incorporate into IDDE Plan.	DPW Operations	Complete within 18 months of permit effective date.	FY2019
Assessment and Priority Ranking of Outfalls/Interconnections	Assess and rank the potential for all catchments to have illicit discharges.	DPW Operations/Health Department	Determine ranking and priority order for screening outfalls and interconnections. Complete within 1 year of permit effective date.	FY2019
Follow-up Ranking	Update catchment prioritization and ranking as dry weather screening information becomes available.	DPW Operations	Complete within 3 years of permit effective date.	FY2021

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 4: Construction Site Stormwater Runoff Control

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
Site inspection and enforcement of Erosion and Sediment Control (ESC) measures	Develop written procedures for site inspections and enforcement.	Planning/Engineering	Complete within 1 year of the effective date of permit. Report on the number of site inspections and enforcement actions annually.	FY2019
Site plan review	Develop written procedures for site plan review that meet permit requirements and begin implementation.	Planning/Engineering	Complete within 1 year of the effective date of permit. Report on the number of site plan reviews conducted, inspections conducted, and enforcement actions taken annually.	FY2019
Erosion and Sediment Control Ordinance	Continue to require construction operators to implement a sediment and erosion control program and enhance program as needed to meet permit requirements. Review and update existing ordinance as needed to ensure that construction operators implement a sediment and erosion control program that includes BMPs that are appropriate for conditions at the construction site in accordance with permit requirements.	Planning/Engineering	Update ordinance within 1 year of effective date of permit.	FY2019

Waste Control	Update existing ordinance to include requirements for construction site operators to control wastes, including but not limited to, discarded building materials, concrete truck wash out, chemicals, litter, and sanitary wastes.	Planning	Review existing practices and modify if necessary. Complete within 1 year of the effective date of permit.	FY2019

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 5: Post-Construction Stormwater Management in New Development and Redevelopment

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
As-built plans for on-site stormwater control	Update existing ordinance to require submission of as-built drawings within two years, and long term operation and maintenance of BMPs as needed to meet permit requirements.	Planning/Engineering	Review existing practices for submission of as-built plans and long term O&M for completed projects and modify as necessary.	FY2020
Target properties to reduce impervious areas	Identify at least 5 permittee-owned properties that could be modified or retrofitted with BMPs to reduce impervious areas and update annually.	Engineering	Complete 4 years after effective date of permit and report annually on retrofitted properties.	FY2022
Allow green infrastructure practices	Develop a report assessing existing local regulations to determine the feasibility of making green infrastructure practices allowable when appropriate site conditions exist.	Planning/Engineering	Review existing practices and complete any revisions after 4 years of effective date of permit and implement recommendations of report, where feasible.	FY2022
Street design and parking lot guidelines	Develop a report assessing requirements that affect the creation of impervious cover to determine if changes to design standards for streets and parking lots can be modified to support low impact design options.	Planning/Engineering	Complete within 4 years of permit effective date and implement recommendations of report, where feasible.	FY2022

Ensure any stormwater controls or management practices for new development and redevelopment meet the retention or treatment requirements of the permit and all applicable requirements of the Massachusetts Stormwater Handbook	Review, and update existing regulations as needed, to meet retention and treatment requirements of the permit, and require compliance with the Stormwater Management Standards.	Planning/Engineering	Review existing regulations and complete any revisions within 2 years of effective date of permit.	FY2020

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

MCM 6: Municipal Good Housekeeping and Pollution Prevention

BMP Categorization (enter your own text to override the drop down menu or entered text)	**BMP Description**	**Responsible Department/Parties** (enter your own text to override the drop down menu)	**Measurable Goal** (all text can be overwritten)	**Beginning Year of BMP Imple-mentation**
O&M procedures	Create written O&M procedures including all requirements contained in 2.3.7.a.ii for parks and open spaces, buildings and facilities, and vehicles and equipment	DPW Operations	Review existing procedures and implement within 2 years of effective date of permit	FY2020
Inventory all permittee-owned parks and open spaces, buildings and facilities, and vehicles and equipment	Municipal Facilities Audit	DPW Operations	Update existing inventory from the November 2009 Audit.	FY2020
Infrastructure O&M	Establish and implement program for repair and rehabilitation of MS4 infrastructure.	DPW Operations	Review existing programs and update as necessary, within two years of permit effective date.	FY2020
Stormwater Pollution Prevention Plan (SWPPP) Development, Inspections, and Training	Create SWPPP for DPW maintenance garage.	DPW Operations	Complete and implement within 2 years of permit effective date, and provide inspections quarterly and training annually thereafter. Track number of employees trained annually.	FY2020
Catch basin cleaning	Establish schedule for catch basin cleaning such that each catch basin is no more than 50% full and clean catch basins on that schedule.	DPW Operations	Clean catch basins on established schedule and report number of catch basins cleaned and volume of material removed annually.	FY2019

Street sweeping program	Continue to sweep all streets and permitee-owned parking lots at least once a year in accordance with permit conditions.	DPW Operations	Continue ongoing program of sweeping every street twice a month from April to November, and report annually the miles of roadway swept or the volume of material removed.	FY2019
Road salt use optimization program	Establish and implement a program to minimize the use of road salt	DPW Operations	Implement salt use optimization during deicing season.	FY2019
Catch Basin Optimization	Develop and implement a plan to optimize inspection, cleaning, and maintenance of catch basins to ensure that permit conditions are met.	DPW Operations	Complete within 2 years of permit effective date.	FY2020

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

Actions for Meeting Total Maximum Daily Load (TMDL) Requirements

Use the drop-down menus to select the applicable TMDL, action description to meet the TMDL requirements, and the responsible department/parties. If no options are applicable, or more than one, **enter your own text to override drop-down menus.**

Applicable TMDL	Action Description	Responsible Department/Parties (enter your own text to override the drop down menu)
	Adhere to requirements in part A.I of Appendix F	

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part III: Stormwater Management Program Summary (continued)

Actions for Meeting Requirements Related to Water Quality Limited Waters

Use the drop-down menus to select the pollutant causing the water quality limitation and enter the waterbody ID(s) experiencing excursions above water quality standards for that pollutant. In addition, if you are subject to additional requirements due to a downstream nutrient impairment (see Part 2.2.2 of the permit) select the pollutant of concern and indicate applicable waterbody IDs or write "all waterbodies" if applicable. Choose the action description from the dropdown menu and indicate the responsible party. If no options are applicable, or more than one, **enter your own text to override drop-down menus.**

Pollutant	Waterbody ID(s)	Action Description	Responsible Department/Parties (enter your own text to override the drop down menu)
Fecal Coliform	Mill Creek (MA 71-08), Chelsea River (MA 71-06), Mystic River (MA 71-03)	Adhere to requirements in part III of Appendix H	DPW Operations
Turbidity	Chelsea River (MA 71-06)	Adhere to requirements in part V of Appendix H	DPW Operations
Petroleum Hydrocarbons	Chelsea River (MA 71-06), Mystic River (MA 71-03)	Adhere to requirements in part V of Appendix H	DPW Operations

Part IV: Notes and additional information

Use the space below to indicate the part(s) of 2.2.1and 2.2.2 that you have identified as not applicable to your MS4 because you do not discharge to the impaired water body or a tributary to an impaired water body due to nitrogen or phosphorus. Provide all supporting documentation below or attach additional documents if necessary.
Also, provide any additional information about your MS4 program below.

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part V: Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: Thomas G. Ambrosino

Title: City Manager

Signature:

Date: 09/26/18

[To be signed according to Appendix B, Subparagraph B.11, Standard Conditions]

Note: When prompted during signing, save the document under a new file name

CITY OF CHELSEA, MA

DRAINAGE MAP

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
Phone: (603) 223-2541 Fax: (603) 223-0104
http://www.fws.gov/newengland

In Reply Refer To: September 06, 2018
Consultation Code: 05E1NE00-2018-SLI-2988
Event Code: 05E1NE00-2018-E-07051
Project Name: General MS4 Compliance

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

New England Ecological Services Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5094
(603) 223-2541

Project Summary

Consultation Code: 05E1NE00-2018-SLI-2988

Event Code: 05E1NE00-2018-E-07051

Project Name: General MS4 Compliance

Project Type: LAND - MANAGEMENT PLANS

Project Description: Notice of Intent

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/42.40051463350514N71.02665305612283W

Counties: Middlesex, MA | Suffolk, MA

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

From: Vuto, Michelle <Vuto.Michelle@epa.gov>
Sent: Tuesday, March 26, 2019 5:17 PM
To: Toscano, Laurie <toscanol@wseinc.com>
Cc: btaverna@chelseama.gov; Mammolette, Lou <LMammolette@chelseama.gov>; Maltez, Fidel <FMaltez@chelseama.gov>; Chesebrough, Patricia <chesebroughp@wseinc.com>; Schwartz, Jaurice <schwartzj@wseinc.com>
Subject: RE: Small MS4 NOI submission - additional or corrected information required

Hi Laurie,

Thank you for the information. Chelsea does not need to follow the Appendix H requirements for phosphorus. The NOI is complete.

Best,
Michelle

Michelle Vuto
Stormwater & Construction Permits
U.S. EPA Region 1
5 Post Office Square—OEP06-4
Boston, MA 02109-3912
617-918-1222

From: Toscano, Laurie <toscanol@wseinc.com>
Sent: Monday, March 25, 2019 12:44 PM
To: Vuto, Michelle <Vuto.Michelle@epa.gov>
Cc: btaverna@chelseama.gov; Mammolette, Lou <LMammolette@chelseama.gov>; Maltez, Fidel <FMaltez@chelseama.gov>; Chesebrough, Patricia <chesebroughp@wseinc.com>; Schwartz, Jaurice <schwartzj@wseinc.com>
Subject: RE: Small MS4 NOI submission - additional or corrected information required

Hi Michelle,

In response to your e-mail below, the City of Chelsea discharges to the section of the Mystic River with Segment ID MA71-03, which extends from the Amelia Earhart Dam, Somerville/Everett to its confluence with the Boston Inner Harbor, Chelsea/Charlestown. This segment of the Mystic River is not currently impaired for phosphorus based on the 2014 Integrated List of Waters. The section of the Mystic River with Segment ID MA71-02 extends from the Outlet of the Lower Mystic Lake in Arlington/Medford to the Amelia Earhart Dam in Somerville/Everett. This section of the Mystic River is impaired for phosphorus, but is upstream of the segment of the Mystic River to which the City discharges. Based on this information, it is our understanding that the City is not tributary to the phosphorus impaired section of the Mystic River or any other water bodies that have phosphorus impairments, and would therefore not be subject to the requirements of Part II of Appendix H for phosphorus-impaired water bodies. Please let me know if my understanding is not correct or if we should discuss further.

Thank you,
Laurie Toscano
TEAM LEADER
direct: 978-532-1900 ext. 2419

Weston & Sampson

From: Vuto, Michelle <Vuto.Michelle@epa.gov>
Sent: Monday, March 18, 2019 10:54 AM
To: btaverna@chelseama.gov
Cc: Toscano, Laurie <toscanol@wseinc.com>
Subject: Small MS4 NOI submission - additional or corrected information required

Hi Bertram,

EPA is reviewing the City of Chelsea's Small MS4 NOI submission and need more information in order to continue with the review process. Please respond confirming that the town will follow the requirements in part II of Appendix H for phosphorus for all waterbodies in the Mystic River Watershed.

Please respond with the requested information as soon as you can. You do not need to resubmit the NOI. If the additional information is not received within 30 days of the date on this email EPA may initiate the process to deny your NOI, unless additional time is granted by EPA for such submission. Let me know if you have any question.

Best,
Michelle

Michelle Vuto
Stormwater & Construction Permits
U.S. EPA Region 1
5 Post Office Square—OEP06-4
Boston, MA 02109-3912
617-918-1222

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 1
5 POST OFFICE SQUARE, SUITE 100
BOSTON, MA 02109-3912

VIA EMAIL

May 30, 2019

Thomas G. Ambrosino
City Manager

And;

Bertram Taverna
Director, Chelsesa DPW
500 Broadway
Chelsea, MA. 02150
Btaverna@chelseama.gov

Re: National Pollutant Discharge Elimination System Permit ID #: MAR041077, City of Chelsea

Dear Bertram Taverna:

The 2016 NPDES General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems in Massachusetts (MS4 General Permit) is a jointly issued EPA-MassDEP permit. Your Notice of Intent (NOI) for coverage under this MS4 General Permit has been reviewed by EPA and appears to be complete. You are hereby granted authorization by EPA and MassDEP to discharge stormwater from your MS4 in accordance with the applicable terms and conditions of the MS4 General Permit, including all relevant and applicable Appendices. This authorization to discharge expires at midnight on **June 30, 2022.**

For those permittees that certified Endangered Species Act eligibility under Criterion C in their NOI, this authorization letter also serves as EPA's concurrence with your determination that your discharges will have no effect on the listed species present in your action area, based on the information provided in your NOI.

As a reminder, your first annual report is due by **September 30, 2019** for the reporting period from May 1, 2018 through June 30, 2019.

Information about the permit and available resources can be found on our website: https://www.epa.gov/npdes-permits/massachusetts-small-ms4-general-permit. Should you have any questions regarding this permit please contact Newton Tedder at tedder.newton@epa.gov or (617) 918-1038.

Sincerely,

Thelma Murphy, Chief
Stormwater and Construction Permits Section
Office of Ecosystem Protection
United States Environmental Protection Agency, Region 1

and;

Lealdon Langley, Director
Wetlands and Wastewater Program
Bureau of Water Resources
Massachusetts Department of Environmental Protection

APPENDIX E

2003 MS4 Annual Reports Reference

2003 MS4 PERMIT ANNUAL REPORTS REFERENCE

Year 1 Annual Report (2003-2004)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2004/Chelseamaar04.pdf

Year 2 Annual Report (2004-2005)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2005/Chelseama05report.pdf

Year 3 Annual Report (2005-2006)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2006/Chelsea06rpt.pdf

Year 4 Annual Report (2006-2007)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2007/Chelsea07.pdf

Year 5 Annual Report (2007-2008)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2008/Chelsea08.pdf

Year 6 Annual Report (2008-2009)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2009/Chelsea09.pdf

Year 7 Annual Report (2009-2010)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2010/Chelsea10.pdf

Year 8 Annual Report (2010-2011)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2011/Chelsea11.pdf

Year 9 Annual Report (2011-2012)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2012/Chelsea12.pdf

Year 10 Annual Report (2012-2013)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2013/Chelsea13.pdf

Year 11 Annual Report (2013-2014)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2014/Chelsea14.pdf

Year 12 Annual Report (2014-2015)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2015/Chelsea15.pdf

Year 13 Annual Report (2015-2016)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2016/Chelsea16.pdf

Year 15 Annual Report (2017-2018)
https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/ma/reports/2018/Chelsea18.pdf

APPENDIX F

MS4 Checklists by Permit Year

Checklist for Year 1 MS4 Permit Requirements – Chelsea, MA

Completion Due Date	Requirement	Task	Permit Section for Reference	Completed?
10/1/2018	Notice of Intent (NOI)	Prepare and Submit NOI for Permit Coverage 90 days from the permit effective date	1.7.2 & Appendix E	Yes
6/30/2019	Stormwater Management Plan (SWMP)	Develop written SWMP	1.10	Yes
6/30/2019	Public Education	Fulfill public education initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.2	Yes
6/30/2019	Public Participation	Fulfill public participation initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.3	Yes
6/30/2019	Sanitary Sewer Overflow (SSO) Inventory	Document all SSOs that have occurred in the last 5 years	2.3.4.4.b	Yes
6/30/2019	Illicit Discharge Detection and Elimination (IDDE) Plan	Update existing written IDDE plan as needed to satisfy permit requirements.	2.3.4.6	Yes[1]
6/30/2019	Catchment Delineation	Delineate outfall & interconnection catchment areas.	2.3.4.5	Yes
6/30/2019	Catchment Prioritization & Ranking	Assess and rank the potential for all catchments to have illicit discharges.	2.3.4.7	Yes[2]
6/30/2019	IDDE Ordinance/Bylaw	Continue to prohibit illicit discharges as outlined in the City's Illicit Discharge Ordinance, and take enforcement actions as needed.	2.3.4.a	Yes
6/30/2019	IDDE Employee Training	Continue to train municipal employees on illicit discharge detection and monitoring.	2.3.4.11	Yes[3]
6/30/2019	Construction Site Runoff Control Regulatory Updates/SOPs	Create written procedures for inspection of construction sites for proper sediment & erosion controls, and	2.3.5.c	Yes[4]

[1] Updates to Chelsea's IDDE Plan are ongoing.
[2] See section 6.2.2. of the SWMP. Priority ranking has been a continuous process of Chelsea's IDDE program.
[3] IDDE Employee training has been ongoing. Additional training specific to this permit may be scheduled.
[4] Regulatory mechanisms exist for Construction Site Runoff Control. Capturing of written procedures is ongoing.

		conducting site plan reviews. Incorporate requirements for waste control. Reference Stormwater Manual for Sediment & Erosion Control BMPs.		
6/30/2019	Street Sweeping	Sweep streets a minimum of once a year in the spring. Include miles cleaned or volume or mass of material removed in the annual report.	2.3.7.a.iii.3	Yes
6/30/2019	Catch Basin Cleaning	Clean catch basins annually to ensure the no catch basin is more than 50% full. Report catch basins cleaned and volume of material removed annually.	2.3.7.a.iii.3	Yes
6/30/2019	Winter Road Maintenance SOP	Develop and implement winter road maintenance procedures including use and storage of sand/salt, and snow storage practices.	2.3.7.a.iii.5	Yes[5]
6/30/2019	Stormwater BMP Inspection & Maintenance	Inspect all stormwater treatment structures (BMPs) at least annually and conduct maintenance as necessary. Track number of structures maintained and inspected annually.	2.3.7.a.iii.6	Yes[6]

[5] Chelsea has a Snow Maintenance Plan which will be reviewed for addressing stormwater management objectives.

[6] Chelsea does not currently have any municipally-owned stormwater treatment structures (BMPs).

Checklist for Year 2 MS4 Permit Requirements – Chelsea, MA

Completion Due Date	Requirement	Task	Permit Section for Reference	Completed?
6/30/2020	Stormwater Management Plan (SWMP)	Update written SWMP	1.10	YES
6/30/2020	Public Education	Fulfill public education initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.2	YES
6/30/2020	Public Participation	Fulfill public participation initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.3	YES
6/30/2020	Update Drainage Map	Update city-wide MS4 mapping to include impaired waters, BMPs, interconnections, and open channel conveyances.	2.3.4.5	YES
6/30/2020	IDDE Ordinance/Bylaw	Continue to prohibit illicit discharges as outlined in the City's Illicit Discharge Ordinance, and take enforcement actions as needed.	2.3.4.a	YES
6/30/2020	IDDE Employee Training	Continue to train municipal employees on illicit discharge detection and monitoring.	2.3.4.11	YES
6/30/2025	IDDE Investigation of Problem Catchments	Begin investigation of problem catchments	2.3.4.8.a	YES
6/30/2020	Post-Construction Stormwater Runoff Control Regulatory Updates	Update existing stormwater regulations as needed to include compliance with the Stormwater Management Standards, to meet retention and treatment requirements, to meet as-built requirements and provide for long term operation & maintenance of BMPs.	2.3.6.a.ii	MOVED TO YEAR 3
6/30/2020	Inventory of Municipal Facilities	Develop an inventory of all permittee-owned facilities.	2.3.7.a.ii	YES
6/30/2020	Operation and Maintenance Procedures	Develop a written set of O&M procedures for municipal facilities, activities and MS4 infrastructure	2.3.7.a.i & 2.3.7.a.iii	YES

6/30/2020	Stormwater Pollution Prevention Plans (SWPPP)	Develop written SWPPPs for municipal waste handling facilities.	2.3.7.b	YES
6/30/2020	Street Sweeping	Sweep streets a minimum of once a year in the spring. Include miles cleaned or volume or mass of material removed in the annual report.	2.3.7.a.iii.3	YES
6/30/2020	Catch Basin Cleaning Optimization	Develop and implement a catch basin cleaning schedule with a goal of ensuring no catch basin is more than 50 % full. Document catch basins inspected and cleaned, including total mass removed and proper disposal.	2.3.7.a.iii.2	N/A
6/30/2020	Stormwater BMP Inspection & Maintenance	Inspect all stormwater treatment structures (BMPs) at least annually and conduct maintenance as necessary. Track number of structures maintained and inspected annually.	2.3.7.a.iii.6	YES

Checklist for Year 3 MS4 Permit Requirements – Chelsea, MA

Completion Due Date	Requirement	Task	Permit Section for Reference	Completed?
6/30/2021	Stormwater Management Plan (SWMP)	Update written SWMP	1.10	
6/30/2021	Public Education	Fulfill public education initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.2	
6/30/2021	Public Participation	Fulfill public participation initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.3	
6/30/2021	Update Drainage Map	Update city-wide drainage mapping as needed to include MS4 infrastructure.	2.3.4.5	
6/30/2021	IDDE Ordinance/Bylaw	Continue to prohibit illicit discharges as outlined in the City's Illicit Discharge Ordinance, and take enforcement actions as needed.	2.3.4.a	
6/30/2021	IDDE Employee Training	Continue to train municipal employees on illicit discharge detection and monitoring.	2.3.4.11	
6/30/2021	Dry Weather Outfall Screening and Sampling	Sample all outfalls and interconnections (excluding problem outfalls and excluded outfalls) for dry weather flow and sample flow if present.	2.3.4.7.b	
6/30/2021	Update Catchment Ranking	Update catchment ranking and prioritization based on dry weather outfall sampling data.	2.3.4.7.b.iii.c.iii	
6/30/2025	Continue IDDE Investigation of Problem Catchments	Continue investigation of problem catchments	2.3.4.8.a	
6/30/2028	Begin IDDE Investigation of High and Low Priority Catchments	Begin investigation of high and low priority catchments	2.3.4.8.a	
6/30/2021	Street Sweeping	Sweep streets a minimum of once a year in the spring. Include miles cleaned or volume or mass of material	2.3.7.a.iii.3	

		removed in the annual report.		
6/30/2021	Catch Basin Cleaning	Clean catch basins annually to ensure the no catch basin is more than 50% full. Report catch basins cleaned and volume of material removed annually.	2.3.7.a.iii.3	
6/30/2021	Stormwater BMP Inspection & Maintenance	Inspect all stormwater treatment structures (BMPs) at least annually and conduct maintenance as necessary. Track number of structures maintained and inspected annually.	2.3.7.a.iii.6	

Checklist for Year 4 MS4 Permit Requirements – Chelsea, MA

Completion Due Date	Requirement	Task	Permit Section for Reference	Completed?
6/30/2022	Stormwater Management Plan (SWMP)	Update written SWMP	1.10	
6/30/2022	Boston Harbor Pathogens TMDL	Implement public education initiatives	F.III.1.a.1.	
6/30/2022	Public Education	Fulfill public education initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.2	
6/30/2022	Public Participation	Fulfill public participation initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.3	
6/30/2022	Update Drainage Map	Update city-wide drainage mapping as needed to include MS4 infrastructure.	2.3.4.5	
6/30/2022	IDDE Ordinance/Bylaw	Continue to prohibit illicit discharges as outlined in the City's Illicit Discharge Ordinance, and take enforcement actions as needed.	2.3.4.a	
6/30/2022	IDDE Employee Training	Continue to train municipal employees on illicit discharge detection and monitoring.	2.3.4.11	
6/30/2025	Continue IDDE Investigation of Problem Catchments	Continue investigation of problem catchments	2.3.4.8.a	
6/30/2028	Continue IDDE Investigation of High and Low Priority Catchments	Continue investigation of high and low priority catchments	2.3.4.8.a	
6/30/2028	Begin Wet Weather Outfall Screening and Sampling	Begin sampling outfalls and interconnections with System Vulnerability Factors during wet weather	2.3.4.8.c	
6/30/2022	Street Design and Parking Lot Guidelines	Develop a report assessing requirements that affect the creation of impervious cover to determine if design standards for streets and parking lots can be modified	2.3.6.b	

		to support low impact design options.		
6/30/2022	Green Infrastructure Practices	Develop a report assessing the barriers and incentives for Green Infrastructure/LID techniques.	2.3.6.c	
6/30/2022	BMP Retrofit Identification	Identify 5 permittee-owned properties that could be retrofitted with stormwater BMPs.	2.3.6.d	
6/30/2022	Street Sweeping	Sweep streets a minimum of once a year in the spring. Include miles cleaned or volume or mass of material removed in the annual report.	2.3.7.a.iii.3	
6/30/2022	Catch Basin Cleaning	Clean catch basins annually to ensure the no catch basin is more than 50% full. Report catch basins cleaned and volume of material removed annually.	2.3.7.a.iii.3	
6/30/2022	Stormwater BMP Inspection & Maintenance	Inspect all stormwater treatment structures (BMPs) at least annually and conduct maintenance as necessary. Track number of structures maintained and inspected annually.	2.3.7.a.iii.6	

Checklist for Year 5 MS4 Permit Requirements – Chelsea, MA

Completion Due Date	Requirement	Task	Permit Section for Reference	Completed?
6/30/2023	Stormwater Management Plan (SWMP)	Update written SWMP	1.10	
6/30/2023	Boston Harbor Pathogens TMDL	Implement public education initiatives	F.III.1.a.1.	
6/30/2023	Public Education	Fulfill public education initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.2	
6/30/2023	Public Participation	Fulfill public participation initiatives aimed at target audiences as outlined in the City's NOI and this SWMP	2.3.3	
6/30/2023	Update Drainage Map	Update city-wide drainage mapping as needed to include MS4 infrastructure.	2.3.4.5	
6/30/2023	IDDE Ordinance/Bylaw	Continue to prohibit illicit discharges as outlined in the City's Illicit Discharge Ordinance, and take enforcement actions as needed.	2.3.4.a	
6/30/2023	IDDE Employee Training	Continue to train municipal employees on illicit discharge detection and monitoring.	2.3.4.11	
6/30/2025	Continue IDDE Investigation of Problem Catchments	Continue investigation of problem catchments	2.3.4.8.a	
6/30/2028	Continue IDDE Investigation of High and Low Priority Catchments	Continue investigation of high and low priority catchments	2.3.4.8.a	
6/30/2028	Continue Wet Weather Outfall Screening and Sampling	Begin sampling outfalls and interconnections with System Vulnerability Factors during wet weather	2.3.4.8.c	
6/30/2023	Street Sweeping	Sweep streets a minimum of once a year in the spring. Include miles cleaned or volume or mass of material removed in the annual report.	2.3.7.a.iii.3	

6/30/2023	Catch Basin Cleaning	Clean catch basins annually to ensure the no catch basin is more than 50% full. Report catch basins cleaned and volume of material removed annually.	2.3.7.a.iii.3	
6/30/2023	Stormwater BMP Inspection & Maintenance	Inspect all stormwater treatment structures (BMPs) at least annually and conduct maintenance as necessary. Track number of structures maintained and inspected annually.	2.3.7.a.iii.6	

APPENDIX G

Public Education Materials

Chelsea Business Stormwater Program

After a storm, stormwater flows over lawns and impervious surfaces like roads, roofs, and parking lots, collecting pollutants and whisking them into local waterbodies, like Chelsea Creek. Currently, stormwater is one of the main sources of pollution to our waterbodies. Examples of pollutants that stormwater transports include: fertilizers containing harmful nutrients, pesticides, oil, grease, viruses, bacteria, toxic metals, sediment, and salts. These pollutants can harm human health and our fragile ecosystems. Chelsea is trying to reduce its stormwater problem and is asking all of its residents and businesses to do their part.

Below are six easy ways you can run a stormwater friendly business:

- Keep it clean - keep all outside areas free of litter, cigarette butts, and leaves. During a storm, litter clogs storm drains and ends up in our lakes and streams.
- Sweep, don't hose - sweep up litter instead of hosing it into storm drains. Dispose of litter in garbage bins, not storm drains.
- Keep it closed - cover grease storage and dumpsters; don't overfill and keep the lid closed.
- Never dump - prevent wash waters and wastes, such as used oil, grease, and chemicals from entering storm drains. Never dump anything but clean water into a storm drain.
- Keep it dry - Cover all materials stored outside to prevent them from washing into stormdrains. Do not store fertilizers, pesticides, or de-icers outside.
- Be prepared - Report chemical spills to the DPW and train staff members to use a spill kit.

For more information visit the Mystic River Watershed Association's website at www.mysticriver.org/stormwater

United States Environmental Protection Agency

Does Your Construction Site Need a Stormwater Permit?

A Construction Site Operator's Guide to EPA's Stormwater Permit Program

Why do I have to get permit coverage?

EPA's National Pollutant Discharge Elimination System (NPDES) program regulates stormwater runoff from construction sites. On July 1, 2003, EPA reissued the Construction General Permit (CGP) to extend coverage to construction sites that disturb 1 or more acres, including smaller sites that are part of a larger plan of development. For example, if you are building a house on a half-acre lot in a 10-acre development, you need permit coverage. Construction site operators need to submit an application called a Notice of Intent (NOI) to be covered under EPA's CGP.

This brochure describes how to meet the requirements of EPA's permit which applies to construction sites in several states and territories (see list below). Most states, however, are authorized to implement the NPDES stormwater program. Authorized states have similar requirements for construction sites. If your construction project is not in one of the areas listed below, you will need to obtain permit coverage from the appropriate state authority. A list of state permitting authorities can be found at www.epa.gov/npdes/stormwater.

EPA's Construction General Permit applies to the following areas:

- Alaska
- District of Columbia
- Idaho
- Massachusetts
- New Hampshire
- New Mexico
- Puerto Rico
- Most Indian Country lands
- Federal facilities in Vermont, Colorado, Delaware, and Washington
- Oil and gas operations and other activities in Texas and Oklahoma.
- U.S. Territories (e.g., Guam, American Samoa), except the Virgin Islands

Photo by Tim McCabe, 1992.

Visit www.epa.gov/npdes/pubs/cgp_appendixb.pdf for a detailed list of the areas under EPA's jurisdiction.

Why is stormwater runoff so bad?

Runoff from rainstorms and snowmelt picks up pollutants like sediment, oil and grease, nitrogen and phosphorus, and other chemicals and carries them into storm drains or directly into waterbodies. Because most storm drain systems do not provide any treatment to the water they collect, preventing contamination of stormwater is critically important or polluted runoff will be discharged untreated into the waterbodies we use for swimming, fishing, and drinking water.

Why is sediment harmful to a waterbody?

Too much sediment in a waterbody can cloud the water and make it difficult or impossible for aquatic plants to receive the sunlight they need to grow. Excess sediment also smothers aquatic habitat, clogs fish gills, and impedes navigation in our waterways, which can lead to expensive dredging.

I need permit coverage. Where do I start?

1. Read EPA's Construction General Permit (CGP)

You can download a copy of EPA's permit at www.epa.gov/npdes/stormwater/cgp. Read EPA's permit carefully, and remember that operators are legally responsible for complying with all its provisions.

Who submits an NOI?

The "operator" submits a Notice of Intent (NOI) form. The operator is the entity (generally company, corporation, etc.) that has operational control over the construction plans or day-to-day activities that are necessary to implement the Stormwater Pollution Prevention Plan (SWPPP) (see below). On some sites, several entities may meet the definition of operator and all must file NOIs. Operators may include owners, general contractors, and subcontractors.

It is the responsibility of the operator(s) to develop and implement a SWPPP and maintain all best management practices (BMPs) during each stage of the project. Best management practices are the techniques (buffers, silt fences, detention ponds, swales, etc.), schedules of activities, prohibitions of practices, and maintenance procedures to prevent or reduce the discharge of pollutants.

2. Develop a stormwater pollution prevention plan (SWPPP)

The SWPPP is a plan for how you will control stormwater runoff from your construction site. It is broader and more complicated than a typical erosion and sediment control plan, so operators might want to enlist the assistance of a professional to save time. The SWPPP must be completed before you file an NOI to apply for coverage under EPA's permit. You don't have to submit the SWPPP with your NOI to obtain permit coverage, but the plan must be available on-site for review during inspection.

Because every site is unique, every SWPPP is unique. The SWPPP needs to be updated as your work progresses. Please visit www.epa.gov/npdes/stormwater/cgp for more information on how to develop your SWPPP.

Basic SWPPP Principles

- Divert stormwater away from disturbed or exposed areas of the construction site.
- Install BMPs to control erosion and sediment and manage stormwater.
- Inspect the site regularly and properly maintain BMPs, especially after rainstorms.
- Revise the SWPPP as site conditions change during construction and improve the SWPPP if BMPs are not effectively controlling erosion and sediment.
- Minimize exposure of bare soils to precipitation to the extent practicable.
- Keep the construction site clean by putting trash in trash cans, keeping storage bins covered, and sweeping up excess sediment on roads and other impervious surfaces.

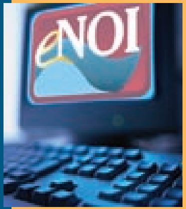
3. Complete an endangered species determination for the project site

The operator must assess the potential effects of stormwater runoff on federally listed endangered and threatened species and any designated critical habitat on or near the site. In making this determination, the operator needs to consider areas beyond the immediate footprint of the construction activity and beyond the property line—areas that could be affected directly or indirectly by stormwater discharges.

The local offices of U.S. Fish and Wildlife Service, National Marine Fisheries Service, and State or Tribal Heritage Centers often maintain lists of federally listed endangered or threatened species on their Web sites. Visit www.epa.gov/npdes/stormwater/esa for more information.

4. File a Notice of Intent (NOI)

The Notice of Intent (NOI) form lets EPA know that you are filing for permit coverage. It is also your certification that you have read, understood, and implemented the requirements of EPA's permit. The fastest and easiest way to obtain permit coverage is through EPA's new online permit application system (www.epa.gov/npdes/enoi). EPA's permit requires a 7-day waiting period after an NOI is filed and posted on EPA's Web site (www.epa.gov/npdes/noisearch). Using EPA's eNOI system is the fastest way to begin this process. Mailing a paper NOI to EPA can add 2 or more weeks to your processing time. During the waiting period, NOIs are reviewed for endangered species impacts and other concerns. Permit coverage begins at the conclusion of the 7-day period unless you are notified otherwise. Your completed NOI should be posted at the construction site in a place accessible to the public.



Using EPA's new eNOI system (www.epa.gov/npdes/enoi) can save you 2 weeks or more.

5. Implement all BMPs outlined in your SWPPP

Remember to follow your SWPPP. All BMPs must be inspected and maintained regularly. Inspections are required either (1) at least once every 7 days or (2) at least once every 14 days and within 24 hours of the end of a rain event of 1/2-inch or more. The plan must also be updated as site conditions and BMPs change. Remember to keep records of your maintenance activities and any SWPPP modifications for review during inspection.

6. File an electronic Notice of Termination

You should terminate permit coverage when your project is completed (generally, when 70% of the density of the original vegetation is reestablished on unpaved areas), when the property has been stabilized and ownership has been transferred to the homeowner (residential projects only), or when another operator has assumed control over the site (new operators will need to file an NOI and meet the requirements of EPA's permit). The electronic Notice of Termination form informs EPA that your construction project is complete and ends your responsibilities under the permit. The form can be completed and filed using the eNOI system at www.epa.gov/npdes/enoi.

Printed with vegetable-based ink on paper that contains a minimum of 50% post-consumer fiber content processed chlorine-free.
EPA 833-F-04-002 February 2004

All construction sites disturbing 1 or more acres (with few exceptions) need stormwater permit coverage!

- Does your construction project disturb 1 or more acres of land through clearing, grading, excavating, or stockpiling of fill material? Remember to count the acreage of the entire project, even if you are responsible for only a small portion.

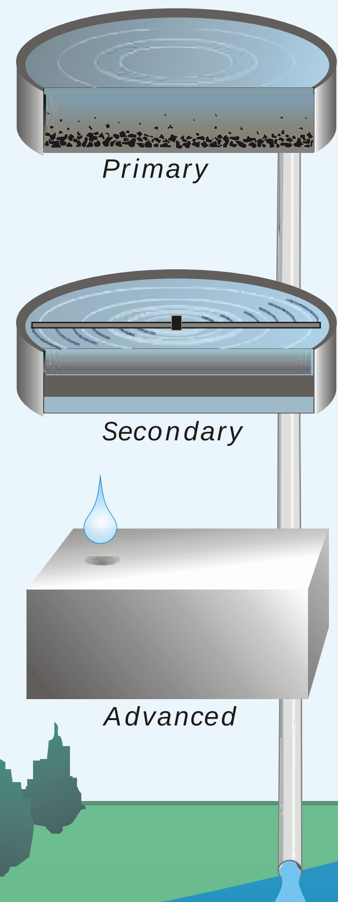
- Is there any possibility that stormwater could run off of your site? (In almost every case, the answer to this question is yes. However, if the topography of your site is such that there is no possibility that rainfall or snow melt could leave the site or enter a waterway under any condition, you would not need permit coverage.)

If you answered "yes" to both of these questions, YOU NEED PERMIT COVERAGE! If you don't have permit coverage, you could be fined up to $32,500 per day!

What Can You Do to Protect Local Waterways?

Wastewater Treatment 101

- Many communities have a wastewater treatment plant that incorporates a series of processes to remove pollutants from water used in homes, small businesses, industries, and other facilities. All wastewater first goes through the primary treatment process, which involves screening and settling out large particles.
- The wastewater then moves on to the secondary treatment process, during which organic matter is removed by allowing bacteria to break down the pollutants. The treated wastewater is then usually disinfected with chlorine to remove the remaining bacteria.
- Some communities go one step further and put the wastewater through an advanced treatment process to reduce the level of pollutants of special concern to the local waterbody, such as nitrogen or phosphorus. After this step, the treated water finally flows through pipes back to a local water body.



Flush Responsibly!

Don't pour household products such as cleansers, beauty products, medicine, auto fluids, paint, and lawn care products down the drain. Properly dispose of them at your local household hazardous waste facility.

Wastewater treatment facilities are designed to treat organic materials, not hazardous chemicals. If you pour hazardous chemicals down the drain, they might end up in your local rivers, lakes, and coastal waters.

Dispose of excess household grease (meat fats, lard, cooking oil, shortening, butter and margarine, etc.) diapers, condoms, and personal hygiene products in the garbage can.

These materials can clog pipes, and could cause raw sewage to overflow in your home or yard, or in public areas. Overflows often occur during periods of high rainfall or snowmelt and can result in basement backups, overflows at manholes, or discharges directly to rivers, lakes, and coastal waters.

Don't pour used motor oil down the drain.

Used motor oil can diminish the effectiveness of the treatment process, and might allow contaminants to be discharged. The contaminants could pollute local waterways or harm aquatic life.

If you're a dark room hobbyist, dispose of spent fixer, developer, and other photographic chemicals in separate containers and transport them to a hazardous waste facility.

Like household hazardous wastes and used motor oil, photographic chemicals can interfere with the wastewater treatment process and could result in pollutants being discharged into local waterways.

Not Down My Drain!

- ✗ cleaners
- ✗ beauty products
- ✗ medicine
- ✗ auto fluids
- ✗ paint
- ✗ lawn care products
- ✗ grease
- ✗ diapers
- ✗ condoms
- ✗ feminine hygiene products
- ✗ motor oil
- ✗ photographic chemicals

For more information on the wastewater treatment process, please contact your local health or public works department. Please visit www.epa.gov/owm for more information on wastewater treatment.

EPA
United States
Environmental Protection
Agency

EPA 832-F-03-008
December 2002

Where Does All the Dirty Water Go?

Protect the Environment in Our Community

What You Flush or Pour Down Your Drain Affects the Rivers, Lakes, and Coastal Waters in Our Community

?

Where does the water go after you flush the toilet or drain the sinks in your home?

When the wastewater flushed from your toilet or drained from your household sinks, washing machine, or dishwasher leaves your home, it flows through your community's sanitary sewer system to a wastewater treatment facility. The wastewater from homes, along with wastewater from businesses, industries, and other facilities, is treated by a variety of processes (see inside for more information) to reduce or remove pollutants.

What happens to the treated water when it leaves the wastewater treatment plant?

The treated wastewater is released into local waterways where it's used again for any number of purposes, such as supplying drinking water, irrigating crops, and sustaining aquatic life.

SANITARY SEWER OVERFLOWS (SSOs)

What is a Sanitary Sewer Overflow (SSO)?

Sanitary sewer systems are meant to collect and transport all of the sewage that flows into them to a wastewater treatment facility (WWTF). However, occasional unintentional discharges of sewage from sanitary sewers occur in almost every system. These types of discharges are called SSOs. The U.S. Environmental Protection Agency (EPA) estimates that there are at least 40,000 SSOs each year. The untreated sewage from these overflows can threaten public health, cause serious water quality problems, and cause significant property damage when overflows are into buildings.

Why Do Sewers Overflow?

SSOs occasionally occur in almost every sewer system, even though systems are intended to collect and contain all the sewage that flows into them. When SSOs happen frequently, it means something is wrong with the system. Problems that typically cause chronic SSOs include:

- Infiltration and Inflow (I/I): Too much rainfall or snowmelt infiltrating through the ground into leaky sanitary sewers not designed to hold rainfall or to drain property and excess water inflowing into sewers through roof drains and sump pumps improperly connected to sewers, broken pipes and sections of pipe settling or shifting so that pipe joints no longer match, and poorly connected sewer service lines.
- Undersized Systems: Sewers and pump stations that are built too small to convey the quantity of sewage, and systems where sediment and other accumulated material reduces the capacity of the sewers.
- Pipe Failures: Blocked, broken, cracked, or collapsed pipes; tree roots growing into the sewers, and build-up of fats, oils, and grease in the sewers.
- Equipment Failures: Pump and power failures.
- Sewer Service Connections: Any of the problems list above, but occurring in sewer service connections to private houses and other buildings.
- Deteriorating Sewer System: General depreciation and deterioration of sewers and other infrastructure with time; improper installation; insufficient maintenance; and lack of funding to address these issues.

What Problems Do SSOs Cause?

Because SSOs contain raw sewage they can carry bacteria, viruses, parasitic organisms, intestinal worms, and inhaled molds and fungi. The diseases they may cause range in severity from mild gastroenteritis (causing stomach cramps and diarrhea) to life-threatening ailments such as cholera, dysentery, infections hepatitis, and severe gastroenteritis. People can be exposed through:

- Sewage in drinking water sources.

- Direct contact in areas of high public access such as basements, lawns or streets, or waters used for recreation.
- Shellfish harvested from areas contaminated by raw sewage.
- Inhalation and skin absorption.

SSOs also damage property. When basements flood, the damaged area must be thoroughly cleaned and disinfected to reduce the risk of disease, and rugs, curtains, flooring, wallboard panels, and upholstered furniture usually must be replaced. Cleanup can be expensive for homeowners and municipalities.

SSOs that enter oceans, bays, estuaries, rivers, lakes, streams, or brackish waters can negatively impact water quality. When bodies of water cannot be used for drinking water, fishing, or recreation, society experiences an economic loss. Tourism and waterfront home values may fall. Fishing and shellfish harvesting may be restricted or halted. SSOs can also close beaches.

Why Is It Important to Report Sanitary Sewer Overflows?
Chelsea is required to notify the EPA and the DEP of any SSO which may endanger health or the environment from portions of the collection system as soon as practicable, but within 24 hours of the time the city becomes aware of the overflow. A written report must also be submitted within five days of the time the city became aware of any overflow that is subject to the immediate reporting provision. In an effort to ensure compliance with these requirements, the City of Chelsea is asking residents and business owners to help by reporting any and all SSOs you may observe. ***Please report all SSOs immediately to Chelsea Water & Sewer at (617) 466-4310.***

Want More Information?
For more information on SSOs, please go to the EPA New England website at http://www.epa.gov/region1/ and follow the Quick Finder link for "Water" and then scroll down to "Sanitary Sewer Overflows."

City of Chelsea Massachusetts- Gov
October 23, 2018

Wondering where to discard your dog poop or cigarettes? Checkout our map of stations!

https://www.google.com/maps/d/viewer...

20 · 8 Shares

Like · Comment · Share

City of Chelsea Massachusetts- Gov
November 5, 2018

Help keep Chelsea clean! Keep the leaves out of our storm drains, streams, rivers, and lakes.

Learn more here:
https://drive.google.com/.../1f7MFebG6pfhKtiW5xtRLkEjmm.../view...

7 · 2 Shares

Like · Comment · Share

City of Chelsea Massachusetts- Gov shared a post.
January 2 ·

Eco-friendly tips to keep chemicals out of our water this winter - shovel first, use de-icer instead of salt, and use it sparingly.

Mystic River Watershed Association
December 20, 2018 ·

When the snow melts where do you think all the salt and de-icer goes? You got it! It flows into our catch basins and straight into our waterways. Keep those chemicals out of our water - shovel first, use de-icer instead of salt, and use de-icer sparingly!

3 | 1 Share

Like Comment Share

City of Chelsea Massachusetts- Gov
February 21 ·

#CleanWaterTip We can build in a way that reduces water pollution and improves aesthetics! Watch this 1-min long video by Mystic River Watershed Association, or visit them at www.mysticriver.org/stormwater to learn more.

DRIVE.GOOGLE.COM
LID Video 2019.mp4

3 | 1 Share

Like Comment Share

City of Chelsea Massachusetts- Gov
April 3 ·

During rainstorms, pollutants on our roads are washed into our storm drains where they flow -untreated - into our water. Street sweeping keeps dirt, sand, trash, and other pollutants out of our water bodies, preserving water quality for all. Want more tips? Visit mysticriver.org/pollution

6 · 2 Comments 1 Share

Like Comment Share

City of Chelsea Massachusetts- Gov
July 18, 2019 ·

You hate stepping in it. And fish hate swimming in it, too! Regularly scoop your dog's poop from public areas and your back yard, before it washes into our waterways. Visit Mystic River Watershed Association at www.mysticriver.org/stormwater for more information.

14 · 2 Comments 4 Shares

Share

APPENDIX H

Regulatory Mechanisms

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Published in 2012 by Order of the City Council

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Adopted: February 27, 2012

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www.municode.com

OFFICIALS

of the

CITY OF CHELSEA, MASSACHUSETTS

AT THE TIME OF THIS RECODIFICATION

____

Leo Robinson/Council President - Councillor at Large

Daniel Cortell - Council Vice President - Districts

Calvin T. Brown - Councillor at Large

Brian Hatleberg - Councillor at Large

Paul R. Murphy - District 1

Christopher Cataldo - District 2

Matthew Frank - District 3

Paula S. Barton - District 4

Joseph Perlatonda - District_5

Giovanni A. Recupero - District 6

Clifford Cunningham - District 7

City Council

____

Jay Ash

City Manager

____

Cheryl Anne Watson

City Solicitor

____

Deborah Clayman

City Clerk

CURRENT OFFICIALS of the CITY OF CHELSEA, MASSACHUSETTS

____

Leo Robinson - Council President - Councillor-at-Large

Damali Vidot - Council Vice President - Councillor-at-Large

Roy Avellaneda - Councillor-at-Large

Paul R. Murphy - District 1

Luis Tejada - District 2

Matthew Frank - District 3

Enio A. Lopez - District 4

Judith Garcia - District 5

Giovanni A. Recupero - District 6

Yamir Rodriguez - District 7

Daniel Cortell - District 8

City Council

____

Thomas G. Ambrosino

City Manager

This Code constitutes a recodification of the general and permanent ordinances of the City of Chelsea, Massachusetts.

Source materials used in the preparation of the Code were the 1994 Code, as supplemented through May 10, 2004, and ordinances adopted by the city council. The source of each section is included in the history note appearing in parentheses at the end thereof. The absence of such a note indicates that the section is new and was adopted for the first time with the adoption of the Code. By use of the comparative tables appearing in the back of this Code, the reader can locate any section of the 1994 Code, as supplemented, and any subsequent ordinance included herein.

The chapters of the Code have been conveniently arranged in alphabetical order, and the various sections within each chapter have been catchlined to facilitate usage. Notes which tie related sections of the Code together and which refer to relevant state law have been included. A table listing the state law citations and setting forth their location within the Code is included at the back of this Code.

Chapter and Section Numbering System

The chapter and section numbering system used in this Code is the same system used in many state and local government codes. Each section number consists of two parts separated by a dash. The figure before the dash refers to the chapter number, and the figure after the dash refers to the position of the section within the chapter. Thus, the second section of chapter 1 is numbered 1-2, and the first section of chapter 6 is 6-1. Under this system, each section is identified with its chapter, and at the same time new sections can be inserted in their proper place by using the decimal system for amendments. For example, if new material consisting of one section that would logically come between sections 6-1 and 6-2 is desired to be added, such new section would be numbered 6-1.5. New articles and new divisions may be included in the same way or, in the case of articles, may be placed at the end of the chapter embracing the subject, and, in the case of divisions, may be placed at the end of the article embracing the subject. The next successive number shall be assigned to the new article or division. New chapters may be included by using one of the reserved chapter numbers. Care should be taken that the alphabetical arrangement of chapters is maintained when including new chapters.

Page Numbering System

The page numbering system used in this Code is a prefix system. The letters to the left of the colon are an abbreviation which represents a certain portion of the volume. The number to the right of the colon represents the number of the page in that portion. In the case of a chapter of the Code, the number to the left of the colon indicates the number of the chapter. In the case of an appendix to the Code, the letter immediately to the left of the colon indicates the letter of the appendix. The following are typical parts of codes of ordinances, which may or may not appear in this Code at this time, and their corresponding prefixes:

Indexes

The indexes have been prepared with the greatest of care. Each particular item has been placed under several headings, some of which are couched in lay phraseology, others in legal terminology, and still others in language generally used by local government officials and employees. There are numerous cross references within the indexes themselves which stand as guideposts to direct the user to the particular item in which the user is interested.

Looseleaf Supplements

A special feature of this publication is the looseleaf system of binding and supplemental servicing of the publication. With this system, the publication will be kept up to date. Subsequent amendatory legislation will be properly edited, and the affected page or pages will be reprinted. These new pages will be distributed to holders of copies of the publication, with instructions for the manner of inserting the new pages and deleting the obsolete pages.

Keeping this publication up to date at all times will depend largely upon the holder of the publication. As revised pages are received, it will then become the responsibility of the holder to have the amendments inserted according to the attached instructions. It is strongly recommended by the publisher that all such amendments be inserted immediately upon receipt to avoid misplacing them and, in addition, that all deleted pages be saved and filed for historical reference purposes.

Acknowledgments

This publication was under the direct supervision of Roger D. Merriam, Senior Code Attorney, and D. J. Heath, Editor, of the Municipal Code Corporation, Tallahassee, Florida. Credit is gratefully given to the other members of the publisher's staff for their sincere interest and able assistance throughout the project.

The publisher is most grateful to Ms. Cheryl Watson, City Solicitor, for her cooperation and assistance during the progress of the work on this publication. It is hoped that her efforts and those of the publisher have resulted in a Code of Ordinances which will make the active law of the city readily accessible to all citizens and which will be a valuable tool in the day-to-day administration of the city's affairs.

AN ORDINANCE ADOPTING AND ENACTING A NEW CODE FOR THE CITY OF CHELSEA, MASSACHUSETTS; PROVIDING FOR THE REPEAL OF CERTAIN ORDINANCES NOT INCLUDED THEREIN; PROVIDING A PENALTY FOR THE VIOLATION THEREOF; PROVIDING FOR THE MANNER OF AMENDING SUCH CODE; AND PROVIDING WHEN SUCH CODE AND THIS ORDINANCE SHALL BECOME EFFECTIVE.

BE IT ORDAINED BY THE CITY COUNCIL OF THE CITY OF CHELSEA, MASSACHUSETTS:

Section 1. The Code entitled "Code of Ordinances, City of Chelsea, Massachusetts," published by Municipal Code Corporation, consisting of chapters 1 through 34, each inclusive, is adopted.

Section 2. All ordinances of a general and permanent nature enacted on or before October 17, 2011, and not included in the Code or recognized and continued in force by reference therein, are repealed.

Section 3. The repeal provided for in section 2 hereof shall not be construed to revive any ordinance or part thereof that has been repealed by a subsequent ordinance that is repealed by this ordinance.

Section 4. Additions or amendments to the Code when passed in such form as to indicate an intention to make the same a part of the Code shall be deemed to be incorporated in the Code, so that reference to the Code includes the additions and amendments.

Section 5. Ordinances adopted after October 17, 2011, that amend or refer to ordinances that have been codified in the Code shall be construed as if they amend or refer to like provisions of the Code.

Section 6. This ordinance shall become effective after passage.

/s/ ___________________________
Councillor Leo Robinson

/s/ ___________________________	/s/ ___________________________
Councillor Calvin T. Brown	Councillor Paul Murphy
/s/ ___________________________	/s/ ___________________________
Councillor Matt Frank	Councillor Joseph Perlatonda

/s/ ___________________________	/s/ ___________________________
Councillor Clifford Cunningham	Councillor Brian Hatleberg
/s/ ___________________________	/s/ ___________________________
Councillor Christopher Cataldo	Councillor Paula Barton
/s/ ___________________________	/s/ ___________________________
Councillor Giovanni A. Recupero	Councillor Dan Cortell

Chapter 4 - ANIMALS[1]

Footnotes:

--- (**1**) ---

State Law reference— Animals generally, M.G.L. c. 140, § 136A et seq.; disposition of old and infirm animals, M.G.L. c. 133; lost goods and stray beasts, M.G.L. c. 134; dogs, M.G.L. c. 140, § 136A et seq.; cruelty to animals, M.G.L. c. 272, § 77 et seq.

ARTICLE I. - IN GENERAL

Sec. 4-1. - Definitions.

The following words, terms and phrases, when used in this chapter, shall have the meanings ascribed to them in this section, except where the context clearly indicates a different meaning:

Animal control officer means any person appointed by the city manager as the animal control officer under the provisions of M.G.L. c. 140, §§ 151 and 151A, and to carry out the provisions of this chapter. In the absence or vacancy in the office or unavailability of the control officer, the city's inspector of animals or deputy shall perform the duties of the animal control officer.

Animal control ordinances means this chapter.

Animal shelter means any premises designated by the city manager for the purpose of impounding and caring for animals held under authority of this chapter.

Dangerous dog means any dog determined to be a nuisance by the chief of police, pursuant to M.G.L. c. 140, § 157.

Guard dog means a dog which meets the provisions of M.G.L. c. 129, § 39B.

Humane officer means any person designated by the humane society as a law enforcement officer and who qualifies to perform such duties under state law.

Humane society means any organization for the prevention of cruelty to animals incorporated under state law.

Owner means any person, having reached the age of majority, owning, keeping or harboring dogs.

Potentially dangerous dog means:

(1) Any dog which, according to the records of any appropriate public official, including, but not limited to, the animal control officer or any police officer, has:

- a. Inflicted serious injury on a human being without provocation on public or private property; or
- b. Killed a domestic animal without provocation while off the owner's property;

(2) Any dog owned or harbored primarily or in part for the purpose of dogfighting or any dog trained for dogfighting;

(3) Any dog not owned by a government or law enforcement unit used primarily to guard public or private property;

(4) Any dog which, when unprovoked, chases or approaches a person on the streets, sidewalks or any public or private property in a menacing fashion or apparent attitude of attack;

(5) Any dog with a known propensity, tendency or disposition to attack, to cause injury, or to otherwise threaten the safety of human beings or domestic animals; or

(6) Any dog which, on three separate occasions within a 12-month period, has been observed being unrestrained or uncontrolled off its owner's premises by the animal control officer or other police officer, or has been impounded by the animal control officer for being unrestrained or uncontrolled off its owner's premises.

All dangerous dogs as defined by this chapter shall be presumed to be a nuisance and a danger to the public safety for the purposes of M.G.L. c. 140, § 157.

Restraint means a dog that is on the premises of its owner or, if outside the premises of the owner, is accompanied by a person who has the dog under control by holding it firmly on a leash.

Serious injury means any physical injury that results in broken bones or lacerations requiring multiple sutures.

Veterinary hospital means an establishment maintained and operated by a licensed veterinarian for the boarding of animals or the diagnosis and treatment of diseases and injuries of animals.

(Code 1994, § 8-11; Ord. of 9-30-1996)

Sec. 4-2. - Purpose.

The purpose of this chapter is to protect the health, safety, welfare and property of all individuals who reside or frequent the city. It is further the purpose of this chapter to prevent the needless health hazards caused by animals, and by animal feces upon public and private properties.

(Code 1994, § 8-10)

Sec. 4-3. - Seizure.

The animal control officer shall have full authority to seize any animal pursuant to this chapter or who is otherwise a clear and imminent threat to the public health, welfare or safety.

(Code 1994, § 8-10; Ord. of 9-30-1996)

Sec. 4-4. - Running at large prohibited.

(a) No person shall allow any domestic fowl, swine, goat, sheep, ox, cow, horse or other grazing animal owned by such person, or in such person's charge or control, to go at large or to graze in or upon:

  (1) Any public ways, or private ways open to the public; or

  (2) Any of the parks, commons, public grounds or lands of the city, whether supervised or not.

(b) No person shall allow any dog owned by such person, or in such person's charge or control, to:

  (1) Swim in a pond or pool in any of the parks or public grounds of the city; or

  (2) Trample upon or injure any flower bed, flower, shrub or other property of the city, in any of such parks or public grounds.

(Code 1994, § 8-12)

State Law reference— Authority to prohibit grazing in streets, M.G.L. c. 85, § 10; strays generally, M.G.L. c. 134.

Sec. 4-5. - Nuisances.

No owner shall fail to exercise proper care and control of such person's animals to prevent them from becoming a public nuisance. Excessive or untimely barking, molesting passersby, chasing vehicles, habitually attacking people or other domestic animals, trespassing upon school grounds, or trespassing upon private property in such manner as to damage property shall be deemed a nuisance.

(Code 1994, § 8-13)

State Law reference— Barking dogs, M.G.L. c. 140, § 157.

Sec. 4-6. - Animals suspected of being rabid.

No police officer or other person shall kill, or cause to be killed, any animal suspected of being rabid, except after the animal has been placed in quarantine and the diagnosis of rabies made by a licensed veterinarian. If a veterinarian diagnoses rabies in an animal in quarantine, then the animal shall be humanely killed and the head of such animal sent to a laboratory for pathological examination and confirmation of diagnosis.

(Code 1994, § 8-14)

Sec. 4-7. - Using animals as prizes.

No person shall:

(1) Give away any live vertebrate animal as:

a. A prize for or as an inducement to enter any contest, game or other competition;

b. An inducement to enter a place of amusement; or

(2) Offer such vertebrate animal as an incentive to enter into any business agreement whereby the offer was for the purpose of attracting trade.

(Code 1994, § 8-150)

State Law reference— Giving away live animals, M.G.L. c. 272, § 80F.

Sec. 4-8. - Animal waste.

(a) The owner of every animal shall be responsible for the removal of any fecal matter deposited by the owner's animal on the owner's property, public walks, recreation areas or private property.

(b) The owner or person who possesses or controls the animal when appearing with the animal on any public walk, street, recreation area or private property shall possess the means of removal of any fecal matter left by such animal.

(c) For the purposes of this section, the means of removal shall include any tool, implement or other device carried for the purpose of picking up and containing such fecal matter. Disposal shall be accomplished by transporting such fecal matter to a place suitable and regularly and specifically reserved for disposal of human fecal matter, specifically reserved for the disposal of dog fecal matter or otherwise designated as appropriate by the director of public health.

(Code 1994, § 8-16; Ord. of 9-30-1996)

Sec. 4-9. - Keeping of exotic animals.

It shall be unlawful for anyone to own, harbor, or permit at large any live monkey, alligator, crocodile, cayman, raccoon, skunk, fox, bear, sea mammal, poisonous snake, member of the feline species other than a domestic cat (Felis domesticus), member of the canine species other than domestic dog (Canis familiaris) or any other animal that would require a standard of care and control greater than that required for customary household pets sold by commercial pet shops or domestic farm animals without the permission of the board of health. Such permission shall be given only if it is demonstrated to the satisfaction of the board that the animal will not constitute a threat to public health or safety.

(Code 1994, § 8-10; Ord. of 9-30-1996)

State Law reference— Possession of certain wild animals, M.G.L. c. 131, § 5.

Sec. 4-10. - Pigeons and wild birds.

(a) *Definitions.* The following words, terms and phrases, when used in this section, shall have the meanings ascribed to them in this subsection, except where the context clearly indicates a different meaning:

Pigeon means any bird belonging to the family Columbidae.

Public property means any property owned and controlled by the city, including streets, parks and sidewalks.

Wild bird means:

(1) Starling, also known as a Sturnus vulgaris;

(2) English sparrow, also know as a Passer domesticus; or

(3) Seagull, also known as the genus Larus.

(b) *Scope/purpose.* It is the purpose of this section to:

(1) Regulate the keeping, feeding, breading, raising and harboring of pigeons, wild pigeons and wild birds in the city in a way to protect and promote the safety of the citizens of the city;

(2) Prevent the spread of disease;

(3) Prevent the creation of nuisance and prevent damage to private and public property.

This section or any rules and regulations promulgated by the board of health pursuant to this section shall not be construed to give a person or entity permission to keep pigeons if said harborage is contrary to other federal, state or local laws.

(c) *Prohibitions.* It shall be unlawful for any person or entity:

(1) To transport, sell, own, keep or otherwise posses any live pigeon and/or wild bird within any public property or any area designated as a residential district under chapter 34, zoning. Nothing in this provision prohibits any person or entity from transporting a live pigeon through a residential district, if the live pigeon is caged during transportation and not released in a residential district.

(2) To willfully and intentionally feed pigeons and wild birds on any public property or property to which the public has right of access.

(3) To willfully and intentionally feed pigeons and wild birds on private property if a nuisance is created or to the extent the public health is threatened. A bird feeder on private property shall be exempted if that bird feeder is not creating a public nuisance. At no time shall a bird feeder feed pigeons or seagulls.

(4) Not to comply with any rule or regulation promulgated by the board of health, unless expressly waived by this section.

(d) *Regulation and control.*

(1) A person or entity may seek a permit from the city's board of health to keep, breed, raise or harbor pigeons, wild pigeons or wild birds.

(2) If a person or entity receives such permit, all such pigeons, wild pigeons and wild birds must be housed or caged in a "pigeon loft" as that term is defined in the rules and regulations of the board of health.

(3) The person or entity with a permit to house pigeons or wild birds shall be responsible for the control of such pigeons or wild birds so as not to create a nuisance and for the maintenance of such roosting or harboring areas in a clean and sanitary condition pursuant to the rules and regulations of the board of health.

(4) A person or entity that can establish that, for at least two months prior to the effective date of the ordinance from which this section is derived, it has been licensed or is a member of a pigeon organization either to raise, breed or harbor pigeons may be exempted from any permit or registration fee created by the board of health. Such persons or entities must, however, register and obtain a permit to feed, raise or harbor pigeons from the board of health.

(e) *Enforcement.* The provisions of this section shall be enforced by the city board of health and inspectional services department. The board of health shall be the issuing authority and coordinator of the permitting process and administration of this section.

(f) *Revocation and suspension.* After notice any permit issued under this section may be revoked or suspended at any time for any cause deemed sufficient by the board of health.

(g) *Penalties.* Any person or entity violating any of the provision of this section shall be subject to a fine of up to $300.00 per offense, and shall in all other respects be subject to the provisions of section 1-8. If the city proceeds by noncriminal disposition, and the violator fails to follow the procedures and requirements of M.G.L. c. 40 § 21D, such outstanding fines shall be recoverable by indictment or by noncriminal complaint pursuant to M.G.L. c. 50, § 21D. Each day on which a violation exists shall be deemed to be a separate offense.

(Ord. of 4-23-2001, § 8-19)

State Law reference— Killing or frightening pigeons, M.G.L. c. 266, § 132.

Secs. 4-11—4-38. - Reserved.

ARTICLE II. - DOGS[2]

Footnotes:

--- (**2**) ---

State Law reference— Dogs, 149. c. 140, § 136A et seq.

Sec. 4-39. - Fines—Generally.

Any person violating any provision of this article shall be deemed guilty of a violation and shall be subject to a criminal fine, for offenses within a calendar year, of:

(1) $25.00 for the first offense;

(2) $50.00 for the second offense;

(3) $75.00 for the third offense and each subsequent offense; and

shall in all other respects be subject to the provisions of section 1-8.

(Code 1994, § 8-36)

Sec. 4-40. - Same—For dogs biting persons.

(a) Any owner of a dog which has bitten a person shall be subject to a criminal fine of:

(1) $50.00 for the first offense;

(2) $75.00 for the second offense;

(3) $100.00 for the third and all subsequent offenses; and

shall in all other respects be subject to the provisions of section 1-8.

(b) If any violation be continuing, each day's violation shall be deemed a separate violation.

(Code 1994, § 8-37)

State Law reference— Report of dog bites, M.G.L. c. 112, § 12Z.

Sec. 4-41. - Issuance of tickets.

The animal control officer and police officers of the city are empowered to issue tickets for violations of the provisions of this article.

(Code 1994, § 8-34)

Sec. 4-42. - Compliance no defense.

Compliance with the requirements of this article shall not be a defense to an order of disposal of a dog pursuant to M.G.L. c. 140, § 157.

(Code 1994, § 8-396; Ord. of 9-30-1996)

Sec. 4-43. - Impoundment—Seizure and quarantine.

(a) Any dog may be immediately confiscated by the animal control officer if the owner, keeper or possessor has not complied with the requirements of this article. Such animal shall be kept by the animal control officer, pending a hearing before the chief of police or designee, and such further disposition or relief as the chief may order.

(b) Potentially dangerous dogs shall be immediately confiscated by the animal control officer and a hearing pursuant to M.G.L. c. 140, § 157 shall be scheduled in due course.

(c) Any dog which bites a person shall be quarantined for ten days if so ordered by the inspector of animals. During quarantine, the dog shall be securely confined and kept from contact with any other animal. At the discretion of the inspector of animals, the quarantine may be on the premises of the owner. If the inspector of animals requires other confinement, the owner shall surrender the animal for the quarantine period to an animal shelter or shall, at such owner's expense, place it in a veterinary hospital.

(d) The animal control officer shall file a verified report of any dog having attacked or bitten any person with the city clerk for filing and such dog shall not be reregistered in the city unless the owner is in full compliance with this article.

(e) Unrestrained dogs, females in heat, dogs found to be disturbing the peace, or dogs having bitten or injured any domestic animal may all be taken by police or the animal control officer and impounded in an animal shelter, and there confined in a humane manner. Such impounding facility shall be available for inspection at specified periods of time by persons seeking lost dogs which may have been impounded.

(1) If by an identification tag or by other means the owner can be identified, the animal control officer shall immediately upon impoundment notify the owner of the impoundment of the animal.

(2) Impounded dogs shall be kept for ten days, unless reclaimed by their owners. Dogs not claimed by their owners within ten days, or placed in suitable new homes, may be humanely euthanized by the animal control officer or by an agency delegated by such officer to exercise that authority.

(Code 1994, § 8-29; Ord. of 9-30-1996)

State Law reference— Impoundment of certain dogs, M.G.L. c. 140, § 151A.

Sec. 4-44. - Same—Release.

An impounded dog shall be released to its owner or keeper upon payment of the impounding facility's fees and on the following additional conditions, as the animal control officer deems each or any applicable:

(1) Upon the obtaining or display of a valid, unexpired license and evidence of a current antirabies vaccination as required by law.

(2) Upon the agreement of the owner or keeper to undertake such restrictions or the control of the animal, as the dog officer shall require for the health and safety of the dog and the public.

(3) In addition to the impounding facility's fees, pay or reimburse the city for all costs, expenses or charged incurred under this article and agree to indemnify and hold it harmless for all damage done by or to said dog.

(Code 1994, § 8-32)

Sec. 4-45. - Sale or disposition of dogs held by city for purpose of experimentation or vivisection prohibited.

All dogs kept in restraint by the animal control officer in the city dog pound shall not be sold or given away for the purpose of experimentation or vivisection.

(Code 1994, § 8-33)

Sec. 4-46. - Hindering enforcement.

Any animal control officer shall have police power in the enforcement of this article. No person shall interfere with or hinder, molest or abuse any animal control officer in the exercise of such powers.

(Code 1994, § 8-38)

Sec. 4-47. - Identification tag required.

(a) Every owner issued a license in accordance with the provisions of M.G.L. c. 140, § 137 for a dog owned or kept within the city will also receive an identification tag from the city clerk's office.

(b) The identification tag shall be a durable tag stamped with an identifying number and of a particular color to signify the specific year of issuance. Tags will be so designed that they may conveniently be fastened to the dog's collar or harness. Dogs must wear identification tags at all times.

(c) The city clerk shall maintain a record of the identifying numbers and shall make this record available to the public.

(d) Any dog unrestrained and without an identification tag shall be apprehended by the animal control officer, and shall not be released until properly licensed. If not properly licensed at the expiration of ten days of confinement, such dog shall be disposed of as set forth in this article.

(e) This license shall not apply to a nonresident keeping a dog within the city for less than 60 days.

(f) No person may use any license for any dog other than for the dog for which it was issued. No person shall keep or control more than three dogs on a single premises.

(g) The city shall automatically place under review all licenses, upon application for renewal, issued to animal owners against whom three or more violations of this article have been assessed in a 12-month period.

(h) It shall be a condition of the issuance of any such license that the city, designated agents or the inspector of animals appointed under M.G.L. c. 29, §§ 15 and 16, be permitted to inspect all animals and the premises where such animals are kept at any time, and, if permission for such inspections are refused, the agent shall seek a search warrant to enter and inspect the premises.

(Code 1994, § 8-25; Ord. of 9-30-1996)

Sec. 4-48. - Owner's duties.

(a) It shall be the duty of every owner of any dog, or anyone having any dog in possession or custody, to exercise reasonable care and to take all necessary steps and precautions to protect other people, property and animals from injuries or damages which might result from their dog's behavior, regardless of whether such behavior is motivated by mischievousness, playfulness or ferocity.

(b) In the event that the owner or keeper of any dog is a minor, the parent or guardian of such minor shall be responsible for ensuring compliance with all provisions of this article.

(c) It shall be the duty of every owner of any dog, or anyone having any dog in possession or custody, to ensure that the dog is kept under restraint and that reasonable care and precautions are taken to prevent the dog from leaving, while unattended, the real property limits of its owner, possessor or custodian, and that:

(1) It is securely and humanly enclosed within a house, building, fence, pen or other enclosure out of which it cannot climb, dig, jump or otherwise escape on its own volition, preventing the animal from gaining access to the exterior of such premises or from reaching persons or animals from within such premises, and such enclosure must be securely locked at any time the animal is left unattended;

(2) It is securely and humanly restrained by chain, cable and trolley, or other tether of sufficient strength to prevent escape. For the safety of the animal, no such chain may be less than eight feet in length; accordingly, if such premises are not of sufficient area to maintain the animals as aforesaid, then such premises may not be used for such purpose; or

(3) It is on a leash, not longer than five feet, strong enough to restrain and control the movements of said dog and under the control of a responsible and competent person.

(Code 1994, § 8-26; Ord. of 9-30-1996)

Sec. 4-49. - Curbing of dogs.

(a) Any dog which scratches, digs, urinates or defecates upon any lawn, tree, shrub, plant, building, sidewalk or any other public or private property, other than the property of the owner or person in charge or control of such dog, is declared to be a nuisance.

(b) No person being the owner in charge or control of any dog shall allow or permit such animal to commit a nuisance on any school grounds, city park or other public property, or upon any private property other than that of the owner or person in charge or control of such dog, without the permission of the owner of such property.

(c) Where the owner or person in charge or control of such dog immediately removes all feces deposited by such dog and disposes of such in a sanitary manner, such nuisance shall be considered abated.

(Code 1994, § 8-27)

Sec. 4-50. - Female dogs in heat.

(a) Every dog in heat shall be confined in a building or secure enclosure in such a manner that such dog cannot come into contact with another animal except for planned breeding.

(b) If the animal control officer determines that a dog in heat, even when properly confined, is attracting other dogs to the area, which causes a disturbance or damage to neighboring property or public areas, the dog may be impounded for the duration, in accordance with section 4-52, and shall be released to the owner or keeper upon compliance with the provisions of section 4-44.

(Code 1994, § 8-29)

Sec. 4-51. - Dangerous dogs regulation.

(a) There shall be a total ban of dangerous dogs anywhere within the city, excepting a dangerous dog kept in accordance and pursuant to an order of the chief of police.

(b) The owner of any dangerous dog, if said animal is found on property not owned or controlled by its owner, or is not restrained in a secure area pursuant to this article, shall be guilty of an offense and said animal shall be forever banned from within the limits of the city.

(c) Subsequent to a hearing by the chief of police, carried out in conformance with the provisions of M.G.L. c. 140, § 157, the chief may order such animal disposed of or forever banned from with the limits of the city, or may order the dog restrained in accordance with section 4-52.

(d) As part of any order of the chief of police issued pursuant to such a hearing, the chief of police shall also be authorized to order the following administrative sanctions and remedies:

(1) Obedience training for the dog in question;

(2) Reduction of the number of animals kept any one location;

(3) Any other measure or sanction designed to eliminate a violation, prevent future violations, or protect the health and safety of the public.

(e) Any person having knowledge which the person believes constitutes probable cause to believe that another is harboring, keeping or maintaining a dangerous or vicious dog which is not registered with and licensed by the city in accordance with this article, shall file with the animal control officer or the police department a sworn affidavit setting forth the basis on which they believe the animal to be a dangerous dog, the name and address of the owner of the dog, and a description of the dog. The animal control officer or the police department shall, upon receipt of such an affidavit, inquire of the city clerk if the dog is currently registered as a dangerous dog pursuant to this article. If the dog is not registered, the city clerk shall notify the police department of this fact and the police department shall notice the owner and shall include the requirement that the owner shall bring the potentially dangerous dog to the veterinarian stated in the aforementioned notice for inspection to determine whether this dog is a "dangerous dog" by the definition as set forth in section 4-1.

(Code 1994, § 8-30; Ord. of 9-30-1996)

State Law reference— Vicious dogs, M.G.L. c. 140, § 157.

Sec. 4-52. - Restraint of dangerous dogs.

The chief of police, pursuant to a hearing, may determine any dog to be a nuisance and may make such order concerning the restraint or disposal of such dog as may be deemed necessary. Any restraint order issued by the chief shall comply with the following regulations:

(1) No person shall allow or suffer any dog to be anywhere except within or upon the principal and usual residential premises of the person to whom such animal is registered, as required by law.

(2) While on the premises of the person to whom such dog is registered, as required by law, be securely confined indoors or in a securely enclosed and locked pen or structure, suitable to prevent the entry of young children and designed to prevent the dog from escaping. Such pen or structure must have a minimum dimensions of five feet by ten feet and must have secure sides and a secure top. If it has no bottom secured to the sides, the sides must be embedded into the ground no less than two feet. The enclosure must also provide protection from the elements for the dog.

(3) The person to whom such dog is registered as required by law shall display a sign on the person's premises warning that there is a dangerous dog on the property. This sign shall be visible and capable of being read from the public street or way. In addition, the owner shall conspicuously display a sign with a symbol warning children of the presence of a dangerous dog.

(4) Such a dangerous dog may be beyond such premises for the purposes of transport of the animal for medical or veterinary care. In such instance, the animal must be securely muzzled and restrained by a leash or chain not exceeding five feet in length; at all such times appropriate care, precaution and security must be maintained to preclude and prevent the animal from gaining access to the exterior of any transport utilized or from reaching persons or animal from within such transport.

(5) Such animal may be beyond such premises for the purpose of transport of the animal permanently out of the limits of the city. In such instance, the procedure for such animal provided in subsection (4) of this section shall be employed.

(Code 1994, § 8-31; Ord. of 9-30-1996)

State Law reference— Vicious dogs, M.G.L. c. 140, § 157.

Sec. 4-53. - On school premises.

The owner or anyone having any dog in possession or the custody of any dog shall not allow such dog to be upon any school grounds between the hours of 7:00 a.m. to 5:00 p.m. on any day that such schools are in session.

(Code 1994, § 8-35; Ord. of 9-30-1996; Ord. of 9-8-1997)

ARTICLE V. - SEWERS AND STORM DRAINS

DIVISION 1. - GENERALLY

Sec. 30-191. - Regulations and authority of others.

No provision of this chapter shall be deemed to contravene or render ineffective any valid federal or state laws, regulations or standards pertaining to, or permitting the agency having jurisdiction over public health, safety and welfare, and the environment or the proper and safe operation of sanitary and combined sewers and storm drains. When duplicate provisions are in effect, the more stringent shall govern.

(Code 1994, § 6-62; Ord. of 10-19-2009)

Sec. 30-192. - Special agreements.

No statement contained in this article shall be construed as preventing any special agreement or arrangement between the city and any industrial concern, whereby an industrial waste of unusual strength or character may be accepted by the city and the MWRA for transportation and treatment.

(Code 1994, § 6-52; Ord. of 10-19-2009)

Sec. 30-193. - Measurements.

All measurements, tests and analyses of the characteristics of waters and wastes to which reference is made in this article shall be determined in accordance with the latest edition of Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association, and shall be determined at the control manhole provided or upon suitable samples taken at said control manhole. In the event that no special manhole has been required, the control manhole shall be considered to be the nearest downstream manhole in the public sewer to the point at which the building sewer is connected. Sampling shall be carried out by customarily accepted methods to reflect the effect of constituents upon the sewage works and to determine the existence of hazards to life, limb and property. Sample analysis shall be performed by an independent laboratory currently certified by the DEP for the parameters being analyzed. The use of a laboratory with provisional DEP certification is prohibited. The particular analyses involved will determine whether a 24-hour composite of all outfalls of a premises is appropriate or whether a grab sample should be taken. Normally, BOD and suspended solids analyses are obtained from 24-hour composites of all outfalls, whereas pHs are determined from periodic grab samples.

(Code 1994, § 6-46; Ord. of 10-19-2009)

Sec. 30-194. - Records.

(a) An owner or user shall retain on its premises and make available to the DPW upon request all documents pertinent to any of the following:

(1) The volume, components or frequency of its discharges to the public sewer, combined sewer and storm drain systems;

(2) Its industrial pretreatment equipment and procedures, if any;

(3) Its design, installation, maintenance, and operation of any special facilities, particle separators, grease or oil traps, building drains, building sewers, building storm drains, or sewers, private sewers, private storm drains or other related facilities or equipment;

(4) Its permits or orders issued pursuant to this chapter.

(b) Unless otherwise specified in this chapter or in any permit or order issued by the DPW or the MWRA, every such document shall be maintained for at least five full years following its preparation or receipt by the user. All records pertaining to matters covered by an order issued under this chapter, or to any enforcement action or litigation involving the DPW, shall be retained until the enforcement action is concluded and all appeal periods concerning the order or action have expired, unless a longer period of retention is otherwise required.

(Code 1994, § 6-13; Ord. of 10-19-2009)

Sec. 30-195. - Notification of city of violations.

(a) Users shall notify the DPW by telephone immediately upon discharge or receiving knowledge of a discharge of water or wastes in violation of this chapter and of any spill or other nonpermitted pollutant release that may reasonably be expected to discharge whether directly or indirectly to any public or private sewer, combined sewer or storm drain, or to a natural outlet. When directed by the DPW or if the user fails to reach the DPW by telephone, the user shall also notify the DEP, EPA and MWRA immediately by telephone.

(b) Each notification shall be followed within 15 days of the date of occurrence by a detailed written statement addressed to the director and, as appropriate, the DEP, EPA, and the MWRA, describing the causes of the discharge and the measures being taken to prevent a recurrence. Such notification will not relieve users of liability for any expense, loss or damage to the public sewer or storm drain systems, to the MWRA sewer system, or for any fines imposed on the DPW, the MWRA, or the owner as a result of such discharge.

(Code 1994, § 6-61; Ord. of 10-19-2009)

Sec. 30-196. - Building sewers and connections.

(a) Owners of a building situated upon any street, easement or way through which a public sewer has been constructed shall construct and maintain building drains, building sewers, and/or private sewers through their premises in their entirety from such structures to the public sewer main, including any chimney, as may be necessary to conduct the sewage from the building or buildings to enter the public sewers. Any person included within the provisions of this section who refuses to make a permit application to the DPW for the construction of such building drains, building sewers and private sewers and connecting the same to the public sewer, or neglects to make such permit application within the space of 14 days after written notice from the director, shall pay the penalty provided for in this chapter.

(b) The owner of a building sewer shall at all times keep such sewers clean and in good repair in order not to cause excessive infiltration, exfiltration or inflow, depletion of groundwater, discharge of pollutants to the environment, damage to property, odor, or harm to the public sewers. Whenever any building drain, building sewer, or private sewer becomes clogged, broken, obstructed, out of order or detrimental to the use of a public sewer or unfit for sewage purposes, the owner, agent, occupant or person having charge of any such sewers shall, when directed by written notice from the director, remove, reconstruct, alter, cleanse or repair such sewers, as the conditions thereof require. In case of neglect or refusal to comply with such notice within five days after the same is given, the director may cause the building sewer, sewer service or private sewer to be removed, reconstructed, repaired, altered or cleaned, as the director may deem expedient, at the expense of the owner, agent, occupant or other person so notified, who shall also be liable to pay the penalty provided for in this chapter. Any person proposing a new discharge into the system or a substantial change in the volume or character of pollutants that are being discharged into the system shall notify the director at least 45 days prior to the proposed change or connection.

(c) There shall be two classes of building sewer permits:

(1) For residential and commercial service; and

(2) For service to establishments producing industrial wastes.

In either case, the owner or the owner's agents shall make application on a special form furnished by the city. The permit application shall be supplemented by any plans, specifications or other information considered pertinent in the judgment of the director. Every user discharging industrial wastes to the public sewerage system or directly into the MWRA sewerage system shall obtain a joint permit from the director and the MWRA. Industrial users proposing new discharges shall obtain such permits prior to constructing a building sewer. The director and the MWRA may change the conditions of the permit from time to time as circumstances, including regulations enacted or promulgated by the state or federal governments or their agencies, may require. The director and the MWRA may stipulate special conditions and terms upon which the permit will be issued. No user may increase the daily volume, strength or rate of the user's permitted discharge beyond 15 percent without first securing an amendment to the permit.

(d) All costs and expense incident to the permitting, installation and connection of the building sewer shall be borne by the owner. The owner shall indemnify the city from any loss or damage that may directly or indirectly be occasioned by the installation of the building sewer.

(e) A separate and independent building sewer shall be provided for every building, except where one building stands at the rear of another on an interior lot and no private sewer is available or can be constructed to the rear building through an adjoining alley, court, yard or driveway, in which case, the building sewer from the front building may, after permission from the director has been obtained, be extended to the rear building and the whole considered as one building sewer. The extension of a building sewer from a front building to a rear building may only be constructed when permitted by the director. The director may condition the construction of such a building sewer extension upon approval of construction methods and written agreement by both affected building owners to provide maintenance of such an extended building sewer.

(f) Old building sewers may be used in connection with new buildings only when they are found, on examination and test by the director, to meet all requirements of this chapter. It is the responsibility of the proponent of utilizing an existing sewer connection to pay all cost associated with all physical examinations and repairs ordered by the director including the case in which the director determines the existing sewer connection is unsuitable for reuse.

(g) The size, slope, alignment, materials of construction of a building sewer, and the methods to be used in excavation, placing of the pipe, jointing, testing and backfilling the trench, shall all conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city. In the absence of such specifications or in amplification thereof, the materials and procedures set forth in appropriate specifications of the ASTM, the WEF Manual of Practice No. 9, Design and Construction of Urban Stormwater Management Systems and Gravity Sanitary Sewer Design and Construction, New England Interstate Water Pollution Control Commission, New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works, title V of the State Environmental Code and the Uniform State Plumbing Code, 248 CMR 10.00 shall apply.

(h) Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. In all buildings in which any building drain is too low to permit gravity flow to the public sewer, the sanitary sewer carried by such building drain shall be lifted by a means approved by the plumbing inspector and the director and discharged by gravity (i.e., not under pressure) to the public sewer.

(i) Prior to installing below-grade plumbing, the owner shall submit a plan of the proposed plumbing to the DPW for review and approval. Plumbing that is subject to the requirements of this section shall include faucets, showers, baths, toilets and washing machine hookups. All plumbing fixtures located at an elevation below the top of the manhole on the public sewer serving the proposed plumbing shall be considered to be liable to backflow and shall be equipped with a backwater valve in accordance with 248 CMR 10.15 of the Uniform State Plumbing Code. The backwater valve shall be installed and maintained at the owner's expense.

(j) Building sewer connections shall be laid at least ten feet apart from any new or existing water service connection.

(k) No person shall make connection of roof downspouts, exterior foundation drains, areaway drains and other sources of stormwater or groundwater to a building sewer or building drain which in turn is connected directly or indirectly to a public sanitary sewer without written permission of the director. Floor drains shall be connected to a building sewer or a building drain which is in turn connected to a building sewer. In no case shall stormwater be discharged to sewers which only conduct sanitary sewage except as otherwise provided herein and within the state building code.

(l) The connection of the building sewer into the public sewer or combined sewer shall conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city, or the procedures set forth in appropriate specifications of the ASTM and WEF Manual of Practice No. 9. All such connections shall be made gastight and watertight. Any deviation from the prescribed procedures and materials must be approved by the director before installation.

(m) The applicant for the building sewer permit shall notify the director when the building sewer is ready for inspection and connection to the public sewer. The connection shall be made under the supervision of the director or designee. If the applicant fails to make such notifications, any and all costs to uncover the connection as necessary for inspection shall be borne by the applicant.

(n) Prior to activating water service, every new building sewer shall be dye tested by owner or designee in the presence of a DPW inspector to establish that the building sewer is properly connected to the public sewer. The director may direct an owner to conduct dye testing of an existing building sewer to establish that it is properly connected to the public sewer. The director may require the owner forthwith to eliminate a connection from a building sewer to a storm drain (also referred to as an illicit connection) at the owner's expense. Where separate sanitary sewers and storm drains exist, the director may also require the owner to dye test in the presence of a DPW inspector, a new or existing building storm drain to establish that the building storm drain is properly connected to the public drain. The director may also require the owner forthwith to eliminate a connection from a building storm drain to a sanitary sewer at the owner's expense.

(Code 1994, § 6-40; Ord. of 10-19-2009)

Sec. 30-197. - Sewage-stormwater separation.

(a) The plumbing of any existing or new building shall be so constructed as to keep all stormwater, surface water, groundwater, roof and surface runoff, subsurface drainage, uncontaminated cooling water and uncontaminated industrial process water, noncontact cooling water and noncontact industrial process water, separate from sanitary sewage and industrial wastes, and from the building drain or building sewer.

(b) The building drain conveying wastewater from plumbing fixtures within the building shall discharge to a building sewer, while the building drain conveying stormwater and other drainage shall discharge to a building storm drain.

(c) Where separate storm drains and sanitary sewers are provided, and the DPW has determined that on-site retainage of stormwater is not possible, building storm drains shall be connected to a storm drain. Connection of a building storm drain to a sanitary sewer is prohibited.

(d) Where separate storm drains and sanitary sewers are provided, building sewers shall be connected to a sanitary sewer. Connection of a building sewer to a storm drain is prohibited.

(e) Where only a combined sewer has been provided, and the DPW has determined that on-site retainage of stormwater is not possible, building storm drains shall be connected directly to the combined sewer. No building storm drain shall be connected to the building sewer and such building sewer made a combined sewer unless specifically authorized by the director.

(f) The director shall require an owner to eliminate a source of infiltration or inflow whenever the director determines that the source is resulting in excessive infiltration or inflow to be discharged directly or indirectly to the sanitary sewer system.

(Code 1994, § 6-53; Ord. of 10-19-2009)

Secs. 30-198—30-217. - Reserved.

DIVISION 2. - STORM DRAINS

Sec. 30-218. - Building storm drains and connections.

(a) Owners of a building or buildings situated upon any street, easement or way through which a public drain has been constructed may make voluntary application to the DPW to construct and maintain building storm drains, private drains and appurtenances through their premises in their entirety from such structures to the public drain as may be necessary to conduct the drainage from the property to enter the public drain. If, in the opinion of the DPW, the lack of private drains is or may endanger public health, create a public nuisance, increase flooding, impair water quality, or pose other negative impacts, the director may make written notice to the owner directing the owner to construct and maintain building storm drains, private drains and appurtenances through the owner's premises as may be necessary to conduct the drainage from the property to the public drain. Any person included within the provisions of this section, who refuses to make a permit application to the DPW for the construction of such building storm drains or private drains and connecting the same to the public drain or neglects to make such permit application within the space of 14 days after written notice from the director, shall pay the penalty provided for in this chapter. Any person proposing a new discharge into the system or a substantial change in the volume or character of pollutants that are being discharged into the system shall notify the director at least 45 days prior to the proposed change or connection.

(b) The owner of a building storm drain shall at all times keep such drains clean and in good repair in order not to cause excessive infiltration, exfiltration or inflow, depletion of groundwater, damage to property, odor, or harm to public drains. Whenever any building drain, building storm drain or other private drain becomes clogged, broken, obstructed, out of order or detrimental to the use of a public drain or unfit for drainage purposes, the owner, agent, occupant or person having charge of any such drain shall, when directed by written notice from the director, remove, reconstruct, alter, cleanse or repair the drain, as the conditions thereof require. In case of neglect or refusal to comply with such notice within five days after the same is given, the director may cause the building drain, building storm drain or other private drain to be removed, reconstructed, repaired, altered or cleaned, as the director may deem expedient, at the expense of the owner, agent, occupant or other person so notified, who shall also be liable to pay the penalty provided for in this chapter.

(c) There shall be one class of building storm drain permit. The owner or agents thereof shall make application on a special form furnished by the city. The permit application shall be supplemented by any plans, specifications, analytical data or other information considered pertinent in the judgment of the director. No user may increase the daily volume or rate of the user's permitted discharge beyond 15 percent, or alter the characteristics or strength of the user's permitted discharge, without first securing an amendment to the user's permit.

(d) All costs and expense incident to the permitting, installation and connection of the building storm drain shall be borne by the owner. The owner shall indemnify the city from any loss or damage that may directly or indirectly be occasioned by the installation of the building storm drain.

(e) A separate and independent building storm drain shall be provided for every building, except where one building stands at the rear of another on an interior lot and no private drain is available or can be constructed to the rear building through an adjoining alley, court, yard, or driveway, in which case, the building storm drain from the front building may, after permission from the director has been obtained, be extended to the rear building and the whole considered as one building drain. The extension of a building storm drain from a front building to a rear building may only be constructed when permitted by the director. The director may condition the construction of such a building storm drain extension upon approval of construction methods and written agreement by both affected building owners to provide maintenance of such an extended building storm drain.

(f) Old building storm drains may be used in connection with new buildings only when they are found, on examination and test by the director, to meet all requirements of this chapter. It is the responsibility of the proponent of utilizing an existing building storm drain connection to pay all cost associated with all physical examinations and repairs ordered by the director including the case in which the director determines the existing drain connection is unsuitable for reuse.

(g) The size, slope, alignment, materials of construction of a building storm drain, and the methods to be used in excavation, placing of the pipe, jointing, testing and backfilling the trench, shall all conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city. In the absence of such specifications or in amplification thereof, the materials and procedures set forth in appropriate specifications of the American Society for Testing and Materials, the WEF Manual of Practice No. 9, Design and Construction of Urban Stormwater Management Systems and Gravity Sanitary Sewer Design and Construction, New England Interstate Water Pollution Control, New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works, title V of the State Environmental Code and the Uniform State Plumbing Code, 248 CMR 2.00 shall apply. Building storm drains shall be laid at least ten feet apart from any new or existing water service connection.

(h) In all buildings in which any building drain is too low to permit gravity flow to the public drain, drainage carried by such building drain shall be lifted by a means approved by the plumbing inspector and the director of public works and discharged by gravity (i.e., not under pressure) to the public drain.

(i) No person shall make connection of illicit discharges directly or indirectly to a building drain or public drain.

(j) The connection of the building storm drain into the public drain shall conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city, or the procedures set forth in appropriate specifications of the ASTM, WEF Manual of Practice No. 9, and Design and Construction of Urban Stormwater Management Systems and Gravity Sanitary Sewer Design and Construction. All such connections shall be made gastight and watertight. Any deviation from the prescribed procedures and materials must be approved by the director before installation.

(k) The applicant for the building storm drain permit shall notify the director when the building storm drain is ready for inspection and connection to the public drain. The connection shall be made under the supervision of the director or designee. If the applicant fails to make such notifications, any and all costs to uncover the connection as necessary for inspection shall be borne by the applicant.

(l) The building storm drain permit shall be denied, revoked, suspended or reissued if the director determines that the discharge, whether singly or in combination with others, is or may cause or contribute to a water quality problem, or may cause or contribute to a violation of the city's NPDES permit.

(m) For a project requiring site plan review, the proponent shall assess the use of methods to contain stormwater on the proposed site and submit such assessment with a sewer or storm drain service application. Connections to public storm drain systems or combined sewer systems will not be approved by the city without an assessment of on-site drainage. For such projects involving more than 25,000 square feet of impervious surface, drainage calculations for runoff shall include the storm frequency, time of concentration, peak rate runoff and total volume of water.

(n) Drainage plans for residential structures that have less than four units shall be approved by the DPW.

(Code 1994, § 6-55; Ord. of 10-19-2009)

Sec. 30-219. - Use of the public drains.

(a) No person shall directly or indirectly discharge or cause to be discharged any pollutants, as defined by federal and state surface water quality standards, to any building storm drain, public drain or natural outlet. No person shall directly or indirectly discharge or cause to be discharged, any sewage or any other waters not composed entirely of stormwater into a building storm drain or public drain except as provided in subsection (c) of this section. Each user shall provide reasonable and appropriate protection from any discharge, including accidental discharges, in violation of this chapter or any federal or state laws or regulations. No person shall directly or indirectly dump, discharge or cause to be discharged into any catchbasin, any solid waste, construction debris, paint or painting product, antifreeze, hazardous waste, oil, gasoline, grease and all other automotive and petroleum products, solvents and degreasers, drain cleaners, commercial and household cleaners, soap, detergent, ammonia, food and food waste, grass or yard waste, leaves, animal feces, dirt, sand, gravel or other pollutant. Any person determined by the director to be responsible for the direct or indirect discharge of any of the substances stated in this subsection to a catchbasin may be held responsible for cleaning the catchbasin, paying the cost for such cleaning or for paying any penalties assessed by the DPW.

(b) Sewage and all other polluted waters shall be discharged to such sewers as are specifically designated as combined sewers or sanitary sewers unless otherwise required by the state building code. Floor drains shall be connected to the building drain. New or substantially rehabilitated decorative fountains shall be recirculating and shall not discharge to a storm drain. New or substantially rehabilitated recreational spray and sprinkler pools shall be not be recirculating and shall not discharge to a storm drain.

(c) Discharges to storm drains which are authorized by this chapter are those specifically permitted under the city's NPDES general permit for discharges from its small municipal separate storm sewer as follows, unless identified by the DPW as significant sources of pollutants or as causing or contributing to a violation of water quality standards:

(1) Discharges composed entirely of stormwater.

(2) Nonstormwater discharges for which the owner has obtained an NPDES permit or NPDES permit exclusion from the EPA, and a building storm drain permit.

(3) Nonstormwater discharges from the following sources or as otherwise permitted under subsequent revisions of the NPDES general permit for discharges from the city's municipal separate storm sewer:

a. Water line flushing;

b. Landscape irrigation;

c. Diverted tide, river or stream flows;

d. Rising groundwater;

e. Uncontaminated groundwater infiltration, as defined at 40 CFR 35.2005(20);

f. Uncontaminated pump groundwater;

g. Discharge from potable water sources;

h. Foundation drains;

i. Air conditioning condensation;

j. Irrigation water, uncontaminated springs;

k. Water from crawl spaces pumps;

l. Footing drains;

m. Lawn watering;

n. Individual resident car washing;

o. Flow from riparian habitats and wetlands;

p. Dechlorinated swimming pool discharges;

q. Street wash waters;

r. Residential building wash waters that do not contain detergents.

(d) Any area which is used to dispense fuel and is covered by a canopy or other type of roof or enclosure shall drain into an approved oil trap and then into a sanitary sewer, or if not available, a combined sewer. An alternative is to contain all runoff within the fuel dispensing area so that it is not drained off. The owner shall be responsible for the removal and disposal of any runoff which is contained in such a manner. The fuel dispensing area shall be graded so as to prevent any runoff to surrounding areas which drain into a storm drain. Runoff from canopies of gas stations and from fuel dispensing areas not in a building or covered by a canopy shall be drained according to city rules or, in the absence of such rules, as prescribed by the director.

(Code 1994, § 6-56; Ord. of 10-19-2009)

Sec. 30-220. - Pollution prevention in the stormwater collection system.

In order to maintain the city's efforts in prohibiting pollutants from being discharged into its waterways the following is required:

(1) In accordance with the city's illicit discharge detection and elimination plan nonstormwater discharges to the city's small MS4 system are strictly prohibited. Failure to comply with this section will require the immediate stoppage of such discharge and removal of any condition causing such discharge upon the order of the director or designee. If such orders are not complied with within seven days of issuance, the city will take such action that is necessary to remedy the situation and the cost of such action shall be the sole responsibility of the property owner.

(2) The proponents of all construction projects within the city must submit to DPW for approval a plan to manage sediment and erosion control, which includes stormwater and drainage, at the proposed location prior to or in conjunction with its building permit application. No building permits shall be approved and issued until such plan has been approved by the director.

(3) The proponents of all development and redevelopment projects within the city must submit to DPW for approval a plan to manage post construction runoff at the proposed location prior to or in conjunction with its building permit application to DPW. No occupancy permits shall be issued by the inspectional services department until such plan has been approved by the director and such approval has been communicated to the inspectional services department.

(Code 1994, § 6-25; Ord. of 10-19-2009)

Sec. 30-221. - Discharges exceeding standards.

(a) If any stormwater or other waters proposed to be discharged to the public drains or a natural outlet, which waters contain substances in excess of local, federal or state surface water quality standards, the director shall:

(1) Reject the wastes;

(2) Require treatment to an acceptable condition before discharge to the public drains or natural outlet.

(b) If the director permits the treatment prior to discharge to the public drain or combined sewer, or natural outlet, the owner shall at the owner's own expense design, construct and maintain a system to reduce such substances to a concentration of no greater than federal and state water quality standards prior to connection to the public drain or combined sewer, or natural outlet.

(Code 1994, § 6-57; Ord. of 10-19-2009)

Sec. 30-222. - NPDES permits.

Every person who is required to be covered under an NPDES permit for a stormwater discharge associated with industrial activities or for stormwater discharges from construction sites shall submit to the director a copy of the completed notice of intent or individual application as submitted to the EPA, and the following information:

(1) Address of the building or premises where the discharge will take place and the name and address of the building or premises owner;

(2) Name of a contact person, title and phone number;

(3) A site plan or sketch which shows the location of the connection of the building storm drain or the points of discharge to the public storm drain or combined sewer, including the street name, size of the storm drain or combined sewer to which the stormwater will discharge and, if the discharge is to a public drain the outfall location to which the discharge will be conveyed and discharged;

(4) Standard industrial code (SIC code) of the facility;

(5) A description of the product or services provided by the facility;

(6) A description of the nature of the discharge;

(7) Existing NPDES permit number, if any;

(8) Facility's water service account number;

(9) A copy of all reports and other correspondence required to be submitted under the NPDES permit.

(Code 1994, § 6-60; Ord. of 10-19-2009)

Sec. 30-223. - Stormwater management.

(a) All owners of existing properties shall implement industry standard structural and nonstructural best management practices (BMPs) to minimize the discharge of pollutants carried by stormwater runoff from their properties to any public drain or natural outlet.

(b) Every owner seeking to establish a new connection to the public drain or combined sewer, or natural outlet; to reconstruct, repair or modify an existing connection for a facility undergoing expansion; or as otherwise deemed necessary by the director under this chapter, may be required to do the following:

(1) Prepare and implement a stormwater management plan that identifies regulatory, structural, administrative, managerial, maintenance, physical and chemical measures or devices designed to prevent the discharge of pollutants to stormwater.

(2) Prepare and implement an erosion and sedimentation control plan to prevent the erosion of soil and the introduction of sediment into the public sewers and drains, during and after construction.

(3) Monitor their discharges to ensure compliance with federal and state surface water quality standards, or as the director or designee may reasonably require including, but not limited to:

a. Laboratory analysis of discharges;

b. Installation, use, and maintenance of monitoring equipment;

c. Keeping records; and

d. Reporting the results of such monitoring to the director.

Such records shall be made available upon request by the director to other agencies having jurisdiction over discharges to the receiving waters.

(4) Implement on-site retainage of stormwater and other stormwater management measures to control the rate and volume of stormwater discharged to the public combined sewer or drains as determined by the director.

(5) Design and install on-site stormwater management measures such as BMPs and treatment systems to control the characteristics of stormwater discharged to the public combined sewer or drains. At a minimum, oil and particle separators shall be required on all newly constructed private storm drains from existing and new outdoor parking or paved areas which connect directly or indirectly to the public storm drain or natural outlet. Particle separators may be required on existing private storm drains from existing or expanded outdoor parking or paved areas whenever appropriate as determined by the director. All separators must be of a type and capacity appropriate for the drainage area served and approved by the director.

(c) All systems required by this section shall be of a type and capacity approved by the director, and shall be located so as to be readily and easily accessible for operation, maintenance, cleaning and inspection. The design and installation of the systems shall all conform to the requirements of the building and plumbing code or other applicable rules and regulations of the city. In the absence of such specifications or in amplification thereof, the materials and procedures set forth in appropriate specifications of the American Society for Testing and Materials, the WEF Manual of Practice No. 9, Design and Construction of Urban Stormwater Management Systems and Gravity Sanitary Sewer Design and Construction, New England Interstate Water Pollution Control Commission, New England Interstate Water Pollution Control Commission Guides for the Design of Wastewater Treatment Works, and title V of the State Environmental Code shall apply. Design and installation shall be at the facility owner's expense. The owner shall notify the director when the systems are ready for inspection and connection to the public drain. The connection shall be made under the supervision of the director or designee. If the applicant fails to make such notifications, any and all costs to uncover the systems as necessary for inspection shall be borne by the applicant.

(d) Prior to startup of all systems required by this section, owners of such systems shall submit to the director for review and approval, an operation and maintenance (O&M) plan for the system. The O&M plan shall include, at a minimum, a detailed listing of all operation, inspection, maintenance, cleaning or other procedures or activities required to ensure that the system operates in a continuously satisfactory and effective manner. The O&M plan shall be prepared at the owner's expense, and include site-specific procedures and activities as recommended by the system manufacturer for the particular installation.

(Code 1994, § 6-58; Ord. of 10-19-2009)

Sec. 30-224. - Maintenance, cleaning and inspection of systems to manage stormwater.

(a) Where systems are provided on a property to treat or otherwise manage stormwater prior to discharge to the public drain, public combined sewer, or natural outlet, the system shall be maintained continuously in satisfactory and effective operation by the owner at the owner's expense, including all maintenance and cleaning of the system as may be recommended by the system manufacturer, and annual inspection of the system by a person authorized by the manufacturer.

Whenever such systems become clogged, broken, obstructed, out of order, unfit for drainage purposes, or detrimental to the public drain or to the receiving water, the owner, agent, occupant or person having charge of any such system shall, when directed by written notice from the director, remove, reconstruct, alter, cleanse or repair the system, as the conditions thereof require. In case of neglect or refusal to comply with such notice within five days after the same is given, the director may cause the system to be removed, reconstructed, repaired, altered or cleaned, as the director may deem expedient, at the expense of the owner, agent, occupant or other person so notified, who shall also be liable to pay the penalty provided for in this chapter.

(b) The owner of such facilities shall maintain a written record describing the date and type of all cleaning, maintenance and inspections performed, and the identity and qualifications of the person who performed such tasks. Records shall be maintained for six years and shall be made available for inspection and copying by the DPW. By March 31 of each year, the owner shall submit to the DPW a written record of the date and type of all maintenance, cleaning, and inspection performed during the prior calendar year. Records shall be specific to the site, system, and work performed. The director may reject any records that are not site specific.

(Code 1994, § 6-59; Ord. of 10-19-2009)

Secs. 30-225—30-241. - Reserved.

DIVISION 3. - SANITARY SEWER DISCHARGE LIMITATIONS

Sec. 30-242. - Generally.

(a) No person shall discharge or cause or allow to be discharged directly or indirectly into a public sanitary sewer or into a sanitary sewer tributary thereto any groundwater, dewatering drainage, subsurface drainage, tidewater, accumulated surface water, noncontact cooling water, noncontact industrial process waters, uncontaminated contact cooling water and uncontaminated industrial process water, or waters associated with the excavation of a foundation or trench, hydrological testing, groundwater treatment/remediation, removal or installation of an underground storage tank or dewatering of a manhole. Authorization for such discharge may be obtained in writing by the DPW and the MWRA when the discharger has taken all reasonable efforts to eliminate and minimize the flow, there is no reasonable access to a storm drain, surface water or another disposal alternative, and the amount to be discharged will not have an actual or potential adverse impact on the sewer system, the quality of receiving water or the DPW's ability to meet its obligations under any law, regulation, including MWRA regulations, permit or order.

(b) Any building sewer or private sewer connecting with a combined sewer shall be constructed with a plug or clapper to prevent completely the reflux of drainage matter, stormwater or tidewater. In order to prevent the direct discharge of wastewater to receiving waters under dry weather conditions, a building sewer shall not be connected to a combined sewer overflow.

(c) No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer or combined sewer:

(1) Any gasoline, benzene, naphtha, fuel oil, or other flammable or explosive liquid, solid or gas.

(2) Any waters or wastes containing toxic or poisonous solids, liquids, or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage treatment process, constitute a hazard to human or animals, create a public nuisance, or create any hazard in the receiving waters of the sewage treatment plant.

(3) Any waters or wastes having a pH lower than 5.5, or having any other corrosive property capable of causing damage or hazard to structures, equipment and personnel of the sewage works.

(4) Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the sewage works including, but not limited to, ash, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, feathers, tar, plastic, wood, unground garbage, whole blood, paunch manure, hair and fleshings, entrails, and paper dishes, cups, milk containers, etc., either whole or ground by garbage grinders.

(d) No person shall discharge or cause to be discharged the following described substances, materials, waters or wastes if it appears likely in the opinion of the director that such wastes, can harm either the sewer, sewage treatment process or equipment, have an adverse effect on the receiving stream, or can otherwise endanger life, limb, public property or constitute a nuisance. In forming an opinion as to the acceptability of these wastes, the director will give consideration to such factors as the quantities of subject wastes in relation to flows and velocities in the sewers, materials of construction of the sewers, nature of the sewage treatment processes, capacity of the sewage treatment plant, degree of treatability of wastes in the sewage treatment plant, and other pertinent factors. The substances prohibited are:

(1) Any liquid or vapor having a temperature higher than 104 degrees Fahrenheit (40 degrees Celsius).

(2) Any water or waste containing fats, wax, grease or oils, whether emulsified or not, in excess of 100 mg/l or containing substances which may solidify or become viscous at temperatures between 21 degrees Fahrenheit and 150 degrees Fahrenheit (between zero degrees Celsius and 65 degrees Celsius).

(3) Any garbage that has not been properly shredded. The installation and operation of any garbage grinder equipped with a motor of one horsepower (1.00 hp) or greater shall be subject to the review and approval of the director.

(4) Any waters or wastes containing strong acid iron pickling wastes or concentrated plating solutions whether neutralized or not.

(5) Any waters or wastes containing iron, chromium, copper, zinc and similar objectionable or toxic substances; or wastes exerting an excessive chlorine requirement to such degree that any such material received in the composite sewage at the sewage treatment works exceeds the limits established by the director for such materials.

(6) Any waters or wastes containing phenols or other taste- or odor-producing substances, in such concentrations exceeding limits which may be established by the director as necessary, after treatment of the composite sewage to meet the requirements of the state, federal or other public agencies or jurisdiction for such discharge to the receiving waters.

(7) Any radioactive wastes or isotopes of such half-life or concentration as may exceed limits established by the director in compliance with applicable state or federal regulations.

(8) Any waters or wastes having a pH in excess of 9.5.

(9) No person shall deposit in any sanitary, storm and combined sewers and appurtenances materials which exert or cause:

a. Unusual concentrations of inert suspended solids (such as, but not limited to, Fuller's earth, lime slurries, and lime residues) or of dissolved solids (such as, but not limited to, sodium chloride and sodium sulfate).

b. Excessive discoloration (such as, but not limited to, dye wastes and vegetable tanning solutions).

c. Unusual BOD, chemical oxygen demand or chlorine requirements in such quantities as to constitute a significant load on the sewage treatment works.

d. Unusual volume of flow or concentration of wastes constituting "slugs" as that term is defined in section 30-1.

(10) Waters or wastes containing substances which are not amenable to treatment or reduction by the sewage treatment process employed or are amenable to treatment only to such degree that the sewage treatment plant effluent cannot meet the requirements of other agencies having jurisdiction over the discharge to the receiving waters.

(e) No person shall allow the discharge or cause the discharge of water on or across a city sidewalk or way.

(Code 1994, § 6-41; Ord. of 10-19-2009)

Sec. 30-243. - Penalties for discharge.

If any waters or wastes are discharged or are proposed to be discharged to the public sewers, which waters contain the substances or possess the characteristics enumerated in section 30-242, and which in the judgment of the director, DEP or MWRA, may have a deleterious effect upon the sewage works, processes, equipment or receiving waters or which otherwise create a hazard to life or constitute a public nuisance, the director may:

(1) Reject the wastes;

(2) Require pretreatment to an acceptable condition for discharge to the public sewers;

(3) Require control over the quantities and rates of discharge; and/or

(4) Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges.

If the director permits the pretreatment or equalization of waste flows, the design and installation of the plants and equipment shall be subject to the requirements of all applicable codes, ordinances and laws.

(Code 1994, § 6-42; Ord. of 10-19-2009)

Sec. 30-244. - Grease and oil separators.

(a) Grease, oil, gas, and sand interceptors/separators shall be provided when in the opinion of the director, they are necessary for the proper handling of liquid wastes containing grease in excessive amounts or any flammable wastes, sand or other harmful ingredients, except that such interceptors shall not be required for private living quarters or dwelling units. At a minimum, oil traps or separators shall be installed on all building sewers and building floor drains from commercial garages, and enclosed parking areas.

(b) All interceptors shall be of a type and capacity approved by the director, and shall be located so as to be readily and easily accessible for cleaning and inspection. Where grease, oil, gas, and sand interceptors/separators are provided for any waters or wastes, the system shall be maintained continuously in satisfactory and effective operation by the owner at the owner's expense.

(Code 1994, § 6-43; Ord. of 10-19-2009)

Sec. 30-245. - Preliminary treatment.

Where preliminary treatment or flow-equalizing facilities are provided for any waters or wastes, the system shall be maintained continuously in satisfactory and effective operation by the owner at the owner's expense.

(Code 1994, § 6-44; Ord. of 10-19-2009)

Sec. 30-246. - Owner manholes.

When required by the director, the owner of any property serviced by a public sewer, combined sewer or drain shall install a suitable control manhole together with such necessary meters, and other appurtenances in the building to facilitate observation, sampling, and measurement of the waters or wastes being discharged. Such manhole, when required, shall be accessible and safely located, and shall be constructed in accordance with plans approved by the director. The manhole shall be installed by the owner at the owner's expense, and shall be maintained by the owner so as to be safe and accessible at all times.

(Code 1994, § 6-45; Ord. of 10-19-2009)

Sec. 30-247. - Special facilities.

When required by the director a user shall design, construct, install, operate and maintain special facilities which will provide for the regulation and control of the rate, volume and characteristics of discharges to the public sanitary sewers, combined sewers or drains. The design of such special facilities shall be subject to the approval of the director. Such special facilities shall be designed, constructed, operated and maintained at the owner's expense. The DPW shall have the right to inspect such special facilities in accordance with the provisions of this chapter to ascertain compliance with these regulations.

(Code 1994, § 6-54; Ord. of 10-19-2009)

Sec. 30-248. - Industry monitoring.

All industries discharging into a public sewer shall perform such monitoring of their discharges as the director or designee may reasonably require, including installation, use, and maintenance of monitoring equipment, keeping records and reporting the results of such monitoring to the director. Such records shall be made available upon request by the director to other agencies having jurisdiction over discharges to the receiving waters.

(Code 1994, § 6-47; Ord. of 10-19-2009)

Secs. 30-249—30-274. - Reserved.

DIVISION 4. - INDUSTRIAL WASTE PERMITS

Sec. 30-275. - Required.

(a) Every industrial user shall be required to obtain a permit and shall, within 90 days of the promulgation of the regulations codified in this chapter, complete and file at their own expense a permit application form with the director and the MWRA, unless a current permit is on file with both the director and the MWRA. Known industrial users who have not filed a permit application will be notified by the director or the MWRA to apply for a permit. All industrial users are advised to apply for a permit prior to such notification. Permit application forms may be obtained from the director and shall be filed within 30 calendar days of notification to both the director and the MWRA. Industrial user permits shall be renewed on a yearly basis on or before the expiration date of the current permit.

(b) The director and the MWRA shall evaluate the adequacy of data furnished in the application form. If insufficient data has been furnished, the director and/or the MWRA will notify the industrial user to provide additional data within a specified time. After acceptance of data, and satisfactory completion of any investigations deemed pertinent, the director and the MWRA will issue the permit. The director and the MWRA may stipulate special conditions and terms upon which the permit may be issued.

(Code 1994, § 6-48; Ord. of 10-19-2009)

Sec. 30-276. - Conditions.

(a) Industrial waste permits may contain the following conditions:

(1) Limits on rate, time and characteristics of discharge or requirements for flow regulation and equalization;

(2) Installation of inspection, flow measurement and sampling facilities, including access to such facilities;

(3) Specifications for monitoring programs which may include flow measurement, sampling chemical and biological test, recording of data, and reporting schedule;

(4) Pretreatment requirements and schedules for implementation, including schedules for reporting progress toward meeting these requirements;

(5) Submission of discharge reports;

(6) Special service charges or fees;

(7) Other conditions as deemed appropriate by the director and/or the MWRA to ensure compliance with this chapter and with applicable requirements of state or federal law.

(b) The conditions of all permits shall be enforced by the director and the MWRA in accordance with provisions of this chapter.

(c) When required by the permit, each industrial permittee shall submit a duly signed discharge report to the director and the MWRA containing all information requested by the director and/or the MWRA in a form acceptable to the director and the MWRA. The director and the MWRA will evaluate the data furnished. If insufficient data has been furnished, additional information shall be furnished as required.

(d) The director and the MWRA may use the information provided in the permit applications, permits and discharge reports as the basis for determining user charges.

(e) Notwithstanding the limitations set forth herein, a special permit between the MWRA and the city and the user may be issued whereby a waste of unusual character or strength may be accepted on an interim basis when, in the opinion of the MWRA and the director, unusual or extraordinary circumstances compel special terms and/or conditions of temporary duration. Such permit or amendment will be issued only when, in the opinion of the MWRA and the director, it would not cause any interference with or disruption in the treatment works, would not violate the National Pollutant Discharge Elimination System (NPDES) permit or state water quality standards, and would not force additional controls on other discharges to achieve compliance with effluent limitations.

(Code 1994, § 6-49; Ord. of 10-19-2009)

Sec. 30-277. - Transferability.

An industrial waste permit shall not be reassigned or transferred.

(Code 1994, § 6-50; Ord. of 10-19-2009)

Sec. 30-278. - Revocation.

If an individual user discharges amounts or rates of pollutants in violation of this chapter, the director or the MWRA may revoke the existing permit. If an industrial user shows that changes in the industrial process have improved the characteristics and/or volume of its discharge, the permit may be modified upon application by the industrial user to the DPW and the MWRA.

(Code 1994, § 6-51; Ord. of 10-19-2009)

APPENDIX I

Standard Operating Procedures
(To be appended as completed)

Weston & Sampson[SM]

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OPERATIONS & MAINTENANCE PLAN

MS4 GENERAL PERMIT COMPLIANCE

OCTOBER 2020

CITY OF
Chelsea
MASSACHUSETTS

o&m

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LIST OF APPENDICES

1.0 INTRODUCTION

1.1 Requirement for Standard Operating Procedures

The 2016 Massachusetts MS4 General Permit, which came into effect on July 1, 2018, regulates discharges from small municipal separate storm sewer systems (MS4s) to waters of the United States. The Permit requires MS4 operators to develop, implement, and enforce a stormwater management program (SWMP). The purpose of the SWMP is to reduce the discharge of pollutants from the MS4 to the maximum extent practicable, to protect water quality, and to satisfy the applicable water quality requirements of the Clean Water Act. MS4 operators implement various Best Management Practices (BMPs) for each of six minimum control measures. These minimum control measures are as follows:

- Public Education and Outreach
- Public Involvement/Participation
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-Construction Stormwater Management in New Development and Redevelopment
- Good Housekeeping and Pollution Prevention for Municipal Operations

As part of the minimum control measure for Good Housekeeping and Pollution Prevention for Municipal Operations, Section 2.3.7 of the 2016 MS4 Permit requires regulated communities to develop and implement a written Operations and Maintenance (O&M) program for municipal activities and facilities. The O&M program serves to prevent or reduce pollutant runoff and protect water quality, and is required to include the following components:

1. Written O&M procedures for the following activities/facilities:
    a. Parks and open space
    b. Buildings and facilities where pollutants are exposed to stormwater runoff
    c. Vehicles and equipment
2. An inventory of all permittee-owned facilities
3. A written program outlining the necessary actions the permittee will implement so that the MS4 is properly maintained to reduce the discharge of pollutants from the MS4, including:
    a. Optimization of routine inspections, cleaning and maintenance of catch basins
    b. Implementation of procedures for sweeping and/or cleaning streets and municipally owned parking lots
    c. Proper storage and disposal of catch basin cleanings and street sweepings
    d. Implementation of procedures for winter road maintenance
    e. Implementation of inspection and maintenance frequencies and procedures for storm drain systems and stormwater treatment structures
4. Written records for all maintenance activities, inspections, and training.

To address these requirements, Standard Operating Procedures (SOPs) associated with these municipal activities and facilities were taken and/or adapted from templates developed by EPA and the Central Massachusetts Regional Stormwater Coalition (CMRSWC). These templates were developed for use by MS4 communities in complying with the permit requirements outlined above. These pre-developed SOPs can be implemented by the City or adjusted to fit current practices as long as these practices meet all MS4 requirements.

1.2 Applicability

The operation and maintenance procedures outlined in this document and the accompanying SOPs apply to all the facilities, vehicles, and equipment denoted in the inventory included in Appendix A, as well as any activities associated with each facility, vehicle, or piece of equipment. They shall also apply to all drainage infrastructure owned or operated by the City. The inventory will be updated annually to reflect any changes in property or equipment ownership.

2.0 PARKS AND OPEN SPACE

2.1 Overview

The City of Chelsea and its contractors perform regular maintenance on parks and open spaces to ensure aesthetic appeal throughout the city. Maintenance consists of mowing, weeding, pruning, mulching, irrigation, and solid waste management. Stormwater pollutants that can be generated from these activities include nutrients, pesticides, organics, sediment, trash, and bacteria.

The City of Chelsea owns and maintains the following parks and playgrounds:

- Anita's Garden
- Bellingham Hill Park
- Bosson Playground
- Box District Park
- Carter Park
- Chelsea River Walk
- Chelsea Square (Winnisimmet Park)
- Ciepela Park
- Creekside Common
- Eden Street Park
- Garden Cemetery
- Highland Green Corridor
- Highland Park
- Island End Park
- John Ruiz Park
- KaBOOM! Disney Park
- Kayem Park
- Mace Tot Lot
- Mary C. Burke Athletic Fields
- Mill Creek River Walk
- Mystic River Overlook Park
- O'Neil Park
- Paul A. Denver Park
- Polonia Park
- PORT Park*
- Quigley Park
- Veteran's Field at Memorial Stadium
- Voke Park
- Washington Park
- Williams School Courtyard

* PORT Park is privately owned, but municipally managed.

This list of parks, playgrounds, and additional open spaces along with their respective locations and sizes can be found in Appendix A.

2.2 Operation and Maintenance Activities

Maintenance of most parks, memorials, and green spaces is performed by a contractor, NE Acreage Group. NE Acreage is responsible for the mowing and trimming. The City's Department of Public Works maintains some small parks on an as-needed basis. Cut grass and leaves are disposed of at the City Yard in the yard waste container.

Collection and disposal of solid waste is performed by DPW staff, who empty trash receptacles daily or as needed based on the frequency of use. Trash barrels have been installed in every park and pet waste handling and collection locations have been established throughout the City. Solid waste is disposed of at the RESCO landfill in Saugus.

All pesticide, herbicide, and fertilizer application is performed by contractor, TruGreen. TruGreen is responsible for all procedures that address the proper use, storage, and disposal of pesticides, herbicides, and fertilizers including minimizing the use of these products and using only in accordance manufacturer's instruction.

Appendix B Provides Standard Operating Procedures that the City should follow for all operation and maintenance activities in its parks and open spaces, including

- B.1 Parks and Open Space Management

3.0 MUNICIPAL BUILDINGS AND FACILITIES

3.1 Overview

Chelsea owns and operates a variety of different buildings that have the potential for pollutants to be exposed to stormwater runoff. A complete list and the location can be seen in Appendix A. Below is the list of Municipal buildings owned and operated by the City of Chelsea:

- Carter Street Pump Station
- Chelsea City Hall
- Chelsea High School (CHS)
- Chelsea Police Department
- Chelsea Public Library
- Chelsea Senior Center
- Commercial Redevelopment at old Salvation Army Location
- DPW City Yard
- Emergency Management Building
- Fire Stations (3)
- John Silber Early Learning Center (ELC) School
- Mary C. Burke Elementary School Complex (MCB)
    - Berkowitz Elementary
    - Kelly Elementary
    - Hooks Elementary
    - Sokolowski Elementary
- Morris H. Seigal Clark Avenue Middle School (CAMS)
- Public Safety Building
- Williams Middle School Complex
    - Browne Middle School
    - Wright Science & Technology Academy

3.2 Use, Storage, and Disposal of Petroleum Products and Other Stormwater Pollutants

The City has restrictions in place regarding the use, storage, and disposal of petroleum products and other stormwater pollutants to prevent the potential for polluted stormwater. Red, leak-proof gas cans are used for handling smaller amounts of flammable liquids, such as gasoline, stored in the maintenance bays of the DPW City Yard. Four waste oil tanks are stored in the maintenance bays in secondary containment. Although there was once a fueling station at the City Yard, the fuel tanks have been removed and all fueling of City vehicles is now done at commercial fueling stations.

Appendix C provides Standard Operating Procedures that the City should follow for the use, storage, and disposal of petroleum or other hazardous products utilized at municipal facilities, including:

- C.1: Fuel and Oil Handling
- C.2: Hazardous Materials Storage and Handling

3.3 Employee Training

The City has developed an employee training program, which provides information regarding stormwater pollution prevention and good housekeeping practices for municipal operations. Management practices included as part of the training program consist of: (1) minimizing and preventing exposure of vehicles and equipment to stormwater, (2) good housekeeping operations, (3) preventative maintenance, (4) spill prevention and response, (5) erosion and sediment control, (6) stormwater runoff management, (7) management of salt and piles containing salt and (8) maintenance of control measures. Training on the proper use, storage, and disposal of petroleum products is also included.

The City has implemented a Stormwater Pollution Prevention Plan (SWPPP) for the Department of Public Works City Yard beginning in 2020. Employees at the DPW City Yard will complete annual training on the management practices outlined in the SWPPP.

3.4 Spill Prevention and Response

Good housekeeping measures are in place at the DPW City Yard to minimize the risk of spilled pollutants entering nearby surface waters and catch basins. Hydraulic equipment is kept in good repair to prevent leaks. Equipment and vehicles are regularly inspected to avoid situations that may result in leaks, spills, and other releases of pollutants that could be conveyed with stormwater to receiving waters. Spills are immediately cleaned up with an absorbent.

Appendix C provides additional Standard Operating Procedures that the City should follow for spill response at all facilities, including:

- C.3: Spill Response and Cleanup

3.5 Waste Management and Other Applicable Good Housekeeping Practices

Building maintenance and waste management is conducted at the DPW City Yard to minimize the potential for stormwater pollution including sweeping the facility driveways daily and inspecting the building quarterly for leaks.

Appendix C provides Standard Operating Procedures pertaining to waste management and facility housekeeping, including:

- C.4: Operations and Maintenance of Municipal Buildings and Facilities

There are other Standard Operating Procedures that are applicable to municipal buildings and facilities but are discussed and referenced exclusively in other sections. These include the following:

- SOPs for lawn maintenance and landscaping activities, which are included under Section 2.0, Parks and Open Space
- SOPs for vehicle and equipment storage, washing, and fueling, which are discussed in Section 4.0, Municipal Vehicles and Equipment
- SOPs for street sweeping, snow disposal, and the storage and application of deicing materials, which are discussed exclusively under Section 5.0, Infrastructure Operations and Maintenance.

4.0 MUNICIPAL VEHICLES AND EQUIPMENT

4.1 Overview

The Chelsea DPW is responsible for operating and maintaining a majority of the City's vehicles and equipment excluding those under the responsibility of the Fire and Police Departments. An inventory of all vehicles operated and maintained by the DPW is included in Appendix A.

4.2 Municipal Vehicle Storage, Maintenance, and Repair

Vehicle maintenance facilities have the potential for spills that could contaminate stormwater. Potential pollutants associated with municipal vehicle storage, maintenance, and repair activities include oil and grease, petroleum products, metals, organics and chlorides.

In Chelsea, vehicle maintenance is performed within the maintenance garage at the DPW City Yard. Employees use spigots/funnels to minimize drips/leaks, use drip pans when changing fluids, and have absorbing compounds available for use in the event of a spill. The maintenance garage is equipped with floor drains, which discharge to the storm sewer via an oil/water separator. Spill prevention practices are still encouraged to reduce the amount of oil entering the oil-water separator or the sanitary sewer. Municipal vehicles and equipment are stored indoors to the maximum extent feasible.

4.3 Municipal Vehicle and Equipment Fueling

Potential stormwater pollutants associated with municipal vehicle and equipment fueling include oil and grease, petroleum products, trash, metals and organics. The City fuels its fleet of vehicles at commercial fueling locations and not at City-owned properties.

4.4 Municipal Vehicle Washing

Potential stormwater pollutants associated with municipal vehicle washing include sediment, nutrients, chlorides, trash, metals, oil & grease, petroleum products and organics. Municipal vehicle washing often occurs in the parking lot, with washwater discharging to catch basins in the parking lot. Vehicles should be washed inside, with washwater discharging to a floor drain where possible.

4.5 Other Applicable Good House Keeping/ Pollution Prevention Practices

Appendix D provides Standard Operating Procedures related to vehicle and equipment operation and maintenance, including:

- D.1: Operations and Maintenance of Municipal Vehicles and Equipment

There are other Standard Operating Procedures that are applicable to Municipal Vehicles and Equipment but are discussed and referenced exclusively in other sections. These include the following:

- SOPs for the use, storage, and disposal of petroleum products; SOPs for spill prevention and response, and SOPs for waste management, which are included under Section 3.0, Municipal Buildings and Facilities
- SOPs for street sweeping, which are discussed exclusively under Section 5.0, Infrastructure Operations and Maintenance

5.0 INFRASTRUCTURE OPERATIONS AND MAINTENANCE

5.1 Drainage System Overview

Chelsea has developed a comprehensive map of the City's drainage system in GIS, which includes city-wide mapping of outfalls, culverts, drain manholes, catch basins, drainage pipes, etc. The system consists of approximately:

- 10 miles of stormwater drains and 40 miles of sanitary and combined sewage collection conduit/piping
- 1,350 municipal catch basins
- 24 municipal outfalls
- 37 non-municipal outfalls
- 5 inter-municipal connections from Everett

The City has no structural BMPs.

5.2 Catch Basin Cleaning

The Department of Public Works performs routine inspections, cleaning, and maintenance of their 1,350 catch basins that are located within the MS4 regulated area. Currently the City cleans approximately 450 annually but plans to increase frequency such that each catch basin is cleaned at least once per year. In addition to annual cleaning, the City performs catch basin cleaning as needed or in response to complaints. The City of Chelsea will implement the following catch basin inspection and cleaning procedures to reduce the discharge of pollutants from the MS4. Catch basin inspection and cleaning procedures are included in Appendix E. All catch basin cleanings are brought to the DPW City Yard

To meet anticipated requirements of the new MS4 Permit, the City will need to optimize catch basin inspection, cleaning and maintenance such that the following conditions are met:

- If a catch basin sump is more than 50 percent full during two consecutive routine inspections or cleaning events, the finding will be documented, the contributing drainage area will be investigated for sources of excessive sediment loading, and to the extent practicable, contributing sources will be addressed. If no contributing sources are found, the inspection and cleaning frequency will be increased.
- Catch basins located near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment) will be inspected and cleaned more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings (i.e., catch basins more than 50 percent full). Priority will also be given to catch basins that discharge to impaired waters.
- The following information will be included in each annual report:
    - Any action taken in response to excessive sediment or debris loadings
    - Total number of catch basins
    - Number of catch basins inspected
    - Number of catch basins cleaned
    - Total volume or mass of material removed from catch basins.

Appendix E provides Standard Operating Procedures that the City should follow, including:

- E.1: Catch Basin Inspection and Cleaning

5.3 Street Sweeping

Street sweeping for the City of Chelsea is contracted to a street sweeping company. The contractor sweeps more than 4,100 miles of streets per year. All streets and parking lots under municipal jurisdiction are swept a minimum of twice per month between March 31st and December 31st.

The City of Chelsea has been in effect for more than 10 years and will continue to implement the following street and parking lot sweeping procedures to reduce the discharge of pollutants from the MS4:

- All streets with the exception high speed limited access highways will be swept and/or cleaned a minimum of twice per month between March 31st and December 31st.
- The City will report the number of miles of roadway swept and/or the volume or mass of material removed to EPA annually.
- All street sweepings are temporarily stockpiled at the DPW City Yard. The City hires an outside contractor to haul the spoils offsite and dispose of them properly.

Appendix F provides Standard Operating Procedures that the City should follow, including:

- F.1: Street Sweeping

5.4 Inspection and Maintenance of Stormwater Treatment Structures

Chelsea does not currently own any stormwater treatment structures. Should it build any in the future, it will be responsible for the inspection and maintenance of said structure.

5.5 Winter Road Maintenance

Potential stormwater pollutants associated with winter road maintenance include chloride, sediment and various deicing materials. Pollution potential is reduced by properly storing salt and sand, minimizing the use of sodium chloride and other salts, evaluating opportunities for use of alternative materials, and ensuring that snow disposal activities do not result in disposal of snow into waters of the United States.

The Chelsea Department of Public Works stores all salt and pre-treatment chemicals in its Salt Enclosure, a covered structure located at the DPW City Yard. All vehicles used to spread salt are loaded with salt outside the enclosure and the loading area is swept clean.

Appendix G provides Standard Operating Procedures for winter road maintenance, including:

- G.1: Salt Use Optimization/ Winter Road Maintenance

There are other Standard Operating Procedures that are applicable to Winter Road Maintenance but are discussed and referenced exclusively in other sections. These include the following:

- SOPs for the operation and maintenance of vehicles and equipment, which are discussed exclusively under Section 4.0, Municipal Vehicles and Equipment

APPENDIX A

Parks and Open Space Inventory

Municipal Buildings and Facilities Inventory

Municipal Vehicles and Equipment Inventory

City of Chelsea, MA
Inventory of Parks and Open Space

List of Open Spaces in Chelsea, MA				
Name	Location	Type	Size (acres)	Description
Parking Lot	16 Annese St	Parking Lot	0.37	Parking Lot
Parking Lot	48 Broadway	Parking Lot	0.48	Parking Lot
Parking Lot	420 Broadway	Parking Lot	0.37	Parking Lot
Parking Lot	300 Carter St	Parking Lot	0.55	Parking Lot
Parking Lot	154 Chestnut St	Parking Lot	0.13	Parking Lot
Parking Lot	208 Chestnut St	Parking Lot	0.05	Parking Lot
Parking Lot	212 Chestnut St	Parking Lot	0.34	Parking Lot
Parking Lot	19 Crescent Av	Parking Lot	0.22	Parking Lot
Parking Lot	43 Orange St	Parking Lot	0.07	Parking Lot
Parking Lot	27 Park St	Parking Lot	0.03	Parking Lot
Parking Lot	241 Spencer Av	Parking Lot	0.12	Parking Lot
Vacant Lot	336 Carter St	Vacant Lot	0.01	Unpaved
Vacant Lot	131 Clark Av	Vacant Lot	0.1	Unpaved
Vacant Lot	19 Columbus St	Vacant Lot	0.01	Unpaved
Vacant Lot	131 Essex ST	Vacant Lot	0.03	Paved
Vacant Lot	14 Hillside Av	Vacant Lot	0.01	Unpaved
Vacant Lot	3 Lafayette Av	Vacant Lot	0.24	Unpaved
Vacant Lot	5 Lafayette Av	Vacant Lot	0.19	Unpaved
Vacant Lot	421R Locust St	Vacant Lot	0.00	Unpaved
Vacant Lot	15 Park St	Vacant Lot	0.03	Paved
Vacant Lot	113 Sagamore Av	Vacant Lot	0.11	Paved
Vacant Lot	2 Stockton St	Vacant Lot	0.03	Unpaved
Vacant Lot	202 Williams St	Vacant Lot	0.08	Unpaved

City of Chelsea, MA
Inventory of Parks and Open Space

List of Parks and Playgrounds in Chelsea, MA				
Name	Location	Type	Size (acres)	Description
Anita's Garden	79 Heard Street	Park	0.05	Benches. Garden.
Bellingham Hill Park	111 Bellington St.	Park	0.39	Playground. Picnic. Benches.
Bosson Playground	50 Bellingham St.	Park	0.73	Playground. Benches. Picnic Area.
Box District Park	180 Highland St.	Park	0.31	Playground. Benches. Nature & Water Spray. Picnic Area.
Carter Park	200 Orange Street	Park, Playground, Sports Field	2.96	Acres of grass for soccer and baseball. Jungle-gym. Parking
Chelsea Greenway	327 Chestnut St	Park		Walking Trail.
Chelsea Riverwalk	257 Marginal St.	Park	0.64	Nature & Water Spray. Walking Trail
Chelsea Square (Winnisimmet Park)	171 Broadway St.	Park	0.42	Benches. Fountain. Art Sculptures.
Ciepela Park	27, 29, 31 Medford St	Park	0.06	Benches. Patio.
Creekside Common	100 Gillooly St.	Park	0.93	Playground. Benches. Picnic Area. Nature & Water Spray.
Eden Street Park	26 Eden Street	Park	0.22	Playground. Benches. Garden. Nature & Water Spray
Garden Cemetary	70 Central Ave.	Cemetary	3.14	Nature & Water Spray. Garden.
Highland Green Corridor	Highland Street	Park	0.1	Nature & Water Spray. Walking Trail.
Highland Park	31 Willow Street	Park	3.33	Nature & Water Spray. Benches. Basketball. Parking. Soccer & Football.
Island End Park	Justin Drive	Park	1.96	Nature & Water Spray. Benches. Walking Trail. Picnic Area.
John Ruiz Park	141 Washington Avenue	Park	0.17	Playground. Benches. Nature & Water Spray. Picnic Area.
KaBOOM! Disney Park	252 Spruce Street	Park	0.07	Playground. Benches. Garden
Kayem Park	40 Fifth Street	Park	0.11	Playground. Benches.
Mace Tot Lot	59 Cresent Avenue	Park	0.14	Playground. Benches.
Mary C. Burke Athletic Fields	300 Cresent Avenue (School)	Playground, Park, Sports Fields	9.08	Playing Fields. Playground.Parking. Benches.
Mill Creek River Walk	Revere Beach Parkway	Park	0.55	Nature & Water Spray. Parking. Walking Trail.
Mystic River Overlook Park	10 - 20 Broadway St. (Under Tobin Bridge)	Park	1.91	Picnic Area. Benches. Walking Trail.
O'Neil Park	96 Beacon Street	Playground, Park	0.09	Playground. Benches.
Paul A. Denver Park	60 Gillooly Road	Park, Playground, Sports Field	0.28	Playground. Benches. Picnic Area. Basketball.
Polonia Park	37 Tremont Street	Playground, Park	0.39	Playground. Benches. Picnic Area.
PORT Park (privately owned, municipally managed)	99 Marginal Street	Park	5.66	Nature & Water Spray. Walking Trail. Benches. Parking.
Quigley Park	25 Essex Street	Playground, Park	0.55	Playground. Benches. Nature & Water Spray.
Vacant Lot	97 Library St	Park	0.04	Benches
Veterans' Field at Memorial Stadium	299 Everett Avenue (Chelsea High School)	Sports Fields, Park	7.04	Playnig Fields. Running Track. Parking. Walking Trail. Soccer & Football.
Voke Park	540 Washington Ave.	Park, Playground, Sports Fields	3.27	Parking. Basketball. Nature & Water Spray. Tennis. Playing Fields. Playground. Benches.
Washington Park	390 Washington Ave.	Park	1.68	Benches. Playground. Picnic Area
Williams School Courtyard	149-165 Arlington Street	Sports Fields	3.3	Basketball

City of Chelsea, MA
Inventory of Municipal Buildings and Facilities

List of City Owned Buildings and Facilities in Chelsea, MA		
Name	Location	Type
DPW City Yard	380 Beacham Av	DPW
Carter St. Pump Station	237 Second St	DPW
Central Fire Station	307, 311 Chestnut Street	Fire
Fire Station (Engine 3, Ladder 2)	883 Broadway	Fire
Public Safety Building/ Fire Station	40 Sagamore Av	Fire
Chelsea City Hall	500 Broadway	Municipal - Other
Chelsea Public Library	569 Broadway	Library
Chelsea Senior Center	311 Chestnut St	Municipal - Other
Emergency Management	45 Washington Street	Municipal - Other
Chelsea Police Department	19 Park Street	Police
Berkowitz Elemtentary	300 Crescent Avenue	School
Browne Middle School	180 Walnut Street	School
Chelsea High School	299 Everett Avenue	School
Clark Avenue Middle School	8 Clark Avenue	School
Hooks Elementary	300 Crescent Avenue	School
John Silber Early Learning Center	99 Hawthorne Street	School
Kelly Elementary	300 Crescent Avenue	School
Sokolowski Elementary	300 Crescent Avenue	School
Wright Science & Technology Academy	181 Walnut Street	School
Commercial Redevelopment	440 Broadway	Municipal - Other

City of Chelsea, MA
Inventory of Municipal Vehicles and Equipment (DPW)

Cust Veh #	Year	Make	Model	VIN	Body Type	Lic Plate #
DPW	2011	Terex	Skid loader	ASVSV070PDWS00111	loader	M87363
DPW	2012	Case	Loader	NCF215510	4 door extended cab/chassis	M68577
DPW	2018	Caterpillar	420F2	CAT0420FTHWD03082	Backhoe Loader	M2914A
DPW	2017	Ford	F550	1FDUF5HT7HEE49889	Cabca	M98538
DPW	2017	Ford	F550	1FDUF5HT0HEE49670	CABCA	M99596
DPW	1997	Performance	Brush Bandit	003317	Chipper	M74514
DPW	2017	SALSC	Chipper	4S9PC1312HC171025	Chipper	M99595
DPW	2003	Atlas	other	4500A06103H006602	Compressor	M90784
DPW	2011	Ford	550	1FDUF5HT1BEB25862	DRWSUP	M90789
DPW	2011	Ford	550	1FDUF5HTXBEB53689	DRWSUP	M83770
DPW	2000	International	400SER	1HTSEAAR5YH274775	Dump	M62303
DPW	2018	Freightliner	M2016	3ALDCWFC1JDJJ7502	Dump semi-trailer	M98544
DPW	2018	Freighliner	M2016	3ALDCWFC3JDJJ7503	Dump semi-trailer	M98543
DPW	2004	Freightliner	Dump Truck	1FVABXAK64NH05401	Dump Truck	M66437
DPW	2015	Freighliner	108SD	1FVDG5CY3FHFY1653	Dump truck	M82142
DPW	2015	Freightliner	108SD	1FVDG5CY5FHFY1654	Dump truck	M2913A
DPW	2016	Ford	F550	1FDUF5HT7GED16659	Dump truck	M98399
DPW	2016	Ford	F550	1FDUF5HT3GED16660	Dump truck	M98400
DPW	2018	International	4000	1HTMMMML9JH714751	Dump truck	M98536
DPW	2000	International	400SER	1HTSEAAR7H274776	Dump truck	M83775
DPW	2005	Ford	Dump Truck	1FDXF47P15ED25849	Dumptruck	M80977
DPW	2007	Toyota	Prius	JTDKB20U577689018	Hatchback	M3019A
DPW	2017	ASV	Skidsteer	AVVS075JHDS00907	Loader	M98537
DPW	2019	ASV	Loader	ASVRT030VJDS088040	Loader	M3000A
DPW	2003	MADVAC	Madvac	3157	MADVAC	M72119
DPW	2003	Ford	F650	3FDNF65Y83MB00057	Patcher	M68076
DPW	2000	Ford	F250	1FTNF21L2YEA40104	Pickup	M61438
DPW	2008	Ford	F350	1FTWF31588EC61881	Pickup	M90788
DPW	2008	Ford	F550	1FDAF57R68ED32801	Pickup	M97588
DPW	2008	Ford	F550	1FDAF57R48ED32800	Pickup	M90787
DPW	2019	Ford	F350	1FTRF3B64KEDO2826	Pickup	M3002A
DPW	2019	Ford	F350	1FDRF3H63KED02836	Pickup	M97590
DPW	2014	Ford	F150	1FTMF1CM9EFC74516	Pickup truck	M82135

Cust Veh #	Year	Make	Model	VIN	Body Type	Lic Plate #
DPW	2001	Ford	LGTCON	1FTRX18W31NB56037	Pickup truck	M95239
DPW	2017	Ford	F350	1FTRF3B63HEB60137	Pickup truck	M95230
DPW	2005	Chev	Silverado	1GCHK23UX5F892642	Pickup truck	M3001A
DPW	2010	Ford	Crown Victoria	2FABP7BV3AX136234	Sedan	M98379
DPW	2019	Ford	Fusion	3FA6P0HD8KR151707	sedan	M3003A
DPW	2019	Ford	Fusion	3FA6P0HD5KR255054	Sedan	M3011A
DPW	2012	Ford	Fusion	3FADP0L38CR445826	Sport utility	M1940A
DPW	2003	Ford	Explorer	1FMZU3K93UB82954	Sport utility	M98382
DPW	2009	Ford	Expedition	1FMFK165X9LA09373	Sport utility	MI943A
DPW	2007	Ford	Explorer	1FMEU73E67UB70484	SUV	M63229
DPW	2015	Ford	Explorer	1FM5K8D84FGA35389	Suv	M82134
DPW	2013	Madvac	LR50	5057	Sweeper	M86592
DPW	2013	Madvac	LR50	5058	Sweeper	M86593
DPW	2002	Trackless	MTV	MT5TD2065	Tractor	M66434
DPW	2000	Trac-Vac	Leaf Dump	193841	Trailer	M61426
DPW	2001	Car Mate	Utility	5A3U610S21L000029	Trailer	M61439
DPW	1977	Utility	Trailer	24BE75174584	Trailer	M52745
DPW	2002	Car Mate	Utility	5A3U408S02L000908	Trailer	M61433
DPW	2002	Trafcon	TC1-ADS	0302ADS5633	Trailer	M66444
DPW	2002	Trafcon	TC2-ADS	0302ADS5634	Trailer	M66433
DPW	1995	Cross Country	Trailer	1C9FS1621S1432252	Trailer	M52744
DPW	2017	CAM	Trailer	FJPBU2327HP047041	Trailer	M95248
DPW	2007	Ford	F550	1FDAF57P27EA69106	Truck	M90783
DPW	1999	Ford	F450	3FDXF46S1XMA17213	Truck	M74075
DPW	2015	Falcon	Utility	1F9P21429FM339158	Utility trailer	M90796
DPW	2019	Ford	Transit	!FDBW5PM8KK665995	Van	M3020A
DPW	2012	Ford	E250	1FDWE3FL7DCA79593	Van (C)	M90785
DPW	2014	Ford	Transit S6E	NMOLS6E74E1161515	Van (C)	M81236

APPENDIX B

Standard Operating Procedure – Parks and Open Space

B.1: Parks and Open Space Management

Standard Operating Procedures *Chelsea, MA* *Department of Public Works* **Parks and Open Space Management**	**Issue Date:** 9-24-2020

Approved by:

Public Works Director (or similar)

MA Small MS4 General Permit Requirement Summary:

Part 2.3.7.a.i.
Within two (2) years from the effective date of the permit, the permittee shall develop, if not already developed, written (hardcopy or electronic) operations and maintenance procedures for all Parks and open spaces. These written procedures shall be included as part of the SWMP.

Part 2.3.7.a.ii.1.
Maintenance of parks, memorials and green spaces, including mowing and trimming in various locations is contracted out to NE Acreage Group. Some small parks are maintained by the DPW on an as needed basis. Cut grass and leaves are disposed of at City yard in the yard waste bin.
Trash barrels have been installed in every park. DPW personnel empty these receptacles daily or on an as needed basis. The collected debris is then transferred to Ressco in Saugus along with other trash that the DPW picks up.

All pesticides, herbicides and fertilizers applications are contracted out to a licensed contractor, TruGreen. Fertilization utilizes a slow-release formula that is applied at key points in every season to stimulate and maintain growth. TruGreen is responsible for all procedures that address the proper use, storage, and disposal of pesticides, herbicides, and fertilizers including minimizing the use of these products and using only in accordance manufacturer's instruction.

The City of Chelsea has established pet waste handling collection and disposal locations at all parks and open space where pets are permitted, including the placing of proper signage concerning the proper collection and disposal of pet waste. An interactive map is available on the City web page.

Municipal Parks and Open Space Inventory
The following is a list of properties covered by these procedures. This inventory shall be updated annually during SWMP review.

Park	Address/Location	Lawn Mowing	Landscaping	Fertilizing	Pesticide/Herbicid	Trash mgmt.	Pet waste mgmt.	Cigarette buttlers	Maintained by:
Anita's Garden	79 Heard Street	X	X	X	X	X			
Bellingham Hill Park	111 Bellingham St.	X	X	X	X	X	x		
Bosson Playground	50 Bellingham St.	X	X	X	X	X			
Box District Park	180 Highland St.	X	X	X	X	X	x		
Carter Park	200 Orange Street	X	X	X	x	x			
Chelsea Greenway	327 Chestnut St	X	X	X	X	X			

Chelsea Riverwalk	257 Marginal St.	X	X	X	X	X			
Chelsea Square (Winnisimmet Park)	171 Broadway St.	X	X	X	X	X			
Ciepela Park	27, 29, 31 Medford St	X	X	X	X	X			
Creekside Common	100 Gillooly St.	X	X	X	X	X	x		
Eden Street Park	26 Eden Street	X	X	X	X	X			
Garden Cemetary	70 Central Ave.	X	X	X	X	X	x		
Highland Green Corridor	Highland Street	X	X	X	X	X	x		
Highland Park	31 Willow Street	X	X	X	X	X			
Island End Park	Justin Drive	X	X	X	X	X			
John Ruiz Park	141 Washington Avenue	X	X	X	X	X			
KaBOOM! Disney Park	252 Spruce Street	X	X	X	X	X			
Kayem Park	40 Fifth Street	X	X	X	X	X			
Mace Tot Lot	59 Cresent Avenue	X	X	X	X	X	x		
Mary C. Burke Athletic Fields	300 Cresent Avenue (School)	X	X	X	X	X	x		
Mill Creek River Walk	Revere Beach Parkway	X	X	X	X	X			
Mystic River Overlook Park	10 - 20 Broadway St. (Under Tobin Bridge)	X	X	X	X	X	x		
O'Neil Park	96 Beacon Street	X	X	X	X	X	x		
Paul A. Denver Park	60 Gillooly Road	X	X	X	X	X			
Polonia Park	37 Tremont Street	X	X	X	X	X	x		
PORT Park	99 Marginal Street	X	X	X	X	X			
Quigley Park	25 Essex Street	X	X	X	X	X	x		
Vacant Lot	97 Library St	X	X	X	X	X			
Veterans' Field at Memorial Stadium	299 Everett Avenue (Chelsea High School)	X	X	X	X	X			
Voke Park	540 Washington Ave.	X	X	X	X	X	x		
Washington Park	390 Washington Ave.	X	X	X	X	X	x	x	
Williams School Courtyard	149-165 Arlington Street	x	X	x	X	x			

Personnel

The following personnel are responsible for municipal parks and open space management. Employees performing the procedures in this SOP shall attend annual stormwater pollution prevention training.

Name	Responsibility
James Caron	City Yard Supervisor
Lam Vu	Field Operations Manager

Standard Operating Procedures *Chelsea, MA* *Department of Public Works* **Parks and Open Space Management**	**Issue Date:**

Lawn Mowing

On the following schedule: as needed

Responsible Personnel: NE Acreage Group

Standard Operating Procedures:

→ Lawns shall be mowed to a height of 3".

→ Mowing pattern shall vary to prevent ruts and promote even growth.

→ Grass clippings shall be mulched using a mulching mower OR disposed of a The Hopkinton Recycling Center so as to avoid entering the storm drain system.

Pesticide, Herbicide, and Fertilizer Use

On the following schedule:

Except during drought conditions or preceding heavy rainfall.

All fertilizer and Herbicide is under contract to TruGreen, 16 Progress Drive Boston, Mass.

Pest Management is contracted to B&B Pest Management Services, 271 Western Ave Lynn, Mass.

The following chemicals are utilized for municipal parks and open space management:

All fertilizer is applied stored and ordered by a private vendor through the Parks/Recreation Department.

Standard Operating Procedures:

→ Pesticides, Herbicides, and Fertilizers shall be applied following manufacturer's instructions as well as additional municipal instructions:

→

Other Landscaping

Involves the following:

- Weeding
- Planting/reseeding
- Pruning
- Leaf litter removal

Other Landscaping practices occur when necessary to keep the landscape in a healthy condition.

Standard Operating Procedures *Chelsea, MA* *Department of Public Works* **Parks and Open Space Management**	**Issue Date:**

Responsible Personnel: James Caron

Standard Operating Procedures:

- → Landscaping waste shall be disposed of in the dumpster set aside for yard waste at the DPW yard. This material will be transported to Saugus for composting so as to avoid entering the storm drain system.
- → Weeding shall be done manually where possible to reduce herbicide use.
- → Leaf litter shall be disposed of at the DPW site temporarily and transferred to Waste Management in Saugus, Mass to avoid entering the storm drain system.

Waste Management

Trash cans and/or dumpsters are located at the all parks.

Emptying and replacing bags/inspecting for leaks shall take place on the following schedule: Once per week

Responsible Personnel: James Caron, Lam Vu, Mike Sandoval

Additional trash cans or other necessary equipment shall be ordered by Mike Sandoval based on the results of park inspections.

Parks shall be inspected and cleaned for litter on the following schedule: Once per week

Responsible personnel: James Caron

The following is the list of Pet waste receptacles and/or bags are located at the following locations:

1. 312 Broadway
2. **JJ Mahoney Rest Area** [178 Broadway]
3. **Mystic Overlook Park**
4. **Polonia Playground**
5. **O'Neil Tot Lot** [96 Beacon street]
6. Intersection of Congress Avenue and Highland Street

7. **Bellingham Hill Park**
8. **Box District Park** [146 Library Street]
9. **Box District Park** [180 Highland Ave]
10. 615 Broadway
11. **Cary Square**
12. **Malone Park**
13. **Washington Park**
14. **Creek side Commons Park**
15. 124 Spencer Ave
16. **Garden Cemetery** [71 Chester Ave]
17. 130 Crescent Ave
18. **Washington Park** [1 Franklin Ave]
19. 215 Spencer Ave
20. 1 Webster Ave
21. 241 Spencer Ave
22. **Voke Park** [540 Washington Ave]
23. **Mill Creek River Walk** [105 Clinton St]
24. **Chelsea Greenway** [625 Broadway]
25. 144 Library St
26. 212 Chestnut St
27. 73-75 Shawmut St
28. 85 Central Ave

29. 74 Broadway
30. 25 Essex St
31. 32 Clinton St
32. 353 Crescent Ave
33. 35 Washburn St
34. 42 Willard St

The following is the list of Cigarette Butler locations:

1. City Hall Plaza
2. Monument Steps
3. 2 Washington
4. 447 Broadway
5. 175 Hawthorne
6. 424 Broadway
7. 301 Broadway
8. 289 Broadway
9. 212 Broadway
10. 249 Broadway
11. Christopher Columbus Statue
12. 177 Winnisimmet St
13. Across from 208 Broadway
14. J.J. Mahoney Rest Area
15. 164 Broadway

16. 120 Broadway
17. 1 Park St
18. MGH at Roca
19. 104 Park Street
20. 390 Washington Street
21. 95 Crest Ave
22. 40 Washington Ave

Additional pet waste receptacles, signage, bags, etc. shall be ordered by Mike Sandoval based on the results of park inspections.

APPENDIX C

Standard Operating Procedures – Municipal Buildings and Facilities

C.1 Fuel and Oil Handling

C.2 Hazardous Materials Storage and Handling

C.3 Spill Response

C.4 Operation and Maintenance of Buildings and Facilities

C.1: Fuel and Oil Handling

Introduction

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, representing a potential source of stormwater pollution, even in small volumes. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on a variety of ways by which fuels and petroleum-based materials can be delivered, as well as steps to be taken when petroleum products (such as waste oil) are loaded onto vehicles for offsite disposal or recycling. Delivery, unloading, and loading of waste oils are hereafter referred to as "handling."

The City of Chelsea undertakes various procedures and precautions in handling fuel and oil, as described in Section 3.0 of the City's Operation and Maintenance Plan.

Procedures

The City of Chelsea will implement the following fuel and oil handling procedures to help reduce the discharge of pollutants from the MS4:

General Guidelines

For all manners of fuel and oil handling described below, a member of the facility's Pollution Prevention Team (if the facility has a SWPPP) or another knowledgeable person familiar with the facility should be present during handling procedures. This person should ensure that the following are observed:

- There is no smoking while fuel handling is in process or underway.
- Sources of flame are kept away while fuel handling is being completed. This includes smoking, lighting matches, carrying any flame, or carrying a lighted cigar, pipe, or cigarette.
- The delivery vehicle's hand brake is set, and wheels are chocked while the activity is being completed.
- Catch basins and drain manholes are adequately protected.
- No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
- No flammable liquid should be unloaded from any motor vehicle while the engine is operating unless the engine of the motor vehicle is required to be used for the operation of a pump.
- Ensure that local traffic does not interfere with fuel/oil transfer operations. If it does, make appropriate accommodations.
- The attending persons should watch for any leaks or spills:
    - Any small leaks or spills should be immediately stopped, and spilled materials absorbed and disposed of properly. Follow the procedures in SOP C.3: Spill Response and Cleanup.
    - In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative should activate the facility's Stormwater Pollution Prevention Plan (SWPPP) and report the incident as specified in the document.

Delivery of Drummed Materials

Drummed materials may include motor oil, hydraulic fluid, transmission fluid, or waste oil from another facility (as approved). Procedures for the delivery of drummed materials should include the following:

- The truck driver should check in with the facility upon arrival.

- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible Refer to SOP C.3: Spill Response and Cleanup for examples of spill cleanup and response materials. The facility representative should closely examine the shipment for damaged drums.
    - If damaged drums are found, they should be closely inspected for leaks or punctures.
    - Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
    - Drums should be disposed of in accordance with all applicable regulations.
- Drummed materials should not be unloaded outdoors during wet weather events.
- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- Drums should be handled and unloaded carefully to prevent damage.
- Upon completion of unloading, the facility representative should inspect the unloading point and the drums to verify that no leaks have occurred, that any leaked or spilled material has been cleaned up and disposed of properly, and that the unloaded drums are not leaking.
- The facility representative should check to ensure that the proper amount of fuel or other material is delivered and collect a receipt from the truck driver.

Removal of Waste Oil from the Facility

When waste oil or similar oil products need to be removed from the premises, only haulers certified to transport waste oil should be utilized. Procedures should include the following:

- The disposal truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to SOP C.3: Spill Response and Cleanup for examples of spill cleanup and response materials. The truck driver and the facility representative should both remain with the vehicle during the tank draining process.
- When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The facility representative should inspect the loading point and the tank to verify that no leaks have occurred, or that any leaked or spilled material has been cleaned up and disposed of properly.
- The facility representative should collect a receipt from the truck driver.
- When draining bulk oil tanks:
    - The facility representative should verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
    - The disposal hauler vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.

Employee Training

- Employees who handle or deliver fuel and/or oil are trained once per year on proper procedures.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.

- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Related Standard Operating Procedures

- C.3: Spill Response and Cleanup

C.2: Hazardous Materials Storage and Handling

Introduction

A hazardous material is any biological, chemical, or physical material with properties that make it dangerous or potentially harmful to human health or the environment. Hazardous materials can be released to the environment in a variety of ways. When hazardous materials come into contact with rain or snow, the pollutants are washed into the storm sewer system and to surface waterbodies and/or groundwater. Hazardous materials associated with municipal facilities and their operations include, but are not limited to, oil, gasoline, antifreeze, fertilizers, pesticides, and de-icing agents and additives.

Municipally owned or managed facilities where hazardous materials are commonly stored and handled include:

- Equipment storage and maintenance yards
- Hazardous waste disposal facilities
- Hazardous waste handling and transfer facilities
- Composting facilities
- Materials storage yards
- Municipal buildings and facilities (e.g., schools, libraries, police and fire departments, city offices, municipal pools, and parking garages)
- Public works yards
- Solid waste handling and transfer facilities
- Vehicle storage and maintenance yards
- Water and wastewater facilities

Minimizing or eliminating contact of hazardous materials with stormwater can significantly reduce pollution of receiving waters. Proper hazardous material handling and storage also contributes to employee health, an organized workplace, and efficient operations. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help prevent stormwater pollution resulting from the handling and storage of hazardous materials. If services are contracted, this SOP should be provided to the contractor. The contract should also specify that the contractor is responsible for compliance with all applicable laws.

The City of Chelsea undertakes various activities regarding handling and storing hazardous materials. These activities are outlined in Section 3.2 of the City's Operation and Maintenance Plan.

Procedures

The City of Chelsea will implement the following procedures for handling and storing hazardous materials to reduce the discharge of pollutants to the MS4:

Handling, Loading, and Unloading

- Avoid loading/unloading materials in the rain and/or provide cover.
- Retrace areas where materials have been transferred to identify spills. If spills are found, immediately

clean them up. Follow procedures in SOP C.3: Spill Response and Cleanup.
- Time delivery and handling of materials during favorable weather conditions whenever possible (e.g., avoid receiving loads of sand during windy weather).
- Inspect containers for material compatibility and structural integrity prior to loading/unloading any raw or waste materials.
- Use dry cleanup methods (e.g., squeegee and dust pan, sweeping, and absorbents as last step) rather than hosing down surfaces.

Material Storage
- Confine material storage indoors whenever possible. Plug or disconnect floor drains that lead to the stormwater system.
- Confine outdoor material storage to designated areas that are covered, on impervious surfaces, away from high traffic areas, and outside of drainage pathways.
- Store containers on pallets or equivalent structures to facilitate leak inspection and to prevent contact with wet floors that can cause corrosion. This technique also reduces incidences of container damage by insects and rodents.
- Store materials and waste in materially compatible containment units.
- Keep hazardous materials in their original containers.
- If materials are not in their original containers, clearly label all storage containers with the name of the chemical, the expiration date, and handling instructions.
- Maintain an inventory of all raw and waste materials to identify leakage. Order new materials only when needed.
- Provide secondary containment for storage tanks and drums with sufficient volume to store 110 percent of the volume of the material.
- Provide sufficient aisle space to allow for routine inspections and access for spill cleanup.
- Inspect storage areas for spills or leaks and containment units for corrosion or other failures.

Waste Treatment, Disposal, and Cleanup
- Adopt a regular schedule for the pick-up and disposal of waste materials.
- Recycle leftover materials whenever possible.
- Substitute nonhazardous or less-hazardous materials for hazardous materials whenever possible.
- Protect empty containers from exposure to stormwater and dispose of them regularly to avoid contamination from container residues.

Employee Training
- Employees who handle and use hazardous materials are trained once per year on these procedures.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

C.3: Spill Response and Cleanup

Introduction

Municipalities are responsible for any contaminant spill or release that occurs on property that they own or operate. Particular areas of concern include any facilities that use or store chemicals, fuel oil, or hazardous waste, including schools, garages, and landfills. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help reduce the discharge of pollutants from the MS4 as a result of spills or releases.

The City of Chelsea undertakes various precautions with spill response and cleanup procedures, which are described in Section 3.4 of the City's Operation and Maintenance Plan.

Procedures

The City of Chelsea will implement the following spill response and cleanup procedures to reduce the discharge of pollutants from the MS4:

Responding to a Spill

Employees should be trained in proper spill response specific to the materials used at their site and appropriate personal protective equipment (PPE). In the event of a spill, follow these spill response and cleanup procedures:

- If the facility has a Stormwater Pollution Prevention Plan (SWPPP), notify a member of the facility's Pollution Prevention Team, the facility supervisor, and/or the facility safety officer. If not, continue to follow the procedures outlined below.
- Assess the contaminant release site for potential safety issues and for direction of flow.
- Complete the following:
    - Stop the contaminant release.
    - Contain the contaminant release through the use of spill containment berms or absorbents.
    - Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers.
    - Clean up the spill.
    - Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
        - i. Soil contaminated with petroleum should be handled and disposed of as described in MassDEP policy WCS-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils (https://www.mass.gov/files/documents/2016/08/mq/94-400.pdf).
        - ii. Products saturated with petroleum products or other hazardous chemicals require special handling and disposal by licensed transporters. Licensed transporters will pick up spill contaminated materials for recycling or disposal. Save the shipping records for at least three years.
        - iii. Waste oil contaminated industrial wipes and sorptive minerals:
            1. Perform the "one drop" test to ensure absorbents do not contain enough

oil to be considered hazardous, as described in the MassDEP Waste Oil Management Guide (https://www.mass.gov/files/documents/2018/12/18/oilwiper.pdf).

2. Wring absorbents through a paint filter. If doing so does not generate one drop of oil, the materials are not hazardous.
3. If absorbents pass the "one drop" test they may be discarded in the trash unless contaminated with another hazardous waste.
    a. It is acceptable to mix the following fluids and handle them as waste oil:
        i. Waste motor oil
        ii. Hydraulic fluid
        iii. Power steering fluid
        iv. Transmission fluid
        v. Brake fluid
        vi. Gear oil
    b. **Do not mix** the following materials with waste oil. Store each separately:
        i. Gasoline
        ii. Antifreeze
        iii. Brake and carburetor cleaners
        iv. Cleaning solvents
        v. Other hazardous wastes
4. If absorbents do not pass the "one drop" test they should be placed in separate metal containers with tight fitting lids, labeled "Oily Waste Absorbents Only."

- If you need assistance containing and/or cleaning up the spill, or preventing it from discharging to a surface water (or an engineered storm drain system), contact your local fire department using the number listed below. **In the case of an emergency call 911**.
    - Captain Richard Carroccino, Chelsea Fire Department, Hazardous Materials Division at:
        i. 617-833-2543
        ii. 617-466-4611
        iii. rcarroccino@chelseama.gov
- Contact the MassDEP 24-hour spill reporting notification line, toll-free at **(888)-304-1133**;
    - The following scenarios **are exempt** from MassDEP reporting requirements (see the MassDEP factsheet on oil and hazardous materials handling for more information: https://www.mass.gov/files/documents/2016/08/xm/spillmgm.pdf).
        i. Spills that are less than 10 gallons of petroleum and do not impact a water body
        ii. Spills that are less than one pound of hazardous chemicals and do not present an imminent health or safety hazard
        iii. Fuel spills from passenger vehicle accidents
        iv. Spills within a vault or building with a watertight floor and walls that completely contain all released chemicals

Reporting a Spill

When contacting emergency response personnel or a regulatory agency, or when reporting the contaminant release, be prepared to provide the following information:

1. Your name and the phone number you are calling from.
2. The exact address and location of the contaminant release.
3. Specifics of release, including:
    a. What was released;
    b. How much was released, which may include:
        i. Pounds
        ii. Gallons
        iii. Number of containers
4. Where was the release sent/what was contaminated, addressing:
    a. Pavement
    b. Soil
    c. Drains
    d. Catch basins
    e. Water bodies
    f. Public streets
    g. Public sidewalks
5. The concentration of the released contaminant.
6. What/who caused the release.
7. Is the release being contained and/or cleaned up or is the response complete.
8. Type and amount of petroleum stored on site, if any.
9. Characteristics of contaminant container, including:
    a. Tanks
    b. Pipes
    c. Valves

Maintenance and Prevention Guidance

Prevention of spills is preferable to even the best response and cleanup. To mitigate the effects of a contaminant release, provide proper maintenance and inspection at each facility. To protect against contaminant release adhere to the following guidance:

- Ensure all employees are properly trained to respond in the case of a spill, understand the nature and properties of the contaminant, and understand the spill control materials and personnel safety equipment. Maintain training records of current personnel on site and retain training records of former personnel for at least three years from the date last worked at the facility.
- Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to underground storage tanks. Maintain maintenance and inspection records on site.
- Implement good management practices where chemicals and hazardous wastes are stored:
    a. Ensure storage in closed containers inside a building and on an impervious surface wherever possible.
    b. If storage cannot be provided inside, ensure secondary containment for 110 percent of the maximum volume of the storage container.
    c. Locate storage areas near maintenance areas to decrease the distance required for transfer.
    d. Provide accurate labels, Material Safety Data Sheets (MSDS) information, and warnings for all stored materials.
    e. Regularly inspect storage areas for leaks.

  f. Ensure secure storage locations, preventing access by untrained or unauthorized persons.
  g. Maintain accurate records of stored materials.

- Replace traditional hazardous materials such as pesticides and cleansers with non-hazardous products such as bio-lubricants which can reduce response costs in the case of a spill.

Maintain appropriately stocked spill response kits at each facilities and locations where oil, chemicals, or other hazardous materials are handled and stored.

Employee Training

- Employees who perform work with potential stormwater pollutants are trained once per year on proper spill procedures.
- Employees are also trained on stormwater pollution prevention and illicit discharge detection and elimination (IDDE) procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Attachments

1. Spill Response and Cleanup Contact List

Spill Response and Cleanup Contact List

Contact	Phone Number	Date and Time Contacted
Public Works Commissioner: Fidel Maltez	**(617) 466-4204**	
Fire Department: Capt. Robert Carroccino, Hazardous Materials Division	**(617) 466-4611** **(617) 833-2543**	
MassDEP 24-Hour Spill Reporting	**(888) 304-1133**	
MassDEP Regional Offices:		
Northeast Regional Office	**(978) 694-3200**	
Southeast Regional Office	**(508) 946-2700**	
Central Regional Office	**(508) 792-7650**	
Western Regional Office	**(413) 784-1100**	
Hazardous Waste Compliance Assistance Line	**(617) 292-5898**	
Household Hazardous Products Hotline	**(800) 343-3420**	
Massachusetts Department of Fire Services	**(978) 567-3100 or** **(413) 587-3181**	
Licensed Site Professionals Association (Wakefield, MA) Licensed Site Professionals Board	**(781) 876-8915** **(617) 556-1091**	

C.4: Operations and Maintenance of Municipal Buildings and Facilities

Introduction

Municipal buildings and facilities (schools, municipal offices, police and fire stations, municipal pools, parking garages, etc.) often house various chemicals, such as petroleum products and hazardous materials. As a result, these buildings and facilities are potential sources of pollutant discharges to the storm drainage system. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on the use, storage, and disposal of chemicals and other stormwater pollutants to reduce the discharge of pollutants from the MS4. If services are contracted, this SOP should be provided to the contractor. The contract should specify that the contractor is responsible for compliance with all applicable laws.

The City of Chelsea performs a variety of operations and maintenance activities at its municipally owned and operated buildings, as mentioned in the Operation and Maintenance Plan. An inventory of all municipal buildings and facilities is included in Appendix A of that plan and will be updated annually.

Procedures

The City of Chelsea will implement the following procedures for municipally owned or operated buildings and facilities to reduce the discharge of pollutants from the MS4:

Handling, Storage, Transfer, and Disposal of Trash and Recyclables

All liquid and solid waste must be disposed of properly. Some of the most common sources of pollution at municipal facilities are a result of littering, improper collection of debris, and improper disposal of solid or liquid waste.

- All waste and recycling receptacles must be leak-tight with tight-fitting lids or covers.
- Always keep lids on dumpsters and containers closed unless adding or removing material. If using an open-top roll-off dumpster, cover it and tie it down with a tarp unless adding materials.
- Place waste or recycling receptacles indoors or under a roof or overhang whenever possible.
- Locate dumpsters on a flat, paved surface and install berms or curbs around the storage area to prevent run-on and run-off.
- Do not locate dumpsters over or adjacent to catch basins.
- Prior to transporting waste, trash, or recycling, ensure that containers are not leaking (double bag if needed) and properly secure containers to the vehicle.
- Clean and sweep up around outdoor waste containers regularly.

- Clean up any liquid leaks or spills with dry cleanup methods.
- Arrange for waste or recycling to be picked up regularly and disposed of at approved disposal facilities.
- Never place hazardous materials, liquids, or liquid-containing wastes in a dumpster or recycling or trash container (see SOP C.2: Hazardous Materials Storage and Handling).
- Do not wash trash or recycling containers outdoors or in parking lots.
- Conduct periodic inspections of solid and liquid waste storage areas to check for leaks and spills.
- Conduct periodic inspections of work areas to ensure that all wastes are being disposed of properly.
- In dumpster areas, regularly pick up surrounding trash and debris and regularly sweep the area.
- In compactor areas, regularly check the hydraulic fluid hoses and reservoir to ensure that there are no cracks or leaks. Regularly sweep the area.

Building Maintenance

- When power washing buildings and facilities, ensure that the washwater does not flow into the storm system. Containment or filtering systems should be provided.
- Paint and other chemicals should not be applied on the outside of buildings when it is raining or prior to expected rain.
- When sanding, painting, power washing, etc., ensure that sites are properly prepared (e.g., use tarps) and cleaned (e.g., use dry cleaning methods) especially if they are near storm drains. Protect catch basins when maintenance work is conducted upgradient of them.
- When painting, use a drop cloth and clean up any spills immediately.
- Do not leave open containers on the ground where they may accidentally tip over.
- Buildings should be routinely inspected for areas of potential leaks.
- Do not discharge chlorinated pool water into the stormwater system. Water must be properly dechlorinated and tested before it is discharged.
- Streets and parking lots surrounding municipal buildings and facilities should be swept and kept clean to reduce runoff of pollutants and debris to the stormwater system.
- Streets and parking lots around buildings and facilities will be swept in accordance with the procedures in SOP F.1: Streets and Parking Lots.

Storage of Petroleum Products and Potential Pollutants

- Floor drains in storage areas should be disconnected from the stormwater system.
- Routinely inspect buildings and facilities for areas of potential leaks.
- For storage and handling procedures of petroleum products and potential pollutants, refer to SOP C.2: Hazardous Materials Storage and Handling and SOP C.1: Fuel and Oil Handling Procedures.
- Should the City begin to store and apply fertilizer, herbicides, or pesticides, a separate SOP shall be developed for all activities relevant to those potential pollutants.
- All municipal buildings and facilities should be periodically inspected to address potential pollutant sources (e.g., leaks).

Spill Prevention Plan

- Spill prevention plans such as Spill Prevention Control and Countermeasure (SPCC) Plans should be in place where applicable, based on inventories of material storage and potential pollutants. Coordinate with the local fire department if necessary.
- Spill SOPs are outlined in SOP C.3: Spill Response and Cleanup.

Employee Training

- Employees who perform maintenance or other applicable work at municipal buildings and facilities are trained once per year on these procedures and the proper operation of related equipment.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Related Standard Operating Procedures

1. C.1: Fuel and Oil Handling
2. C.2: Hazardous Material Storage and Handling
3. C.3: Spill Response and Cleanup
4. F.1: Street Sweeping

APPENDIX D

Standard Operating Procedures – Municipal Vehicles and Equipment

D.1: Operation and Maintenance of Municipal Vehicles and Equipment

D.1: Operations and Maintenance of Municipal Vehicles and Equipment

Introduction

Regular maintenance of both municipal and contracted vehicles and heavy equipment not only prolongs the life of municipal assets but also helps reduce the potential for leaking of fluids associated with normal wear and tear. Potential pollutants include fuels, oil, antifreeze, brake fluid, solvents, and battery acid. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help reduce the discharge of pollutants from the MS4 because of leaks from vehicles and equipment. If services are contracted with respect to vehicles and equipment, this SOP should be provided to the contractor. The contract should also specify that the contractor is responsible for compliance with all applicable laws.

The City of Chelsea undertakes various procedures regarding its municipal vehicles and equipment, which are explained in detail in Section 4.0 of the City's Operation and Maintenance Plan. An inventory of all municipal vehicles and equipment is included in Appendix A of that Plan and updated annually.

Procedures

The City of Chelsea will implement the following procedures for municipally owned and operated vehicles and equipment to reduce the discharge of pollutants from the MS4:

Vehicle and Equipment Maintenance

Vehicle Storage

- Monitor vehicles and equipment for leaks and use drip pans as needed until repairs can be performed.
- When drip pans are used, avoid overtopping.
- Drain fluids from leaking or wrecked vehicles and parts as soon as possible. Dispose of fluids properly.
- Store and park vehicles on impervious surfaces and/or under cover or indoors whenever possible.

Vehicle Maintenance

- Conduct routine inspections of heavy equipment and vehicles to proactively identify maintenance needs or potential leaks.
- Perform routine preventive maintenance to ensure heavy equipment and vehicles are operating optimally.
- Recycle or dispose of waste properly and promptly.
- Sweep and pick up trash and debris as needed.
- Do not dump any liquids or other materials outside, especially near or in storm drains or ditches.

Body Repair and Painting

- Conduct all body repair and painting work indoors.
- Minimize waste from paints and thinners. Calculate paint needs based on surface area.
- Use dry cleanup methods (vacuum, sweep) to clean up metal filings and dust and paint chips from grinding, shaving and sanding. Sweep debris from wet sanding after allowing it to dry overnight on the shop floor. Dispose of waste properly; never dump waste into storm or sanitary sewers.
- Use sanding tools equipped with vacuum capability to pick up debris and dust.

Material Management

- Store materials and waste in labeled containers under cover and in secondary containment.
- Chemicals should not be combined in containers.
- Hazardous waste must be labeled and stored according to hazardous waste regulations. Follow the procedures in SOP C.2: Hazardous Materials Storage and Handling.
- Carefully transfer collected fluids from containers into designated storage areas as soon as possible.
- Store new and used batteries securely to avoid breakage. Store indoors or in secondary containment to contain potential acid leaks. Recycle used batteries.
- Conduct periodic inspections of storage areas to detect possible leaks.
- Do not wash or hose down storage areas unless there is prior approval to collect and discharge the water into the sanitary sewer. Use dry cleanup methods whenever possible.
- Keep lids on containers. Store them indoors or under cover to reduce exposure to rain.
- Inspect and maintain all pretreatment equipment, including interceptors, according to the manufacturer's maintenance schedule and at least once per year.
- Proper spill protocol should be followed to prevent chemicals from entering the stormwater system. Follow the procedures in SOP C.3: Spill Response and Cleanup.

Parts Cleaning

- Use designated areas for engine, parts, or radiator cleaning. Do not wash or rinse parts outdoors. If parts cleaning equipment is not available, then capture parts cleaning fluids.
- Recycle cleaning solution. Never discharge waste to the sanitary sewer or storm sewer.
- Use steam cleaning or pressure washing of parts instead of solvent cleaning. Cleaning equipment must be connected to an oil/water interceptor prior entering the sanitary sewer.
- When using solvents for cleaning, drain parts over the solvent tank to avoid drips to the floor. Catch excess solutions and divert them back to tank. Allow parts to dry over the hot tank.

Vehicle and Equipment Washing

Vehicle washing can result in the discharge of nutrients, sediment, petroleum products, and other contaminants to a surface water body or to a stormwater system. The MS4 Permit does not authorize the discharge of municipal vehicle washing byproducts into the MS4.

Outdoor Vehicle Washing Procedures

Outdoor washing of municipal vehicles should be avoided unless wash water is contained in a tight tank or similar structure. Where no alternative wash system is available, and full containment of wash water cannot be achieved, adhere to the following procedures:

- Avoid discharge of any wash water directly to the storm drainage system or surface water (e.g., stream, pond, or drainage swale)
- Minimize the use of water to the extent practicable.
- Where the use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of a biodegradable, phosphate-free detergent is preferred.
- Do not use solvents except in dedicated solvent parts washer systems or in areas not connected to a sanitary sewer.
- Do not power wash, steam clean, or perform engine or undercarriage cleaning.
- Grassy and pervious (porous) surfaces may be used to promote direct infiltration of wash water, providing treatment before recharging groundwater and minimizing runoff to an adjacent stormwater system. Pervious surfaces or other infiltration-based systems should not be used within wellhead protection areas or within other protected resources.
- Impervious surfaces discharging to the storm drainage system should not discharge directly to a surface water unless treatment is provided. The treatment device should be positioned such that all drainage must flow through the device, preventing bypassing or short-circuiting.
- Periodic sweeping and/or cleaning should be completed to prevent accumulation from forming on the washing area.
- Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Follow the procedures in SOP C.3: Spill Response and Cleanup.
- Heavily soiled vehicles or vehicles dirtied from salting or snow removal efforts should follow the SOPs in the "Heavy Equipment Washing Procedures" below.

Indoor Vehicle Washing Procedures

- Vehicles and equipment should be washed inside whenever possible to reduce runoff to the stormwater system.
- Where the use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of biodegradable, phosphate-free detergent is preferred.
- Detergents should not be used in areas where oil/water separators provide pre-treatment of drainage.
- Floor drains should be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems should be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
- Designate separate areas for routine maintenance and vehicle cleaning. This helps prevent

contamination of wash water by motor oils, hydraulic lubricants, greases, or other chemicals.
- Dry cleanup methods are recommended within garage facilities. Do not wash down floors and work areas with water.
- Bring smaller vehicles to commercial washing stations.
- Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Follow the procedures in SOP C.3: Spill Response and Cleanup.

Heavy Equipment Washing Procedures

- Mud and heavy debris removal should occur on impervious surfaces or within a retention area.
- Maintain these areas with frequent mechanical removal and proper disposal of waste.
- Impervious surfaces with engineered storm drain systems should not discharge directly to a surface water.
- Floor drains should be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface waterbodies or engineered storm drain systems should be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
- Where the use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of biodegradable, phosphate-free detergent is preferred.
- Detergents should not be used in areas where oil/water separators provide pre-treatment of drainage.
- Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Follow the procedures in SOP C.3: Spill Response and Cleanup.

Engine and Steam Washing Procedures

- Do not wash parts outdoors.
- Maintain drip pans and smaller containers to contain motor oils, hydraulic lubricants, greases, etc. and to capture and collect spills or noticeable leaks observed during washing activities, to the extent practicable. Follow the procedures in SOP C.3: Spill Response and Cleanup.
- Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. The use of a biodegradable, phosphate-free detergent is preferred.
- Avoid cleaning with solvents except in dedicated solvent parts washer systems. Make use of pressure washing and steam cleaning.
- Recycle clean solutions and rinse water to the extent practicable.
- Wash water should discharge to a tight tank or a sanitary sewer via an oil/water separator. Detergents should not be used in areas where oil/water separators provide pre-treatment of drainage.

Employee Training

- Employees who perform work on/with municipal vehicles or equipment are trained once per year on these procedures and the proper operation of related equipment.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

APPENDIX E

Standard Operating Procedures – Catch Basin Inspection and Cleaning

E.1: Catch Basin Inspection and Cleaning

E.1: Catch Basin Inspection and Cleaning

Introduction

Catch basins help minimize flooding and protect water quality by removing trash, sediment, decaying debris, and other solids from stormwater runoff. These materials are retained in a sump below the invert of the outlet pipe (older catch basins may not have a sump). Catch basin cleaning reduces foul odors, prevents clogs in the storm drain system, and reduces the loading of trash, suspended solids, nutrients, bacteria, and other pollutants to receiving waters. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on catch basin inspection and cleaning to reduce the discharge of pollutants from the MS4. If services are contracted, this SOP should be provided to the contractor. The contract should specify that the contractor is responsible for compliance with all applicable laws.

This SOP can also be used for inspection of catch basins or manholes for the purpose of conducting catchment investigations as part of the municipality's Illicit Discharge Detection and Elimination program.

The Chelsea Department of Public Works performs routine inspections, cleaning, and maintenance on over 1,350 catch basins that are located within the City of Chelsea. The City will include an optimization plan for catch basin cleaning and inspection in its annual report. A description of current City practices for catch basin cleaning and inspection is included in Section 5.2 of the Operation and Maintenance Plan.

Chelsea will implement the following catch basin inspection and cleaning procedures to reduce the discharge of pollutants from the MS4:

Procedures

Inspection and Cleaning Frequency

- Each catch basin should be cleaned and inspected at least annually.
- Catch basins near construction activities (roadway construction, residential, commercial, or industrial development or redevelopment) or high-use areas should be inspected and cleaned more frequently if inspection finds excessive sediments or debris loadings.
- Catch basins should be cleaned to ensure that they are no more than 50 percent full[1] at any time. Establish inspection and maintenance frequencies needed to meet this "50 percent" goal. If a catch basin sump is more than 50 percent full during two consecutive inspections, document the findings, investigate the contributing drainage area for sources of excessive sediment loading, and, if possible, address the contributing sources. If no contributing sources are found, increase the inspection and cleaning frequencies of the sump.
- Street sweeping performed on an appropriate schedule will reduce the amount of sediment, debris, and organic matter entering the catch basins, which will in turn reduce the frequency with which they need to be cleaned. Reference SOP 16: Streets and Parking Lots for information on appropriate street sweeping frequencies. Street sweeping schedules should also be adjusted based on catch basin inspection findings, with more frequent sweepings for areas with higher catch basin loads.

Inspection and Cleaning Procedures

Catch basin inspection and cleaning procedures should address both the grate opening and the catch basin structure, including the sump and any inlet and outlet pipes. Document any and all observations about the

[1] . A catch basin sump is more than 50 percent full if the contents within the sump exceed one half the distance between the bottom interior of the catch basin to the invert of the deepest outlet of the catch basin

condition of the catch basin structure and water quality. Collect data on the condition of the physical basin structure, its frame, and the grate, as well as on the quality of stormwater conveyed by the structure. Observations like those below can indicate sources of pollution within the storm drain system:

- Oil sheen
- Discoloration
- Trash and debris

Both oil and bacteria can create a sheen on the water's surface. The source of a sheen can be differentiating by disturbing it (e.g., with a pole). A sheen caused by oil will remain intact and move in a swirl pattern, while a sheen caused by bacteria will separate and appear "blocky." The bacteria that cause this sheen are naturally occurring iron bacteria – they are not considered a pollutant but should be noted. Other types of bacteria, such as fecal bacteria, are considered pollutants and their discovery should be recorded

Observations like those below can indicate a potential connection of a sanitary sewer to the storm drain system, which is an illicit discharge:

- Indications of sanitary sewage, including fecal matter or sewage odors
- Foaming, such as from detergent
- Optical enhancers, fluorescent dye added to laundry detergent

In general, adhere to the following procedures when inspecting and cleaning catch basins. Record the findings:

1. Implement appropriate traffic safety procedures (e.g., traffic cones) prior to and during the catch basin inspection and cleaning process.
2. Work upstream to downstream in a given drainage network.
3. Clean sediment and trash off the grate.
4. Visually inspect the outside of the grate.
5. Remove the grate and visually inspect the inside of the catch basin to determine cleaning needs.
6. Inspect the catch basin for structural integrity.
7. Determine the most appropriate equipment and method for cleaning the basin:
    a. Manually use a shovel to remove accumulated sediments.
    b. Use a bucket loader to remove accumulated sediments.
    c. Use a high pressure washer to clean any remaining material out of the catch basin while capturing the slurry with a vacuum.
    d. If necessary, after the catch basin is cleaned, use the rodder of the vacuum truck to clean the downstream pipe and pull back sediment that might have entered it.
8. If contamination is suspected, chemical analysis will be required to determine if the materials comply with the Massachusetts Department of Environmental Protection (MassDEP) Hazardous Waste Regulations, 310 CMR 30.000 (https://www.mass.gov/files/documents/2016/08/xl/310cmr30_7883_54357.pdf). The chemical analysis required will depend on suspected contaminants. Note the identification number of the catch basin on the sample label and note sample collection on the Catch Basin Inspection Form.

Handling and Disposal of Catch Basin Cleanings

- Properly dispose of collected sediments and catch basin cleanings (solid material, such as leaves, sand, and twigs removed from stormwater collection systems during cleaning operations).
- Cleanings from stormwater-only drainage systems may be disposed at any landfill that is permitted by MassDEP to accept solid waste. MassDEP does not routinely require stormwater-only catch basin cleanings to be tested before disposal, unless there is evidence that they have been contaminated by a spill or some other means.
- Screenings may need to be placed in a drying bed to allow water to evaporate before proper disposal.

In this case, ensure that the screenings are managed properly to prevent pollution.

- Catch basin cleanings must be handled and disposed in accordance with compliance with the applicable MassDEP regulations, policies, and guidance (https://www.mass.gov/files/documents/2018/03/09/catch-basins.pdf).

Documentation and Reporting

The following information should be documented and included in the municipality's annual report:

- Metrics and other information used to reach the determination that the established plan for cleaning and maintenance is optimal for the MS4 (include in the SWMP and first annual report)
- Any action taken in response to excessive sediment or debris loadings
- Total number of catch basins
- Number of catch basins inspected
- Number of catch basins cleaned
- Total volume or mass of material removed from catch basins.
-

Employee Training

- Employees who perform catch basin cleaning and inspection are trained once per year on these procedures and the proper operation of related equipment.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
    - If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

APPENDIX F

Standard Operating Procedures – Street Sweeping

F.1: Street Sweeping

Standard Operating Procedures *Chelsea, MA* *Department of Public Works* **Sweeping Streets and Parking Lots**	**Issue Date:** 9-21-2020

Approved by:

Public Works Director (or similar)

Purpose of SOPs:

Procedures for the operation and maintenance of street sweepers, frequency of sweeping, disposal of debris, and recordkeeping to maintain clean and safe roadways all while preventing pollution from entering the stormwater sewer systems. Pollutants like sand, trash and leaves can enter the storm sewer and have a negative impact on the receiving water body.

MA Small MS4 General Permit Requirement Summary:

Part 2.3.7.a.iii.3.

The City of Chelsea street sweeping is contracted out. The current contractor is Arrow Sweeping. Street sweeping is ongoing from March1st until December 31st. All streets with**in the City of Chelsea** shall be swept and/or cleaned **on one side on the 1st and 3rd of the month and the other side on the 2nd and 4th of the month. On Saturdays and Sundays Broadway, Hawthorne and other targeted /high use areas will be swept and/or cleaned. These targeted areas will be** determined by the director of Public Works on the basis of pollutant load reduction potential, based on inspections, pollutant loads, catch basin cleaning or inspection results, land use, water quality limited or TMDL waters or other relevant factors as determined by The City. The **contractor** shall report the **number of miles swept monthly and the total volume or mass of material removed yearly to the Compliance Manager as a means to completing** each annual report.

Part 2.3.a.iii.4.

The **City** shall ensure proper storage of catch basin cleanings and street sweepings prior to disposal or reuse such that they do not discharge to receiving waters.

Equipment Inventory:

The following is a list of street sweeping equipment:

Equipment Number	Make	Description	Sweeper Speed (or other notes)
1	Elgin Pelican	The Elgin® Pelican® broom sweeper is a three-wheel mechanical sweeper.	4-6 miles per hour Holds 220 gallons of water Has 3yd hopper

Operations

1. Operate all sweepers and equipment according to the manufacturer's recommended settings, standards, and procedures.

2. While sweeping, drive between the optimal sweeping speed limit, as recorded in the equipment list above.

3. Sweeping will not take place during moderate to heavy rainfall or during periods of extreme cold (temperatures lower than 15 degrees Fahrenheit).

4. If spills occur or illegal discharges are seen, report to Shavaun Callahan of Public Works at 857-205-9571

Maintenance

1. Sweepers will be checked for leaks after each use. If a leak is discovered, it will immediately be contained and properly cleaned up.

2. Regular preventative maintenance to prolong equipment use (such as greasing moving parts and minor adjustments) occur once per month.

3. Parts are replaced when necessary. Brushes shall be replaced in accordance with manufacturer specifications.

4. Equipment is washed at Arrow Sweeping located at 62 S Irving St, Revere, MA 02151 to trap grease, oils and sediment.

5. The left-over debris is scraped out from the hopper after 25 debris dumps.

Schedule

1. Street sweeping will primarily take place between the months of March 1st and December 31st.

2. All streets with curbing and/or catch basins and municipal parking lots shall be swept a twice per month between March 31st and December 31st. Streets are swept according to the street list and schedule located at the DPW and on the City Website.

3. Roads/Parking lots that have catch basins that are more than 50% full of sediment during two consecutive cleanings, shall be swept more to reduce sediment entering the basins.

4. The sweeping schedule is assessed once per year and updated as necessary.

5. A map of city roads and parking lots is at the DPW.

6. If any event/activity such as fairs, construction, firefighting activities produce an excess amount of debris on the roadway or parking lot it should be swept as soon as practicable.

Storage and Disposal

Solid sweeping debris is brought immediately to the 380 Beacham Street for temporary disposal.

2.

Weighing process: The amount of solid sweeping debris will be weighed at Waste Management in Saugus, MA. This data will be recorded by the City and included in the Yearly Annual Report to the EPA.

Training

1. Employees are trained once per year on this procedure and the proper operation of equipment. Employees are also trained on stormwater pollution prevention, spill and response, and illicit discharge detection and elimination procedures.

Record Keeping

1. Records are kept at the DPW Facility located at 380 Beacham Street, Chelsea, MA.
2. The number of miles swept is recorded after each sweeping and emailed to the Compliance Manager monthly.
3. The number of curb miles swept per year is calculated annually and included in the City's Annual Report to the EPA.
4. A list of employees implementing the SOPs and the completion of their training(s) will be kept at the DPW.

Revising the SOPs

1. These procedures are reviewed once per year and updated as needed.

APPENDIX G

Standard Operating Procedure – Salt Use Optimization/ Winter Road Maintenance

G.1: Salt Use Optimization/ Winter Road Maintenance

Chelsea DPW

Snow Plowing and Removal Plan

Objective

The City of Chelsea, acting through the Department of Public Works (DPW), has developed this plan to document a comprehensive approach to managing and implementing snow plowing and removal work. DPW has endeavored to create a clear plan that can be easily understood, and outlines the extensive efforts that DPW has been making for many years. While snow events will always be unique, with specific minor issues that will differ each time; there are common challenges with every storm that are addressed with proper planning, management, and execution.

Background

The City of Chelsea is situated just across the Mystic River from the City of Boston, MA. With a land area of 2.2 +/- square miles and an estimated population of 40,000 +/-, Chelsea is the second most densely populated community in MA. Current zoning in the downtown/Broadway corridor and the Everett Avenue commercial corridor will surely increase the residential population as mixed-use commercial/residential development continues to be built. Several such projects are currently being planned/designed by private investors/large developers.

Chelsea streets can be grouped into three categories based upon paved width.

Neighborhood Streets, which constitutes the most lane-miles of streets in the City, includes several subcategories as follows:

- Two-Way, Double Sidewalks (TWDS)
- Two-Way, Single Sidewalks (TWSS)
- One-Way, Double Sidewalks (OWDS)
- One-Way, Single Sidewalks (OWSS)

These streets are challenging in terms of snow plowing because DPW operations has the greatest chance to negatively impact the residents and small businesses in residential neighborhoods.

Boulevards, such as Everett Avenue, Eastern Avenue, Washington Avenue, and Broadway, have wider paved cross-sections than neighborhood streets.

Alleys, such as Division Street and Cherry Street, are narrow one-way streets with no sidewalks. These streets require careful plowing to avoid pushing snow onto private property. Consideration should be given to performing snow removal instead of simple plowing in public alleys.

Situational Analysis

To prevent the overtaxing of manpower during extended storms/cleanup durations, proper managing of DPW staff and contractors is vitally important. There are many factors that push DPW operations well past a typical 8-hour shift. Longer storms/cleanups put a significant strain on the DPW Operations Management, and requires seamless assistance from the DPW Director and Assistant Directors. Coordination must be consistent with this plan, while also limiting outside influences or deviations.

Because each snow event is unique, DPW must modify its snow fighting approach for each event using situational analysis of the following factors:

- **Forecasted snow total**. It takes DPW roughly four hours to plow the City completely on a single pass with two inches of snow on the ground. This is accomplished by a team of six plow drivers. The more snow that falls, the more passes it takes to handle the storm. Unforeseen breakdown of vehicles or equipment is addressed as soon as it occurs to keep DPW operations working.
- **Forecasted storm duration and start time**. It takes DPW roughly two hours to salt the City completely on a single pass as a method of pretreating the road surface prior to the storm. This is accomplished by a team of six truck drivers. Plowing begins once the first two inches of snow have fallen. The longer it snows, the more passes it takes to handle the storm.
- **Availability and need for outside contractors**. While DPW strives to remain self-sufficient, there are valid reasons for temporarily employing outside contractors to assist in snow plowing. Unfortunately, the availability of this assistance can be limited. Proper planning, management, and execution of this plan will help DPW limit its reliance on outside help.
- **Forecasted temperatures in the five days following the storm**. Because there is so little room to accommodate snow storage on City streets, DPW understands the dynamic role that the environment plays in snow fighting. In the days that follow the storm, a temperature drop can freeze snow banks and make it challenging for DPW to plow or remove snow. It also makes it very difficult for residents to shovel sidewalks and parking spaces. On the other hand, a warming trend can erode snow banks quickly and reduce the need for snow removal.
- **Forecasted snowfall in the seven days following the storm**. Simply put, more snow on the way means that properly addressing current issues is critical. If the most recent storm brought significant snowfall, or if the next forecasted snowfall is greater than 6 inches, DPW may need to focus on snow removal to make some additional snow storage capacity on City streets. The only bright spot may be that successive snow patterns tend to come with temperatures at or above freezing, which helps to facilitate snow plowing and removal efforts.
- **Existing snow bank heights and sidewalk conditions**. The accumulation of snow from multiple snow storms only compounds winter issues in the City. Closely-spaced events are even more problematic.

At least 24 hours before each snow storm, the Operations Manager shall perform a situational analysis for the upcoming event.

Snow Storm Ranking

Following completion of the situational analysis, the Operations Manager shall complete the Snow Storm Ranking Sheet provided in **Appendix A**. For each of five criteria related to existing conditions and weather forecast, a rating of 0-3 points will be given. From the total points, a storm ranking will be identified as follows:

- **Category 1 (0-5 total points)**. DPW considers this to be a minor snow storm. It typically requires one day of snow plowing, one day of cleanup, two days of sidewalk clearing, and no snow removal. The use of multiple work teams may not be required.
- **Category 2 (6-10 total points)**. DPW considers this to be a medium snow storm. It typically requires one or two days of snow plowing, two days of cleanup, three days of sidewalk clearing, and two to four days of snow removal. The use of multiple work teams is always required.
- **Category 3 (11-15 total points)**. DPW considers this to be a major snow storm. It typically requires two days of snow plowing, two to three days of cleanup, three to four days of sidewalk clearing, and four to six days of snow removal. The use of multiple work teams is always required.

Based upon the storm category, DPW will implement the action items shown on the Snow Storm Action Plan also provided in **Appendix B**.

Lines of Communication

The key to a successful plan involves establishing and consistently maintaining lines of communication. Failure to do so results in confusion, inefficiency, and the potential for accidents. For snow operations, 99% of the management decisions should come from the DPW Operations Manager in conformance with this plan. Internal DPW communications will cover all planned tasks, as well as outside requests. DPW chain of command will be followed for communicating directives to the field staff and contractors.

For the few instances where directives come from above the DPW Director, senior City leadership shall evaluate the issue. To proceed, the lines of communication to DPW shall follow the paths shown below:

Directive From:	Directive To:	Alternatively To:	Or:
State/Federal Agency	City Manager	Assistant City Manager	
City Council	DPW Director	Assistant DPW Director – Operations	Assistant DPW Director – Facilities & Administration
CPD/CFD/CEM	DPW Director	Assistant DPW Director – Operations	Assistant DPW Director – Facilities & Administration
City Manager	DPW Director	Assistant DPW Director – Operations	Assistant DPW Director – Facilities & Administration
Assistant City Manager	DPW Director	Assistant DPW Director – Operations	Assistant DPW Director – Facilities & Administration
DPW Director	DPW Operations Manager	DPW City Yard Supervisor	

Equipment

Appendix C includes a current list of all DPW vehicles and motorized equipment used in snow operations. The Snow Fighting Equipment List inventories equipment by the following criteria:

- **Type**. DPW owns a variety of trucks, including dump trucks, loaders, skid steers, pickup trucks, sanders, etc. DPW also owns an array of motorized equipment, including snow blowers, snow broom, etc.

- **Year**. This is the year in which DPW purchased the item. DPW strives to maintain newer vehicles and equipment in good shape, and with regular maintenance and replacement.

- **Make/Model**. This is the manufacturer and series of the item. DPW keeps apprised of advances in our industry to ensure we have the proper vehicles and equipment to do the job correctly, efficiently, and cost-effectively.

- **Condition/Comments**. DPW monitors the condition of all vehicles and equipment as part of a program of regular maintenance and replacement. Comments include identification of planned replacement by fiscal year Capital Improvement Plan purchase (e.g. Sidewalk plow to be added in FY19).

Staff

DPW staff is listed on the next page, and includes the following groups:

- Department management (City Hall).

- Operations management (City Yard).

- Senior operational staff (Streets & Sidewalks).

- Junior operational staff (Streets & Sidewalks).

- Building maintenance staff.

The staff list is used to field Work Teams, and maintain leadership coverage. The use of Work Teams allows for the proper execution of planned tasks regardless of storm/cleanup duration. **Appendix D** contains the Work Team Deployment Sheet, which shall be completed by the Operations Manager once the Snow Storm Action Plan has been identified. This shall occur in time to allow staff a reasonable accommodation of their sleep schedule. We need staff/management rested and ready to work.

Failure to limit management and staff from working excessive hours without a reasonable amount of rest, puts the plan and our employees at risk. It also exposes the City to unnecessary risk and liability.

To manage and respond to resident calls during snow storms, one of the two people on the Operations Management team will be responsible for answering incoming calls to the City Yard / (617) 466-4300. This would also include fielding calls from the EOC/911. Calls to the City Yard will be pushed to the cell phone of the “On-Call” team leader.

Appendix E includes the Leadership Rotation/Coverage schedule, which provides for continuous two-person coverage of 12-hour shifts, offset by six hours, to maintain continuity.

Staff (Cont'd)

Name	Title	Date of Hire	CDL License	Hoisting License
Fidel Maltez	Commissioner	4/24/2017	No	No
Bertram (Bert) Taverna	Deputy Commissioner	12/9/1996	No	No
Louis (Lou) Mammolette	Assistant DPW Director – Operations	06/05/2017	No	No
Lam Vu	Field Operations Manager	01/14/2002	Yes	Yes
James (Jimmy) Caron	City Yard Supervisor/Timekeeper	12/08/2003	Yes	Yes
Luis (Lou) Cetina	Assistant Superintendent WSD	7/28/2003	Yes	Yes
Radames (Junior) Garcia	Foreman	10/20/2016	Yes	Yes
Alejandro Arroyo	Foreman	11/06/2017	Yes	Yes
Jody Robinson	Senior Licensed DPW Specialist	07/06/1993	Yes	No
Wai Leong	Senior Licensed DPW Specialist	03/21/2016	Yes	Yes
Carlos Figueroa	Licensed DPW Specialist	11/17/2004	Yes	No
Brian Santiago	Licensed DPW Specialist	09/30/2015	Yes	No
Kevin Chavez	Licensed DPW Specialist	09/18/2017	Yes	No
Chris Pazos	Licensed DPW Specialist	09/18/2017	Yes	No
Felix Vega	Licensed DPW Specialist	10/02/2017	Yes	No
John Pisaturo	Licensed DPW Specialist	10/15/2018	Yes	No
Stephen Puppo	Licensed DPW Specialist	10/22/2018	No	No
Scott Nowicki	Licensed DPW Specialist	9/9/2019	Yes	No
Jan Martinez	Licensed DPW Specialist	10/21/2019	No	Yes
Cesar Cortez	Licensed DPW Specialist	10/28/2019	No	No
Eber Rivera	Licensed DPW Specialist	10/28/2019	No	No
Jose Ayala	WSD Junior Operator	06/05/2000	Yes	Yes
Hector (Franco) Ortiz	WSD Junior Operator	02/28/2012	Yes	Yes
Antonio (Tony) Rosa	WSD Junior Operator	08/21/2017	Yes	Yes
Tyler Cetina	WSD Junior Operator	09/18/2017	Yes	Yes

Staff (Cont'd)

Name	Title	Date of Hire	CDL License	Hoisting License
Mariano (Mario)Cimino	Building Maintenance Craftsman Laborer	3/13/2007	No	No
Francisco Lemus	Building Maintenance Craftsman Laborer	10/4/2017	No	No
Cristhian Novoa	Building Maintenance Craftsman Laborer	3/26/2018	No	No
Arlex Baca Flores	Building Maintenance Craftsman Laborer	10/15/2018	No	No

Work Teams and Priority Tasks

As referenced in a prior section, DPW uses Work Teams to perform many tasks – even outside of snow operations. In order to tackle the longer snow storms/cleanups, DPW will divide the DPW staff into two work teams. Each team will consist of half the staff, and will work in shifts of no more than twelve hours.

Prior to each event, the Operations Manager will have the City Yard Supervisor and seven staff come in four hours ahead of the forecasted start time to pretreat the streets with salt. When temperatures are below 18 degrees, sand is used instead of salt**.** If the event is forecasted to start as rain, DPW will not pretreat since the material just washes away. **Appendix F** lists the City-Wide Salting Routes. Each route includes instructions to treat steeper streets before flatter streets, and identifies these hills accordingly.

The rest of the first work team will arrive near the forecasted start time of the storm to begin snow plowing. To maximize the effectiveness of the salting operations, snow plowing will begin once two inches of snow has fallen. This may be begin sooner if the early part of the storm is the strongest. **Appendix G** lists the City-Wide Snow Plowing Routes. Each route includes instructions to plow in multiple passes where required. Snow plowing of City streets will always be the first priority of DPW snow fighting. The goal is to maintain passable streets for fire trucks, ambulances, and police vehicles pursuant to public safety. With passable streets, residents and City commerce can also move freely. To assist DPW snow operations, DPW inspectors will be driving City streets looking for instances where residents and businesses are throwing snow into City streets. Where initial warnings are not heeded, DPW will issue tickets to enforce **City Ordinances Sec. 24-21 & 24-22**.

Once streets are passable following a Category 1 storm, DPW will focus on clearing City-owned sidewalks and other City assets. For Category 2 and Category 3 storms, DPW will focus on streets during and after the storm events. For critical City-owned sidewalks and assets, DPW will utilize outside contractors on an "as-needed" basis. Future efforts will be made to develop an on-call temporary winter workforce of Chelsea residents to handle City sidewalk clearing. **Appendix H** includes the City Sidewalk Clearing List with priority locations topping the list.

Snow Removal

Snow removal has, and will continue to be, an important part of the DPW snow fighting approach. Because the City is the second most densely populated community in MA, the ability of the City to store snow on sidewalks and as snowbanks is limited. DPW estimates that a single 12-inch snow storm will generate enough snow to reasonably reach the City's capacity for sidewalk storage. DPW considers this sidewalk capacity to be an amount of snow above which residents and businesses will be unable to accommodate any additional snow without resorting to throwing it into the street, reducing the cleared width of sidewalks, or further reducing the number of parking spaces on their street.

When the plan identifies the need for snow removal, DPW will initiate these efforts in the Critical Snow Removal Locations identified in **Appendix I**. Snow will be hauled to temporary sites within the City until spring melting can occur. For the 2018 winter season, the City has secured approval to use the property at the rear of 295 Eastern Avenue. Given its prime location for snow removal and construction laydown operations, the City will explore entering into a long-term lease arrangement or purchase. The cost to the City could be offset by fees charged to private contractors who would need the land for similar purposes. A second option would be to use City parks for snow storage, but requiring spring restoration.

Snow Removal (Cont'd)

If weather forecast dictates, DPW will expand snow removal to Emergency Arteries as listed in City Code Sec. 10-99. Refer to **Appendix J**. This work will be performed primarily by an outside contractor through the annual DPW snow removal contract (Tufts Construction until 12/31/18) to be rebid in Aug. 2018.

For excessive snowfall and/or closely-spaced events, DPW may be forced to further expand snow removal to address side streets. If this becomes necessary, DPW will consult with senior City leadership to determine a fair and equitable way to prioritize additional streets.

City Hall/Emergency Operations Center/Senior Center/Library

The Buildings and Grounds crew is responsible for snow operations on critical facilities identified in Appendix I. The full crew will start once the first two inches of snow have fallen. The crew will work up to 12 hours before ending their shift. For longer events, DPW Streets and Sidewalks forces and/or outside contractors will assist in these efforts on an "as-needed" basis. As with sidewalk clearing, a future on-call temporary winter workforce of Chelsea residents could be used to support Buildings and Grounds snow operations.

APPENDIX J

Annual Reports for 2016 MS4 Permit
(To be appended as completed)

Year 1 Annual Report
Massachusetts Small MS4 General Permit
Reporting Period: May 1, 2018-June 30, 2019

Please DO NOT attach any documents to this form. Instead, attach all requested documents to an email when submitting the form

Unless otherwise noted, all fields are required to be filled out. If a field is left blank, it will be assumed the requirement or task has not been completed.

Part I: Contact Information

Name of Municipality or Organization: City of Chelsea

EPA NPDES Permit Number: MAR041077

Primary MS4 Program Manager Contact Information

Name: Fidel Maltez   Title: Commissioner, Chelsea DPW

Street Address Line 1: 500 Broadway

Street Address Line 2: N/A

City: Chelsea   State: MA   Zip Code: 02150

Email: FMaltez@chelseama.gov   Phone Number: (617) 466-4204

Fax Number: N/A

Stormwater Management Program (SWMP) Information

SWMP Location (web address): https://www.chelseama.gov/public-works/pages/dpw-public-notices-news

Date SWMP was Last Updated: Jun 30, 2019

If the SWMP is not available on the web please provide the physical address and an explanation of why it is not posted on the web:

Part II: Self Assessment

First, in the box below, select the impairment(s) and/or TMDL(s) that are applicable to your MS4.

Impairment(s)

☒ Bacteria/Pathogens ☒ Chloride ☐ Nitrogen ☐ Phosphorus
☒ Solids/ Oil/ Grease (Hydrocarbons)/ Metals

TMDL(s)

In State: ☐ Assabet River Phosphorus ☒ Bacteria and Pathogen ☐ Cape Cod Nitrogen
☐ Charles River Watershed Phosphorus ☐ Lake and Pond Phosphorus

Out of State: ☐ Bacteria/Pathogens ☐ Metals ☐ Nitrogen ☐ Phosphorus

Clear Impairments and TMDLs

Next, check off all requirements below that have been completed. ***By checking each box you are certifying that you have completed that permit requirement fully.*** *If you have not completed a requirement leave the box unchecked. Additional information will be requested in later sections.*

Year 1 Requirements

☒ Develop and begin public education and outreach program

☒ Identify and develop inventory of all known locations where SSOs have discharged to the MS4 in the last 5 years

- ◉ The SSO inventory is attached to the email submission
- ○ The SSO inventory can be found at the following website:

☒ Develop written IDDE plan including a procedure for screening and sampling outfalls

☒ IDDE ordinance complete

☒ Identify each outfall and interconnection discharging from MS4, classify into the relevant category, and priority rank each catchment for investigation

- ◉ The priority ranking of outfalls/interconnections is attached to the email submission
- ○ The priority ranking of outfalls/interconnections can be found at the following website:

☒ Construction/ Erosion and Sediment Control (ESC) ordinance complete

☒ Develop written procedures for site inspections and enforcement of sediment and erosion control measures

☒ Develop written procedures for site plan review

☒ Keep a log of catch basins cleaned or inspected

☐ Complete inspection of all stormwater treatment structures

Annual Requirements

- ☒ Annual opportunity for public participation in review and implementation of SWMP
- ☒ Comply with State Public Notice requirements
- ☒ Keep records relating to the permit available for 5 years and make available to the public
- ☐ Properly store and dispose of catch basin cleanings and street sweepings so they do not discharge to receiving waters
- ☐ Annual training to employees involved in IDDE program
- ☒ All curbed roadways have been swept a minimum of one time per year

Bacteria/ Pathogens (Combination of Impaired Waters Requirements and TMDL Requirements as Applicable)

Annual Requirements

*Public Education and Outreach**

- ☒ Annual message encouraging the proper management of pet waste, including noting any existing ordinances where appropriate
- ☐ Permittee or its agents disseminate educational material to dog owners at the time of issuance or renewal of dog license, or other appropriate time
- ☐ Provide information to owners of septic systems about proper maintenance in any catchment that discharges to a water body impaired for bacteria

** Public education messages can be combined with other public education requirements as applicable (see Appendix H and F for more information)*

Chloride

Annual Requirements

Public Education and Outreach

- ☐ Include an annual message in November/ December to private road salt applicators and commercial industrial site owners on the proper storage and application rates of winter deicing material, along with the steps that can be taken to minimize salt use and protect local waterbodies

Solids, Oil and Grease (Hydrocarbons), or Metals

Annual Requirements

Good Housekeeping and Pollution Prevention for Permittee Owned Operations

- ☒ Increase street sweeping frequency of all municipal owned streets and parking lots to a schedule to target areas with potential for high pollutant loads
- ☐ Prioritize inspection and maintenance for catch basins to ensure that no sump shall be more than 50 percent full; Clean catch basins more frequently if inspection and maintenance activities indicate excessive sediment or debris loadings

Use the box below to input additional details on any unchecked boxes above or any additional information you would like to share as part of your self assessment:

The priority ranking of each outfall and interconnection has been completed according to criteria outlined in Chelsea's IDDE plan. The ranking has been informed by annual dry and wet weather sampling completed beginning in 2006 and updated annually. This priority ranking is attached to the email submission of this report.

The City does not own any stormwater treatment structures and therefore is not able to complete any inspections.

The City temporarily stores catch basin cleanings and street sweepings at the DPW yard prior to sampling and disposal at a permitted solid waste landfill. The City will incorporate measures to prevent dust, erosion, and off-site migration during temporary storage when creating its SWPPP for the DPW site and its ongoing drainage redesign project.

Two IDDE training sessions are scheduled to take place on November 13, 2019 and November 15, 2019.

Public education messages encouraging the proper management of pet waste has been published to the City's official Facebook page.

The City currently sweeps all of its streets twice per week between March 1st and December 31st; targeted areas are swept more frequently. It would not be feasible for the City to additionally increase that frequency. The City is finalizing a draft catch basin cleaning optimization plan, that when finalized, will prioritize the cleaning of catch basins such that no sump shall be more than fifty percent full.

Part III: Receiving Waters/Impaired Waters/TMDL

Have you made any changes to your lists of receiving waters, outfalls, or impairments since the NOI was submitted?

Yes ☒ No ☐

If yes, describe below, including any relevant impairments or TMDLs:

The total number of outfalls has changed from 27 to 24. One outfall at the Chelsea River was determined not to be owned by Chelsea. One at Island End was determined to not be an outfall. One outfall at Mill Creek was determined not be owned by Chelsea.

Additionally, the City has no known interconnections. Inter-municipal connections originating in Everett and entering Chelsea's MS4 were previously classified as "interconnections" in Annual Stormwater Monitoring Reports and Chelsea's NOI, despite not meeting this MS4 permit's definition of interconnection .

Part IV: Minimum Control Measures

Please fill out all of the metrics below. If applicable, include in the description who completed the task if completed by a third party.

MCM1: Public Education

Number of educational messages completed during the reporting period: 6

Below, report on the educational messages completed during the first year. For the measurable goal(s) please describe the method/measures used to assess the overall effectiveness of the educational program.

BMP:Meeting

Message Description and Distribution Method:

Continue partnership program with Chelsea GreenRoots Inc. & Mystic River Watershed Org.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

DPW and partners will conduct public forums on a yearly basis and track the number of attendees.

Message Date(s): FY2019

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ☐ No ☒

If yes, describe why the change was made:

BMP:Social Media

Message Description and Distribution Method:

The City published information to its official Facebook page with tips about stormwater management and links to additional information, including posts about proper pet waste management.

Targeted Audience: Residents

Responsible Department/Parties: DPW

Measurable Goal(s):

The number of followers of the City's Facebook page is tracked.

Message Date(s): FY 2019

Message Completed for: Appendix F Requirements ☐ Appendix H Requirements ☐

Was this message different than what was proposed in your NOI? Yes ☒ No ☐

If yes, describe why the change was made:

This message was not included in Chelsea's NOI.

Add an Educational Message

MCM2: Public Participation

Describe the opportunity provided for public involvement in the development of the Stormwater Management Program (SWMP) during the reporting period:

Review of the Stormwater Management Plan was made available by posting the plan on the City's website in June 2019. Once submitted, this Annual Report will be appended to the SWMP and the version on the City's website will be updated accordingly.

Was this opportunity different than what was proposed in your NOI? Yes ☐ No ☒

Describe any other public involvement or participation opportunities conducted during the reporting period:

On June 22, 2019, the City continued its annual hazardous waste program with a household hazardous waste collection day at Chelsea High School for Chelsea residents.

Through a continued relationship with the Mystic River Watershed Association, the Chelsea residents were able to participate in several participation opportunities including volunteer water quality monitoring, invasive species removal events, and public meetings. Over 1,100 volunteers participated in these and other watershed presevation activities in 2018.

MCM3: Illicit Discharge Detection and Elimination (IDDE)

Sanitary Sewer Overflows (SSOs)

Below, report on the number of SSOs identified in the MS4 system and removed during this reporting period.

Number of SSOs identified: 1

Number of SSOs removed: 1

Below, report on the total number of SSOs identified in the MS4 system and removed to date. At a minimum, report SSOs identified since 2013.

Total number of SSOs identified: 16

Total number of SSOs removed: 16

MS4 System Mapping

Describe the status of your MS4 map, including any progress made during the reporting period (phase I map due in year 2):

The City has a comprehensive map of the drainage system, including outfalls, pipes, manholes, catch basins, and inter-municipal connections originating in Everett. The map is updated annually to capture any capital improvement projects and findings from inspections and monitoring.

Screening of Outfalls/Interconnections

If conducted, please submit any outfall monitoring results from this reporting period. Outfall monitoring results should include the date, outfall/interconnection identifier, location, weather conditions at time of sampling, precipitation in previous 48 hours, field screening parameter results, and results from all analyses.

- (●) The outfall screening data is attached to the email submission
- ( ) The outfall screening data can be found at the following website:

Below, report on the number of outfalls/interconnections screened during this reporting period.

Number of outfalls screened: 24

Below, report on the percent of total outfalls/ interconnections screened to date.

Percent of total outfalls screened: 100

Catchment Investigations

If conducted, please submit all data collected during this reporting period as part of the dry and wet weather investigations. Also include the presence or absence of System Vulnerability Factors for each catchment.

- (●) The catchment investigation data is attached to the email submission
- ( ) The catchment investigation data can be found at the following website:

Below, report on the number of catchment investigations completed during this reporting period.

Number of catchment investigations completed this reporting period: 1

Below, report on the percent of catchments investigated to date.

Percent of total catchments investigated: 71

Optional: Provide any additional information for clarity regarding the catchment investigations below:

The City of Chelsea has been performing catchment investigations, as needed, according to wet- and dry-weather sampling results since 2006. Since then, the City has initiated an investigation in every catchment with the presence of likely sewer input indicators. The catchments which have not had sewer indicators present continue to be sampled on an annual basis. The catchment investigation data therefore is based on sampling results rather than System Vulnerability Factors.

IDDE Progress

If illicit discharges were found, please submit a document describing work conducted over this reporting period, and cumulative to date, including location source; description of the discharge; method of discovery; date of discovery; and date of elimination, mitigation, or enforcement OR planned corrective measures and schedule of removal.

- (●) The illicit discharge removal report is attached to the email submission
- ( ) The illicit discharge removal report can be found at the following website:

Below, report on the number of illicit discharges identified and removed, along with the volume of sewage removed during this reporting period.

Number of illicit discharges identified: 1

Number of illicit discharges removed: 1

Estimated volume of sewage removed: unknown [UNITS]

Below, report on the total number of illicit discharges identified and removed to date. At a minimum, report on the number of illicit discharges identified and removed since the effective date of the permit.

Total number of illicit discharges identified: 26

Total number of illicit discharges removed: 20

Optional: Provide any additional information for clarity regarding illicit discharges identified, removed, or planned to be removed below:

The single illicit discharge removed during this reporting period was an overflow from a sewer and therefore the City was unable to provide an estimate of removed sewage volume.

Of the six illicit discharges identified but not yet removed to date, three are being pursued with the private owner, two have had investigation work performed but are awaiting follow up monitoring data analysis, and one is currently in the process of receiving proposals for CCTV work.

Employee Training

Describe the frequency and type of employee training conducted during the reporting period:

Employees have been trained on IDDE and Stormwater Management on an as-needed basis under the 2003 MS4 Permit. Annual employee trainings pursuant to this permit is scheduled to take place on November 13, 2019 and November 15, 2019.

MCM4: Construction Site Stormwater Runoff Control

Below, report on the construction site plan reviews, inspections, and enforcement actions completed during this reporting period.

Number of site plan reviews completed: 7

Number of inspections completed: N/A

Number of enforcement actions taken: N/A

MCM5: Post-Construction Stormwater Management in New Development and Redevelopment

Ordinance Development

Describe the status of the post-construction ordinance required to be complete in year 2 of the permit term:

The City currently has a Sewer and Storm Drains Ordinance which covers post-construction requirements, including language for Operation & Maintenance of stormwater management practices. During FY2020, Chelsea will seek to include more detailed language regarding the design of stormwater management BMPs, the submission of as-built drawings, and the inclusion of Low Impact Design practices.

As-built Drawings

Describe the status of the measures the MS4 has utilized to require the submission of as-built drawings and ensure long term operation and maintenance of completed construction sites required to be complete in year 2 of the permit term:

Requirements for the submission of as-built drawings will be included in changes to the City's post-construction stormwater management ordinance. The new ordinance is planned to be adopted in FY2020.

Street Design and Parking Lots Report

Describe the status of the street design and parking lots assessment due in year 4 of the permit term, including any planned or completed changes to local regulations and guidelines:

The City will begin working on the street design and parking lots assessment in FY2022, as outlined in the NOI. The report will be complete within 4 years of the permit effective date.

Green Infrastructure Report

Describe the status of the green infrastructure report due in year 4 of the permit term, including the findings and progress towards making the practice allowable:

The City will begin working on the green infrastructure report in FY 2022, as outlined in the NOI. The report will be complete within 4 years of the permit effective date.

Retrofit Properties Inventory

Describe the status of the inventory, due in year 4 of the permit term, of permittee-owned properties that could be modified or retrofitted with BMPs to mitigate impervious areas and report on any properties that have been modified or retrofitted:

The City will begin working on the retrofit properties inventory in FY 2022, as outlined in the NOI. The City will identify a minimum of 5 permittee-owned properties that could be modified with BMPs within 4 years of the permit effective date.

MCM6: Good Housekeeping

Catch Basin Cleaning

Describe the status of the catch basin cleaning optimization plan:

The City has drafted a catch basin cleaning optimization plan that has not yet been finalized.

If complete, attach the catch basin cleaning optimization plan or the schedule to gather information to develop the optimization plan:

- [x] The catch basin cleaning optimization plan or schedule is attached to the email submission
- [ ] The catch basin cleaning optimization plan or schedule can be found at the following website:

Below, report on the number of catch basins inspected and cleaned, along with the total volume of material removed from the catch basins during this reporting period.

Number of catch basins inspected: 649

Number of catch basins cleaned: 649

Total volume or mass of material removed from all catch basins: 346 cubic yards

Below, report on the total number of catch basins in the MS4 system, if known.

Total number of catch basins: 1350

If applicable:

Report on the actions taken if a catch basin sump is more than 50% full during two consecutive routine inspections/cleaning events:

Street Sweeping

Describe the status of the written procedures for sweeping streets and municipal-owned lots:

The City currently sweeps each of its streets twice per week between March 1st and December 31st; targeted areas are swept more frequently.

Report on street sweeping completed during the reporting period using one of the three metrics below.

- [x] Number of miles cleaned: 4168
- [ ] Volume of material removed: [UNITS]
- [ ] Weight of material removed: [UNITS]

If applicable:

For rural uncurbed roadways with no catch basins, describe the progress of the inspection, documentation, and targeted sweeping plan:

N/A

Winter Road Maintenance

Describe the status of the written procedures for winter road maintenance including the storage of salt and sand:

The City is working on winter road maintenance procedures that will balance the requirement to minimize the use of salts while prioritizing public safety. The procedures will be completed in FY 2020.

Inventory of Permittee-Owned Properties

Describe the status of the inventory, due in year 2 of the permit term, of permittee-owned properties, including parks and open spaces, buildings and facilities, and vehicles and equipment, and include any updates:

The City completed an inventory and performed stormwater audits of all City-owned property under the 2003 MS4 Permit. The inventory will be updated in FY 2020.

O&M Procedures for Parks and Open Spaces, Buildings and Facilities, and Vehicles and Equipment

Describe the status of the operation and maintenance procedures, due in year 2 of the permit term, of permittee-owned properties (parks and open spaces, buildings and facilities, vehicles and equipment) and include maintenance activities associated with each:

The City is working to create and implement standard operation and maintenance procedures for all municipal activities and facilities. These SOPs will be as specific as possible, following guidelines published by EPA. These written procedures will be completed in FY 2020.

Stormwater Pollution Prevention Plan (SWPPP)

Describe the status of any SWPPP, due in year 2 of the permit term, for permittee-owned or operated facilities including maintenance garages, public works yards, transfer stations, and other waste handling facilities where pollutants are exposed to stormwater:

The City completed a stormwater audit for its DPW maintenance facility under the 2003 MS4 Permit. The City is working to develop a written Stormwater Pollution Prevention Plan for this facility to be completed in FY 2020, as outlined in the NOI.

Below, report on the number of site inspections for facilities that require a SWPPP completed during this reporting period.

Number of site inspections completed: 0

Describe any corrective actions taken at a facility with a SWPPP:

O&M Procedures for Stormwater Treatment Structures

Describe the status of the written procedure for stormwater treatment structure maintenance:

The City does not currently own any stormwater treatment structures. Should the City become an owner of stormwater treatment structures, it will develop O&M procedures.

Additional Information

Monitoring or Study Results

Results from any other stormwater or receiving water quality monitoring or studies conducted during the reporting period not otherwise mentioned above, where the data is being used to inform permit compliance or permit effectiveness must be attached.

- (●) Not applicable
- ( ) The results from additional reports or studies are attached to the email submission

○ The results from additional reports or studies can be found at the following website(s):

If such monitoring or studies were conducted on your behalf or if monitoring or studies conducted by other entities were reported to you, a brief description of the type of information gathered or received shall be described below:

Additional Information

Optional: Enter any additional information relevant to your stormwater management program implementation during the reporting period. Include any BMP modifications made by the MS4 if not already discussed above:

Activities Planned for Next Reporting Period

Please confirm that your SWMP has been, or will be, updated to comply with all applicable permit requirements including but not limited to the year 2 requirements summarized below. (Note: impaired waters and TMDL requirements are not listed below)

Yes, I agree ☒

- Complete system mapping Phase I
- Begin investigations of catchments associated with Problem Outfalls
- Develop or modify an ordinance or other regulatory mechanism for post-construction stormwater runoff from new development and redevelopment
- Establish and implement written procedures to require the submission of as-built drawings no later than two years after the completion of construction projects
- Develop, if not already developed, written operations and maintenance procedures
- Develop an inventory of all permittee owned facilities in the categories of parks and open space, buildings and facilities, and vehicles and equipment; review annually and update as necessary
- Establish a written program detailing the activities and procedures the permittee will implement so that the MS4 infrastructure is maintained in a timely manner
- Develop and implement a written SWPPP for maintenance garages, public works yards, transfer stations, and other waste handling facilities where pollutants are exposed to stormwater
- Enclose or cover storage piles of salt or piles containing salt used for deicing or other purposes
- Develop, if not already developed, written procedures for sweeping streets and municipal-owned lots
- Develop, if not already developed, written procedures for winter road maintenance including storage of salt and sand
- Develop, if not already developed, a schedule for catch basin cleaning
- Develop, if not already developed, a written procedure for stormwater treatment structure maintenance

- Develop a written catchment investigation procedure *(18 months)*

Annual Requirements

- Annual report submitted and available to the public
- Annual opportunity for public participation in review and implementation of SWMP
- Keep records relating to the permit available for 5 years and make available to the public
- Properly store and dispose of catch basin cleanings and street sweepings so they do not discharge to receiving waters
- Annual training to employees involved in IDDE program
- Update inventory of all known locations where SSOs have discharged to the MS4 in the last 5 years
- Continue public education and outreach program
- Update outfall and interconnection inventory and priority ranking and include data collected in connection with the dry weather screening and other relevant inspections conducted
- Implement IDDE program
- Review site plans of construction sites as part of the construction stormwater runoff control program
- Conduct site inspection of construction sites as necessary
- Inspect and maintain stormwater treatment structures
- Log catch basins cleaned or inspected
- Sweep all uncurbed streets at least annually

Provide any additional details on activities planned for permit year 2 below:

Part V: Certification of Small MS4 Annual Report 2019

40 CFR 144.32(d) Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: Thomas G. Ambrosino

Title: City Manager

Signature: Thomas G. Ambrosino

Date: 9/25/19

[Signatory may be a duly authorized representative]

APPENDIX K

Sanitary Sewer Overflow Inventory

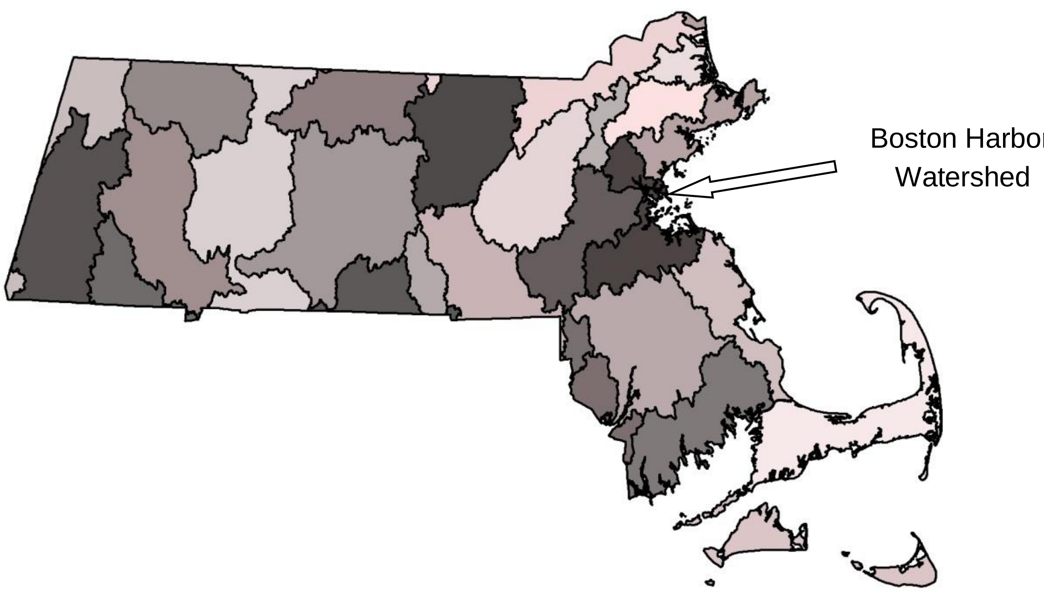
Chelsea, Massachusetts
SSO Summary Table

Date	Location	Time Start	Time End	Cause	Volume Estimate (gallons)	SSO to:	Corrective Action Taken	Date of Corrective Action
08/01/13	7 Jones Ave.	8:55 AM	10:35 AM	Block in City Main	<1000	Backup into residence; to sump pump; to city CB; to combined sewer	Cleared sewer block. Cleaned and disinfected area.	8/1/2013
12/29/13	73 Addison St.	6:00 PM	unknown	Block in Main / Heavy Rain	10,000 - 100,000	Basement	repaired sewer/ cleared blockage	12/29/2013
01/25/14	59 Essex St.	6:00 PM	unknown	Block in City Main	<10,000	Basement	repair in street	1/27/2014
12/12/14	193 Nichols St.	8:30 AM	11:30 AM	Block in Main / Heavy Rain	<1,000	Basement	blockage cleared	12/12/2014
03/16/15	22-24 Washington Ave.	2:30 PM	3:30 PM	Block in City Main	200	Basement	blockage cleared	3/17/2015
02/16/16	300 Third St.	3:00 PM	4:00 PM	Block in City Main	25,000	Owner pumped to catch basin tributary to Carter St. PS; ultimate discharge Island End River.	blockage cleared	2/16/2016
03/02/16	Eleanor & Clark	9:00 AM	10:30 AM	Block in City Main	<1,000	From SMH to CB; to separate drain; back into combined sewer at Eleanor/Crescent. To Chelsea Creek	blockage cleared	3/2/2016
04/11/16	75 Boatswains Way	6:55 AM	8:30 AM	Block in City Main	1,000	From SMH to CB; discharge to Island End River.	blockage cleared	4/11/2016
05/25/16	330 Third St.	7:00 AM	9:40 AM	Block in City Main	15,000	Backed up into CB connected to combined sewer; discharge back to CS.	blockage cleared	5/26/2016
06/22/16	Everett & Poplar	8:15 AM	unknown	Block/ collapse in City Main	10,000	Overland to city street; to city CB; back to combined sewer	blockage cleared	6/23/2016
09/09/16	41-43 Central Ave.	8:00 AM	unknown	Block/collapse in City Main	100	Basement	excavate/repair	9/9/2016
10/22/16	Normandy Rd.	2:30 PM	10:00 PM	Block in Main / Heavy Rain	unknown	Backup ponded and receeded via CBs.	blockage cleared	10/22/2016
04/27/17	79 & 87 Gillooly Rd.	8:50 AM	10:30 AM	Block in City Main	<2000	Basement	blockage cleared	4/24/2017
07/18/17	165 Blosson St. 35 Central St. 53 Columbus St. 175 Hawthorne St. 227 Marginal St. 75 Shawmut St. 207 Shurleff St. 62, 64, 78, 166, 185 Washington Ave. 126 Watts St.	5:00 PM	7:00 PM	Heavy Rain	unknown	Basement	sewers and drains were inspected and affected residents' concerns were recorded	7/18/2017
09/30/17	21 Jones Ave.	5:00 PM	7:30 PM	Block in Main / Heavy Rain	2,500- 3,000	Basement	blockage cleared	9/30/2017
03/22/19	149 Everett Ave.	11:45 AM	1:00 PM	Block/collapse in City Main	>10,000	CB surcharge; flow to CB on Combined Sewer	manhole-to-manhole sewer replacement	3/24/2019
09/31/2020	12 Hawthorne St.	11:00 AM	12:00 PM	old infrastructure and work in the area	aprox 400 gallons	basement of 12 Hawthorne St	sewer was redirected towards Marginal	10/1/2020

APPENDIX L

Pathogen TMDL for the Boston Harbor

Final Pathogen TMDL for the
Boston Harbor, Weymouth-Weir, and Mystic Watersheds
October 2018
(Control Number CN 157.1)



Prepared as a cooperative effort by:

Massachusetts DEP
1 Winter Street
Boston, Massachusetts 02108

USEPA New England Region 1
1 Congress Street, Suite 1100
Boston, Massachusetts 02114

ENSR International (now AECOM)
2 Technology Park Drive, Westford, MA 01886

NOTICE OF AVAILABILITY

Limited copies of this report are available at no cost by written request to:

Massachusetts Department of Environmental Protection (MassDEP)
Division of Watershed Management
8 New Bond Street
Worcester, Massachusetts 01606

This report is also available on MassDEP's web page http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html.

A complete list of reports published since 1963 is updated annually and printed in July. This list, titled "Publications of the Massachusetts Division of Watershed Management (DWM) – Watershed Planning Program, 1963-(current year)", is also available by contacting Robin Murphy at robin.murphy@state.ma.us or by writing to the DWM at the address above.

DISCLAIMER

References to trade names, commercial products, manufacturers, or distributors in this report constituted neither endorsement nor recommendations by the Division of Watershed Management for use.

Acknowledgement
This report was developed by ENSR through a partnership with Resource Triangle Institute (RTI) contracting with the United States Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection Agency under the National Watershed Protection Program. The report follows the same format and methodology for previously approved bacteria TMDLs (Charles, Cape Cod, Buzzards Bay, North Coastal, and South Coastal).

Total Maximum Daily Loads for Pathogens
Boston Harbor, Weymouth-Weir, and Mystic Watersheds

Key Features: Pathogen TMDL for the Boston Harbor, Weymouth-Weir, and Mystic Watersheds
Location: EPA Region 1
Land Type: New England Coastal
303(d) Listings: Pathogens

Boston Harbor Sub-basin:
Winthrop Bay (MA70-10)
Boston Inner Harbor (MA70-02)
Pleasure Bay (MA70-11)
Dorchester Bay (MA70-03)
Quincy Bay (MA70-04; MA70-05)
Hingham Bay (MA70-06; MA70-07)
Hull Bay (MA70-09)
Boston Harbor (MA70-01)

Weymouth-Weir Sub-basin:
Cochato River (MA74-06)
Monatiquot River (MA74-08)
Town Brook (MA74-09)
Town River Bay (MA74-15)
Hingham Harbor (MA74-18 (formerly MA70-08))
Weymouth Fore River (MA74-14)
Old Swamp River (MA74-03)
Mill River (MA74-04)
Weymouth Back River (MA74-05; MA74-13)
Weir River (MA74-02; MA74-11)

Mystic River Sub-basin[1]:

Aberjona River (MA71-01)
Mystic River (MA71-02; MA71-03)
Alewife Brook (MA71-04)
Malden River (MA71-05)
Mill Brook (MA71-07)
Chelsea River (MA71-06)
Winn Brook (MA71-09)[2]
Mill Creek (MA71-08)[2]
Unnamed Tributary (MA71-13)[2]
Belle Isle Inlet (MA71-14)[2]

[1] Ell Pond (MA71014) and Judkins Pond (MA71021) were removed from the 2005 Draft Boston Harbor Watershed TMDL. The methodology used to determine the TMDLs provided in this report is for rivers and estuaries and is not appropriate for lakes and ponds.
[2] New Pathogen Impaired Segments that were identified in the Integrated Report (2006 through 2016) after the public comment period for this TMDL are included in the Boston Harbor Addendum, CN# 157.2 that is in the process of being developed.

Data Sources:

- MassDEP "Boston Harbor 1999, and 2004-2008 Water Quality Assessment Reports"
- Massachusetts Water Resources Authority (MWRA)
- Massachusetts Division of Marine Fisheries (DMF)
- Department of Public Health Beaches Data (DPH)
- Massachusetts Coastal Zone Management (CZM)
- Department of Conservation and Recreation (DCR)
- Boston Water and Sewer Commission, CSO and Stormwater Control Progress Information
- Mystic River Watershed Association (MyRWA);
- Environmental Monitoring for Public Access and Community Tracking Project (EMPACT) Water Quality Data

Data Mechanism: Massachusetts Surface Water Quality Standards for Bacteria; The Federal Beach Act; Massachusetts Department of Public Health Bathing Beaches; Massachusetts Division of Marine Fisheries Shellfish Sanitation and Management; Massachusetts Coastal Zone Management

Monitoring Plan: Massachusetts Watershed Five-Year Cycle; Division of Marine Fisheries; Massachusetts Coastal Zone Management

Control Measures: Watershed Management; Phase I and Phase II Stormwater Management (e.g., illicit discharge removals, public education/behavior modification); Combined Sewer Overflow (CSO) & Sanitary Sewer Overflow (SSO) Abatement; Best

Management Practices (BMPs); No Discharge Areas; By-laws; Ordinances; Septic System Maintenance/Upgrades

ACRONYM LIST

7Q10	Seven Day Ten Year Low Flow
ACEC	Area of Critical Environmental Concern
BMP	Best Management Practice
cfu	colony forming units
CSO	Combined Sewer Overflow
CWA	Clean Water Act, Federal
CWA § 303(d)	Section 303 (d) of the CWA and the implementing regulations at 40 CFR 130.7 require states to identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and to prioritize and schedule them for the development of a total maximum daily load (TMDL).
CZM	Coastal Zone Management
DCR	Department of Conservation and Recreation
DFG or MA DFG	Division of Fish and Game
DMF or MA DMF	Division of Marine Fisheries
DWM	Division of Watershed Management
EEA	Energy and Environmental Affairs
EMC	Event Mean Concentration
EPA or US EPA	United States Environmental Protection Agency
EQIP	Environmental Quality Incentive Program
GIS	Geographic Information System
IDDE	Illicit Discharge Detection and Elimination System
LA	Load Allocation
LID	Low Impact Development
LTCP	Long Term Control Plan
MassBays	Massachusetts Bays Estuary Program
DPH or MADPH	Massachusetts Department of Public Health
MassDEP	Massachusetts Department of Environmental Protection
MWRA	Massachusetts Water Resources Authority
MDC	Metropolitan District Commission
MEP	Maximum Extent Practicable
MEPA	Massachusetts Environmental Policy Act
MG	Million Gallons
MHD	Massachusetts Highway Department
MOS	Margin of Safety
MPN	Most Probable Number
MSD	Marine Sanitary Device
MS4	Municipal Separate Storm Sewer Systems
NDA	No Discharge Area
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
ORW	Outstanding Resource Water
POTW	Publically Owned Treatment Works
SRF	State Revolving Fund
SSO	Sanitary Sewer Overflows
SWMP	Stormwater Management Plan
SWPP	Stormwater Program Plan
TBHA	The Boston Harbor Association
TMDL	Total Maximum Daily Load

TSS	Total Suspended Solids
USACOE	United States Army Corps of Engineers
WLA	Waste Load Allocation
WPP	Watershed Planning Program
WQA	Water Quality Assessment
WQS	Water Quality Standards
WWTP	Wastewater Treatment Plant

Executive Summary

Purpose and Intended Audience

This document provides a framework to address bacterial pathogens and other fecal-related pollution in surface waters of Massachusetts. Pathogens refers to the set of indicator bacterial organisms that includes fecal coliform, Escherichia coli (*E. coli*), and enterococci, and represent a threat to human health and the environment. Although not all bacteria are pathogenic the words “pathogens” and “bacteria” are used interchangeably in this TMDL. Pathogen contamination of our surface waters is most often a direct result of the improper management of human wastes, excrement from barnyard animals, pet feces and agricultural applications of manure. It can also result from large congregations of birds such as geese and gulls. Discharges of inadequately treated boat waste are of particular concern in urban coastal areas. Inappropriate disposal of human and animal wastes can degrade aquatic ecosystems and negatively affect public health. Pathogen contamination can also result in closures of shellfish beds, bathing beaches, and drinking water supplies. The closure of such important public resources can erode quality of life and diminish property values.

Coastal communities rely on clean, productive, aesthetically pleasing marine and estuarine waters for swimming, boating, fishing and tourism. Failure to reduce and control bacterial contamination results in illness in humans, closures of shellfishing areas and bathing beaches, fish kills, unpleasant odors and visible scum. Total Maximum Daily Loads (TMDLs) for pathogens have been established for waterbody segments within the Boston Harbor, Mystic, Weir and Weymouth Watersheds. This TMDL will be used to set permit limits and provide stakeholders a document to identify bacterial sources and take appropriate actions to reduce their effects.

Who should read this document?

The following groups and individuals can benefit from the information in this report:

a) Towns and municipalities, especially National Pollutant Discharge Elimination System (NPDES) Phase I and Phase II regulated communities, that are required by law to address stormwater and/or combined sewage overflows (CSOs), Sanitary Sewer Overflows (SSO) and other sources of contamination (e.g., broken sewerage pipes and illicit connections) that contribute to a waterbody’s failure to meet Massachusetts Water Quality Standards for pathogens;

b) watershed groups that wish to pursue funding to identify and/or mitigate sources of pathogens in their watersheds;

c) harbormasters, public health officials and/or municipalities that are responsible for monitoring, enforcing or otherwise mitigating contamination that results in beach and/or shellfish closures or results in the failure of other surface waters to meet Massachusetts standards for pathogens;

d) citizens who wish to become more aware of pollution issues and who may be interested in helping build local support for implementation of remediation measures; and

e) government agencies that provide planning, technical assistance, and funding to groups for remediation of pollution including pathogens.

Boston Harbor Watershed

The Boston Harbor Watershed, encompassing 293 square miles (m^2) of land area, including all or part of 39 municipalities, as well as downtown Boston, is located in and around historic Boston Harbor. The watershed includes the Mystic River Watershed to the north, and the Neponset, Weymouth and Weir River Watersheds to the south. This report includes information regarding each of these sub-basins with the exception of the Neponset River sub-basin. The Massachusetts Department of Environmental Protection (MassDEP or DEP) prepared a TMDL for the Neponset River sub-basin in 2002 and an addendum in 2012. Both reports are available on the MassDEP website at http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html. The Charles River is not included in this report because it has its own watershed and TMDLs. The TMDLs in this report do not include fresh water lakes or ponds.

Boston Harbor Subwatershed- The Boston Harbor Proper Watershed, is approximately 176 square miles and includes estuary segments totaling 40.65 mi^2. Subwatersheds in Boston Harbor include Boston Inner Harbor, Dorchester Bay, Quincy Bay, Hull Bay, Hingham Bay, Winthrop Bay, Pleasure Bay, and Boston Harbor. This TMDL includes ten impaired estuarine segments, or 100% of the estuaries within Boston Harbor proper.

Weymouth and Weir Subwatershed - The Weymouth and Weir River Basin is located in the southeast region of the Boston Harbor Watershed. The subwatershed includes roughly 38.2 river miles, 23.7 miles are pathogen impaired. The subwatershed includes Weymouth Fore and Back Rivers, Weir River, Monatiquot River, Old Swamp River, and Mill River and estuarine segments also include Hingham Harbor and Town River Bay. This TMDL covers five estuarine and seven impaired river segments.

Mystic River Subwatershed - The Mystic River is located in the northeast region of the Boston Harbor Watershed. The subwatershed includes roughly 24 impaired river miles out of a total of 27.6 river miles, including the Aberjona River, Alewife Brook, Malden River, Chelsea River, and the main stem of the Mystic River. Four out of a total of five estuaries are impaired in the subwatershed. This TMDL covers four estuarine and seven impaired river segments.

Boston Harbor is a highly urbanized watershed with >60% of its landuse developed. Historically, water quality problems have been attributed to point source discharges from wastewater treatment plants (WWTPs) and combined sewer overflows (CSOs) and stormwater runoff from urban areas. Growth pressures continue to affect the Boston Harbor Watersheds, as many of the communities face challenges to handle the new growth. Growth pressures are caused by population increases as well as increased encroachment on the land from high-density redevelopment, residential construction, commercial and industrial facilities. To support the increased growth, increased municipal services, roadways, and recreational facilities and parks are needed to support the growing populace. For example, between 2010 and 2015, the City of Boston alone, grew by nearly 50,000 people, or 7%, (617,680 in 2010 and 667,137 in 2015).

Bacteria pollution problems in the segments covered in this report persist over much of the area due to a combination of point and non-point source pollution. Point sources include wastewater treatment plant effluent, piped discharges of stormwater from Phase I and Phase II communities and discharges from CSOs and SSOs. Non-point sources may include stormwater runoff from, failing septic systems, illicit connections, wildlife and pet wastes, boat and marina wastes. Most of this watershed is geographically oriented to coastal estuarine areas, which historically were rich in shellfishing reserves. To protect human health the water quality standards for bacteria required to support shellfishing are particularly stringent, and therefore the water quality conditions have resulted in many of these areas being closed for decades for this particular use.

Progress in Reducing Bacteria Sources In the Watershed

Significant progress has been made in the last 15 years to address bacterial contamination of Boston Harbor. Interventions to address water quality issues have been carried out by water authorities (MWRA, Boston and Water Sewer Commission (BWSC)), Towns, organizations, state agencies, and citizens to resolve various water quality problems in the basin. Nutrient and bacteria identification and source discovery has been the emphasis of many of the interventions that have been carried out. The principal contributors in general are effects of CSOs, SSOs, and overland stormwater flows as these pick up various pollutants, such as wildlife and pet wastes, and garbage, etc. Sources of bacteria are in the process of being addressed through the focused efforts of MassDEP and the regulated community that have targeted remediation efforts to address the bacteria loads from CSO and illicit connections to stormdrain systems. Particularly strident efforts are necessary in controlling pollutants such as bacteria because the geography of this watershed is shaped as such that most of it is closely oriented (within a few miles) to coastal/ estuarine locations that have a high proportion of potential shellfishing usage. The following paragraphs include some highlights of work that has been done:

In August 2006, the Executive Office of Environmental Affairs formally announced the coastal area, encompassing Boston, Medford, Quincy, Braintree, Weymouth, Hingham, and Cohasset, became a No Discharge Area (NDA), meaning that any discharge of boat sewage is prohibited (Figure 2-3). This was enacted to better protect the waters from receiving nutrient and bacterial wastes from marine vessels operating within these waters (EOEA 2006).

By 2001, upgrades were completed to the Deer Island Wastewater Treatment Plant and relocation of the outfall discharge of treated wastewater was placed 9.5 miles out into the ocean. The Deer Island Wastewater Treatment Plant receives sewage from 43 greater Boston communities and has a higher capacity than the combined capacities of the former Deer Island and Nut Island facilities, greatly reducing back-ups and overflows throughout the system (MWRA 2008).

Implementation of the Massachusetts Water Resources Authority Long-Term CSO Control Plan (MWRA 2016) has dramatically reduced CSO flows and loads into the Boston Harbor watershed. The MWRA has completed all of the 35 projects in their Long-Term Control Plan, closed 34 of the 84 CSO outfalls that were active at plan inception, eliminated CSO discharges to sensitive use areas, and reduced system wide CSO discharge volume in a typical rainfall year by 86%, from 3.3 billion gallons in 1988 to 0.49 billion gallons as of 2015. Pursuant to the federal court order, MWRA is now planning an assessment phase during the years 2018 – 2020, where the MWRA will conduct field investigations and sewer system modeling and monitoring to confirm the CSO benefits estimated in the Long-Term CSO Control Plan.

There have been significant improvements to Boston Harbor since the wastewater upgrades were completed and the MWRA Deer Island WWTP discharge location was moved further offshore into Massachusetts Bay. These include: 30-55% reductions in concentrations of phosphorus and nitrogen, 25-30% reductions of chlorophyll, 30% reduction of particulate organic carbon, and 5% increases in bottom water dissolved oxygen levels (Taylor 2006). This translates to other data in Boston Harbor such as improvements in bacteria levels as well (NEERS 2006). Subsequent reports and studies show further improvements in all these parameters, with 2013 nitrogen and phosphorus concentrations the lowest measured since 1995, bottom-water concentrations of dissolved oxygen the highest since wastewater discharges ended in the Harbor, and symptoms of over-enrichment within the Harbor significantly improved (Taylor 2011; Taylor 2013).

Initiatives in the Weymouth and Weir sub-basin have been undertaken to reduce SSOs and infiltration and inflow (I&I). These initiatives include reducing overflows from the MWRA Braintree-Weymouth Interceptor and the Braintree and Weymouth municipal sewer systems. The MWRA Braintree-Weymouth Relief Facilities increased the system's capacity and streamlined the route the wastewater takes from the communities directly to the Deer Island Treatment Plant. (MWRA 2010, MWRA 2015).

The Mystic River Watershed Association (MyRWA) has sponsored water quality monitoring efforts throughout the watershed for more than 15 years. These data have helped identify and monitor areas with high bacteria counts. MWRA also has conducted receiving water sampling in Boston Harbor and the Alewife/Mystic River watershed since the 1990's, and has monitored water quality under both wet and dry weather conditions.

In the last several years, MyRWA has conducted hotspot outfall pipe monitoring, and has identified stormdrain outfalls discharging high bacteria counts. Water quality problems have been identified and mitigation actions implemented, with many more in progress. In December 2005, EPA issued administrative orders to the Cities of Chelsea, Everett, Malden, Revere, and Medford, based on evidence that those communities had illicit discharges to the Mystic River or its tributaries. The orders required each of these communities to develop comprehensive Illicit Discharge Detection and Elimination (IDDE) Plans (Brander 2015). MassDEP has active enforcement actions with the City of Cambridge, the town of Arlington, and the City of Somerville, all of which are targeting illicit wastewater connections to their stormdrain systems.

In the Alewife Brook segment (MA71-04), five formerly active CSO discharges have been permanently closed, with six presently active CSO discharges permitted to the cities of Somerville and Cambridge, as well as to the MWRA. The Alewife Brook CSO Control Plan is predicted to reduce annual CSO volume to the Alewife Brook by 85% in a typical year, from 50 million gallons in 1997 to 7.3 million gallons in 2016.

Bacterial Water Quality Indicators

The use of the terms "pathogens" or "bacteria" in this report is used to refer to bacteriological data collected and analyzed for Fecal coliform, *E. coli*, or Enterococci. Massachusetts Surface Water Quality Standards (WQS), 314 CMR 4.00 were revised in 2007, replacing Fecal coliform as the water quality indicator for both fresh and marine waters with ***E. coli* for fresh water** and **Enterococci for fresh and marine waters** (MassDEP 2007). MWRA and MyRWA also follow the Massachusetts WQS. **Fecal coliform** is the water quality indicator used by Division of Marine Fisheries (DMF) for shellfish harvesting in coastal-estuarine segments. Readily available data for the 303(d)[1] listed segments in Boston Harbor, Weir, Weymouth, and the Mystic subbasins are listed in tables in Section 4 of this report.

Bacterial Implementation Priorities

In an effort to provide guidance for setting bacterial implementation priorities within the Boston Harbor Watershed, a summary table is provided. Table ES-1 though ES-3 provides a prioritized lists of pathogen-impaired segments that may require additional bacterial source tracking work and stepwise implementation of structural (e.g., fixing failing infrastructure) and non-structural (e.g., administrative controls) Best Management Practices (BMP's). Since limited source information and data are available in each impaired segment, a simple scheme was used to prioritize segments based on bacteria concentrations and designated uses. Depending on the particular bacteria indicator sampled and analyzed by the particular organization, the data listed are either Fecal coliform, *E. coli*, or Enterococci.

High priority was assigned to those segments where dry or wet weather concentrations were equal to or greater than 10,000 col/100 ml since such high levels generally indicate a direct sanitary source. Medium priority was assigned to segments where concentrations ranged from 1,000 to 9,999 col/100ml since this range of concentrations generally indicates a direct sewage source that may get diluted in the conveyance system. Low priority was assigned to segments where concentrations were observed less than 1,000 col/100 ml. It should be noted that in all cases, waters identified in Table ES-1 to ES-3 exceed the water quality standards for bacteria, and are thereby considered impaired.

Also, prioritization is adjusted upward based on proximity of waters, within the segment, to sensitive areas such as Outstanding Resource Waters (ORW's), or designated uses that require higher water quality standards than Class B, such as public water supply intakes, public swimming areas, or shellfishing areas. Best professional judgment was used in determining this upward adjustment.

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[1] Section 303(d) of the Clean Water Act requires states to identify those waterbodies that are not expected to meet surface water quality standards after the implementation of technology-based controls and to prioritize and schedule them for the derivation of total maximum daily loads (TMDLs).

Generally speaking, waters that were determined to be lower priority based on the numeric range identified above were elevated up one level of priority if that segment were adjacent to or immediately upstream of a sensitive use. An asterisk * in the priority column of the specific segment in Tables ES-1 to ES-3 would indicate this situation.

MassDEP believes that segments ranked as high priority in Tables ES-1 to ES-3 are indicative of the potential presence of raw sewage and therefore they pose a greater risk to the public. These segments should continue to be subject to aggressive efforts to identify and eliminate illicit wastewater connections to the stormdrain systems. CSOs and Sanitary Sewer Overflows (SSOs) have historically been a significant contributor to bacteria pollution to the Harbor area, and the MWRA CSO Program Assessment that will be conducted under the federal court order, together with the information being gathered under the terms and conditions of the CSO Variance should be focused on determining the impacts of remaining CSO discharges, and the feasibility of higher levels of CSO control. Eliminating illicit connections, reducing the risk of SSO events, and fixing failing infrastructure is tantamount to improving bacterial water quality. As the bacteria loads from SSOs and CSOs continue to decline it is anticipated that stormwater discharges from Phase I and Phase II regulated communities will remain the predominate source of bacteria pollution along with non-point sources such as failing septic systems.

A top priority activity for finding illicit connection sources should be bacteria source tracking activities during dry weather in those segments where sampling activities show elevated levels of bacteria. Identification and remediation of dry weather bacteria sources is usually more straightforward and successful than tracking and eliminating wet weather sources. Finding and eliminating direct and indirect illicit bacteria sources will result in a dramatic reduction of bacteria concentration in the segment in both dry and wet-weather.

Finding the bacteria related pollution sources from failed infrastructure and fixing these poses real challenges. Overland stormwater runoff greatly exacerbates the pollution from failed infrastructure sources. Segments that remain impaired during wet weather should be evaluated for stormwater BMP implementation opportunities starting with less costly non-structural practices first (such as street sweeping, catch basin cleaning, and/or managerial approaches using local regulatory controls), and lastly, more expensive structural measures. Unfortunately, many failed infrastructure problems require the more expensive structural repair measures to be considered. This would require additional study to identify the most cost efficient and effective technology.

Table ES 1-1 Pathogen Impaired Segment Priorities- Boston Harbor Subwatershed

Segment ID	Segment Name Waterbody Class	Segment Size(m^2)	Segment Description	Priority	Indicators
MA70-10	Winthrop Bay, Class SB	1.65 mi^2	From the tidal flats at Coleridge Street, Boston (East Boston) to a line between Logan International Airport and Point Shirley, East Boston/Winthrop	High*, Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA70-02	Boston Inner Harbor, Class SB/CSO[1]	2.56 mi^2	From the Mystic and Chelsea rivers, Chelsea/Boston, to the line between Governors Island and Fort Independence, Boston (East Boston), including Fort Point, Reserved, and Little Mystic Channels).	High*,Shell-fishing	Enterococci, Fecal Coliform
MA70-11	Pleasure Bay, Class SB	0.22 mi^2	A semi-enclosed bay, the flow restricted through two channels between Castle and Head islands, Boston	High*, Shellfishing, Public Swimming	Enterococci, Fecal Coliform,
MA70-03	Dorchester Bay, Class SB	3.46 mi^2	From the mouth of the Neponset River, Boston/Quincy to the line between Head Island and the north side of Thompson Island and the line between the south point of Thompson Island, Boston and Chapel Rocks, Quincy.	High*, Shell-Fishing, Public Swimming	Enterococci, Fecal Coliform
MA70-04	Quincy Bay, Class SA	1.52 mi^2	From Bromfield Street near the Wollaston Yacht Club, Quincy, northeast to N42 17.3 W71 00.1, then southeast to Houghs Neck near Sea Street and Peterson Road (formerly referred to as the "Willows") Quincy.	Medium* Shell-fishing	Enterococci, Fecal Coliform
MA70-05	Quincy Bay, Class SB	4.41 mi^2	Quincy Bay, north of the class SA waters (segment MA70-04), Quincy to the line between Moon Head and Nut Island, Quincy	High*, Dry Weather Problems, Shellfish, Public Swimming	Enterococci, Fecal Coliform
MA70-06	Hingham Bay, Class SB	0.96 mi^2	The area north of the mouth of the Weymouth Fore River extending on the west along the line from Prince Head just east of Pig Rock to the mouth of the Weymouth Fore River (midway between Lower Neck and Manot Beach), Quincy	Medium* Shellfish.	Fecal Coliform
MA70-07	Hingham Bay, Class SB	4.8 mi^2	The area defined between Peddocks Island and Windmill Point; from Windmill Point southeast to Bumkin Island; from Bumkin Island southeast to Sunset Point; from Sunset Point across the mouth of the Weir River to Worlds End; from Worlds End across the mouth of Hingham Harbor to Crow Point; from Beach Lane, Hingham across the mouth of the Weymouth Back River to Lower Neck; and from Lower Neck midway across the mouth of the Weymouth Fore River	Medium* Shellfish.	Fecal Coliform
MA70-09	Hull Bay, Class SB	2.48 mi^2	The area defined east of a line from Windmill Point, Hull to Bumpkin Island, Hingham and from Bumpkin Island to Sunset Point, Hull	Medium* Shellfish.	Fecal Coliform
MA70-01	Boston Harbor, Class SB	18.59 mi^2	The area defined by a line from the southerly tip of Deer Island to Boston Lighthouse on Little Brewster Island, then south to Point Allerton;	High*, Shellfish.	Fecal Coliform

Segment ID	Segment Name Waterbody Class	Segment Size(m^2)	Segment Description	Priority	Indicators
			across Hull and West guts; across the mouths of Quincy and Dorchester Bays, Boston Inner Harbor and Winthrop Bay (including Presidents Roads and Nantasket Roads)		

[1] The remaining CSO discharges in this segment are permitted under the SB/CSO designation, subject to the limitations on CSO activations and volumes in the final MWRA Long-Term CSO Control Plan.

Table ES 1-2 Pathogen Impaired Segment Priorities - Weir & Weymouth Subwatershed

Segment ID	Segment Name	Segment Size (mi or m^2)	Segment Description	Priority	Indicators
MA74-06	Cochato River, Class B	4.1 mi	Outlet Lake Holbrook, Holbrook to confluence with Farm and Monatiquot Rivers, Braintree (through former pond segment Ice House Pond MA74028). (SARIS note: the upper portion of this segment is comprised of three surface waters: unnamed tributary from the outlet of Lake Holbrook, portion of Mary Lee Brook, portion of Glovers Brook).	Medium	*E. coli*
MA74-08	Monatiquot River, Class B	4.4 mi	Headwaters at confluence of Cochato and Farm Rivers, Braintree to confluence with Weymouth Fore River at Commercial Street, Braintree	Medium, Wet and Dry Weather Problems	*E. coli*
MA74-09	Town Brook, Class B/SB	3.5 mi	Outlet Old Quincy Reservoir, Braintree to confluence with Town River Bay north of Route 3A, Quincy (includes "The Canal"/Town River) (portions culverted underground).	High, Wet and Dry Weather Problems	*E. coli*
MA74-15	Town River Bay, Class SA	0.46 mi^2	From the headwaters at the Route 3A bridge, Quincy to the mouth at the Weymouth Fore River between Shipyard and Germantown Points, Quincy.	High* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-14	Weymouth Fore River, Class B/SB	2.29 mi^2	Commercial Street, Braintree to mouth (eastern point at Lower Neck, Weymouth and western point at Wall Street on Houghs Neck, Quincy	High* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-03	Old Swamp River, Class A (PWS Trib, ORW)	5.2 mi	Headwaters just west of Pleasant Street and north of Liberty Street, Rockland to inlet Whitmans Pond, Weymouth	High*, Public Water Supply	*E. coli*, Enterococci
MA74-04	Mill River, Class A (PWS Trib, ORW)	3.4 mi	Headwaters, west of Route 18 and south of Randolph Street, Weymouth to inlet Whitmans Pond, Weymouth (portions culverted underground).	High* Public Water Supply Tributary	*E. coli*
MA74-05	Weymouth Back River, Class B (ORW)	0.4 mi	Outlet Elias Pond, Weymouth to the base of the fish ladder north of Commercial Street, Weymouth	High* ORW Wet and Dry Weather Problem	*E. coli*
MA74-13	Weymouth Back River, Class SA	0.86 mi^2	From the base of the fish ladder north of Commercial Street, Weymouth to mouth between Lower Neck to the west and Wompatuck Road, Hingham.	Medium* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-18	Hingham	1.12 mi^2	Hingham Harbor, inside a line from Crows Point	Medium*	Enterococci,

Segment ID	Segment Name	Segment Size (mi or m2)	Segment Description	Priority	Indicators
	Harbor, Class SA		to Worlds End, Hingham (formerly reported as MA70-08).	Shellfishing, Public Swimming	Fecal Coliform
MA74-02	Weir River, Class B/SA	2.7 mi	Headwaters at confluence of Crooked Meadow River and Fulling Mill Brook, Hingham to Foundry Pond Outlet, Hingham (through former pond segment Foundry Pond MA74011).	Medium	*E. coli*
MA74-11	Weir River, Class SA	0.83 mi	From Foundry Pond outlet, Hingham to mouth at Worlds End, Hingham and Nantasket Road near Beech Avenue, Hull (including unnamed tributary from outlet Straits Pond, Hingham/Hull).	Medium* Shellfishing, Public Swimming	Enterococci, Fecal Coliform

Table ES 1-3 Pathogen Impaired Segment Priorities- Mystic Subwatershed

Segment ID	Segment Name	Segment size(mi or m2)	Segment Description	Priority	Indicator
MA71-01	Aberjona River, Class B	9.1 mi.	Source just south of Birch Meadow Drive, Reading to inlet Upper Mystic Lake at Mystic Valley Parkway, Winchester (portion culverted underground). (through former pond segments Judkins Pond MA71021 and Mill Pond MA71031).	High, Wet Weather	*E. coli*, Entercocci
MA71-04	Alewife Brook, Class B CSO Variance[1]	2.3 mi.	Outlet of Little Pond, Belmont to confluence with Mystic River, Arlington/Somerville (portion in Belmont and Cambridge identified as Little River with name changing to Alewife Brook at Arlington corporate boundary).	High, CSO, Dry Weather Problem Wet Weather	*E. coli*, Enterococci
MA71-05	Malden River, Class B	2.3 mi.	Headwaters south of Exchange Street, Malden to confluence with Mystic River, Everett/Medford.	High, Wet and Dry Weather Problems	*E. coli*, Enterococci
MA71-02	Mystic River, Class B** CSO Variance[1]	4.9 mi.	Outlet Lower Mystic Lake, Arlington/Medford to Amelia Earhart Dam, Somerville/Everett	High, CSO. Wet and Dry Weather Problems	*E. coli*, Enterococci
MA71-06	Chelsea River, Class SB/CSO[2]	0.38 mi^2	From confluence with Mill Creek, Chelsea/Revere to confluence with Boston Inner Harbor, Mystic River, Chelsea/East Boston/Charlestown	High*, Wet and Dry Weather Problems	Fecal Coliform
MA71-03	Mystic River, Class SB/CSO[2]	0.49 mi^2	Amelia Earhart Dam, Somerville/Everett to confluence with Boston Inner Harbor, Chelsea River, Chelsea/Charlestown (Includes Island End River)	High*, Shellfishing, Wet and Dry Weather Problems	Fecal Coliform
MA71-07	Mill Brook Class B	3.9 mi	Headwaters south of Massachusetts Avenue, Lexington to inlet of Lower Mystic Lake, Arlington (portions are culverted underground)	High, Wet and Dry Weather Problems	*E. coli*, Enterococci
MA71-08[3]	Mill Creek Class SB	0.02 mi^2	From Route 1, Chelsea/Revere to confluence with Chelsea River, Chelsea/Revere.	High, Wet Weather Problems	Fecal Coliform
MA71-09[3]	Winn Brook	1.4 mi	Headwaters near Juniper Road and the	High, Wet	*E. coli*,

Segment ID	Segment Name	Segment size(mi or m^2)	Segment Description	Priority	Indicator
	Class B		Belmont Hill School, Belmont to confluence with Little Pond, Belmont. (portions culverted underground).	and Dry Weather Problems	Enterococci
MA71-14[3]	Belle Isle Inlet Class SA	0.12 mi^2	From Tidegate at Bennington Street, Boston/Revere to confluence with Winthrop Bay, Boston/Winthrop.	High*, Wet Weather Problems, Shellfishing	Fecal Coliform
MA71-13[3]	Unnamed Tributary Class B**	0.1 mi	Unnamed tributary locally lnown as Local known as 'Meetinghouse Brook', from emergence south of Route 16/east of Winthrop St., Medford to confluence with Mystic River, Medford. (brook not apparent on 1985 Boston North USGS quad – 2005 orthophotos used to delineate stream)	Medium*, Wet Weather Problems	*E. coli*, Enterococci
** may have salt influx					

[1] Remaining CSO discharges are allowed under a variance of water quality standards, as analyses are conducted and progress is made to improve water quality.

[2] The remaining CSO discharges in this segment are permitted under the SB/CSO designation, subject to the limitations on CSO activations and volumes in the final MWRA Long-Term CSO Control Plan.

[3] New Pathogen Impaired Segments that were identified in the Integrated Report (2006 through 2014), after the public comment period for this TMDL, are included in the Boston Harbor Addendum, CN# 157.2 that is in the process of being developed.

TMDL Overview

The Massachusetts Department of Environmental Protection (MassDEP) is responsible for monitoring the waters of the Commonwealth, identifying those waters that are impaired, and developing a plan to bring them back into compliance with the Massachusetts Water Quality Standards (WQS). The Massachusetts Year 2014 Integrated List of Waters contains a list of impaired waters (Category 5 Waters) that require a TMDL (formerly known as the "303d list", which identifies impaired segments of rivers and streams, coastal waters, and the reasons for the impairment). It should be noted that all the waterbodies are influenced by seasonal variations in flow and temperature and the tidal cycles in the estuaries. All these variations will directly impact the extent to which these waterbodies are impaired.

Once a water body is identified as impaired, the MassDEP is required by the Federal Clean Water Act (CWA) to develop a "pollution budget" designed to restore the health of the impaired body of water. The process of developing this budget, generally referred to as a Total Maximum Daily Load (TMDL), includes identifying the source(s) of the pollutant from direct discharges (point sources) and indirect discharges (non-point sources), determining the maximum amount of the pollutant that can be discharged to a specific water body to meet water quality standards, and assigning pollutant load allocations to the sources. A plan to implement the necessary pollutant reductions is essential in order to reach the ultimate goal of restoring uses and meeting the water quality standards in stream.

Pathogen TMDL: This report represents a TMDL for bacteria indicators (e.g. Fecal coliform, *E. coli*, and Enterococci bacteria) in the Boston Harbor watershed. Certain bacteria, such as Fecal coliform, *E. coli*, and Enterococci bacteria, are indicators of contamination from sewage and/or the feces of warm-blooded wildlife (mammals and birds). Such contamination may pose a risk to human health. Therefore, in order to prevent further degradation in water quality and to ensure that waterbodies within the watershed meet state water quality standards, the TMDL establishes indicator bacteria limits and outlines corrective actions to achieve that goal.

Sources of indicator bacteria in the Boston Harbor watershed were found to be many and varied. Most of the bacteria sources are believed to be stormwater related. In Section 5, Table 5-1 provides a general compilation of likely bacteria sources in the Boston Harbor watershed including, combined sewer overflows (CSOs), sanitary sewer overflows (SSOs), sewer pipes connected to storm drains, certain recreational activities, wildlife including birds along with domestic pets and animals and direct overland stormwater runoff. Note that bacteria from wildlife would be considered a natural condition unless some form of human inducement, such as feeding, is causing congregation of wild birds or animals. A discussion of pathogen related control measures and best management practices are provided in the companion document: "*Mitigation Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts*" (ENSR 2005)[1] and on the interactive web site, Massachusetts Clean Water Toolkit, http://prj.geosyntec.com/npsmanual/default.aspx.

This TMDL applies to the 33 bacteria impaired segments of the Boston Harbor watershed that are currently listed on the CWA § 303(d) list of impaired waters (29 segments in this TMDL and 4 to be covered in an Addendum CN 157.2). MassDEP recommends however, that the information contained in this TMDL guide management activities for all other waters throughout the watershed to help maintain and protect existing water quality.

The analyses conducted for the bacteria impaired segments in this TMDL would apply to the non-impaired segments, since the sources and their characteristics are equivalent. The concentration waste load and/or load allocation for each source and designated use would be the same as specified in this TMDL. Therefore, the pollution prevention TMDLs would have identical waste load and load allocations based on the sources present and the designated use of the water body segment (see ES-4 and Table 7.1). This Boston Harbor watershed TMDL may, in appropriate circumstances, also apply to segments that are listed for bacteria impairment in future Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, after listing the waters for bacteria impairment and taking into account all relevant comments submitted on the CWA § 303(d) list, the Commonwealth determines with EPA approval of the future CWA § 303(d) Integrated List of Waters that this TMDL should apply to newly listed bacteria impaired segments.

Since accurate estimates of existing sources are generally unavailable, it is difficult to estimate the pollutant reductions for specific sources. For the illicit sources, the goal is complete elimination (100% reduction). However, overall wet weather indicator bacteria load reductions can be estimated using typical stormwater bacteria concentrations. These data indicate that in general two to three orders of

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[1] This document was created at the initiation of the project in 2005 to be used as a companion guide by communities for addressing bacteria pollution impairments and should be used judiciously since the content does not represent the current status of regulations, permits, and grant programs.

magnitude (i.e., greater than 90%) reductions in stormwater bacteria loading will be necessary, especially in developed areas. This goal is expected to be accomplished through stepwise implementation of illicit discharge detection and elimination programs (IDDE), best management practices, such as those associated with the Phase I and Phase II control program for stormwater.

TMDL goals for each type of bacteria source are provided in Table ES-4. Municipalities are the primary responsible parties for achieving water quality standards through elimination of these sources. TMDL implementation to achieve these goals should be an iterative process with selection and implementation of mitigation measures followed by monitoring to determine the extent of water quality improvement realized. Recommended TMDL implementation measures include identification and elimination of prohibited sources such as leaky or improperly connected sanitary sewer flows and best management practices to mitigate stormwater runoff volume. Certain towns in the watershed are classified as Urban Areas by the United States Census Bureau and are subject to the Stormwater Phase II Final Rule that requires the development and implementation of an IDDE plan. Combined sewer overflows will be addressed through the MWRA Long-Term CSO Control Plan, the associated federal court order, and other actions to require compliance with Massachusetts water quality standards.

In most cases, authority to regulate non-point source pollution and thus successful implementation of this TMDL is limited to local government entities and will require cooperative support from volunteers, watershed associations, and local officials in municipal government. Those activities can take the form of expanded education, obtaining and/or providing funding, and possibly local enforcement. In some cases, such as subsurface disposal of wastewater from homes, the Commonwealth provides the framework, but the administration occurs on the local level. All communities should be encouraged to develop stormwater utilities or other administrative mechanisms to secure a dedicated funding stream to address stormwater issues. Sources of funding for TMDL implementation in NPDES regulated areas are scarce. 319 Nonpoint Source Competitive grant funds, previously a major source of funding for TMDL implementation in urban areas, cannot be used for work that addresses the requirements of NPDES permits; however, this funding can be used to develop stormwater utilities in regulated municipalities. MassDEP's Water Quality Management Planning Grants (Section 604b) and CZM's Coastal Pollution Remediation grants remain available on a competitive basis. State Revolving (Loan) Fund Program (SRF) funds can provide low-interest loans for pollution mitigation.

Table ES 1-4 Sources and Expectations for Limiting Bacterial Contamination in the Boston Harbor Watershed

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (cfu/100 mL)[1]	Load Allocation Indicator Bacteria (cfu/100 mL)[1]
A, B, SA, SB (prohibited)	Illicit discharges to storm drains	0	Not applicable
	Leaking sanitary sewer lines	0	Not Applicable
	Failing septic systems	Not Applicable	0
A (Includes filtered water supply) & **B**	Any regulated discharge- including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges [7,9]	Either; a) *E. coli* <=geometric mean[5] 126 colonies per 100 mL; single sample <=235 colonies per 100 mL[11]; or b) Enterococci geometric mean[5] <= 33 colonies per 100 mL and single sample <= 61 colonies per 100 mL[11]	Not Applicable
	Nonpoint source stormwater runoff[4]	Not Applicable	Either a) *E. coli* <=geometric mean[5] 126 colonies per 100 mL; single sample <=235 colonies per 100 mL; or Enterococci geometric mean[5]<= 33 colonies per 100 mL and single sample <= 61 colonies per 100 mL
SA (approved for shellfishing)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9]	Fecal Coliform <= geometric mean, MPN, of 14 organisms per 100 mL nor shall 10% of the samples be >=28 organisms per 100 mL	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Fecal Coliform <= geometric mean, MPN, of 14 organisms per 100 mL nor shall 10% of the samples be >=28 organisms per 100 mL
SA & SB[10] (Beaches[8] and non-designated shellfish areas)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9]	Enterococci - geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL[11]	Not Applicable

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (cfu/100 mL)[1]	Load Allocation Indicator Bacteria (cfu/100 mL)[1]
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Enterococci -geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL
SB (approved for shellfishing w/depuration)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9]	Fecal Coliform <= median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be >=260 organisms per 100 mL[11]	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Fecal Coliform <= median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be >=260 organisms per 100 mL
SB/CSO (segments Boston Inner Harbor (MA 71-02), Chelsea River (MA 71-06), Mystic River (MA 71-03)[12]	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9], and combined sewer overflows[6].	**For Non-CSO Discharges:** Enterococci - geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL[11] **For CSO Discharges**: CSO activations and volumes limited to those included and identified in permitted Long-Term CSO Control Plan.[12]	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Enterococci -geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL
B/CSO Variance Alewife Brook (MA 71-04), Upper Mystic (MA71-02)	Combined Sewer Overflows	CSO activations and volumes limited to those included and identified in the permitted Long-Term CSO Control Plan. [12]	Not applicable

[1] Waste Load Allocation (WLA) and Load Allocation (LA) refer to fecal coliform densities unless specified in table.
[2] In all samples taken during any 6 month period
[3] In 90% of the samples taken in any six month period;
[4] The expectation for WLAs and LAs for stormwater discharges is that they will be achieved through the implementation of BMPs and other controls to the maximum extent practical.
[5] Geometric mean of the 5 most recent samples is used at bathing beaches. For all other waters and during the non-bathing season the geometric mean of all samples taken within the most recent six months, typically based on a minimum of five samples.
[6] Or other applicable water quality standards for CSO's
[7] Or shall be consistent with the Waste Water Treatment Plant (WWTP) National Pollutant Discharge Elimination System (NPDES) permit.

[8] Massachusetts Department of Public Health regulations (105 CMR Section 445)
[9] Seasonal disinfection may be allowed by the Department on a case-by-case basis.
[10] Segments identified as CSO have a Long Term Control Plan in place.
[11] Threshold for beach closure. Beaches Environmental Assessment and Coastal Health (BEACH) Act.
[12] See Second Stipulation of the United States and the Massachusetts Water Resources Authority on "Responsibility and Legal Liability for Combined Sewer Overflow Control" filed in US District Court on March 15, 2006. (MWRA 2006).

Note: This table represents waste load and load allocations based on water quality standards current as of the publication date of these TMDLs. If the pathogen criteria change in the future, MassDEP intends to revise the TMDL by addendum to reflect the revised criteria. Waste load allocation (WLA) as a concept in this document refers to pollutants discharged from pipes and channels that require a discharge permit (point sources). Load allocation refers to pollutants entering waterbodies through overland runoff (nonpoint sources). A major difference between the two categories is the greater legal and regulatory control generally available to address point sources while voluntary cooperation added by incentives in some cases is the main vehicle for addressing non-point sources.

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1.0 Introduction

Section 303(d) of the Federal Clean Water Act (CWA) and Environmental Protection Agencies (EPA's) Water Quality Planning and Management Regulations (40 CFR Part 130) require states to place waterbodies that do not meet established water quality standards on a list of impaired waterbodies (commonly referred to as the "303d List") and to develop Total Maximum Daily Loads (TMDLs) for listed waters and the pollutant(s) contributing to the impairment. In Massachusetts, impaired waterbodies are included in Category 5 of the "*Massachusetts Year 2014 Integrated List of Water: Final Listing of the Condition of Massachusetts' Waters Pursuant to Sections 305(b), 314 and 303(d)* of the Clean Water Act" (MassDEP 2015). Figure 1-1 provides a map of the Boston Harbor watershed (excluding the Neponset River sub-basin shown in grey). Figure 1-2 is a map of the subwatersheds with bacteria impaired segments indicated. As shown in Figure 1-2 and Tables ES-1 through 3, much of the Boston Harbor waterbodies are listed as a Category 5 "impaired or threatened for one or more uses and requiring a TMDL" due to excessive indicator bacteria concentrations.

The Final Report has been greatly expanded from the original Draft TMDL. Section 4, Problem Assessment, has been substantially updated with current DEP, MWRA, MyRWA, and CZM data, along with information on all important NPDES dischargers. Sections 5 and 6 have been reworked to give more information on both possible and actual sources of pathogen pollution. Section 7 has been modified to include giving WLA and LA loadings calculations for each segment. Section 8, Implementation, has been rewritten to include detailed up- to- date information on CSO and SSO dischargers, along with progress on CSO and SSO control efforts. Also added to Section 8 is a detailed update on activities and progress of each community in the watershed under the Phase II Stormwater Program. Section 10, Reasonable Assurances has been expanded to give details on various tools and resources that are potentially available to communities and organizations for pathogen pollution controls.

TMDLs are to be developed for water bodies that are not meeting designated uses under technology-based controls only. TMDLs determine the amount of a pollutant that a waterbody can safely assimilate without violating water quality standards. The TMDL process establishes the maximum allowable loading of pollutants or other quantifiable parameters for a water body based on the relationship between pollutant sources and instream conditions. The TMDL process is designed to assist states and watershed stakeholders in the implementation of water quality-based controls specifically targeted to identified sources of pollution in order to restore and maintain the quality of their water resources (USEPA 2001). TMDLs allow watershed stewards to establish measurable water quality goals based on the difference between site-specific instream conditions and state water quality standards.

A major goal of this TMDL is to achieve meaningful environmental results with regard to the designated uses of the Boston Harbor waterbodies. These include: water supply, shellfish harvesting, fishing, boating, and swimming. This TMDL establishes the necessary pollutant load to achieve designated uses and water quality standard and the companion document entitled: "*Mitigation Measures to Address*

Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts" (ENSR 2005)[1] which provides guidance for the implementation of this TMDL. http://www.mass.gov/eea/agencies/massdep/water/watersheds/total-maximum-daily-loads-tmdls.html and on the interactive web site, *Massachusetts Clean Water Toolkit*, http://prj.geosyntec.com/npsmanual/default.aspx.

Historically, water and sediment quality studies have focused on the control of point sources of pollutants (i.e., discharges from pipes and other structural conveyances) that discharge directly into well-defined hydrologic resources, such as estuaries, lakes, ponds, or river segments. While this localized approach may be appropriate under certain situations, it typically fails to characterize the more subtle and chronic sources of pollutants that are widely scattered throughout a broad geographic region such as a watershed (e.g., roadway runoff, failing septic systems in high groundwater, areas of concentrated wildfowl use, fertilizers, pesticides, pet waste, and certain agricultural sources). These so called nonpoint sources of pollution often contribute significantly to the decline of water quality through their cumulative impacts. A watershed-level approach that uses the surface drainage area as the basic study unit enables managers to gain a more complete understanding of the potential pollutant sources impacting a waterbody and increases the precision of identifying local problem areas or "hot spots" which may detrimentally affect water and sediment quality. It is within this watershed-level framework that the Massachusetts Department of Environmental Protection (MassDEP) commissioned the development of watershed based TMDLs.

1.1. Pathogens and Indicator Bacteria

The Boston Harbor pathogen TMDL is designed to support the reduction of waterborne disease-causing organisms, known as pathogens, to reduce public health risk. Waterborne pathogens enter surface waters from a variety of sources including sewage and the feces of warm-blooded wildlife. These pathogens can pose a risk to human health due to gastrointestinal illness through exposure via ingestion and contact with recreational waters, ingestion of drinking water, and consumption of filter-feeding shellfish.

Waterborne pathogens include a broad range of bacteria, viruses, and protozoans that are difficult to identify and isolate. Thus, specific nonpathogenic bacteria have been identified that are typically associated with harmful pathogens in fecal contamination. These associated nonpathogenic bacteria are used as indicator bacteria as they are easier to identify and measure in the environment. High densities of indicator bacteria increase the likelihood of the presence of pathogenic organisms.

[1] This document was created at the initiation of the project in 2005 to be used as a companion guide by communities for addressing bacteria pollution impairments and should be used judiciously since content of does not represent the current status of regulations, permits, and grant programs.

Selection of indicator bacteria is difficult as new technologies challenge current methods of detection and the strength of correlation of indicator bacteria and human illness. Currently, coliform and fecal streptococci bacteria are commonly used as indicators of potential pathogens (i.e., indicator bacteria). Coliform bacteria include total coliforms, Fecal coliform and *Escherichia coli* (*E. coli*). Fecal coliform (a subset of total coliform) and *E. coli* (a subset of Fecal coliform) bacteria are present in the intestinal tracts of warm blooded animals. Presence of coliform bacteria in water indicates the possible presence of fecal contamination. Fecal streptococci bacteria are also used as indicator bacteria, specifically Enterococci a subgroup of fecal streptococci. These bacteria also live in the intestinal tract of animals, and their presence is a better predictor of human gastrointestinal illness than Fecal coliform since the die-off rate of Enterococci is much lower (i.e., Enterococci bacteria remain in the environment longer) (USEPA 2001). The relationship of indicator organisms is provided in Figure 1-3. The EPA, in the "*Ambient Water Quality Criteria for Bacteria – 1986"* (US EPA 1986) and *"2012 Recreational Water Quality Criteria for Bacteria*" documents, recommends the use of *E. coli* or Enterococci as potential pathogen indicators in fresh water and Enterococci in marine waters (US EPA 2012).

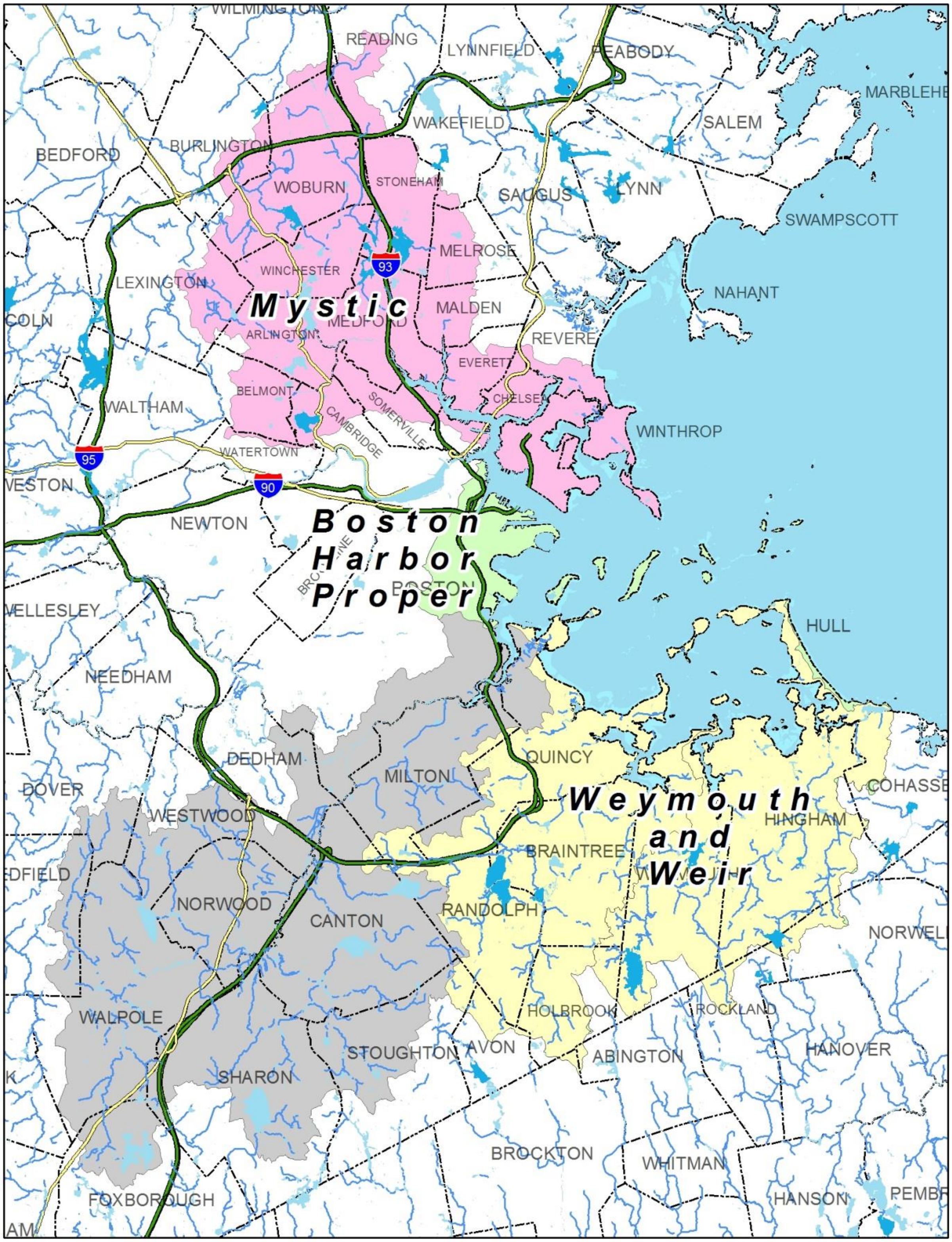


Figure 1-1 Boston Harbor, Weymouth-Weir, and Mystic Subwatersheds

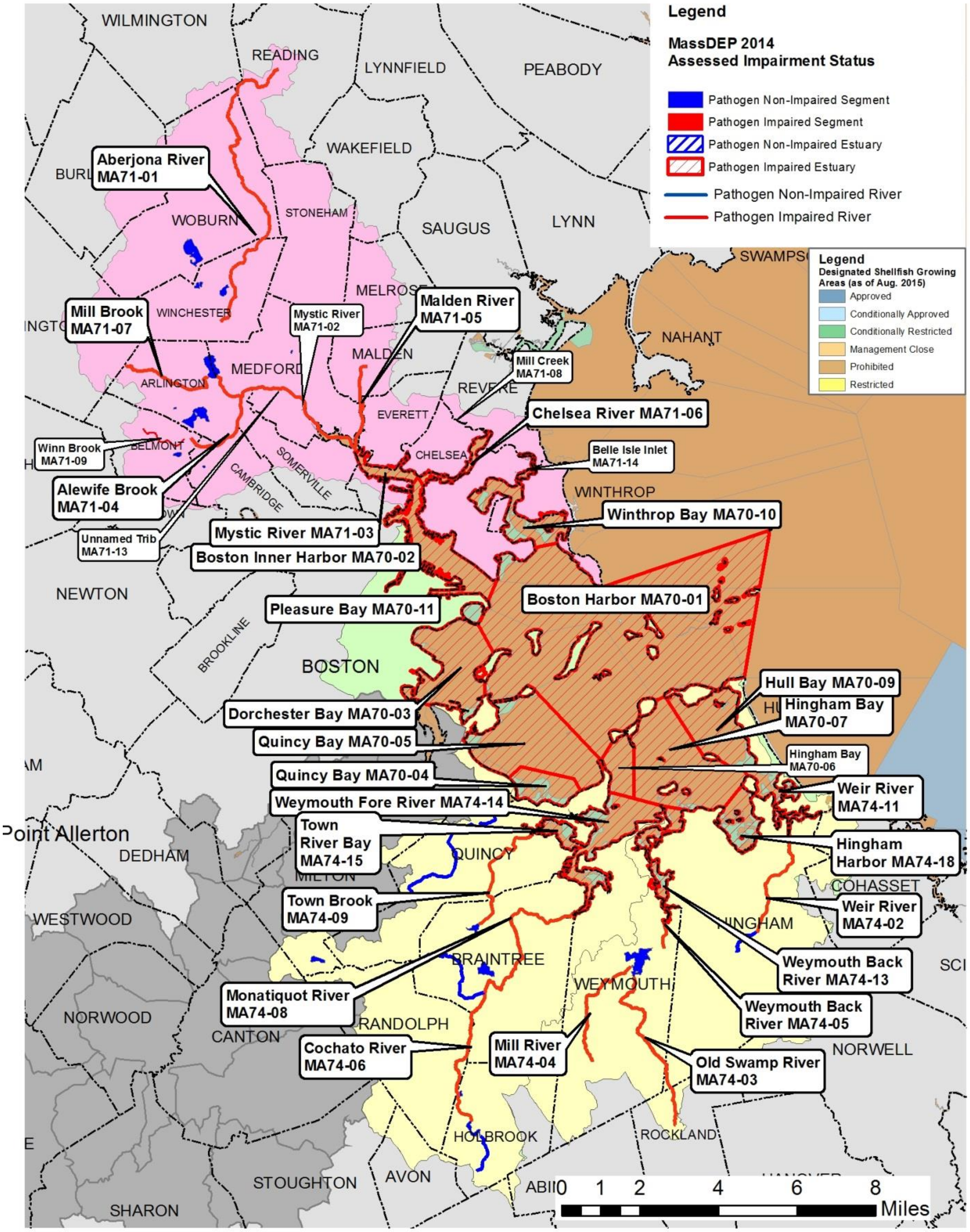


Figure 1-2 Boston Harbor Watershed, Pathogen Impaired Segments (MassDEP 2015) and Shellfish Growing Areas (DMF 2015).

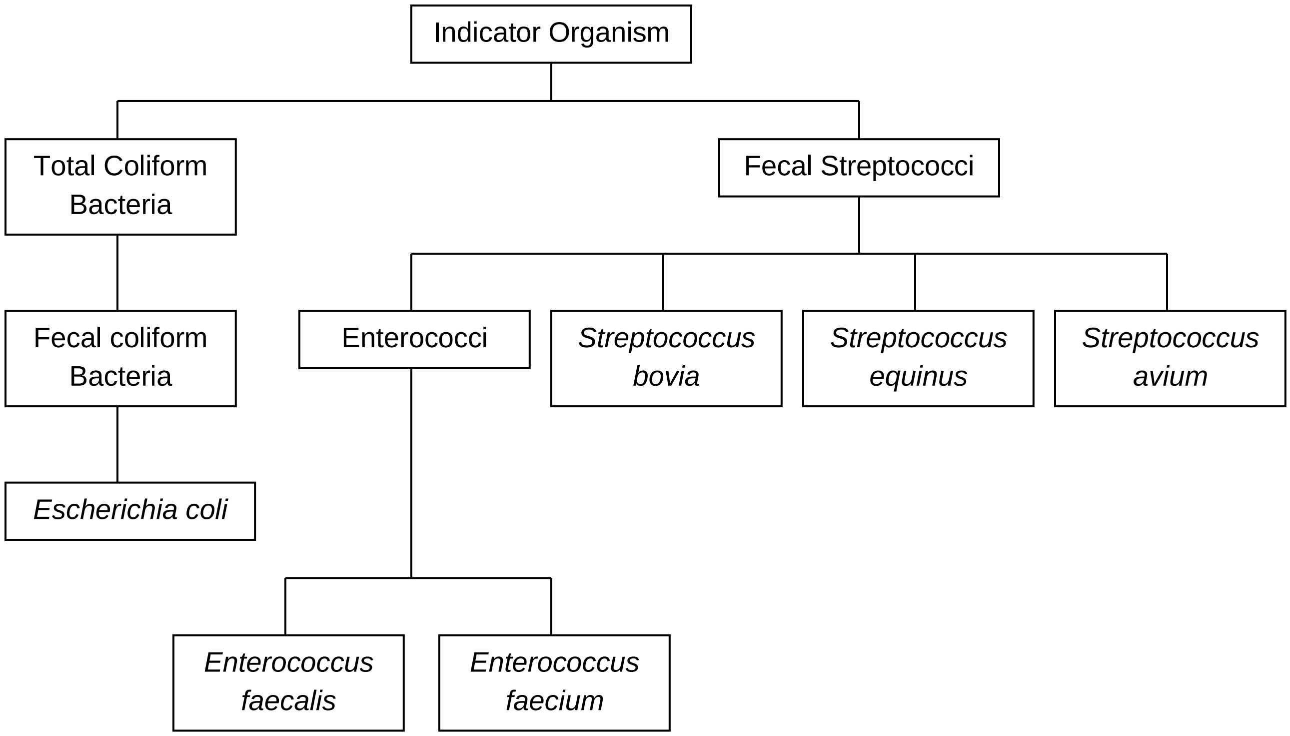


Figure 1-3 Relationships Among Indicator Organisms (US EPA 2001).

The Boston Harbor watershed pathogen TMDLs have been developed using Fecal coliform as an indicator bacterium for shellfish areas and Enterococci for bathing in marine waters and generally *E. coli* for fresh waters (even though some of the data included in the TMDL are Fecal coliform). Any future changes in the Massachusetts pathogen water quality standard will apply to this TMDL at the time of the standard change. Massachusetts believes that the magnitude of indicator bacteria loading reductions outlined in this TMDL will be both necessary and sufficient to attain present WQS and any future modifications to the WQS for pathogens.

Consistent with Section 303(d) of the CWA, the MassDEP has chosen to complete pathogen TMDLs for all waterbodies in the Boston Harbor watershed at this time, regardless of current impairment status (i.e., for all waterbody categories in the *2014 Integrated List*). MassDEP believes a comprehensive management approach carried out by all watershed communities is needed to address the ubiquitous nature of pathogen sources present in the Boston Harbor watershed. Watershed-wide implementation is needed to meet WQS and restore designated uses in impaired segments while providing protection of desirable water quality in waters that are not currently impaired or not assessed.

1.2. Comprehensive Watershed-based Approach to TMDL Development

As discussed below, this TMDL applies to the 33 pathogen impaired segments of the Boston Harbor watershed that are currently listed on the CWA § 303(d) list of impaired waters. MassDEP recommends however, that the information contained in this TMDL guide management activities for all other waters throughout the watershed to help maintain and protect existing water quality. For these non-impaired waters, Massachusetts is proposing "pollution prevention TMDLs" consistent with CWA § 303(d)(3).

The analyses conducted for the pathogen impaired segments in this TMDL would apply to the non-impaired segments, since the sources and their characteristics are equivalent. The waste load and/or load allocation for each source and designated use would be the same as specified herein. Therefore, the pollution prevention TMDLs would have identical waste load and load allocations based on the sources present and the designated use of the water body segment (see Table ES-4 or Table 7-1).

This Boston Harbor watershed TMDL may, in appropriate circumstances, also apply to segments that are listed for pathogen impairment in subsequent Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, after listing the waters for pathogen impairment and taking into account all relevant comments submitted on the CWA § 303(d) list, MassDEP determines with EPA approval of the CWA § 303(d) list that this TMDL should apply to future pathogen impaired segments.

There are 61 waterbody segments assessed by the MassDEP in the Boston Harbor, Weymouth-Weir, and Mystic watersheds. Of the 61 segments, 19 are ponds not covered by this TMDL. Thirty-three river or estuarine segments are pathogen impaired, and are listed in Category 5 (i.e. require a TMDL) of the Massachusetts 2014 Integrated List of Waters (MassDEP 2015). Pathogen impairment has been documented by the MassDEP in previous reports, including the *Boston Harbor 2004-2008 Water Quality Assessment Reports* (MassDEP 2010a), resulting in the impairment determination. In this TMDL document, an overview of pathogen impairment is provided in Chapter 4 to illustrate the nature and extent of the pathogen impairment problem. Additional data, not collected by the MassDEP that are used to determine impairment status, are also provided in this TMDL to illustrate the pathogen problem. Since pathogen impairment has been previously established only a summary is provided herein.

The watershed-based approach that was applied to complete the Boston Harbor pathogen TMDL is straightforward. The approach is focused on identification of sources, source reduction, and implementation of appropriate management plans. Once identified, sources are required to meet applicable WQS for indicator bacteria or be eliminated. This approach does not include water quality analysis or other approaches designed to link ambient concentrations with source loadings. For pathogens and indicator bacteria, water quality analyses are generally resource intensive and provide results with large degrees of uncertainty. Rather, this approach focuses on sources and required load reductions, proceeding efficiently toward water quality restoration activities.

The implementation strategy for reducing indicator bacteria is an iterative process where data are gathered on an ongoing basis, sources are identified and eliminated if possible, and control measures including Best Management Practices (BMPs) are implemented, assessed and modified as needed. Measures to abate probable sources of waterborne pathogens include everything from public education, to improved stormwater management, to reducing the influence from inadequate and/or failing sanitary sewer infrastructure.

1.3. TMDL Report Format

This document contains the following sections:

- (Section 2) Watershed Description – provides watershed specific information
- (Section 3) Water Quality Standards – provides a summary of current Massachusetts WQS as they relate to indicator bacteria
- (Section 4) Problem Assessment – provides an overview of indicator bacteria measurements collected in the Boston Harbor watershed
- (Section 5) Identification of Sources – identifies and discusses potential sources of waterborne pathogens within the Boston Harbor watershed.
- (Section 6) Prioritization and Known Sources – identifies and discusses specific sources of waterborne pathogens and assigns pollution priorities to specific segments.
- (Section 7) TMDL Development – specifies required TMDL development components including:
    - Definitions and Equation
    - Loading Capacity
    - Load and Waste Load Allocations
    - Margin of Safety
    - Seasonal Variability
- (Section 8) Implementation Plan– describes specific implementation activities designed to remove pathogen impairment. This section, the companion document "*Mitigation Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts*", ENSR 2005,) and the interactive web site, Massachusetts Clean Water Toolkit, http://prj.geosyntec.com/npsmanual/default.aspx. should be used together to support implementing management actions.
- (Section 9) Monitoring Plan– describes recommended monitoring activities
- (Section 10) Reasonable Assurances– describes reasonable assurances the TMDL will be implemented
- (Section 11) Public Participation– describes the public participation process
- (Section 12) References

2.0 Boston Harbor Watershed Description

The Boston Harbor Watershed, encompassing 293 square miles of land area, including all or part of 45 municipalities, as well as downtown Boston, is located in and around historic Boston Harbor. The watershed includes the Mystic River Watershed to the north and the Neponset, Weymouth and Weir River Watersheds to the south. This report includes information regarding each of these sub-basins with the exception of the Neponset River sub-basin. MassDEP prepared a TMDL for the Neponset River sub-basin in 2002 with an addendum in 2012 (MassDEP 2002c, MassDEP 2012a). The Boston Harbor Watershed, without the Neponset River Watershed, includes approximately 176 square miles.

Land use within the Boston Harbor, Weymouth-Weir, and Mystic watersheds is largely comprised of highly urbanized communities with landuse approximately 65% developed (i.e., residential, commercial/industry, etc.) and approximately 36% undeveloped land (i.e., open space, water, wetlands, etc.), Table 2-1; Figure 2-1 (MassGIS 2015). Surface waters in the watershed are commonly used for primary and secondary contact recreation (swimming and boating) and habitat for aquatic life. As of the date of the report, shellfishing is largely prohibited in the watershed because of management closures or poor water quality.

The Department of Conservation and Recreation (DCR) manages several beaches within these watersheds. Figure 2-2 shows the marine swimming beach locations in this watershed. DCR collects bacteriological water quality data and maintains a "Beaches Water Quality Hotline" for daily updates on water quality at the beaches they manage. The locations of the sampling points may be found at: http://www.mwra.state.ma.us/harbor/html/bhbeaches.htm. Detailed information regarding water quality at swimming beaches (both fresh and marine waters) can be obtained from the beach quality annual reports available for download at the Massachusetts Department of Public Health (DPH) website: mass.digitalhealthdepartment.com/public_21/index.cfm.

MassDEP completed a report on DCR state property beaches for the five year period of 2008 through 2012. This report included 18 marine bathing beaches in the metropolitan Boston-area (MassDEP Undated). Eight of these beaches had precautionary rainfall posting procedures in place in 2012, whereby beaches are posted if specific rainfall thresholds are exceeded. These procedures were introduced by DCR because at certain urban beaches, the previous day's rainfall volume was identified as a better predictor of poor water quality than using only the prior day's enterococci counts. This procedure helps protect the public from potentially elevated bacteria levels due to stormwater runoff. Fifteen of the 18 beaches in metropolitan Boston were reported as receiving >/=90% overall safety scores during the 2008-2012 time frame. The yearly overall safety score was determined based on the percentage of samples that met the single sample maximum numeric water criteria for bacteria.

All offshore areas in this watershed are protected against the disposal of treated or untreated sewage from vessels (i.e., No Discharge Areas; see Figure 2-3).

It should be noted that all waterbodies are influenced by seasonal variations in flow and temperature and the tidal cycles in the estuaries. All these variations will directly impact the extent to which these waterbodies are impaired.

Table 2-1 Boston Harbor, Weymouth-Weir, and Mystic Watersheds Land Use, 2005

Land Use Category	% of Total Watershed Area
Pasture, Open Land, Crop Land	2.2
Woody Perennial; Forest	21.4
Wetland; Salt Wetland	7.5
Water, Water Based Recreation	4.4
Total of General Undeveloped	**35.5**
Recreation; Spectator and Participation	3.2
Low, Medium, and High Residential	39.9
Mining, Commercial, Industrial, Urban Public, Waste Disposal	21.4
Total of General Developed	**64.5**

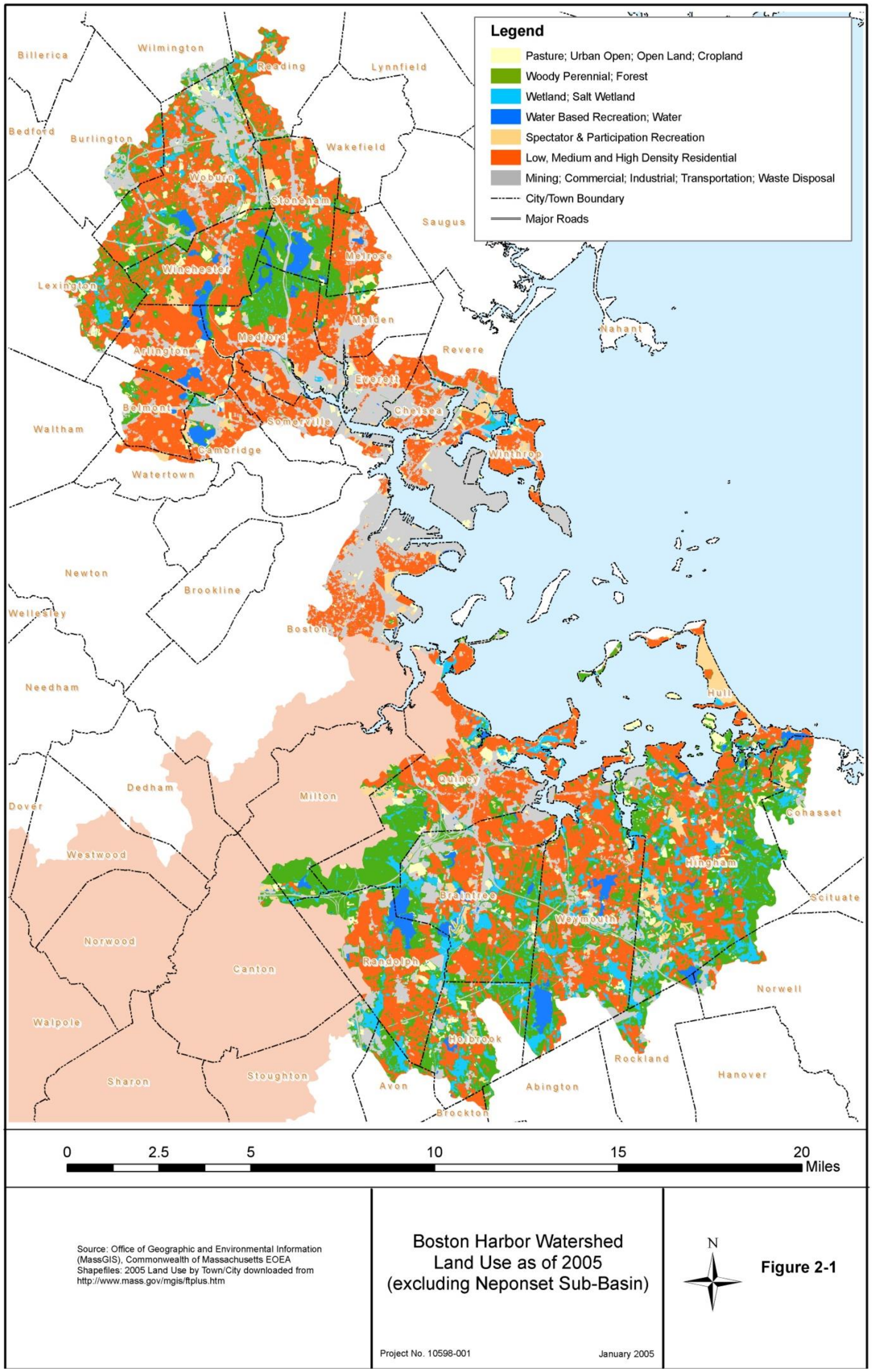


Figure 2-1 Boston Harbor, Weymouth-Weir, Mystic Watersheds Land Use in 2005.

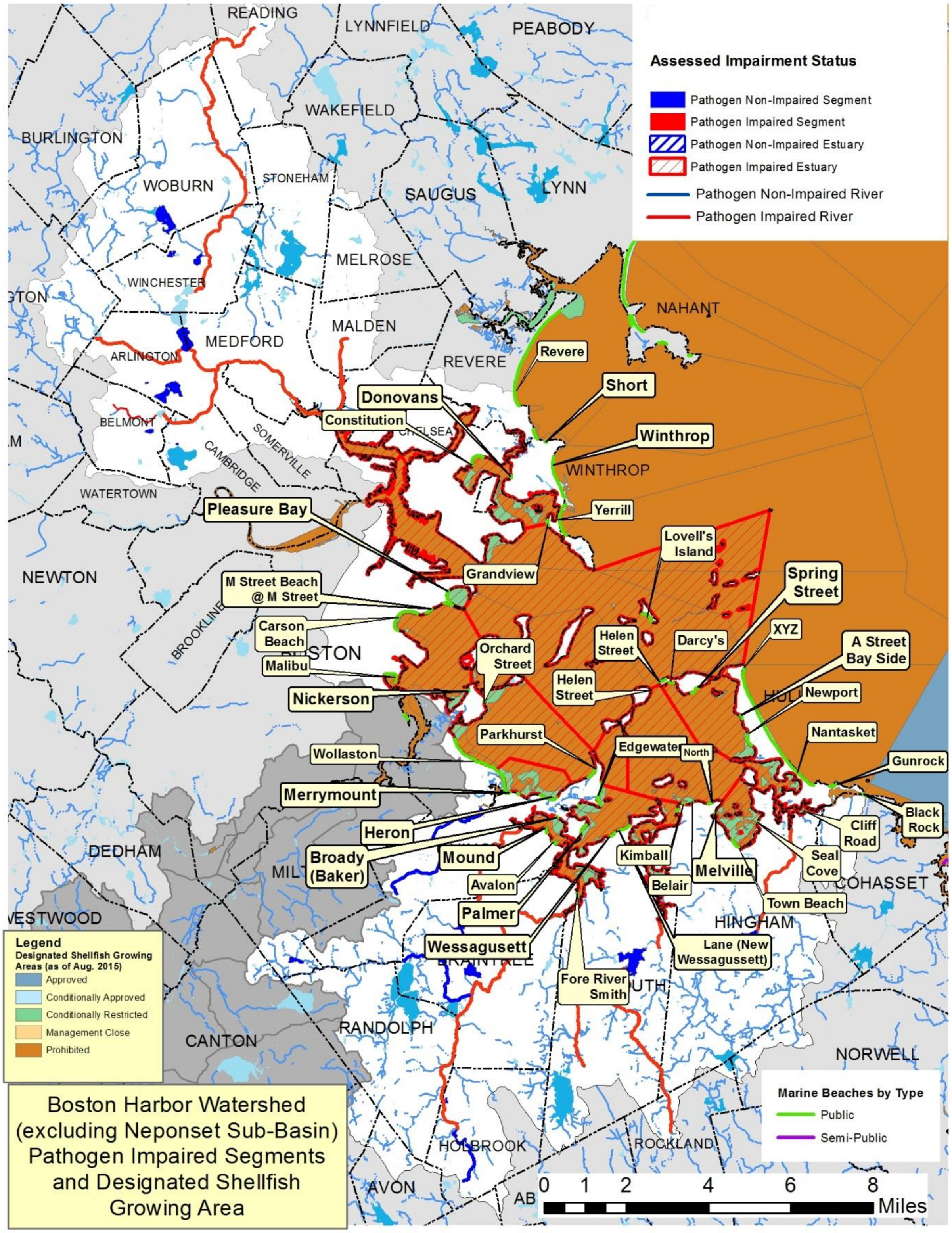


Figure 2-2 Boston Harbor Watershed Marine Beach Locations, Designated Shellfish Growing Areas and Pathogen Impaired Segments (MassDEP 2015).

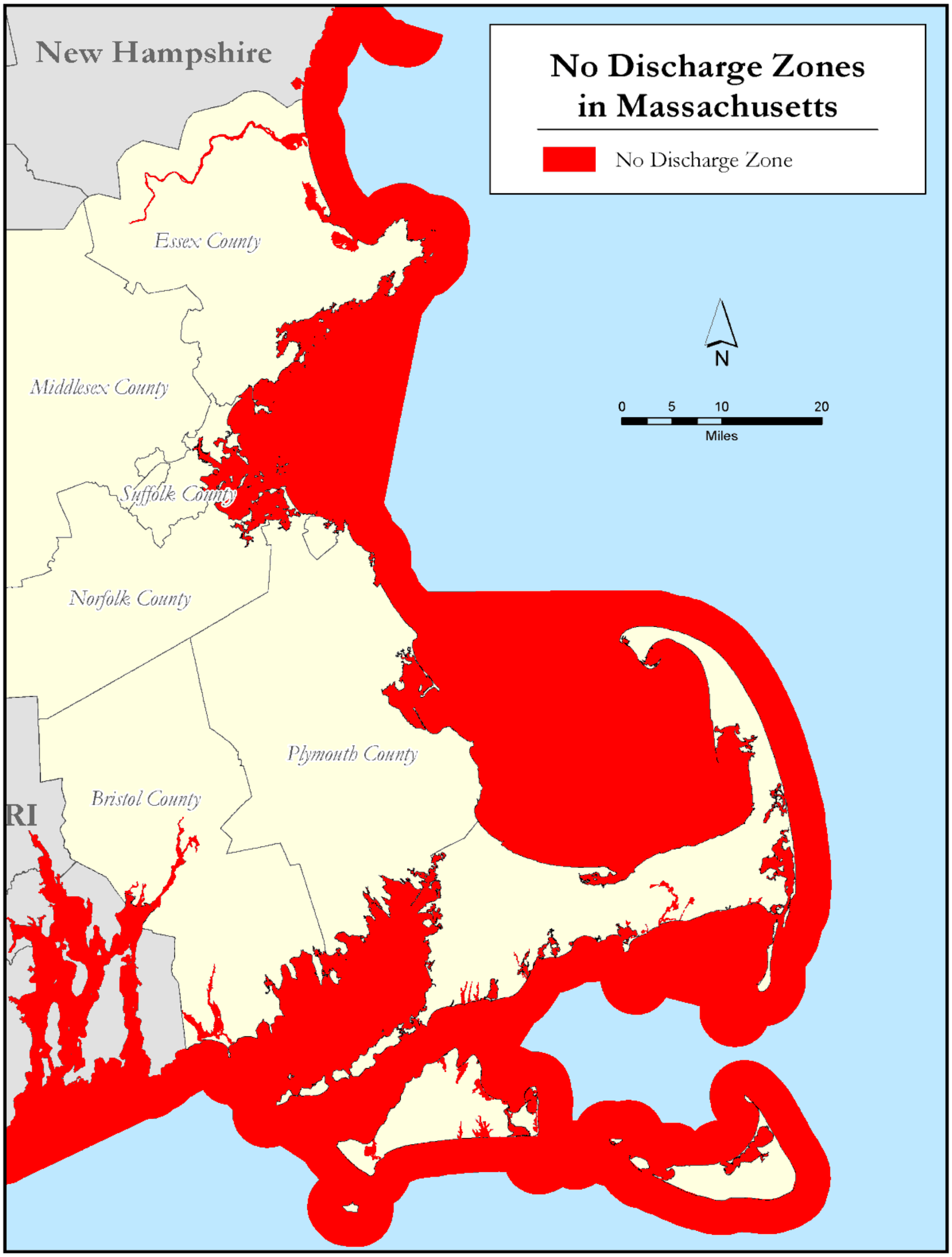


Figure 2-3 No Discharge Zones in Massachusetts (DMF 2015c).

2.1. Boston Harbor Proper Sub-basin and Land Use

The Boston Harbor Proper sub-basin includes the shoreline areas of Boston, Quincy, Hull, and Chelsea and the watershed communities of Winthrop, Hingham, and Weymouth. The Harbor Islands are also included in this sub-basin. The sub-basin extends south from the Chelsea River, east from the Charles River Dam, north from Hingham Bay, and east from the confluence of the Neponset River with Dorchester Bay to a line connecting the Boston Lighthouse to Deer Island in Boston and Point Allerton in Hull. The harbor is often dredged to maintain access to the Inner Harbor for deep draft vessels. More than 2,200 acres of Boston Harbor has been filled to expand Logan Airport. More than one million cubic yards of clays produced from the construction of the Ted Williams Tunnel have been disposed of in the outer harbor. Excavated materials from the Central Artery have been disposed of on Spectacle Island. The Boston Harbor Proper sub-basin is highly urbanized (Table 2-2; Figure 2-1). The Boston Harbor Proper sub-basin waters are commonly used for primary and secondary contact recreation (swimming and boating), habitat for aquatic life, and shellfishing.

2.2. Weir and Weymouth Rivers Sub-basin and Land Use

The Weymouth and Weir Rivers sub-basin lies south of Boston Harbor. The following sixteen communities lie within or partially within the areas drained by the Weymouth and Weir Rivers: Abington, Avon, Braintree, Brockton, Canton, Cohasset, Hingham, Holbrook, Hull, Milton, Norwell, Quincy, Randolph, Rockland, Stoughton, and Weymouth.

Five river systems make up this watershed: Furnace Brook, Town River, Weymouth Fore River, Weymouth Back River, and Weir River. Furnace Brook flows 2.7 miles northeast to Quincy Bay and the other rivers generally flow northeast to Hingham Bay. Town Brook originates in the Blue Hills and flows 3.2 miles from the Old Quincy Reservoir through downtown Quincy to the Town River. Town River flows into Town River Bay, which joins with the Weymouth Fore River before flowing into Hingham Bay. The Weymouth Fore River System originates at Lake Holbrook and flows for 4.0 miles as the Cochato River. When Farm River joins Cochato River, they form the Monatiquot River. The Monatiquot River flows north then east for a total of 4.3 miles before it becomes a tidal estuary and is considered the Weymouth Fore River. The Weymouth Back River originates as the Old Swamp River in Rockland. The river flows to the southern shore of Whitmans Pond in Weymouth. The Weymouth Back River flows from the outlet of Whitmans Pond to the Weymouth Back River estuary. The Weir River is formed at the confluence of Crooked Meadow River and Fulling Mill Brook. The river flows 2.8 miles to its tidal portion. The Weir River System includes the Plymouth, Cooked Meadow, and Weir Rivers. The Weymouth and Weir Rivers sub-basin waters are commonly used for primary and secondary contact recreation (swimming and boating), fishing, habitat for aquatic life, and shellfishing.

2.3. Mystic River Sub-basin and Land Use

The Mystic River watershed includes all or part of the following cities and towns within the northern section of the Greater Boston area: Arlington, Belmont, Boston, Burlington, Cambridge, Charlestown, Chelsea, Everett, Lexington, Malden, Medford, Melrose, Somerville, Reading, Revere, Wakefield, Wilmington, Winchester, Winthrop, and Woburn. The Mystic River is fed by the Aberjona River and Hall's Brook. Horn Pond Brook, Mill Brook, and Alewife Brook are also tributaries to the Mystic River farther along its course. The Amelia Earhart Dam restricts the Mystic's flow just downstream of its confluence with the Malden River. The Chelsea River is the last river to flow into the Mystic River before it discharges into Boston Inner Harbor. The Mystic River and tributaries are commonly used for primary and secondary contact recreation (swimming and boating), fishing, habitat for aquatic life, and shellfishing.

3.0 Water Quality Standards

The Surface Water Quality Standards (WQS) for the Commonwealth of Massachusetts establish chemical, physical, and biological standards for the restoration and maintenance of the most sensitive uses (MassDEP 2007). The WQS limit the discharge of pollutants to surface waters for the protection of existing uses and attainment of designated uses in downstream and adjacent segments.

The Boston Harbor Watershed contains waterbodies classified as Class A (tributaries), B, SA, and SB, SB/CSO and Class B CSO Variance. According to the Massachusetts WQS these waters should be suitable for the following uses: (1) habitat for fish, other aquatic life, wildlife, (2) primary and secondary contact recreation, (3) shellfish harvesting in approved areas, and (4) should have consistently good aesthetic value (A and SA should be excellent). The pathogen impairments (exceedences of Fecal coliform, Enterococci, and *E. coli* bacteria criteria) associated with the waterbodies of interest in this report affect primary contact recreation and shellfishing uses. There are a number of Combined Sewer Overflow (CSO) receiving waters within the Boston Harbor Sub-watershed. Because the WQS were in transition during the development of statewide pathogen TMDLs, and were formally changed after the draft reports were produced, the new bacteria indicator standards are presented in Table ES-4 and 7-1, and can be found at : http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-4-00-mass-surface-water-quality-standards.html

Fecal coliform, Enterococci, and *E. coli* bacteria are found in the intestinal tract of warm-blooded animals, soil, water, and certain food and wood processing wastes. Although they are generally not harmful themselves, they indicate the possible presence of pathogenic (disease-causing) bacteria, viruses, and protozoans that also live in human and animal digestive systems. These bacteria are often used as indicator bacteria since it is expensive and sometimes difficult to test for the presence of individual pathogenic organisms.

Pathogens can significantly impact humans through ingestion of, and contact with recreational waters, ingestion of drinking water, and consumption of filter-feeding shellfish. In addition to contact recreation, excessive pathogen numbers impact potable water supplies. The amount of treatment (i.e., disinfection) required to produce potable water increases with increased pathogen contamination. Such treatment may cause the generation of disinfection by-products that are also harmful to humans. Further detail on pathogen impacts can be accessed at the following EPA websites:

- Water Quality Criteria: Microbial (Pathogen)
  https://www.epa.gov/wqc/microbial-pathogenrecreational-water-quality-criteria
- Advisories and Technical Resources for Fish and Shellfish Consumption
  http://www.epa.gov/waterscience/fish/
- Swimming Advisories:
  http://www.epa.gov/waterscience/beaches/seasons/

Massachusetts revised its freshwater WQS in 2007 by replacing fecal coliform with *E. coli* and *Enterococci* as the regulated indicator bacteria in freshwater systems, as recommended by the EPA in the "Ambient Water Quality Criteria for Bacteria – 1986" and "2012 Recreational Water Quality Criteria" documents (US EPA 1986 and US EPA 2012). The Massachusetts Department of Public Health had previously revised regulations that protect public beaches as discussed below. Up until January of 2007 Massachusetts used fecal coliform as the indicator organism for all waters except for marine bathing beaches, where the Federal BEACH Act requires the use of *Enterococci*. Massachusetts adopted *E. coli* and *Enterococci* for all fresh waters and Enterococci for all marine waters, including non-bathing marine beaches. Fecal coliform remains the indicator organism for shellfishing areas.

Some of the threshold values provided in this TMDL are those established by the MassDEP in the WQS and are:

- **Class A** -Unfiltered water supply intakes – either fecal coliform shall not exceed 20 colony forming units, or cfu per 100 ml in all samples taken in any six month or total coliform shall not exceed 100 cfu/100 ml in 90% of the samples in any six month period.
- **Class SA** -Shellfishing Approved- geometric mean for Fecal coliform shall not exceed 14 cfu/100 mL, and 10% of the samples shall not exceed 28 cfu/100 mL;
- **Class SB** -Shellfishing Approved (but not necessarily open)- geometric mean for Fecal coliform shall not exceed 88 cfu/100 mL, and 10% of samples shall not exceed 260 cfu/100 mL;
- **Class SA** and **SB** Beaches and non- designated shellfish areas- geometric mean for Enterococci shall not exceed 35 cfu/100 mL, and a single sample shall not exceed 104 cfu/ 100 mL for the purposes of beach closure.
- **Class B** –Beaches - geometric average for *E. coli* shall not exceed 126 cfu/100 mL, and a single sample shall not exceed 235 cfu/100 mL.
- **Class SB/CSO** have to goal of meeting the criteria for Class SB but allow for limited CSO discharges as set forth in the approved Long-Term CSO Control Plan reference in the table below.
- **Class B CSO Variance** have the goal of meeting the criteria for Class B but allow for limited CSO discharges as set forth in the Long-Term CSO Control Plan reference in the table below.

Segments where permits and plans are in place to address CSO discharges to Class SB/CSO and Class B CSO Variance receiving water are summarized below.

Name, Class[1]	**Segment**
Boston Inner Harbor, SB/CSO	MA71-02
Chelsea River, SB/CSO	MA71-06
Mystic River, SB/CSO	MA71-03
Alewife Brook, Class B CSO Variance	MA71-04
Mystic River, Class B CSO Variance	MA71-03

[1] For specific CSO and CSO Variance plan implementation, see MWRA 2006.

Shellfish growing areas are classified by the Massachusetts Division of Marine Fisheries (DMF 2015a). The classification system as provided below is a summary of the DMF classification included in the MassDEP Consolidated Assessment and Listing Methodology, or CALM (MassDEP 2016. Figure 2-2 provides designated shellfish growing areas status as of July 2015.

Approved "...open for harvest of shellfish for direct human consumption subject to local rules and regulations..." An approved area is open all the time and closes only due to hurricanes or other major coastwide events."

Conditionally Approved "...subject to intermittent microbiological pollution..." During the time the area is open, it is "...for harvest of shellfish for direct human consumption subject to local rules and regulations…" A conditionally approved area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, shellfish harvested are treated as from an approved area."

Restricted "…area contains a "limited degree of pollution." It is open for "harvest of shellfish with depuration subject to local rules and state regulations" or for the relay of shellfish. A restricted area is used by DMF for the relay of shellfish to a less contaminated area."

Conditionally Restricted "...subject to intermittent microbiological pollution..." During the time area is restricted, it is only open for "the harvest of shellfish with depuration subject to local rules and state regulations." A conditionally restricted area is closed some of the time due to runoff from rainfall or seasonally poor water quality. When open, only soft shell clams may be harvested by specially licensed diggers (Master/Subordinate Diggers) and transported to the DMF Shellfish Purification Plant for depuration (purification)."

Prohibited "Closed for harvest of shellfish."

In general, shellfish harvesting use is supported (i.e., non-impaired) when shellfish harvested from approved open shellfish areas are suitable for consumption without depuration and shellfish harvested from restricted shellfish areas are suitable for consumption with depuration. For an expanded discussion on the relationship between the DMF shellfish growing areas classification and the MassDEP designated use support status, please see any of the completed MassDEP Water Quality Assessment Reports available on-line (for example the "*Boston Harbor Watershed 2004-2008 Water Quality Assessment Report*").

In addition to the WQS, the Massachusetts Department of Public Health (MADPH) has established minimum standards for bathing beaches (105 CMR 445.000) under the State Sanitary Code, Chapter VII http://mass.digitalhealthdepartment.com/public_21/index.cfm. These standards have been adopted by the MassDEP as state surface WQS for fresh water and will apply to this TMDL. The MA DPH bathing beach standards are generally the same as those which were recommended in the US EPA's "Ambient Water Quality Criteria for Bacteria – 1986" (EPA 1986) and the 2012 Recreational Water Quality Criteria (EPA 2012). The EPA recommended the use of Enterococci as the indicator bacterium for marine recreational waters and Enterococci or *E. coli* for fresh waters. As such, the following MADPH standards have been established for bathing beaches in Massachusetts:

Marine Waters - No single Enterococci sample shall exceed 104 colonies per 100 mL and the geometric mean of the most recent five Enterococci levels within the same bathing season shall not exceed 35 colonies per 100 mL.

Freshwaters - No single *E. coli* sample shall exceed 235 colonies per 100 mL and the geometric mean of the most recent five *E. coli* samples within the same bathing season shall not exceed 126 colonies per 100 mL; or (2) No single Enterococci sample shall exceed 61 colonies per 100 mL and the geometric mean of the most recent five Enterococci samples within the same bathing season shall not exceed 33 colonies per 100 mL.

The Federal BEACH Act of 2000 established a Federal standard for marine beaches. These standards are essentially the same as the MADPH marine beach standard. The Federal BEACH Act and MADPH standards can be accessed at:
https://www.epa.gov/beach-tech/beach-act-2000, and
http://www.mass.gov/eohhs/docs/dph/regs/105cmr445.pdf, respectively.

Figure 2-3 provides the location of marine bathing beaches, where the MADPH Marine Waters and the Federal BEACH Act standards would apply. A list of beaches, both fresh and marine, by community with indicator bacteria data can be found in the annual reports on the testing of public and semi-public beaches provided by the MADPH. These reports are available for download from the MADPH website located at: https://www.mass.gov/orgs/department-of-public-health.

4.0 Problem Assessment

Pathogen impairment has been documented at numerous locations throughout the Boston Harbor watershed, as shown in Figure 1-2. Excessive concentrations of indicator bacteria (e.g., Fecal coliform, Enterococci, *E. coli* etc.) can indicate the presence of sewage contamination and possible presence of pathogenic organisms. The amount of indicator bacteria and potential pathogens entering waterbodies is dependent on several factors including watershed characteristics and meteorological conditions. Indicator bacteria levels generally increase with increasing development activities, including increased impervious cover, illicit sewer connections, and failed septic systems.

Indicator bacteria levels also tend to increase with wet weather conditions as storm sewer systems overflow and/or stormwater runoff carries fecal matter that has accumulated to the river via overland flow and stormwater conduits. In some cases, dry weather bacteria concentrations can be higher when there is a constant source that becomes diluted during periods of precipitation, such as with illicit connections. The magnitude of these relationships is variable, however, and can be substantially different temporally and spatially within each watershed.

Tables 4-1 and 4-2 provide ranges of Fecal coliform concentrations in stormwater associated with various land use types. Pristine areas are observed to have low indicator bacteria levels and residential areas are observed to have elevated indicator bacteria levels. Development activity generally leads to decreased water quality (e.g., pathogen impairment) in a watershed. Development-related watershed modification includes increased impervious surface area which can (EPA 1997):

- Increase flow volume,
- Increase peak flow,
- Increase peak flow duration,
- Increase stream temperature,
- Decrease base flow, and
- Change sediment loading rates.

Many of these impacts associated with increased impervious surface area also result in changes in pathogen loading (e.g., increased sediment loading can result in increased pathogen loading). In addition to increased impervious surface impacts, increased human and pet densities in developed areas increase potential fecal contamination. Furthermore, stormwater drainage systems and associated stormwater culverts and outfall pipes often result in the channelization of streams which leads to less attenuation of pathogen pollution.

Table 4-1 Wachusett Reservoir Stormwater Sampling (as reported in MassDEP 2002c) original data provided in MDC Wachusett Stormwater Study (June 1997).

Land Use Category	Fecal Coliform Bacteria[1] (CFU / 100 mL)
Agriculture, Storm 1	110 - 21,200
Agriculture, Storm 2	200 - 56,400
"Pristine" (not developed, forest), Storm 1	0 - 51
"Pristine" (not developed, forest), Storm 2	8 - 766
High Density Residential (not sewered, on septic systems), Storm 1	30 - 29,600
High Density Residential (not sewered, on septic systems), Storm 2	430 - 122,000

[1] Grab sample collected for four storms between September 15, 1999 and June 7, 2000

Table 4-2 Lower Charles River Basin Stormwater Event Mean Bacteria Concentrations (data summarized from USGS 2002)[1].

Land Use Category	Fecal coliform (CFU/100 mL)	Enterococci Bacteria (CFU/100 mL)	Number of Events
Single Family Residential	2,800 – 94,000	5,500 – 87,000	8
Multifamily Residential	2,200 – 31,000	3,200 – 49,000	8
Commercial	680 – 28,000	2,100 – 35,000	8

[1] An Event Mean Concentration (EMC) is the concentration of a flow proportioned sample throughout a storm event. These samples are commonly collected using an automated sampler which can proportion sample aliquots based on flow.

There are 42 river and estuarine segments identified in the Boston Harbor watershed (including Weymouth-Weir, and Mystic) as defined by the MassDEP in the *2014 Integrated List* (MassDEP 2015). Table 4-3 provides summary statistics of assessed and impaired waters within the Boston Harbor watershed. In total, 33 segments contain indicator bacteria concentrations in excess of the Massachusetts WQS for Class A, SA, B, or SB waterbodies (314 CMR 4.05), the MADPH standard for bathing beaches, and/or the BEACH Act. In addition, as described in Section 3 the standards include provisions to address bacteria pollution in CSO receiving waters (Class SB/CSO and Class B CSO variance). Massachusetts has included all waters known not to be meeting water quality standards for bacteria in Boston Harbor on its 2014 Section 303(d) list. Under its current listing approach, Massachusetts keeps a waterbody on its impaired waters list until a new assessment reveals that the waterbody is meeting all applicable waters quality standards or when the original basis for listing is determined to be flawed. The basis for impairment listings is provided in the *2014 Integrated List* (MassDEP 2015). The listings that occurred in prior integrated listing cycles has been documented in water quality assessment reports

(MassDEP 2002a, MassDEP 2010a, Mass2010b, MassDEP 2010c). The methods used to develop listing decisions are described in the Comprehensive Assessment and Listing Methodology (MassDEP 2016) http://www.mass.gov/eea/docs/dep/water/resources/07v5/2012calm.pdf.

A list of pathogen impaired segments requiring TMDLs are provided in Tables 4-4 through 4-6. An overview of the Boston Harbor watershed pathogen impairments is provided in this section to illustrate the nature and extent of the impairment. Since pathogen impairment has been previously established and documented, it is not necessary to provide detailed documentation of pathogen impairment herein. Data were reviewed and are summarized by segment below for illustrative purposes. Segments are listed and discussed in hydrologic order (upstream to downstream) in the following sections. Additional details regarding each impaired segment including water withdrawals, discharges, use assessments and recommendations to meet use criteria are provided in the MassDEP WQA reports.

This TMDL was based on the current WQS using Fecal coliform as an indicator for shellfish areas, and *E. coli* for fresh and Enterococci for either salt or fresh water bathing, respectively. MassDEP has incorporated *E. coli* and Enterococci as indicator organisms for all waters other than shellfishing and potable water intake areas. Not all data presented herein were used to determine impairment listing due to a variety of reasons (including data quality assurance and quality control).

Table 4-3 Assessed and Pathogen Impaired Segment Statistics for the Boston Harbor Watershed (MassDEP 2015).

	Boston Harbor (Proper)	Boston Harbor: Weymouth & Weir	Boston Harbor: Mystic	Total Boston Harbor (excluding Neponset River sub-basin)
ESTUARY (COUNT)	10	5	5	20
total pathogen impaired segments by basin (COUNT)	10	5	4	19
% impaired	100.00	100.00	80.00	95.00
ESTUARY (mi^2)	40.65	5.56	1.018	47.228
total pathogen impaired segments by basin (mi^2)	40.65	5.56	1.01	47.22
% impaired	100.00	100.00	99.21	99.98
RIVER (COUNT)	0	13	9	22
total pathogen impaired segments by basin (COUNT)	0	7	7	14
% impaired	0.00	53.85	77.78	63.64
RIVER (mi)	0	38.2	27.6	65.8
total pathogen impaired segments by basin (mi)	0	23.7	24	47.7
% impaired	0.00	62.04	86.96	72.49

Table 4-4 Boston Harbor Proper Sub-basin Pathogen Impaired Segments Requiring TMDLs (MassDEP 2015).

Segment ID	Segment Name Waterbody Type	Segment Type	Segment Size[1]	Segment Description
MA70-10	Winthrop Bay, Class SB	Estuary	1.65 mi^2	From the tidal flats at Coleridge Street, Boston (East Boston) to a line between Logan International Airport and Point Shirley, East Boston/Winthrop.
MA70-02	Boston Inner Harbor, Class SB/CSO[2]	Estuary	2.56 mi^2	From the Mystic and Chelsea rivers, Chelsea/Boston, to the line between Governors Island and Fort Independence, Boston (East Boston), including Fort Point, Reserved, and Little Mystic Channels).
MA70-11	Pleasure Bay, Class SB	Estuary	0.22 mi^2	A semi-enclosed bay, the flow restricted through two channels between Castle and Head islands, Boston.
MA70-03	Dorchester Bay, Class SB	Estuary	3.46 mi^2	From the mouth of the Neponset River, Boston/Quincy to the line between Head Island and the north side of Thompson Island and the line between the south point of Thompson Island, Boston and Chapel Rocks, Quincy.
MA70-04	Quincy Bay, Class SA	Estuary	1.52 mi^2	From Bromfield Street near the Wollaston Yacht Club, Quincy, northeast to N42 17.3 W71 00.1, then southeast to Houghs Neck near Sea Street and Peterson Road (formerly referred to as the “Willows”) Quincy.
MA70-05	Quincy Bay, Class SB	Estuary	4.41 mi^2	Quincy Bay, north of the class SA waters (segment MA70-04), Quincy to the line between Moon Head and Nut Island, Quincy.
MA70-06	Hingham Bay, Class SB	Estuary	0.96 mi^2	The area north of the mouth of the Weymouth Fore River extending on the west along the line from Prince Head just east of Pig Rock to the mouth of the Weymouth Fore River (midway between Lower Neck and Manot Beach), Quincy.
MA70-07	Hingham Bay, Class SB	Estuary	4.8 mi^2	The area defined between Peddocks Island and Windmill Point; from Windmill Point southeast to Bumkin Island; from Bumkin Island southeast to Sunset Point; from Sunset Point across the mouth of the Weir River to Worlds End; from Worlds End across the mouth of Hingham Harbor to Crow Point; from Beach Lane, Hingham across the mouth of the Weymouth Back River to Lower Neck; and from Lower Neck midway across the mouth of the Weymouth Fore River.
MA70-09	Hull Bay, Class SB	Estuary	2.48 mi^2	The area defined east of a line from Windmill Point, Hull to Bumpkin Island, Hingham and from Bumpkin Island to Sunset Point, Hull.
MA70-01	Boston Harbor, Class SB	Estuary	18.59 mi^2	The area defined by a line from the southerly tip of Deer Island to Boston Lighthouse on Little Brewster Island, then south to Point Allerton; across Hull and West guts; across the mouths of Quincy and Dorchester Bays, Boston Inner Harbor and Winthrop Bay (including Presidents Roads and Nantasket Roads).

[1] Units = Miles for river segments, square miles for estuaries

[2] The remaining CSO discharges in this segment are permitted under the SB/CSO designation, subject to the limitations on CSO activations and volumes in the final Long-Term CSO Control Plan.

Table 4-5 Weir & Weymouth Sub-basin Pathogen Impaired Segments (MassDEP 2015).

Segment ID	Segment Name Waterbody Type	Segment Type	Segment Size[1]	Segment Description
MA74-06	Cochato River, Class B	River	4.1 mi	Outlet Lake Holbrook, Holbrook to confluence with Farm and Monatiquot Rivers, Braintree (through former pond segment Ice House Pond MA74028). (SARIS note: the upper portion of this segment is comprised of three surface waters: unnamed tributary from the outlet of Lake Holbrook, portion of Mary Lee Brook, portion of Glovers Brook).
MA74-08	Monatiquot River, Class B	River	4.4 mi	Headwaters at confluence of Cochato and Farm Rivers, Braintree to confluence with Weymouth Fore River at Commercial Street, Braintree.
MA74-09	Town Brook, Class B/SB	River	3.5 mi	Outlet Old Quincy Reservoir, Braintree to confluence with Town River Bay north of Route 3A, Quincy (includes "The Canal"/Town River) (portions culverted underground).
MA74-18	Hingham Harbor, Class SA	Estuary	1.12 mi^2	Hingham Harbor, inside a line from Crows Point to Worlds End, Hingham (formerly reported as MA70-08).
MA74-15	Town River Bay, Class SA	Estuary	0.46 mi^2	From the headwaters at the Route 3A bridge, Quincy to the mouth at the Weymouth Fore River between Shipyard and Germantown Points, Quincy.
MA74-14	Weymouth Fore River, Class B/SB	River	2.29 mi	Commercial Street, Braintree to mouth (eastern point at Lower Neck, Weymouth and western point at Wall Street on Houghs Neck, Quincy.
MA74-03	Old Swamp River, Class A (PWS Trib, ORW)	River	5.2 mi	Headwaters, west of Route 18 and south of Randolph Street, Weymouth to inlet Whitmans Pond, Weymouth (portions culverted underground).
MA74-04	Mill River, Class A (PWS Trib.)	River	3.4 mi	Headwaters, west of Route 18 and south of Randolph Street, Weymouth to inlet Whitmans Pond, Weymouth (portions culverted underground).
MA74-05	Weymouth Back River, Class B (ORW)	River	0.4 mi	Outlet Elias Pond, Weymouth to the base of the fish ladder north of Commercial Street, Weymouth.
MA74-13	Weymouth Back River, Class SA	Estuary	0.86 mi^2	From the base of the fish ladder north of Commercial Street, Weymouth to mouth between Lower Neck to the west and Wompatuck Road, Hingham.
MA74-02	Weir River, Class B/SA	River	2.7 mi	Headwaters at confluence of Crooked Meadow River and Fulling Mill Brook, Hingham to Foundry Pond Outlet, Hingham (through former pond segment Foundry Pond MA74011).
MA74-11	Weir River, Class SA	River	0.83 mi	From Foundry Pond outlet, Hingham to mouth at Worlds End, Hingham and Nantasket Road near Beech Avenue, Hull (including unnamed tributary from outlet Straits Pond, Hingham/Hull).

[1] Units = Miles for river segments, square miles for estuaries

Table 4-6 Mystic River Sub-basin Pathogen Impaired Segments[2] (MassDEP 2015).

Segment ID	Segment Name	Segment Type	Segment [1] Size	Segment Description
MA71-01	Aberjona River, Class B	River	9.1 mi.	Source just south of Birch Meadow Drive, Reading to inlet Upper Mystic Lake at Mystic Valley Parkway, Winchester (portion

Segment ID	Segment Name	Segment Type	Segment [1] Size	Segment Description
				culverted underground). (through former pond segments Judkins Pond MA71021 and Mill Pond MA71031).
MA71-04	Alewife Brook, Class B CSO Variance[2]	River	2.3 mi.	Outlet of Little Pond, Belmont to confluence with Mystic River, Arlington/Somerville (portion in Belmont and Cambridge identified as Little River with name changing to Alewife Brook at Arlington corporate boundary).
MA71-05	Malden River, Class B	River	2.3 mi.	Headwaters south of Exchange Street, Malden to confluence with Mystic River, Everett/Medford.
MA71-02	Mystic River, Class B** CSO Variance[2]	River	4.9 mi.	Outlet Lower Mystic Lake, Arlington/Medford to Amelia Earhart Dam, Somerville/Everett.
MA71-06	Chelsea River, Class SB/CSO[3]	Estuary	0.38 mi^2	From confluence with Mill Creek, Chelsea/Revere to confluence with Boston Inner Harbor, Chelsea/East Boston/Charlestown.
MA71-03	Mystic River, Class SB/CSO[3]	Estuary	0.49 mi^2	Amelia Earhart Dam, Somerville/Everett to confluence with Boston Inner Harbor, Chelsea/Charlestown (Includes Island End River).
MA71-07	Mill Brook, Class B	River	3.9 mi	Headwaters south of Massachusetts Avenue, Lexington to inlet of Lower Mystic Lake, Arlington (portions culverted underground).
MA71-08[4]	Mill Creek, Class SB	Estuary	0.02 mi^2	From Route 1, Chelsea/Revere to confluence with Chelsea River, Chelsea/Revere.
MA71-09[4]	Winn Brook, Class B	River	1.4 mi	Headwaters near Juniper Road and the Belmont Hill School, Belmont to confluence with Little Pond, Belmont (portions culverted underground).
MA71-14[4]	Belle Isle Inlet, Class SA	Estuary	0.12 mi^2	From Tidegate at Bennington Street, Boston/Revere to confluence with Winthrop Bay, Boston/Winthrop.
MA71-13[4]	Unnamed Tributary, Class B**	River	0.1 mi	Unnamed tributary locally known as 'Meetinghouse Brook', from emergence south of Route 16/east of Winthrop Street, Medford to confluence with the Mystic River, Medford. (brook not apparent on 1985 Boston North USGS quad – 2005 orthophotos used to delineate stream).

** may have salt influx

[1] Units = Miles for river segments, square miles for estuaries

[2] Remaining CSO discharges are permitted under a modification of water quality standards, as analyses are conducted and progress is made to improve water quality.

[3] The remaining CSO discharges in this segment are permitted under the SB/CSO designation, subject to the limitations on CSO activations and volumes in the final Long-Term CSO Control Plan.

[4] New Pathogen Impaired Segments that were identified in the Integrated Report (2006 through 2016) after the public comment period for this TMDL, are included in the Boston Harbor Addendum, CN#157.2 that is in the process of being developed.

Data from the Massachusetts Division of Marine Fisheries (DMF) were used, in part, as the basis for pathogen impairment for many of the estuarine areas (Figure 1-2). Numerous samples have been collected throughout the Boston Harbor watershed by the DMF. DMF has a well-established and effective shellfish monitoring program, consistent with the National Shellfish Sanitation Program, that provides quality assured data for each shellfish growing area. Each growing area must have a complete sanitary survey every 12 years, a triennial evaluation every three years, and an annual review in order to maintain a shellfish harvesting classification with the exception of those areas already classified as Prohibited. Annual fecal coliform water quality monitoring includes identification of specific sources and assessment of effectiveness of controls and attainment of standards. DMF reports that "Each year water samples are collected by the DMF at 2,320 stations in 294 growing areas in Massachusetts's coastal waters at a minimum frequency of five times while open to harvesting" (DMF 2016). Designated Shellfish Growing Areas Status as of July 1, 2015 are shown on Figure 1-2 and 2-2.

Available bacteria data are summarized in the following section. The primary sources of data include but are not limited to DMF, CZM, MassDEP, the Massachusetts Water Resources Authority (MWRA), the Mystic River Watershed Association (MyRWA), and the Environmental Monitoring for Public Access and Community Tracking (EMPACT).

Note that while many of the data included here are for Fecal coliform, (the indicator of sanitary quality for shellfish areas) *E. coli* and Enterococci in fresh water and Enterococci in salt water are now the standards for swimming. Nevertheless, Fecal coliform remains a qualitative indicator of water quality.

The MADPH publishes annual reports on the testing of public and semi-public beaches for both marine and fresh waters and note where exceedances of water quality criteria result in beach closures. These reports are available for download from the MADPH website either at http://ma.healthinspections.us/public_21/.

4.1 Boston Harbor Proper Sub-basin

<u>Winthrop Bay Segment MA70-10</u>

This 1.65 square mile Class SB, segment extends from the tidal flats at Coleridge Street in East Boston to a line between Logan International Airport and Point Shirley, East Boston/Winthrop. There are several stormwater discharges in this segment.

- MassPort Authority and the Co-Permittees of Logan International Airport (MA0000787) have an individual stormwater permit for two major stormwater outfalls to this segment and numerous smaller runway outfalls, which discharge to this segment.
- Boston Water and Sewer Commission has a stormwater permit (separate storm drainage system) (MAS01000) for 2 major outfalls and 4 non-major outfalls. Winthrop has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041084) for their municipal separate storm sewer system (MS4).
- The Atlantis Marina is a vessel pump-out facility located within this segment.

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.61 square miles; Prohibited for 0.98 square miles (Figure 1-2) (DMF 2015a).

Primary Contact Recreational use is assessed as impaired due to the frequency of closures at Constitution Beach associated with elevated levels of Enterococci bacteria. Secondary Contact Recreation is listed as Support and Aesthetics is not assessed.

The MWRA collected bacteria data at Station #130, as part of their Combined Sewer Overflow (CSO) monitoring program between 2003 and 2014 (MassDEP 2002a). Results of this sampling are provided in Table 4-7. The MWRA also collected daily seasonal bacteria samples between 2008 and 2014 at three stations at Constitution Beach (Table 4-7) (MassDEP 2010a); (MWRA 2014a).

Table 4-7 MA70-10 Winthrop Bay Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1,2] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)			**Fecal coliform (cfu/100 mL)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.		
	Geometric mean	**Range**	**n**	**Geometric mean**	**Range**	**n**
Winthrop Harbor, green can #1 (MWRA site 130)						
2003 - 2007	1.6	0 - 140	206	1.8	0 - 510	202
2008 - 2009	3.3	0 - 1370	43	2.4	0 - 65	44
2010 - 2014	2.3	1 - 637	108	2.7	1 - 340	108
2008 - 2009	7.9	0 - 9210	477			
2010 - 2014	5.3	1 - 6490	1164			
All locations						
2008 - 2009	7.3	0 - 9210	520	2.4	0 - 65	44
2010 - 2014	4.9	1 - 6490	1272	2.7	1 - 340	108

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform or *E. coli*).
Average of a minimum of 5 samples.
[3]Three sampling locations are included in the Constitution Beach sampling – North Site (MWRA site MD16), Bathhouse Site (MWRA site MD17), and Recreation Center (MWRA site MD18).
[4]N/A = no data; Fecal coliform was analyzed at Constitution Beach after 2000.

Boston Inner Harbor Segment MA70-02

This 2.56 square mile Class SB/CSO, Combined Sewer Overflow (CSO) receiving water segment extends from Chelsea/Boston to East Boston/Boston. The segment includes the waters from the Mystic and Chelsea Rivers to a line drawn from Governors Island to Fort Independence. Fort Point, Reserved and Little Mystic Channels are also included in this segment.

The following are permitted NPDES discharges within this segment, which include CSO outfalls as indicated:

- Boston Water and Sewer Commission (BWSC) (MA0101192): including numerous CSO outfalls (MWRA internal outfall MRW215) from the BWSC and MWRA co-permitted Union Park CSO Treatment Facility.
- Exelon New Boston, LLC (MA0004731): Facility closed December 2007, permit terminated June 2009. Exelon now has coverage for stormwater outfalls under the 2008 Multi-Sector General Permit (MSGP) for Stormwater Discharges Associated with Industrial Activities.
- MGH Institute of Health Professionals (MAG250019)
- Boston Ship Repair, LLC (MA0040142)
- P&G Gillette Company (MA0003832)
- MassPort Authority and the Co-Permittees of Logan International Airport (MA0000787) (3 major outfalls to this segment and numerous minor runway stormwater outfalls).
- Massachusetts Water Resources Authority (MA0103284) CSO Outfall 203 Prison Point CSO Treatment Facility
- New England Aquarium Corporation (MA0003123)
- U.S. Coast Guard Integrated Support Command (MA0090671) permit was terminated in December 2006.
- Massachusetts Turnpike Authority Central Artery Tunnel Project (MA0033928) permit was terminated in August 2008.
- Boston Water and Sewer Commission (MAS010001) NPDES Stormwater Permit.
- City of Chelsea MS4 (MAR041077)

There are four vessel sewage pump-out facilities located within this segment: Boston Waterboat Marina, Long Wharf, Constitution Marina, Shipyard Quarters Marina, and Marina at Rowes Wharf.
According to the MassDEP WQA, other state (and related) agencies operating public storm drains, including the Department of Conservation and Recreation (DCR), MA Department of Transportation, Boston Water and Sewer Commission, and the Massachusetts Water Resources Authority (MWRA) are required to obtain NPDES stormwater permits.

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.00156 square miles; Prohibited for 2.45 square miles (Figure 1-2) (DMF 2015a).

Primary and Secondary Contact Recreational use is assessed as unimpaired with the exception of the Fort Point Channel of Boston Inner Harbor is impaired for Primary Contact Recreational use. Fort Point Channel was impaired due to elevated levels of Enterococci bacteria. Aesthetics use is not assessed.

The MWRA collected bacteria data as part of their CSO monitoring program between 2008 and 2014 (MassDEP 2010a); (MWRA 2014). Summary results of this sampling are provided in Table 4-8.

Table 4-8 MA70-02 Boston Inner Harbor Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)**[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Upper Inner Harbor/Chelsea River confluence(MWRA site 015)								
2008 - 2009	2.4	0 - 538	83		21	0 - 1180	83	
2010 - 2014	8.1	1 - 5480	124		35.8	1 - 12000	123	
Upper Inner Harbor/Charles River mouth (MWRA site 014)								
2008 - 2009	2.4	0 - 448	201		6.2	0 - 8400	189	
2010 - 2014	4.7	1 - 631	116		23.2	1 - 1730	115	
Near New England Aquarium (MWRA site 138)								
2008 - 2009	3.9	0 - 201	96		22	0 - 1470	84	
2010 - 2014	3.6	1 - 158	129		23.3	1 - 555	129	
Head of Fort Point Channel (MWRA site 075)								
2008 - 2009	404	0 - 33100	92		4270	9 - 290000	89	
2010 - 2014	494	1 - 73300	200		4651	27 - 360000	200	
Mid Fort Point Channel/Summer St. Bridge (MWRA site 018)								
2008 - 2009	14	0 - 24200	131		158	0 - 382000	128	
2010 - 2014	59	1 - 13000	202		524	1 - 968000	202	
Mouth of Fort Point Channel (MWRA site 019)								
2008 - 2009	3.5	0 - 495	109		27	0 - 16800	109	
2010 - 2014	6.2	1 - 2610	119		36	1 - 5900	118	
Reserved Channel (MWRA site 022)								
2008 - 2009	2.6	0 - 627	83		5.7	0 - 2500	83	
2010 - 2014	6.9	1 - 3650	122		14.5	1 - 16000	121	
Mouth of Inner Harbor (MWRA site 024)								
2008 - 2009	2.4	0 - 448	201		6.2	0 - 8400	189	
2010 - 2014	3.2	1 - 2100	282		7.3	1 - 5900	281	
All locations combined								
2008 - 2009	5.9	0 - 33100	877		33.8	0 - 382000	847	
2010 - 2014	14.4	1 - 73300	1294		69.5	1 - 968000	1289	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform).
(Ave of a minimum of 5 samples)

Pleasure Bay Segment MA70-11

This is a 0.22 square mile Class SB in Boston. The segment is a semi-enclosed bay with two channels between Castle and Head Islands restricting flow. The Massachusetts Water Resources Authority was authorized to discharge under the Remediation General Permit (MAG910128) at the Pleasure Bay Stormwater Relocation project in South Boston (permit issued November 2005 and expired September 2010). The project entailed diverting Pleasure Bay stormwater drainage away from the beach area and into the Reserved Channel requiring the construction of 4,600 feet of new drain piping ranging from 18 to 48 inches. The project was a component of MWRA's Long-Term CSO Control Plan for North Dorchester Bay and Reserved Channel. This has been completed in compliance with the Court-ordered schedule. The new storm drains run along Day Boulevard and Shore Road and ultimately connected to the existing BOS080 outfall at Reserved Channel. Upon completion of the North Dorchester Bay Storage Tunnel in 2008, the discharge from BOS081 was eliminated. (Water quality with respect to pathogen contamination was greatly improved between 2011 and 2015, such that closures at Carson Beach drastically reduced from 18% to 4% of the time, following very heavy rain events. See Section 8.2 for more details).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.22 square miles; Prohibited for 0.000043 square miles (Figure 1-2) (DMF 2015a).

Primary and Secondary Contact Recreational are assessed as support for Pleasant Bay based on generally acceptable levels of Enterococci bacteria expressed in terms of beach closures. The Primary Contact Recreational Use is identified with an Alert status because of occasional beach closures although major stormwater related projects that have recently been completed should result in improved conditions. Aesthetics use is not assessed.

The MWRA collected weekly bacteria data at one main sampling station between 2007 and 2014 (MassDEP 2010); (MWRA 2014). Results of this sampling are provided in Table 4-9.

Table 4-9 - MA70-11 Pleasure Bay Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1,2] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)		
	Geometric mean	**Range**	**n**
Pleasure Bay Beach[2]			
2008 - 2009	6.0	0 - 4000	46
2010 - 2014	2.3	1 - 2610	445

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform). (Ave of a minimum of 5 samples)
[2]One sampling location is included in the Pleasure Bay Beach sampling conducted by DCR – Broadway St (MWRA site MDC20).

Dorchester Bay Segment MA70-03

This 3.5 square mile Class SB, Shellfishing Restricted, segment is located in Boston/Quincy. The segment includes the waters delineated by the mouth of the Neponset River and a line drawn between the south point of Thompson Island and Chapel Rocks. This segment has one vessel sewage pump-out facility located at Marina Bay. The following are NPDES Permits within this segment:

- University of Massachusetts-Boston (MA0040304)
- Boston Water and Sewer Commission (BWSC) (MA0101192) Outfalls BOS081 – BOS087, (7 discharges), no longer discharge to South Boston beaches. There were four major MWRA infrastructure projects completed in 2011 to abate CSO's from these outfalls and all CSO discharges to Dorchester Bay were eliminated for storms up to and including a 25-year storm event (regulator structures will remain open to relieve the system for larger events; secondary benefit is stormwater will also be collected and diverted from the beaches for all storms up to a five-year event).
- North Dorchester Bay Storage Tunnel--completed 12/09
- Pleasure Bay Storm Drain Improvements within the Dorchester Bay segment--completed 3/06
- Morrissey Blvd. Storm Drain--completed 6/09
- Conley Terminal Pump Station and Odor Control Facility--completed 2011
- Massachusetts Water Resources Authority (MA0103284) CSO outfall 209 Fox Point via BOS088/089 was eliminated in 2007 as result of sewer separation work in South Dorchester Bay.
- City of Quincy Phase II Stormwater MS4 Permit (MAR041081).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.26 square miles; Prohibited for 3.11 square miles (Figure 1-2) (DMF 2015a).

Primary Contact Recreational use is assessed as impaired based on the frequency of beach closures at four of the six public beaches in this segment that were associated with elevated levels of Enterococci bacteria from storm events. The frequency of Secchi disk depths below the swimming criterion in the southern Dorchester Bay is also a concern. Secondary Contact Recreational is assessed as support based on the acceptable Enterococci bacteria levels and generally good Secchi disk depths. Aesthetics use is not assessed.

The MWRA collected bacteria data as part of their CSO monitoring program between 2003 and 2014 (MassDEP 2010a) (MWRA 2014a). Results of this sampling are provided in Table 4-10. Data in this table are from seven ambient stations in the Bay itself. Additionally, the MWRA and MDC took weekly bacteria samples between 2003 and 2014 at bathing beaches in this segment. Most of the high bacteria counts were associated with wet weather. A summary of the bathing beaches sampling is presented in Table 4-10 below.

Table 4-10 MA70-03 Dorchester Bay Bacterial Water Quality Summary

Site Description	Enterococcus (cfu/100 mL) [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				Fecal coliform (cfu/100 ml) [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
North Dorchester Bay, Carson Beach at L St (MWRA site 033)								
2008 - 2009	3.8	0 - 1790	72		9.6	0 - 2100	73	
2010 - 2014	4.5	1 - 768	169		6.8	1 - 2800	169	
North Dorchester Bay, Carson Beach Bathhouse (MWRA site 036)								
2008 - 2009	6.1	0 - 1270	78		19.8	0 - 23400	79	
2010 - 2014	5.4	1 - 2360	171		6.9	1 - 5800	171	
North Dorchester Bay, central (MWRA site 038)								
2008 - 2009	2.1	0 - 171	96		5.2	0 - 160	86	
2010 - 2014	1.6	1 - 52	132		4.7	1 - 170	131	
South Dorchester Bay, Columbia Point at Buoy 12 (MWRA site 084)								
2008 - 2009	4.3	0 - 471	107		17.7	0 - 2400	109	
2010 - 2014	4.6	1 - 464	122		23.7	1 - 2000	122	
South Dorchester Bay at Neponset R. mouth (MWRA site 140)								
2008 - 2009	3.0	0 - 317	94		18.8	0 - 1240	84	
2010 - 2014	4.8	1 - 833	141		27	1 - 540	141	
Malibu Bay (MWRA site 040)								
2008 - 2009	3.5	0 - 121	41		47.2	0 - 730	42	
2010 - 2014	5	1 - 2360	109		36.3	1 - 2900	109	
Savin Hill Cove, at UMASS dock (MWRA site 039)								
2008 - 2009	10.9	0 - 6870	128		67.5	0 - 63000	127	
2010 - 2014	15.6	1 - 6130	171		77.4	1 - 19800	169	
All locations								
2008 - 2009	4.5	0 - 6870	616		20.1	0 - 63000	600	
2010 - 2014	5.1	1 - 6130	1015		16.5	1 - 19800	1012	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform).

Table 4-11 MA70-03 Carson, M Street, and City Point Beach Bacterial Water Quality Summary

Site Description	Enterococcus (cfu/100 mL) [1,2] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)		
	Geometric mean	**Range**	**n**
Carson Beach, Bathhouse (MWRA site MDC23)			
2008 - 2009	9.3	0 - 4630	159
2010 - 2014	5	1 - 1420	331
Carson Beach, I Street (MWRA site MDC22)			
2008 - 2009	9.8	0 - 4160	159
2010 - 2014	3.8	1 - 691	332
M Street Beach (MWRA site MDC21)			
2008 - 2009	4.7	0 - 1270	159
2010 - 2014	2.9	1 - 402	330
City Point Beach (MWRA site MDC45)			
2008 - 2009	4.2	0 - 677	159
2010 - 2014	2.7	1 - 420	329
All locations			
2008 - 2009	6.5	0 - 4630	636
2010 - 2014	3.5	1 - 1420	1322

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*).

Quincy Bay Segment MA70-04

This 1.2 square mile segment is a Class SA Waterbody in Quincy. The segment extends from Bromfield Street near the Wollaston Yacht Club northeast to N42.2781 W70.9941, southeast to N42.2735 W70.9678, and south to Newton Street on the northerly shore of Houghs Neck. Quincy has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041081) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.41 square miles; Prohibited for 1.11 square miles (Figure 1-2) (DMF 2015a).

Primary Contact Recreational use is assessed as impaired based on the frequency of beach closures at a public beach (Wollaston beach) associated with elevated levels of Enterococci bacteria from storm events. Secondary Contact Recreational use is assessed as support in Dorchester Bay. Aesthetics use is unassessed.

The MWRA sampled bacteria samples at one location on this segment between 2008 and 2009 (MassDEP 2010); (MWRA 2014). Results are summarized in Table 4-12 below.

Table 4-12 MA70-04 Quincy Bay Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Quincy Bay, off Merrymount Park (MWRA site 077) 2008 - 2009	3.3	0 – 10	2		2.0	0 – 0	2	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform). Ave of a minimum of 5 samples. Routine monitoring at Station 077 ended in 2009.

Quincy Bay Segment MA70-05

This 4.8 square mile Class SB, segment is located in Quincy. This segment is north of segment MA70-04 and extends to a line drawn between Moon Island and Nut Island. Quincy has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041081) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.34 square miles; Prohibited for 4.05 square miles (Figure 1-2) (DMF 2015a).

Primary Contact Recreational use is assessed as impaired based on the frequency of beach closures at Wollaston Beach associated with elevated levels of Enterococci bacteria from storm events The Secondary Contact Recreational use is assessed as support based on the acceptable Enterococci bacteria levels and good Secchi Disk depths. Aesthetics use is not assessed.

The MWRA took weekly bacteria samples between 2008 and 2014 at six locations at Wollaston Beach and just offshore within this segment. Most of the high bacteria counts, particularly near or at beaches, have been associated with wet weather (MassDEP 2010a). A summary of the bathing beach and offshore sampling is also presented in Table 4-13 below.

Table 4-13 MA70-05 Quincy Bay and Wollaston Beach Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Quincy Bay, Hangman's Is. (MWRA site 139)								
2008 – 2009	1.4	0 - 10	46		2.5	0 - 60	38	
2010 - 2014	1.3	1 - 20	131		2.4	1 - 150	131	
Quincy Bay, offshore near Sachem St (MWRA site 047)								
2008 – 2009	1.7	0 - 10	18		3.3	0 - 105	18	
2010 - 2014	2.4	1 - 282	113		3.6	1 - 590	113	
Wollaston Beach, Milton Rd (MWRA site MDC29)								
2008 – 2009	16.4	0 - 7270	161		60.9	0 - 2000	34	
2010 - 2014	11.8	1 - 8160	397					
Wollaston Beach, Channing St. (MWRA site MDC31)								
2008 – 2009	13.9	0 - 2930	77		150	5 - 2500	34	
2010 - 2014	16.1	1 - 19900	402					
Wollaston Beach, Sachem St. (MWRA site MDC30)								
2008 – 2009	9.9	0 - 4110	77		64	0 - 3800	34	
2010 - 2014	10.9	1 - 24200	399					
Wollaston Beach, Rice Rd (MWRA site MDC32)								
2008 - 2009	8.9	0 - 2380	77		23.9	0 - 4800	34	
2010 - 2014	6.6	1 - 24200	395					
All locations								
2008 - 2009	7.6	0 - 7270	372		61.1	0 – 4800	136	
2010 - 2014	8.5	1 - 24200	1837		2.9	1 - 590	244	

[1] Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform).

Hingham Bay Segment MA70-06

This is a 1.0 square mile Class SB segment in Quincy. The segment is enclosed by lines connecting the area north of the mouth of the Weymouth Fore River to Nut Island then to Prince Head and then to Pig Rock. Nut Island was formerly the site of one of MWRA's sewage treatment plants and now serves as a headworks for the south system flows to the Deer Island Treatment Plant. Three former outfalls have been retained (Nut Island Emergency Spillway as part of MA0103284) and only discharge during extreme high flow rain events to prevent sewage backups into homes and businesses. Quincy has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041081) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.01 square miles; Prohibited for 0.93 square miles (Figure 1-2) (DMF 2015a).

The Primary and Secondary Recreational uses are assessed as support for this segment of Hingham Bay based on the Enterococci bacteria data and the generally low frequency of beach closures at Edgewater Beach. Aesthetics use is not assessed.

The MWRA collected limited bacteria samples from the Quincy Yacht Club, Red Buoy #2 (Station # 080) between 2008 and 2014. The results are summarized in Table 4-14 below (MRWA 2014).

Table 4-14 MA70-06 Hingham Bay Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Quincy Yacht Club, Red Buoy #2 (MWRA site 080)								
2008 - 2009	1.1	0 - 10	39		2.0	0 - 205	40	
2010 - 2014	2	1 - 712	110		2.2	1 - 2480	110	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform).

Hingham Bay Segment MA70-07

This is a 4.8 square mile Class SB segment between Peddocks Island and Windmill Point. The area is defined by lines from Windmill Point southeast to Bumkin Island, from Bumkin Island southeast to Sunset Point, from Sunset Point across the mouth of the Weir River to Worlds End, from Worlds End across the mouth of Hingham Harbor to Crow Point, from Beach Lane, Hingham across the mouth of the Weymouth Back River to Lower Neck, and from Lower Neck midway across the mouth of the Weymouth Fore River. The communities of Hull, Hingham, and Weymouth have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041040; MAR041038; MAR041070) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.11 square miles; Prohibited for 4.61 square miles (Figure 1-2) (DMF 2015a).

The Primary and Secondary Contact Recreational uses are assessed as support for this segment of Hingham Bay based on the Enterococci bacteria data and the lack of any beach closures at Kimball, Belair and North beaches in Hingham. Aesthetics use is not assessed.

The MWRA sampled for bacteria at one to two locations in this segment between 2008 and 2014 (MassDEP 2010a); (MWRA 2014). Results are summarized in Table 4-15 below.

Table 4-15 MA70-07 Hingham Bay Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)**[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Hingham/Hull Bay green can #1 (MWRA site 117)								
2010 - 2014	3.2	1 - 10	2		12.8	9.09 - 18	2	
Hingham Bay, Crow Point flats (MWRA site 124)								
2008 - 2009	1.1	0 - 10	18		2.1	0 - 30	18	
2010 - 2014	1.1	1 - 20	81		1.8	1 - 23.1	81	

[1]Values equal to 0 are below detection limits (generally <10 for *Enterococcus*, and <5 for Fecal coliform).

<u>Boston Harbor Segment MA70-01</u>

This is a 24.2 square mile Class SB segment. This Boston Harbor segment is in Massachusetts Bay and extends from the line between Fort Dawes on Deer Island to The Graves, and from The Graves south to Point Allerton, across Hull and West Guts; across the mouths of Quincy and Dorchester Bays, Boston Inner Harbor and Winthrop Bay (including President Roads and Nantasket Roads).

The following have NPDES wastewater permits to discharge to Boston Harbor:

- MassPort Authority and the Co-Permittees of Logan International Airport (MA0000787) has numerous runway outfalls that discharge to this segment.
- Massachusetts Water Resource Authority has 3 permitted emergency discharge outfalls from the Nut Island Headworks and 4 permitted emergency discharge outfalls from the Deer Island Treatment Plant (MA0103284).
- Town of Hull Water Pollution Control Facility (MA0101231).
- U.S. Department of Homeland Security/U.S. Coast Guard Boston Light (MA0090433).
- Massachusetts Port Authority Logan International Airport Fire Training Facility (MA0032751).
- Boston Water and Sewer Commission (MAS01000).
- Town of Hull MS4 (MAR041040).
- City of Quincy MS4 (MAR041081).

- Town of Winthrop MS4 (MAR041084).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.33 square miles; Prohibited for 18.1 square miles (Figure 1-2) (DMF 2015a).

The MWRA sampled for bacteria at seven locations in this segment between 2003 and 2014 (MassDEP 2010a); (MWRA 2014). The samples with the highest numbers were collected during wet weather. Results are summarized in Table 4-16 below.

Table 4-16 MA70-01 Boston Harbor Bacterial Water Quality Summary

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Mouth of Dorchester Bay (MWRA site 044)								
2008 - 2009	2.1	0 - 63	106		4.3	0 - 2200	108	
2010 - 2014	3.2	1 - 1130	124		3.8	1 - 2400	123	
Moon Island (MWRA site 048)								
2008 - 2009	1.4	0 - 41	80		2.4	0 - 45	82	
2010 - 2014	1.8	1 - 350	109		2.3	1 - 510	109	
North of Spectacle Island (MWRA site 065)								
2008 - 2009	2.4	0 - 52	41		4.2	0 - 150	42	
2010 - 2014	1.9	1 - 341	109		3.3	1 - 1280	109	
North of Long Island (MWRA site 106)								
2008 - 2009	1.2	0 - 10	93		1.9	0 - 40	83	
2010 - 2014	1.3	1 - 41	121		2.1	1 - 210	120	
North of Peddocks Island (MWRA site 141)								
2008 - 2009	1.2	0 - 10	94		2.1	0 - 65	84	
2010 - 2014	1.1	1 - 20	126		1.5	1 - 35	125	
President Roads (MWRA site 142)								
2008 - 2009	1.1	0 - 61	89		1.9	0 - 45	79	
2010 - 2014	1.2	1 - 10	116		1.7	1 - 75	116	
All locations								
2008 - 2009	1.4	0 - 63	503		2.6	0 - 2200	478	
2010 - 2014	1.6	1 - 1130	705		2.3	1 - 2400	702	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform or *E. coli*).

Hull Bay Segment MA70-09

This is a 2.5 square mile Class SB, segment located in the Massachusetts Bay in that area defined as: between the west coastline of Hull and a line drawn from Windmill Point to Bumpkin Island to Sunset Point, Hull. Hull has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041040) for their municipal separate storm sewer system (MS4).

The town of Hull has done Enterococcus bacteria sampling at James Ave Bayside, A Street Bayside, and Newport, which are all along the coastline of Hull Harbor. Sampling results are summarized in Table 4-17 below.

The Primary and Secondary Contact Recreational uses are assessed as support for this segment based on the lack of any frequent or prolonged beach closures. Aesthetics use is not assessed.

DMF Designated Shellfish Growing Areas Status as of July 1, 2000: Conditionally Restricted for 0.22 square miles; Prohibited for 2.22 square miles (Figure 1-2) (DMF 2015a).

Table 4-17 MA70-09 Summary of Enterococcus Data (Town of Hull) 2003- 2015 for Hull Bay

Site Description	Min	Max	Number of Samples >104*	Number Samples
	cfu/100 mL			
At James Avenue Bayside 2003-9	<2	990	3	99
At James Avenue Bayside 2011-15	<10	75	0	41
At A Street Bayside 2003-9	<2	1,800	7	101
At A Street Bayside 2011-15	<10	800	5	56
At Newport 2003-9	<2	380	2	98
At Newport 2011-15	<10	20	0	24

*Indicator Bacteria, Enterococcus: geometric mean <=35 col/100 mL and single sample <=104 col/100 mL

4.2 Weir and Weymouth Sub-basin

Cochato River Segment MA74-06

This is a 4.1 mile long Class B segment extending from Holbrook to Braintree. The segment begins at the outlet of Lake Holbrook and ends at its confluence with Farm and Monatiquot rivers. The Lake Holbrook Dam is located along this segment and is maintained by the Holbrook Conservation Commission.

Holbrook and Braintree have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) MS4 stormwater general permit (MAR041039; MAR041029) for their municipal separate storm sewer system (MS4).

This segment first appeared on the 303d List of Waters for pathogens in 1992. Primary and Secondary Contact Recreation and Aesthetics uses are not assessed due to insufficient data available (MassDEP 2010a).

The MassDEP collected *E. coli* samples from the Cochato River during 2009. The data are summarized in Table 4-18 below.

Table 4-18 MA74-06 Cochato River *E. coli* Data Summary.

Primary Contact Season			
	Min	Max	
Site Description	cfu/100mL		n
MassDEP 2009			
Downstream of road and 2 stormwater outfalls, Route 37 (Washington St), Braintree	70	1,500	6

Monatiquot River Segment MA74-08

This is a 4.4 mile long Class B segment in Braintree. The segment begins at the confluence of Cochato and Farm Rivers and ends at its confluence with Weymouth Fore River at Route 53. Braintree has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041029) for their municipal separate storm sewer system (MS4).

This segment first appeared on the 303d List of Waters for pathogens in 1992. Primary and Secondary Contact Recreation and Aesthetics uses were not assessed due to insufficient data available (MassDEP 2010a).

The USGS collected wet and dry weather Fecal coliform bacteria samples from the Monatiquot River for the Massachusetts Watershed Initiative MWI99-02 grant project in 1999 and 2000 (MassDEP 2002a). The MassDEP collected *E. coli* samples from the Monatiquot River during 2009. Data from the USGS, and MassDEP samplings are summarized below in Table 4-19 below.

Table 4-19 MA74-08 Monatiquot River Fecal coliform and *E. coli* Data Summary

Primary Contact Season				
	Min	Max		
Site Description	cfu/100mL		n	n
USGS 1999-2000, Fecal coliform				
Commercial Street, East Braintree	270	4,800	10	7

Primary Contact Season				
Site Description	Min	Max	n	n
MassDEP 2009, *E. coli*				
700' upstream of Commercial Street, Braintree	140	480	6	3
River Street, Braintree	50	460	6	3

<u>Town Brook Segment MA74-09</u>

This 3.5 mile long Class B/SB segment extends from outlet of Old Quincy Reservoir in Braintree to its confluence with Town River, north of Route 3A (includes the "Canal") in Quincy. The Old Quincy Reservoir Dam is located on this segment. The brook is underground for approximately 2.6 miles from the Route 3 interchange in Braintree to Revere Road. The Massachusetts Bay Transit Authority (MBTA) Quincy Pump Station is permitted (MA0033987) to discharge wet weather flow and groundwater to this segment. Quincy and Braintree have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041081; MAR041029) for their municipal separate storm sewer system (MS4).

This segment first appeared on the 303d List of Waters for pathogens in 2002 based on data collected by the USGS. Primary and Secondary Contact Recreation and Aesthetics uses were not assessed due to insufficient data available (MassDEP 2010a).

The USGS collected wet and dry weather Fecal coliform bacteria samples from Town Brook for the Massachusetts Watershed Initiative MWI99-02 grant project between May 1998 and June 2000 (MassDEP 2002a). The MassDEP collected *E. coli* samples from the Town Brook during 2009. Data from the USGS and MassDEP samplings are summarized below in Table 4-20.

Table 4-20 MA74-09 Town Brook Fecal coliform and *E. coli* Data Summary

	Min	Max	
Site Description	cfu/100mL		n
USGS 1998-2000, Fecal coliform			
Downstream from Miller Stile Road	420	23,000	10
MassDEP 2009, *E. coli*,			
Elm Street, Quincy	250	590	6
Miller Stile Road, Quincy	330	2,200	6

<u>Town River Bay Segment MA74-15</u>

This 0.46 square mile Class SA segment extends from its headwaters in Quincy at the Route 3A bridge to its mouth at the Weymouth Fore River between Shipyard and Germantown Points, also in Quincy. Two vessel sewage pump-out facilities are located on this segment: Bay Pointe Marina and Town River Yacht

Club. Twin Rivers Technologies US Inc. discharge non-contact cooling water and boiler blow down (MA0004073) via one outfall to this segment. Sprague has two permits (Sprague Operating Resources LLC (MA0020869), Sprague Twin Rivers Technology (TRT) Terminal (MA0028037)) to discharge treated stormwater runoff through three outfalls to this segment. Quincy has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041081) for their municipal separate storm sewer system (MS4).

Primary and Secondary Contact Recreational uses were assessed as support. With the exception of one beach during one season, all marine beaches had closures during less than 10% of the season. Aesthetics use is not assessed due to insufficient data available (MassDEP 2010a).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.10 square miles; Prohibited for 0.30 square miles (Figure 1-2) (DMF 2015a).

The City of Quincy has done Enterococci bacteria sampling at Delano Avenue, Broady (Baker), and Mound, which are located along the shoreline of Town River Bay. Sampling results are summarized in Table 4-21 below. Additionally, DMF has sampled at two MA74-15 Town River Bay estuary stations approximately 12 times each year, 2011- 2014. The data are summarized in Table 4-22 below.

Table 4-21 MA74-15 Summary of Enterococci Data (Town of Quincy) 2003- 2014

Site Description	Min	Max	# Samples >104	# Samples	Geomean
	cfu/100 mL				
At Delano Avenue, 2003-2010	<2	330	5	55	-
At Delano Avenue, 2011-2014	5	3,282	10	43	32
At Broady (Baker), 2003-2010	<2	637	15	110	-
At Broady (Baker), 2011-2014	5	6,015	8	57	21
At Mound, 2003-2010	<2	6,015	5	105	-
At Mound, 2011-2014	5	4,160	5	40	16

*Indicator Bacteria, Enterococci: geometric mean <=35 col/100 mL and single sample <=104 col/100 mL

Table 4-22 MA74-15 Town River Bay 2 Monitoring Stations* DMF Fecal coliform Data, 2011-2014

2011 Geometric Average of 2 Stations	2012 Geometric Average of 2 Stations	2013 Geometric Average of 2 Stations	2014 Geometric Average of 2 Stations	2011- 2014 Combined Geometric Average of 2 Stations
18.4 cfu/100mL	7.9 cfu/100mL	6.8 cfu/100mL	8.3 cfu/100mL	10.4 cfu/100mL

*An average of 12 samples taken each year at each station

Weymouth Fore River Segment MA74-14

This 2.29 square mile Class B/SB, segment extends from Route 53 in Braintree to the river's mouth. The eastern point of the mouth is located at Lower Neck in Weymouth, and the western point of the mouth is located at Wall Street on Houghs Neck in Quincy. NPDES Permits in this segment include: MA0004782 (Citgo Petroleum Corp, Braintree), MA0004073 (Twin Rivers Technologies L.P.), MA0005517 (Braintree Electric Light Department), MA0031551 (Clean Harbors Of Braintree, Inc). Quincy, Braintree, and Weymouth have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041081; MAR041029; MAR041070) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.59 square miles; Prohibited for 1.56 square miles. (Figure 1-2) (DMF 2015a).

Primary and Secondary Contact Recreation uses are assessed as support. In the majority of the years, the majority of the beaches had closures less than 10% of the season. Aesthetics use was not assessed (MassDEP 2010a).

DMF has sampled fourteen MA74-14 Weymouth Fore River estuary stations approximately 12 times each year, 2011- 2014. The data are summarized in Table 4-23 below.

Table 4-23 MA74-14 Weymouth Fore River- 14 Monitoring Stations* DMF Fecal coliform Data, 2011-2014

2011 Geometric Average of 14 Stations	2012 Geometric Average of 14 Stations	2013 Geometric Average of 14 Stations	2014 Geometric Average of 14 Stations	2011- 2014 Combined Geometric Average of 14 Stations
17.0 cfu/100mL	9.4 cfu/100mL	11.6 cfu/100mL	12.2 cfu/100mL	12.6 cfu/100mL

*An average of 12 samples taken each year at each station

Old Swamp River Segment MA74-03

This 5.2 mile long Class A (PWS/Trib/ORW) segment extends from its headwaters just west of Pleasant Street and north of Liberty Street in Rockland to the inlet to Whitman's Pond in Weymouth. Rockland and Weymouth have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041058; MAR041070) for their municipal separate storm sewer system (MS4).

This segment first appeared on the 303d List of Waters for pathogens in 1992 based on Fecal coliform data. The Primary and Secondary Contact Recreation and Aesthetics uses were not assessed due to insufficient data available (MassDEP 2010a).

The USGS collected Fecal coliform bacteria samples from Old Swamp River for the Massachusetts Watershed Initiative grant project between 1999 and 2000 (MassDEP 2002a). The MassDEP collected *E. coli* samples from the Old Swamp River during 2009. Data from the USGS and MassDEP sampling activities are summarized below in Table 4-24.

Table 4-24 MA74-03 Old Swamp River *E. coli* Data Summary.

Site Description	Min	Max	n
USGS 1999-2000, Fecal coliform			
USGS gage (01105600)	10	2,400	9
MassDEP 2009, *E. coli*			
Sharp Street, Hingham	30	440	6
Ralph Talbot Street, Weymouth	180	1,500	6
Elm Street, Weymouth	160	1,200	6
Libbey Industrial Parkway, Weymouth	110	1,000	6

Mill River Segment MA74-04

This 3.4 mile long Class A (PWS/Trib/ORW) segment extends from the headwaters, west of Route 18 and south of Randolph Street, Weymouth to the inlet of Whitmans Pond, also in Weymouth.

Randolph and Weymouth have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041055; MAR041070) for their municipal separate storm sewer system (MS4).

This segment first appeared on the 303d List of Waters for pathogens in 1992 based on Fecal coliform data. Primary and Secondary Contact Recreation and Aesthetics uses are not assessed due to insufficient data available (MassDEP 2010a).

The MassDEP collected *E. coli* samples from the Mill River during 2009. The data are summarized in Table 4-25 below.

Table 4-25 MA74-04 Mill River *E. coli* Data Summary.

Primary Contact Season			
	Min	Max	
Site Description	cfu/100mL		n
MassDEP 2009			
Front Street, (upstream of the outfall downstream from the bridge), Weymouth	140	3,600	6
West Street, Weymouth	190	2,000	6

Weymouth Back River Segment MA74-05

This 0.4 mile long Class B, Outstanding Resource Water (ORW) segment is located in Weymouth. The river begins at the outlet of Elias Pond and extends to the Old Bay Colony Railroad tracks. Weymouth has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041070) for their municipal separate storm sewer system (MS4).

This segment first appeared on the 303d List of Waters for pathogens in 1992 based on Fecal coliform data collected by USGS. Primary and Secondary Contact Recreation and Aesthetics uses were not assessed due to insufficient data available (MassDEP 2010a).

USGS collected Fecal coliform bacteria samples during both wet and dry weather from their gage located on this segment for the Massachusetts Watershed Initiative grant project between 1999 and 2000 (MassDEP 2002a). The MassDEP collected *E. coli* samples from the Weymouth Back River during 2009. Data from the USGS and MassDEP samplings are summarized below in Table 4-26.

Table 4-26 MA74-05 Weymouth Back River Fecal coliform and *E. coli* Data Summary.

	Min	Max	
Site Description	cfu/100mL		n
USGS 1999-2000, Fecal coliform			
Downstream from Broad Street, East Weymouth	40	28,000	10
MassDEP 2009, *E. coli*			
Approximately 500’ downstream of Commercial Street, Weymouth	310	2,500	6

Weymouth Back River Segment MA74-13

This 0.86 square mile Class SA segment extends from Weymouth to Hingham. The segment begins at the Old Bay Colony Railroad tracks and continues to the river’s mouth between Lower Neck to the west and Wompatuck Road. Weymouth has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041070) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.31 square miles; Prohibited for 0.46 square miles. (Figure 1-2) (DMF 2015a).

The Primary and Secondary Recreational uses are assessed as support for Weymouth Back River segment given the general lack of beach closures due to bacterial contamination at the beaches in this segment. Aesthetics use is not assessed (MassDEP 2010a).

As part of their receiving water monitoring program, the MWRA collected Fecal coliform samples at one station downstream from Route 3A bridge between 1998 and 2000 (MassDEP 2002a) (MWRA 2010). Data from their sampling are summarized in Table 4-27 below. It should be noted here that sampling at this site ended after 2000 due to the final closure of the Nut Island Treatment Plant in 1998 (MWRA, 2006). Additionally, DMF has sampled at twelve MA74-134 Weymouth Back River estuary stations approximately 12 times each year, 2011- 2014. The data are summarized in Table 4-28 below.

Table 4-27 MA74-13 Weymouth Back River Bacterial Water Quality Summary, (MWRA 2014a)

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)			**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with depuration.		
	Geometric mean	**Range**	**n**	**Geometric mean**	**Range**	**n**
Back River, downstream of 3A bridge (MWRA site 086) 1998 - 2000	3.5	0 - 905	70	6.4	0 - 635	70

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform). Monitoring at this location ceased in 2000.

Table 4-28 MA74-13 Weymouth Back River 12 Monitoring Stations* DMF Fecal coliform Data, 2011-2014

2011 Geometric Average of 14 Stations	2012 Geometric Average of 14 Stations	2013 Geometric Average of 14 Stations	2014 Geometric Average of 14 Stations	2011- 2014 Combined Geometric Average of 14 Stations
7.6 cfu/100mL	5.2 cfu/100mL	5.2 cfu/100mL	3.9 cfu/100mL	5.5 cfu/100mL

*An average of 12 samples taken each year at each station

<u>Hingham Harbor Segment MA74-18</u>

This 1.12 square mile Class SA segment is located in Hingham. This segment was report as MA70-08 prior to the 2010 Integrated Report. Hingham Harbor is bounded by a line from Crow Point to Worlds End. There are no permitted water withdrawals or wastewater discharges on this segment. There is one vessel sewage pump-out facility located on Hingham Harbor. Hingham has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041038) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015 Conditionally Restricted for 0.45 square miles; Prohibited for 0.62 square miles (Figure 1-2) (DMF 2015a).

Given the lack of closures due to bacterial contamination at beaches in this segment, Primary and Secondary Contact Recreational uses were assessed as support. Aesthetics use is not assessed due to insufficient data available (MassDEP 2010a).

The town of Hingham has done Enterococci bacteria sampling at Seal Cove, and Town Beach, which is geographically located along the coastline in Hingham Harbor. Sampling results are summarized in Table 4-29 below.

Table 4-29 MA74-18 Hingham Harbor Summary of Enterococcus Data (Town of Hingham) 2003 - 2014

Site Description	Min	Max	# Samples
	cfu/100 mL		
At Seal Cove, 2003-2010	<2	720	92
At Seal Cove, 2010-2014	<10	181	17
At Town Beach, 2003-2010	<2	320	121
At Town Beach, 2010-2014	<10	74	-
At North Beach, 2010-2014	<10	146	1
At Martins Cove, 2010-2014	<10	213	1

Weir River Segment MA74-02

This 2.7 mile long Class B/SA segment extends from its headwaters at the confluence of Crooked Meadow River and Fulling Mill Brook in Hingham to Rockland Street, also in Hingham. Foundry Pond Dam is located on this segment. The Weymouth Great Pond Water Treatment Plant (MAG640031)* and Randolph-Holbrook Water Treatment Plant (MAG640032) have NPDES Permits to discharge to this segment. Hingham and Hull have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041038; MAR041040) for their municipal separate storm sewer system (MS4).

*With regard to permit MAG640031, EPA is in the process of issuing an individual permit (MA0040410).

This segment first appeared on the 303d List of Waters for pathogens in 1992 based on Fecal coliform data. Primary and Secondary Contact Recreation and Aesthetics uses are not assessed due to insufficient data available (MassDEP 2010a).

The USGS collected Fecal coliform bacteria samples from the Route 3A bridge located on this segment for the Massachusetts Watershed Initiative grant project between 1999 and 2000 (MassDEP 2002a). The MassDEP collected *E. coli* samples from the Monatiquot River during 2009 and 2013. Data from the USGS and MassDEP sampling activities are summarized below in Table 4-30.

Table 4-30 MA74-02 Weir River Fecal coliform and *E. coli* Data Summary.

Primary Contact Season			
	Min	Max	
Site Description	cfu/100mL		n
USGS 1999-2000, Fecal coliform			
Route 3A bridge, Hingham	25	570	10*
MassDEP 2009, *E. coli*			
Route 228 (East Street), Hingham	10	250	6
MassDEP 2013, *E. coli*, Station W2395			
~110' upstream/south of Rte. 228(East St.) Hingham	85	590	5

Weir River Segment MA74-11

This 0.83 mile long Class SA segment extends from Rockland Street and the outlet of Straits Pond in Hingham to the river's mouth at Worlds End in Hingham/Hull. Hingham and Hull have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041038; MAR041040) for their municipal separate storm sewer system (MS4).

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Conditionally Restricted for 0.46 square miles; Prohibited for 0.31 square miles (Figure 1-2) (DMF 2015a).

Given the lack of closures due to bacterial contamination at beaches in this segment, Primary and Secondary Contact Recreational uses were assessed as support. Aesthetics uses were not assessed due to insufficient data available (MassDEP 2010a).

DMF conducted Enterococci bacteria sampling at the Rockland Street Bridge between 2007 and 2010 (DMF 2010). MassDEP sampled for *E. coli* bacteria at one station near Rt. 228 (East St.) in Hingham in 2013. Sampling results for DMF and MassDEP are summarized in Table 4-31 below. Additionally, DMF has sampled at 14 MA74-11 Weir River estuary stations approximately 12 times each year, 2011- 2014. The data are summarized in Table 4-32 below.

Table 4-31 MA74-11 Summary of MassDEP *E. coli* (2013) and DMF Enterococci Data, 2007-2010

Site Description	Min	Max	# Number Samples
	cfu/100 mL		
DMF,Rockland Street Bridge, 2010, Enterococci.	10	320	11
DMF,Rockland Street Bridge, 2009, Ent.	10	320	10
DMF,Rockland Street Bridge, 2008, Ent.	10	137	9
DMF,Rockland Street Bridge, 2007, Ent.	10	67	6

Site Description	Min	Max	# Number Samples
	cfu/100 mL		
MassDEP, 2013, Station W2395, ~110' upstream/south of Ret. 228(East St.) Hingham. *E. coli*	85	590	-

Table 4-32 MA74-11 Weir River 14 Monitoring Stations* DMF Fecal coliform Data, 2011-2014

2011 Geometric Average of 14 Stations	2012 Geometric Average of 14 Stations	2013 Geometric Average of 14 Stations	2014 Geometric Average of 14 Stations	2011- 2014 Combined Geometric Average of 14 Stations
8.9 cfu/100mL	6.2 cfu/100mL	6.5 cfu/100mL	6.8 cfu/100mL	7.1 cfu/100mL

*An average of 12 samples taken each year at each station

4.3 Mystic River Sub-basin

Aberjona River Segment MA71-01

This 9.1 mile long Class B, warm water fishery, extends from its source just south of Birch Meadow Drive in Reading to the inlet of the Upper Mystic Lake at Mystic Valley Parkway, Winchester. Parkview Condominium Assoc. (MAG250009), a Non-Contact Cooling Water General Permit (issued 2-12-15), and Olin Corporation (MAG910074), a Remediation General Permit (issued 4-4-12), are permitted to discharge to Halls Brook, a tributary to the Aberjona River, and to the Aberjona River itself. Woburn, Reading and Winchester have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041056; MAR041072) for their municipal separate storm sewer system (MS4).

Primary and Secondary Contact Recreation and Aesthetics uses are assessed as impaired for exceeding Water Quality Standards for *E. coli* of 126 cfu/100 ml, consistently during the years 2002 through 2008 and for turbidity (MassDEP 2010b).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly bacteria data 2010-2014 for 3 monitoring stations (ABR049, ABR028, ABR006), and one MassDEP monitoring station along this segment are summarized in Table 4-33 below.

Table 4-33 MA71-01 Aberjona River *E. coli* Data Summary (MyRWA 2015, MassDEP 2014b).

Site Description	Min	Max*	n
	cfu/100mL		
	E. coli		
MyRWA, 2010 ABR006, Aberjona R. @USGS Station, Winchester	20	3,870	12
MyRWA, 2011 ABR006	52	2,010	12
MyRWA, 2012 ABR006	63	24,200	12
MyRWA, 2013ABR006	109	1,660	11
MyRWA, 2014 ABR006	97	1,330	11
MyRWA, 2010	***E. coli***		
Station ABR028 @ USGS Gage, Winchester	199	6,870	11
MyRWA, 2011 Station ABR028	63	2,990	12
MyRWA, 2012 Station ABR028	52	14,400	12
MyRWA, 2013 Station ABR028	158	2,280	11
MyRWA, 2014 Station ABR028	41	2,500	11
MyRWA, 2010	***E. coli***		
Station ABR049 @ Salem St. Woburn	52	8,660	12
MyRWA, 2011 Station ABR049	20	8,160	11
MyRWA, 2012 Station ABR049	31	24,200	12
MyRWA, 2013 Station ABR049	10	1,610	9
MyRWA, 2014 Station ABR049	160	1,600	11
	E. coli		
MassDEP, 2013 Station Unnamed Trib. To Aberjona R., 700' downstream of Wildwood Rd, Woburn	98	2,100	4

* highest readings followed wet weather

Additional data for the Aberjona River can be obtained from the MyRWA website: https://mysticriver.org/baseline

Alewife Brook Segment MA71-04

This 2.3 mile long Class B, with a CSO variance, warm water fishery extends from the outlet of Little Pond in Belmont to its confluence with the Mystic River in Arlington/Somerville. NPDES Permits include: City Of Somerville (CSOs) (MA0101982), MWRA (CSOs) (MA0103284), City Of Cambridge (CSOs) (MA0101974). There were initially 15 permitted CSO discharges and through years of work, six remain (with reduced discharges). Collectively, these projects are predicted to reduce annual CSO volume to the Alewife Brook by 85% in a typical year, from 50 million gallons in 1997 to 7.3 million gallons. In 2015, CSO activations in a typical year were reduced from 63 in 1997 to seven. Other NPDES permittees include Shire Human Genetic Therapies, Inc. (MA0040321), and Belmont, Arlington and Somerville have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041074; MAR041072, MAR041082) for their municipal separate storm sewer system (MS4).

Some progress has been made in addressing CSO discharges and illegal wastewater connections to stormdrains, but more work is needed moving forward. The CSO Variance in the Alewife/Mystic watershed has been extended by EPA through 2019. During the years 2018 – 2020, MWRA is required under a federal court order to assess the level of CSO control for their planning area, which includes the Alewife/Mystic watershed.

Primary and Secondary Contact Recreation and Aesthetics uses are assessed as impaired for exceeding Water Quality Standards for *E. coli* of 126 cfu/100 ml, seven out of seven years (2002-2008) and for poor Secchi disk transparency (MassDEP 2010b).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly bacteria data 2008-2014 for 1 monitoring station (ALB006, at Broadway Bridge) along this segment are summarized in Table 4-34 below. Additionally, the MWRA samples at four stations (174, 074, 172, 070) with the 2003-2014 data summarized in Table 4-35.

Table 4-34 MA71-04 Alewife Brook Indicator Bacteria Data Summary (MyRWA 2015).

Site Description	Min	Max	n
	cfu/100mL		
MyRWA, 2008	***E. coli***		
ALB006, Broadway Bridge, Somerville	52	563	12
MyRWA, 2009, Station ALB006	98	1,220	6
MyRWA, 2010, Station ALB006	121	3,080	12
MyRWA, 2011, Station ALB006	197	12,000	12
MyRWA, 2012, Station ALB006	211	24,200	12
MyRWA, 2013, Station ALB006	213	2,040	11
MyRWA, 2014, Station ALB006	97	1,250	12

Table 4-35 MA71-04 Alewife Brook Bacteria Data Summary (MWRA 2010, MWRA 2014)

Site Description	***Enterococcus*** **(cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)**[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Little River, upstream of Rt 2 (MWRA site 174)								
2003 - 2007	343	0 - 9100	110		652	70 - 14900	111	
2008 - 2009	62	0 - 2280	44		230	41 - 4110	45	
2010 - 2014	266	1 - 45700	148		1048	118 - 63000	49	
Alewife Brook, near Alewife T ramp (MWRA site 074)								

Site Description	*Enterococcus* (cfu/100 mL) [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
2003 - 2007	348	0 - 22000	135		716	80 - 33100	136	
2008 - 2009	33	0 - 3650	45		209	10 - 17300	45	
2010 - 2014	191.2	1 - 26900	149		1015.7	164 - 56000	49	
Alewife, Mass. Ave Bridge (MWRA site 172)								
2003 - 2007	426	10 - 13000	119		710	50 - 36000	120	
2008 - 2009	67	0 - 2190	45		200	31 - 15500	45	
2010 - 2014	363.9	1 - 45700	149		1021.1	82 - 48000	49	
Alewife, Mystic Valley Pkwy (MWRA site 070)								
2003 - 2007	465	0 - 20000	135		605	41 - 25000	137	
2008 - 2009	117	0 - 3260	45		278	63 - 2480	45	
2010 - 2014	421.9	1 - 24200	150		1093.9	118 - 38000	49	
All locations								
2003 - 2007	394	0 - 22000	499		668	41 - 36000	504	
2008 - 2009	63	0 - 3650	179		227	10 - 17300	180	
2010 - 2014	298	1 - 45700	596		1044.2	82 - 63000	196	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for *E. coli*).

Malden River Segment MA71-05

This 2.5 mile long Class B, warm water fishery extends from its headwaters south of Exchange Street in Malden to its confluence with Mystic River in Everett/Medford. Everett and Medford have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041131; MAR041078) for their municipal separate storm sewer system (MS4).

The Primary and Secondary Contact Recreation and Aesthetic uses are assessed as impaired for chronic elevated bacteria levels, taste, odor, and turbidity (MassDEP 2010b).

The MyRWA MMN monthly bacteria data 2010-2014 for this segment, station MAR036, is summarized in Table 4-36 and MWRA data at station 176 is summarized in Table 4-37.

Table 4-36 MA71-05 Malden River Indicator Bacteria Data Summary (MyRWA 2015)

Site Description	Min	Max**	n
	cfu/100mL		
MyWRA, 2010	***E. coli***		
Station MAR036, Medford St. Bridge	20	7,270	11
MyWRA, 2011	203	9,210	12
MyWRA, 2012	41	24,200	11
MyWRA, 2013	169	3,650	10
MyWRA, 2014	98	8,160	11

* 10 sites had readings > 5,000 ** Highest readings following wet weather

Table 4-37 MA71-05 Malden River Bacterial Water Quality Summary (MWRA 2014)

Site Description	***Enterococcus* (cfu/100 mL)**[1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples				**Fecal coliform (cfu/100 ml)**[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with			
	Geometric mean	Range	n		Geometric mean	Range	n	
Malden River at Rt 16 Bridge (MWRA site 176)								
2003 - 2007	23.8	0 - 9000	103		60.7	0 - 24200	102	
2008 - 2009	12.2	0 - 1990	42		111	0 - 4350	42	
2010 - 2014	10.3	1 - 5480	106		0.4	1 - 17300	36	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for *E. coli*).

<u>Mystic River Segment MA71-02</u>

This 4.9 mile long Class B CSO variance warm water fishery extends from the outlet of Lower Mystic Lake in Arlington/Medford to the Amelia Earhart Dam in Somerville/Everett. This segment has also been designated as a CSO Variance segment, where limited CSO discharges are allowed consistent with the MWRA Long-Term CSO Control Plan. NPDES Permits in this segment consist of one CSO discharge (SOM007A/MWR205A) co-owned by the City of Somerville (MA0101982) and Massachusetts Water Resources Authority (MA0103284). A description of on-going mitigation measures for these discharges is provided in Section 8.2 of this report. Arlington, Medford, Somerville and Everett have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041027; MAR041049. MAR041082, MAR041078) for their municipal separate storm sewer system (MS4). Sithe Mystic, LLC (MA0004740) is permitted to discharge through an outfall to this segment. With regard to CSO controls, considerable efforts have resulted in the closing of 2 CSO outfalls and additional controls at the Somerville Marginal Facility and the BOS019 Storage Conduit. More summary details are covered in Section 8.2.

Primary and Secondary Contact Recreation and Aesthetics are assessed as impaired due to chronic elevated bacteria levels and poor Secchi disk transparency (MassDEP 2010b).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly bacteria data 2010- 2014 for 2 monitoring stations (MEB001, and MYR071) along this segment are summarized in Table 4-38 below. Also, MWRA monitoring data 2003 - 2014 for eight stations are summarized in Table 4-39.

Table 4-38 MA71-02 Mystic River Indicator Bacteria Data Summary (MyRWA 2015)

Site Description	Min	Max	n
	cfu/100mL		
MyWRA, 2010	***E. coli***		
Station MEB001, Meetinghouse Brook, outlet into Mystic River	96	4,610	12
MyWRA, 2011 Station MEB001	52	933	12
MyWRA, 2012 Station MEB001	63	9,800	12
MyWRA 2013 Station MEB001	63	14100	11
MyWRA, 2014 Station MEB001	20	11,200	12
	E. coli		
MyWRA, 2010, Station MYR071 at High St. Bridge, Medford	20	10,500	12
MyWRA, 2011 Station MYR071	10	218	12
MyWRA, 2012 Station MYR071	10	419	12
MyWRA, 2013 Station MYR071	10	160	12
MyWRA, 2014 Station MYR071	31	591	11

Table 4-39 MA71-02 Mystic River Indicator Bacteria Water Quality Summary (MWRA 2014)

Site Description	***Enterococcus* (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)**[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with depuration.			
	Geometric mean	**Range**	**n**		**Geometric mean**	**Range**	**n**	
Downstream of Mystic Lakes (MWRA site 083)								
2003 - 2007	40.0	0 - 7300	152		64.9	0 - 5100	153	
2008 - 2009	17.4	0 - 2100	93		67.8	0 - 1020	93	
2010 - 2014	19.9	1 - 24200	239		80.9	1 - 24200	49	

Site Description	***Enterococcus* (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)**[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with depuration.			
Mystic/Alewife confluence (MWRA site 057)								
2003 - 2007	67.9	0 - 9600	111		95.9	0 - 11200	111	
2008 - 2009	38.1	0 - 1550	43		131.9	0 - 2480	43	
2010 - 2014	35.7	1 - 12000	105		166.6	10 - 24200	33	
Upstream of Rt. 93 overpass (MWRA site 056)								
2003 - 2007	73.0	0 - 18500	98		281.6	0 - 27000	98	
2008 - 2009	21.7	0 - 6490	41		333.4	63 - 15500	41	
2010 - 2014	18.7	1 - 4880	106		251.6	20 - 9210	47	
Boston Ave. bridge (MWRA site 066)								
2003 - 2007	89.0	0 - 6600	150		128.2	0 - 15700	151	
2008 - 2009	30.4	0 - 4110	52		109.9	0 - 2360	52	
2010 - 2014	37.8	1 - 6870	171		183.5	1 - 7270	72	
Route 16 bridge (MWRA site 177)								
2000 - 2003	30.1	0 - 16600	130		107.2	0 - 9800	129	
2008 - 2009	24.1	0 - 794	52		257.2	20 - 3260	52	
2010 - 2014	22.3	1 - 3080	137		313.7	20 - 13000	77	
Route 28 bridge (MWRA site 067)								
2003 - 2007	8.4	0 - 4800	99		28.7	0 - 12400	99	
2008 - 2009	6.2	0 - 1330	43		40.9	0 - 5170	42	
2010 - 2014	4	1 - 988	106		47.1	1 - 3260	16	
Mystic/Malden R. confluence (MWRA site 059)								
2003 - 2007	6.5	0 - 2200	99		24.5	0 - 8400	99	
2008 - 2009	4.6	0 - 669	42		38.1	0 - 2760	42	
2010 - 2014	4.8	1 - 884	104		35.9	1 - 6870	10	
Amelia Earhart dam, upstream (MWRA site 167)								
2003 - 2007	10.8	0 - 3800	134		28.9	0 - 9800	133	
2008 - 2009	4.9	0 - 299	50		70.6	0 - 1350	48	
2010 - 2014	6	1 - 683	144		44.8	1 - 1850	22	
All locations								
2003 - 2007	29.1	0 - 18500	973		69.7	0 - 27000	973	
2008 - 2009	14.5	0 - 6490	416		96.3	0 - 15500	413	
2010 - 2014	15.1	1 - 24200	1112		105.5	1 - 24200	326	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for *E. coli*).

Chelsea River Segment MA71-06

This 0.39 square mile Class SB/CSO segment extends from the river's confluence with Mill Creek in Chelsea/Revere to its confluence with Mystic River in Chelsea/East Boston/Charlestown. NPDES Permits within this segment include: Sunoco Logistics Terminal (MA0004006), Chelsea, City Of (3 CSOs) (MA0101877), Chelsea Sandwich (MA0003280), Gulf Oil - Chelsea (MA0001091), Irving Oil Terminals, Inc. (MA0001929), Global South Terminal, LLC (MA0000825), Global Petroleum Corp - Revere (MA0003425), Global Revco Terminal, LLC (MA0003298), Boston Water And Sewer Commission, (CSO) (MA0101192). Chelsea, Revere, and Boston (includes Charlestown) have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041077; MAR041057, MAR041173) for their municipal separate storm sewer system (MS4). More summary details are covered in Section 8.2.

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Prohibited (Figure 1-2) (DMF 2015a).

Primary and Secondary Contact Recreation and Aesthetics are assessed as impaired due to chronic elevated bacteria levels, poor Secchi disk transparency, and documented petroleum spills/releases to the Chelsea River (MassDEP 2010b).

The MyRWA MMN monthly bacteria data 2010-2014 for this segment for station CHR95S is summarized in Table 4-40. Additionally, MWRA data at station 027 is summarized in Table 4-41.

Table 4-40 MA71-06 Chelsea River Indicator Bacteria Data Summary (MyRWA 2015)

Site Description	Min	Max	n
	Enterococci (cfu/100 mL)		
MyWRA, 2010 Station CHR95S, Chelsea R., E. Boston at Condor St.	2	300	5
MyWRA, 2011 Station CHR95S		57	1
MyWRA, 2012 Station CHR95S	10	2,600	12
MyWRA, 2013 Station CHR95S	10	130	11
MyWRA, 2014 Station CHR95S	1	790	12

Table 4-41 MA71-06 Chelsea River Indicator Bacteria Summary (MWRA 2014a)

Site Description	*Enterococcus* (cfu/100 mL)[1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				Fecal coliform (cfu/100 ml)[1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with depuration.			
	Geometric mean	Range	n		Geometric mean	Range	n	
Midchannel, near Condor Street park (MWRA site 027)								
2008 - 2009	2.4	0 - 794	82		10.1	0 - 1070	82	
2010 - 2014	5.4	1 - 3650	124		17	1 - 2800	123	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform and *E. coli*).

Mystic River Segment MA71-03

This 0.49 square mile Class SB/CSO segment extends from the Amelia Earhart Dam in Somerville to confluence with Chelsea River in Chelsea/East Boston, and includes the Island End River. NPDES Permits within this segment include: City Of Somerville (CSOs) (MA0101982), MWRA (CSOs) (MA0103284), City Of Cambridge (CSOs) (MA0101974); Mystic Exelon Station Power Plant, NCCW withdrawal (MA0004740), BWSC (MA0101192). A detailed discussion on the CSOs, their planned elimination, and progress made to date is discussed in detail in Section 8.2 of this report.

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Prohibited (Figure 1-1) (DMF, 2015).

Primary and Secondary Contact Recreational uses are assessed as supporting. Aesthetic use is not assessed due to lack of data (MassDEP 2010b).

The MyRWA Mystic Monitoring Network (MMN) monthly bacteria data 2010- 2014 for this segment for the two stations MYR275, and MYRMMP are summarized in Table 4-42 below.

Table 4-42 MA71-03 Mystic River Indicator Bacteria Data Summary (MyRWA 2015, MWRA 2014)

Site Description	Min	Max	n
	Enterococci (cfu/100 mL)		
MyWRA, 2010 Station MYR275, Mystic River at Draw 7 Park, Somerville	2	2,400	5
MyWRA, 2011 Station MYR275	-	10	1
MyWRA, 2012 Station MYR275	10	130,000	12
MyWRA, 2013, Station MYR275	10	170	11
MyWRA, 2014, Station MYR275,	10	14,000	11
MyWRA, 2010, Station MYRMMP,	2	760	5

Site Description	Min	Max	n
	Enterococci (cfu/100 mL)		
Mystic R. at O'Malley Park, Chelsea			
MyWRA, 2011, Station MYRMMP	-	66	1
MyWRA, 2012, Station MYRMMP	10	380	12
MyWRA, 2013, Station MYRMMP	10	220	11
MyWRA, 2014, Station MYRMMP	1	790	12

* Geometric mean-- 36

The MWRA periodically sampled at three stations between the years 2003-2014. The data are summarized in Table 4-43 below.

Table 4-43 MA71-03 Mystic River Mouth Indicator Bacteria Summary (MWRA 2014)

Site Description	**Enterococcus (cfu/100 mL)** [1] Primary Contact Recreation = 35 cfu/100 ml Secondary Contact Recreation = 175 cfu/100 ml (Geometric mean of a minimum of 5 samples)				**Fecal coliform (cfu/100 ml)** [1] Threshold for restricted shellfishing is 14 cfu/100 ml without depuration and 88 cfu/100mL with depuration.			
	Geometric mean	Range	n		Geometric mean	Range	n	
Somerville Marginal 205 CSO outfall (MWRA site 052)								
2008 - 2009	11.8	0 - 2910	90		120	0 - 29100	86	
2010 - 2014	16.4	1 - 5170	144		80.6	1 - 52000	143	
Schrafft's Pier at BOS 017 (MWRA site 069)								
2008 - 2009	2.6	0 - 30	32		38.3	0 - 4220	32	
2010 - 2014	12.4	1 - 4880	140		56.9	1 - 22000	139	
Upstream of Tobin Bridge (MWRA site 137)								
2008 - 2009	4.1	0 - 960	93		21.1	0 - 2120	81	
2010 - 2014	4.6	1 - 384	150		20.3	1 - 990	150	
All locations								
2008 - 2009	5.9	0 - 2910	215		49.2	0 - 29100	199	
2010 - 2014	9.7	1 - 5170	434		44.7	1 - 52000	432	

[1]Values equal to 0 are below the detection limit (usually <10 for *Enterococcus*, and <5 for Fecal coliform).

Mill Brook Segment MA71-07

The Mill Brook is a 3.9 mile long, Class B segment, which drains from the outlet of Arlington Reservoir to the inlet of Lower Mystic Lake, Arlington. Portions of this segment are culverted underground. Arlington has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041027) for their municipal separate storm sewer system (MS4).

Primary and Secondary Contact Recreational uses are assessed as impaired due to chronic elevated bacteria levels exceeding Water Quality Standards. Aesthetic use is assessed as supporting as no odors were reported and color was reported as “clear” or “tea colored” (MassDEP 2010b).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly bacteria data 2010-2014 for monitoring station (MIB001) and MassDEP monitoring station W2401 along the MA71-07 Mill River segment are summarized in Table 4-44 below.

Table 4-44 MA71-07 Mill Brook Indicator Bacteria Data Summary (MyRWA 2015)

Site Description	Min	Max	n
	***E. coli* (cfu/100 mL)**		
MyWRA, 2010, Station MIB001,Mill Bk at Mt.Pleasant Cemetery, Arlington	86	8,160	12
MyWRA, 2011, Station MIB001	31	2,010	12
MyWRA, 2012, Station MIB001	20	24,000	12
MyWRA, 2013, Station MIB001	86	1,720	10
MyWRA, 2014, Station MIB001	228	8,160	12
MassDEP, 2013, Station W2401 (prelim.data), 45’ d’stream/east of BrattleSt., Arlington	990	2,990	5

* dry weather high counts

Mill Creek Segment MA71-08

This 0.02 square mile Class SB segment extends from Route 1, Chelsea/ Revere to the confluence with the Chelsea River, Chelsea/ Revere. Chelsea and Revere have coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permit (MAR041077; MAR041057) for their municipal separate storm sewer system (MS4).

Shellfishing use is Prohibited by DMF as of July 1, 2015 (DMF 2015).

Primary and Secondary Contact Recreational use is assessed as impaired for this segment due to elevated Enterococci sample results. Aesthetic use was not assessed due to insufficient available data (MassDEP 2010b).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly bacteria data 2009-2014 for 1 monitoring station (MIC004 at Broadway Bridge, Chelsea) along this segment are summarized in Table 4-45 below.

Table 4-45 MA71-08 Mill Creek Indicator Bacteria Data Summary (MyRWA 2015)

	Min	Max	
Site Description	**cfu/100mL**		**n**
MyRWA, 2009 MIC004,	**Enterococci**		
at Broadway Bridge, Chelsea	43	240	5
MyRWA, 2010 Station MIC004	56	630	5
MyRWA, 2011 Station MIC004	--	870	1
MyRWA, 2012 Station MIC004	74	69,000	12
MyRWA, 2013 Station MIC004	52	6,100	10
MyRWA, 2014 Station MIC004	86	1,800	12

<u>Winn Brook Segment MA71-09</u>

The Winn Brook is a 1.4 mile long, Class B segment which runs from its headwaters near Juniper Road and the Belmont Hill School, Belmont to confluence with Little Pond, Belmont. Belmont has coverage under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits (MAR041074) for their municipal separate storm sewer system (MS4).

Primary and Secondary Contact Recreational use is assessed as impaired for this segment due to elevated Enterococci sample results. Aesthetic use is not assessed due to insufficient available data (MassDEP 2010b).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly *E. coli* bacteria data 2010-2014 for monitoring station (WIB001) along this segment are summarized in Table 4-47.

Table 4-46 MA71-09 Winn Brook Indicator Bacteria Data Summary (MyRWA 2015)

Site Description	Min	Max	n
	Enterococci (cfu/100mL)		
Station WIB001, 2010, on Winn Brook at the outlet to Little Pond, Belmont,	86	11,200	11
Station WIB001, 2011	109	2,250	11
Station WIB001,2012	10	10,500	12
Station WIB001,2013	272	6,870	10
Station WIB001,2014	74	7,700	11

Belle Island Inlet MA71-14

The Belle Island Inlet is a 0.12 square mile, Class SA, inlet estuary water from the Tidegate at Bennington St., Boston/Revere to confluence with Winthrop Bay, Boston/Winthrop. This inlet is bordered on the northeast side by Revere, on the southeast side by Winthrop, and on the west side by East Boston. All three municipalities, Revere, Winthrop, and East Boston (part of Boston) are covered under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits for their municipal separate storm sewer system (MS4).

The Mystic River Watershed Association (MyRWA) Monitoring Network (MMN) monthly *E. coli* bacteria data 2010-2014 for 1 monitoring station (BEI093 at Crystal Ave., Revere) along this segment are summarized in Table 4-45 below.

DMF Designated Shellfish Growing Areas Status as of July 1, 2015: Prohibited (DMF 2015a).

Primary and Secondary Contact Recreation and Aesthetic uses are not assessed due to insufficient data (MassDEP 2010b).

Table 4-47 MA71-14 Belle Island Inlet Indicator Bacteria Data Summary (MyRWA 2015)

Site Description	Min	Max	n
	E. coli **(cfu/100mL)**		
MyRWA,2010 BEI093 Belle Island Inlet at Crystal Ave in Revere	8	490	5
MyRWA, 2011 BEI093	-	220	1
MyRWA, 2012 BEI093	31	34,000	12
MyRWA, 2013 BEI093	10	1,600	11
MyRWA, 2014 BEI093	10	240	12

Unnamed Tributary MA71-13

The Unnamed Tributary is a 0.1 mile long Class B segment, locally known as 'Meetinghouse Brook', from emergence south of Route 16/east of Winthrop St., Medford to confluence with the north side of the Mystic R., Medford, (brook is not apparent on 1985 Boston North quad; 2005 orthophotos used to delineate). This area is heavily urbanized with high population concentrations of residential, commercial and industrial land-uses. Medford is covered under the Phase II National Pollutant Discharge Elimination System (NPDES) stormwater general permits for their municipal separate storm sewer system (MS4).

This segment was assessed as Impaired for Primary Contact Recreational use due to *E. coli* concentrations exceeding Water Quality Standards of 126 cfu/100 ml. Secondary Contact Recreational use was assessed as supporting but on alert status. During one out of seven years (2002 through 2008) of sampling, *E. coli* exceeded the secondary standard of 630 cfu/100 ml (MassDEP 2010b).

5.0 Potential Sources

The Boston Harbor watershed, has 33 segments that are listed as pathogen impaired requiring TMDLs. These segments represent 100% of the estuary area, 72.5% of the river miles assessed in the Boston Harbor proper, Weir and Weymouth Rivers and Mystic River subwatersheds. Sources of indicator bacteria in a densely populated urban environment, such as the Boston Harbor watershed, are many and varied. A significant amount of work has been done in the 20 years to improve the water quality in the Boston Harbor watershed. Largely through the efforts of the MWRA, DMF, BWSC, MyRWA and MassDEP, numerous point and non-point sources of pathogens have been identified Table 5.1).

Table 5-1 Some of the Potential Sources of Bacteria in Pathogen Impaired Segments in the Boston Harbor Watershed*.

Segment ID	Segment Name	Potential Sources
Boston Harbor Proper Sub-basin[1]		
MA70-10	Winthrop Bay	CSO, urban runoff/storm sewers, illicit boat discharges
MA70-02	Boston Inner Harbor	CSO, urban runoff/storm sewers, illicit boat discharges
MA70-11	Pleasure Bay	Urban runoff/storm sewers, illicit boat discharges
MA70-03	Dorchester Bay	Urban runoff/storm sewers, illicit boat discharges
MA70-04	Quincy Bay	Urban runoff/storm sewers, illicit boat discharges municipal point source (SSO)
MA70-05	Quincy Bay	urban runoff/storm sewers, municipal point source (SSO)
MA70-06	Hingham Bay	Urban runoff/storm sewers, illicit boat discharges, municipal point source (SSO)
MA70-07	Hingham Bay	Urban runoff/storm sewers, illicit boat discharges
MA70-09	Hull Bay	Urban runoff/storm sewers, illicit boat discharges
MA70-01	Boston Harbor	Urban runoff/storm sewers, illicit boat discharges municipal point source (SSO)
Weymouth and Weir Sub-basin		
MA74-06	Cochato River	Urban runoff/storm sewers
MA74-08	Monatiquot River	Urban runoff/storm sewers, municipal point source (SSO)
MA74-09	Town Brook	Urban runoff/storm sewers
MA74-15	Town River Bay	Urban runoff/storm sewers
MA74-14	Weymouth Fore River	Municipal Point source (SSO), urban runoff/storm sewers
MA74-03	Old Swamp River	Municipal point source (SSO), urban runoff/storm sewers
MA74-04	Mill River	Urban runoff/storm sewers
MA74-05	Weymouth Back River	Municipal point source (SSO), urban runoff/storm sewers
MA74-13	Weymouth Back River	Urban runoff/storm sewers, municipal point source (SSO)
MA74-18	Hingham Harbor	Urban runoff/storm sewers, illicit boat discharges
MA74-02	Weir River	Urban runoff/storm sewers
MA74-11	Weir River	Urban runoff/storm sewers, illicit boat discharges
Mystic River Sub-basin[1]		
MA71-01	Aberjona River	Illicit sewer connections, urban runoff/storm sewers, wildfowl
MA71-04	Alewife Brook	CSO, urban runoff/storm sewers, illicit sewer connections
MA71-05	Malden River	Urban runoff/storm sewers
MA71-02	Mystic River	CSO, urban runoff/storm sewers
MA71-06	Chelsea River	CSO, urban runoff/storm sewers, industrial point sources, spills
MA71-03	Mystic River	CSO, urban runoff/storm sewers
MA71-07	Mill Brook	Urban runoff/storm sewers
MA71-14[2]	Belle Island Inlet	Urban runoff/storm sewers
MA71-13[2]	Unnamed Tributary	Urban runoff/storm sewers

Segment ID	Segment Name	Potential Sources
MA71-08[2]	Mill Creek	Urban runoff/storm sewers
MA71-09[2]	Winn Brook	Urban runoff/storm sewers

*MassDEP 2002a, MWRA 2014a

[1] The remaining CSO discharges in this segment are permitted under the SB/CSO designation, subject to the limitations on CSO activations and volumes in the final Long-Term CSO Control Plan.

[2] New Pathogen Impaired Segments that were identified in the Integrated Report (2006 through 2016) after the public comment period for this TMDL, are included in the Boston Harbor Addendum, CN#157.2 that is in the process of being developed.

Some dry weather sources include:

- leaking sewer pipes,
- stormwater drainage systems (illicit connections of sanitary sewers to storm drains),
- failing septic systems,
- wildlife, including birds,
- recreational activities, and
- illicit boat discharges.

Some wet weather sources include:

- wildlife and domesticated animals (including pets),
- stormwater runoff including municipal separate storm sewer systems (MS4),
- combined sewer overflows (CSOs), and
- sanitary sewer overflows (SSOs).

It is difficult to provide accurate quantitative estimates of indicator bacteria contributions from the various sources in the Boston Harbor watershed because many of the sources are diffuse and intermittent, and extremely difficult to monitor or accurately model. Therefore, a general level of quantification according to source category is provided (e.g., see Table 5-2 and Table 5-3). This approach is suitable for the TMDL analysis because it indicates the magnitude of the sources and illustrates the need for controlling them. Additionally, many of the sources (failing septic systems, leaking sewer pipes, sanitary sewer overflows, and illicit sanitary sewer connections) are prohibited, because they indicate a potential health risk and, therefore, must be eliminated. However, estimating the magnitude of overall indicator bacteria loading (the sum of all contributing sources) is achieved for wet and dry conditions using the extensive ambient data available that define baseline conditions (see segment summary tables and MassDEP 2002a, MassDEP 2010a, MassDEP 2010b, MassDEP 2010c).

Sanitary Waste

Leaking sewer pipes, illicit sewer connections, sanitary sewer overflows (SSOs), combined sewer overflows (CSOs) and failing septic systems represent a direct threat to public health since they result in discharge of partially treated or untreated human wastes to the surrounding environment. Quantifying these sources is extremely speculative without direct monitoring of the source because the magnitude is directly proportional to the volume of the source and its proximity to the surface water. Typical values of Fecal coliform in untreated domestic wastewater range from 10^4 to 10^6 MPN/100mL (Metcalf and Eddy 1991).

The Weymouth Fore River and Back River watersheds have had chronic problems with SSOs in both their municipal sewer systems. Problems with this and the MWRA interceptor system are being alleviated by the relatively new Intermediate Pumping Station (part of the MWRA $231 million Braintree/Weymouth Relief Facilities Project). In the past, hydraulic deficiencies in the systems, excessive amounts of infiltration and inflow in the municipal systems, and poor maintenance and operation have led to overflows into areas of public water supplies, shellfishing beds, and bathing beaches. In Weymouth between 1992 and March 1999, 530 overflow events occurred and flowed into Whitman's Pond, Mill River, Back River, Fore River, Old Swamp River, and other undetermined receiving waters. In Braintree between 1993 and 1999, 120 overflow events occurred and discharged to the Fore and Monatiquot River. The MWRA regional sewer system can discharge overflows into the Fore River, Monatiquot River and Smelt Brook. In the past, the MWRA Smelt Brook Siphon overflowed several times each year for periods up to 11 days because of excessive wet weather flows contributed by Weymouth, Braintree, Randolph, Holbrook, and Hingham. However, MWRA's Intermediate Pumping Station, which went on-line in December, 2004, has alleviated most of these discharges.

The Braintree-Weymouth area, along MWRA's Braintree/Weymouth Extension Sewer from the Smelt Brook Siphon downstream to the Mill Cove Siphon, was at considerable risk for backups and SSOs. The MWRA Braintree/Weymouth Relief Facilities Project increased the sewer capacity and eliminated SSO events, in both Braintree and Weymouth, up to, and including storm events of 6 hour duration, with 1.72" total rainfall (MWRA 2008). The Town has seen a significant decrease in the number of overflow events and in the number of days an event will last (Town of Weymouth 2009).

The MWRA and the CSO communities of Cambridge, Somerville and Chelsea, have eliminated 34 of 84 CSO outfalls and virtually eliminated the five remaining outfalls along the South Boston beaches (MWRA 2016).

Illicit sewer connections into storm drains result in direct discharges of sewage via the storm drainage system outfalls. The existence of illicit sewer connections to storm drains is well documented in many urban drainage systems, particularly older systems that may have once been combined. The EPA, MWRA, the Boston Water and Sewer Commission (BWSC) and many communities throughout the Commonwealth have been active in the identification and mitigation of these sources. It is estimated by EPA Region 1 that over one million gallons per day (gpd) of illicit discharges were removed in the last decade. It is probable that numerous other illicit sewer connections exist in storm drainage systems serving the older developed portions of the Boston Harbor watershed.

Monitoring of storm drain outfalls during dry weather is needed to document the presence or absence of sewage in the drainage systems. Approximately 87% of the Boston Harbor watershed (including the Neponset River sub-basin) is classified as Urban Areas by the United States Census Bureau and is therefore subject to the Stormwater Phase II Final Rule. This requires the development and implementation of an Illicit Discharge Detection and Elimination (IDDE) plan (See Section 8.0 of this TMDL for information regarding IDDE guidance). As a Phase I community, the City of Boston was required to apply for a NPDES stormwater individual permit for their MS4. The BWSC received the permit in 1999. The system has 104 major and 102 lesser outfalls.

Septic systems designed, installed, operated and maintained in accordance with 310 CMR 15.000: Title 5, are not significant sources of Fecal coliform bacteria. Studies demonstrate that wastewater located four feet below properly functioning septic systems contain on average less than one Fecal coliform bacteria organism per 100 mL (Ayres Associates 1993). Failed or non-conforming septic systems, however, can be a contributor of pathogens in the Boston Harbor watershed. Wastes from failing septic systems enter surface waters either as direct overland flow or via groundwater. Wet weather events typically increase the rate of transport of pollutant loadings from failing septic systems to surface waters because of the wash-off effect from runoff and the increased rate of groundwater recharge. Local Boards of Health enforce the Title 5 regulations, which require inspection of systems at the time of property transfer and convey broad authority to ensure that septic systems are in compliance with the regulations.

Recreational use of waterbodies is a source of pathogen contamination. Swimmers themselves may contribute to bacterial impairment at swimming areas. When swimmers enter the water, residual fecal matter may be washed from the body and contaminate the water with pathogens. In addition, small children in diapers may contribute to contamination of the recreational waters. These sources are likely to be particularly important when the number of swimmers is high and the flushing action of waves or tides is low.

Another potential source of pathogens is the discharge of sewage from vessels with onboard toilets. These vessels are required to have a marine sanitation device (MSD) to either store or treat sewage. When MSDs are operated or maintained incorrectly they have the potential to discharge untreated or inadequately treated sewage. For example, some MSDs are simply tanks designed to hold sewage until it can be pumped out at a shore-based pump-out facility or discharged into the water more than 3 miles from shore. Uneducated boaters may discharge untreated sewage from these devices into near-shore waters. In addition, when MSDs designed to treat sewage are improperly maintained or operated they may malfunction and discharge inadequately treated sewage. Finally, even properly operating MSDs may discharge sewage in concentrations higher than allowed in ambient water for fishing or shellfishing, or primary and secondary contact recreational activities. Vessels are most likely to contribute to bacterial impairment in situations where large numbers of vessels congregate in enclosed environments with low tidal flushing. Many marinas and popular anchorages are located in such environments.

In 2014, the US EPA approved Massachusetts designation of all of Massachusetts water as a "No Discharge Zone" (NDZ). An NDZ means that any discharge of boat sewage is prohibited. This was enacted to better protect the waters from receiving nutrient and bacterial wastes from any marine vessel operating within these waters.

Wildlife and Pet Waste

Wildlife can be a potential source of pathogens. Geese, gulls, and ducks are speculated to be a major pathogen source, particularly at lakes and stormwater ponds where large resident populations have become established (Center for Watershed Protection 1999).

Household pets such as cats and dogs can be a substantial source of bacteria – as much as 23,000,000 colonies/gram (Center for Watershed Protection 1999). A rule of thumb estimate for the number of dogs is approximately 1 dog per 10 people producing an estimated 0.5 pound of feces per dog per day. In 2000, the US Census reported that 589,141 people live in Boston. This translates to almost 60,000 dogs producing almost 30,000 pounds of feces per day in the City of Boston alone. Uncollected pet waste is then flushed from the parks, beaches and yards where pets are walked and transported into nearby waterways during wet-weather.

Stormwater

Stormwater runoff is another significant contributor of pathogen pollution. As discussed above, during rain events fecal matter from domestic animals and wildlife are readily transported to surface waters via the stormwater drainage systems and/or overland flow. The natural filtering capacity provided by vegetative cover and soils is dramatically reduced as urbanization occurs because of the increase in impervious areas (i.e., streets, parking lots, etc.) and stream channelization in the watershed.

Extensive stormwater data have been collected and compiled both locally and nationally (e.g., Tables 5-2 and 5-3) in an attempt to characterize the quality of stormwater. Bacteria are easily the most variable of stormwater pollutants, with concentrations often varying by factors of 10 to 100 during a single storm. Considering this variability, stormwater indicator bacteria concentrations are difficult to accurately predict. Caution must be exercised when using values from single wet weather grab samples to estimate the magnitude of bacteria loading because it is often unknown whether the sample is representative of the "true" mean. To gain an understanding of the magnitude of indicator bacterial loading from stormwater and avoid overestimating or underestimating indicator bacteria loading, event mean concentrations (EMC) are often used. An EMC is the concentration of a flow proportioned sample throughout a storm event. These samples are commonly collected using an automated sampler which can proportion sample aliquots based on flow. Typical stormwater event mean densities for indicator bacteria (fecal coliform) in Massachusetts watersheds and nationwide are provided in Tables 5-2 and 5-3. These EMCs illustrate that stormwater indicator bacteria concentrations from certain land uses (i.e., residential) are typically at levels sufficient to cause water quality problems.

Table 5-2 Lower Charles River Basin Stormwater Event Mean Bacteria Concentrations (data summarized from USGS 2002)

Land Use Category	Fecal coliform EMC (CFU/100 mL)	Number of Events	Pre-2007[1] Class B WQS	Reduction to Meet Pre-2007 WQS (%)
Single Family Residential	2,800 – 94,000	8	10% of the samples shall not exceed 400 organisms/ 100 mL	2,400 – 93,600 (85.7 – 99.6)
Multifamily Residential	2,200 – 31,000	8		1,800 – 30,600 (81.8 – 98.8)
Commercial	680 – 28,000	8		280 – 27,600 (41.2 - 98.6)

[1] This table was developed under the previous Class B Standard (revised in 2007): Shall not exceed a geometric mean of 200 organisms in any set of representative samples, nor shall 10% of the samples exceed 400 organisms. Used 400 to illustrate required reductions in the "Reduction to Meet WQS (%)" Column. The current standards are discussed in the Executive Summary and Section 1.

Table 5-3 Stormwater Event Mean Fecal coliform Concentrations (as reported in MassDEP 2002c; original data provided in Metcalf & Eddy, 1992)

Land Use Category	Fecal coliform[1] Organisms / 100 mL	Pre-2007 Class B WQS [2]	Reduction to Meet Pre-2007 WQS(%)
Single Family Residential	37,000	10% of the samples shall not exceed 400 organisms/ 100 mL	36,600 (98.9)
Multifamily Residential	17,000		16,600 (97.6)
Commercial	16,000		15,600 (97.5)
Industrial	14,000		13,600 (97.1)

[1] Derived from NURP study event mean concentrations and nationwide pollutant buildup data (EPA 1983).

[2] This table was developed under the previous Class B Standard (revised in 2007): Shall not exceed a geometric mean of 200 organisms in any set of representative samples, nor shall 10% of the samples exceed 400 organisms. Used 400 to illustrate required reductions in the "Reduction to Meet WQS (%)" Column. The current standards are discussed in the Executive Summary and Section 1.

6.0 Prioritization and Known Sources

Interventions to address water quality issues have been carried out by Towns, organizations, state agencies, and citizens to resolve various water quality problems in the basin. Nutrient identification and source discovery has been the emphasis, however, measures to address nutrients, in an ancillary way, have addressed pathogen pollution and its principal sources. As the introduction states, the principal contributors in general are CSOs, SSOs, and overland stormwater flows as these pick up various pollutants, such as wildlife and pet wastes, and garbage, etc. Particularly strident efforts are necessary in controlling pollutants such as bacteria because the geography of this watershed is shaped as such that most of it is closely oriented (within a few miles) to coastal/estuarine locations that have a high proportion of potential shellfishing usage. The standards for these potential shellfishing waters (<14 cfu/100mL fecal coliform) are far more stringent than the primary contact recreation standard for inland Class B waters (formerly <200 cfu/100mL, now <126 cfu *E. coli*). All the drainage areas, including rivers, streams and smaller tributaries from the inland areas, must have especially clean waters/very low background bacteria levels in order for shellfishing beds to open up in presently closed areas. Tables 6-1, 6-2, and 6-3 provides a listing of the segments covered in this TMDL and prioritization for implementation strategies based on principal bacteria sources.

Boston Harbor Proper Sub-basin

In 1982, the US Environmental Protection Agency (EPA) and the Conservation Law Foundation filed a lawsuit against the Metropolitan District Commission (MDC), the Boston Water and Sewer Commission, and the Commonwealth of Massachusetts, for violating the 1972 Clean Water Act in Boston Harbor. In 1985, a federal court ordered Boston to improve sewage treatment and issued a compliance schedule. To accomplish this, the Massachusetts Water Resources Authority (MWRA) was formed, and the MWRA began the Boston Harbor Project. Wastewater had been treated at the MWRA Deer Island and Nut Island primary treatment facilities until the new Deer Island Sewage Treatment Plant was completed in 2001. The new 9.5 mile outfall discharges treated wastewater further out into the ocean through openings in the last 6,600 feet of pipe, 100 feet below the surface. The Deer Island Wastewater Treatment Plant receives sewage from 43 greater Boston communities and has a higher capacity than the combined capacities of the former Deer Island and Nut Island facilities, greatly reducing back-ups and overflows throughout the system. The sewage passes through primary and secondary treatment, sludge digestion, disinfection, eventually discharging through a 9.5 mile tunnel into Massachusetts Bay (MWRA 2008).

Combined Sewer Overflow (CSO) discharges have decreased due to ongoing implementation of the MWRA Long-Term CSO Control Plan (MWRA 2004a). The MWRA developed a Three-Phase CSO Plan in 1994 and received approvals from EPA, MassDEP and the Federal Court on a final long-term plan in 2006. MWRA has completed all of the 35 projects in the long-term plan, closed 38 of the 84 CSO outlets that were active at plan inception, and reduced system wide CSO discharge volume in a typical rainfall year by 86%, from 3.3 billion gallons in 1988 to 0.49 billion gallons as of 2015. Treatment (screening, disinfection and dechlorination, at a minimum) of 89% of the remaining discharge occurs at MWRA's four CSO facilities, including a new facility brought on-line in 2007 at the Union Park Pumping Station in the South End (MWRA, 2014a).

There have been significant improvements to receiving waters since the wastewater upgrades were completed and the discharge location was moved further offshore. These include: 30-55% reductions in concentrations of phosphorus and nitrogen, 25-30% reductions of chlorophyll, 30% reduction of particulate organic carbon, and 5% increases in bottom water dissolved oxygen levels (Taylor 2006). This translates to other data in Boston Harbor such as improvements in bacteria levels as well (NEERS 2006). Subsequent reports and studies show further improvements in all these parameters, with 2013 nitrogen and phosphorus concentrations the lowest measured since 1995, bottom-water concentrations of dissolved oxygen the highest since wastewater discharges ended in the Harbor, and symptoms of over-enrichment within the Harbor significantly improved (Taylor 2011; Taylor 2013).

In a 2011 paper published in the journal "Estuaries and Coasts", Taylor and colleagues updated the changes observed in the harbor water-column since the completion of the Boston Harbor Project. They report data through 2007, and note that the changes observed shortly after the discharges from Deer Island were diverted offshore have been sustained since. Nitrogen (N) and Phosphorus (P) concentrations in the harbor have been decreased by 30%, ammonium concentrations by 80%, and ratios of dissolved inorganic N:dissolved inorganic P by 30%. Phytoplankton standing stocks (measured as chlorophyll) have decreased by 30-40%, and the minimum bottom-water DO concentrations have increased by 12% (Taylor 2011).

From 2013 data, the water quality improvements observed after the Deer Island and Nut Island wastewater discharges to the harbor were discontinued in 2000, continue to be sustained (see website reference below). Symptoms of over-enrichment of the harbor continue to improve. Calendar year 2013 N and P concentrations in the harbor water were the lowest observed since 1995. Bottom-water DO concentrations in 2013 were the highest observed since the wastewater discharges to the harbor were discontinued. Amounts of algae in the harbor water were slightly higher than many of the years since the discharges to the harbor were discontinued, but remain lower than during years the harbor received the discharges. Enterococci counts in both the Inner Harbor and Outer Harbor were among the lowest since the discharges were discontinued (Taylor 2013). For the latest MWRA detailed summary report on overall parameter data improvements in the harbor: http://www.mwra.state.ma.us/harbor/enquad/pdf/2016-08.pdf
and http://www.mwra.state.ma.us/harbor/enquad/pdf/2016-14.pdf.

Prioritization of Future Activities

In an effort to provide guidance for setting bacterial implementation priorities within the Boston Harbor, Weymouth-Weir, and Mystic Watersheds, summary tables are provided. Tables 6-1 to 6-3 that follow provide a prioritized list of pathogen-impaired segments that will require additional bacterial source tracking work and stepwise implementation of structural and non-structural Best Management Practices (BMPs). Priority should be given to monitoring segments where there is insufficient information to understand the current conditions. Since limited source information and data are available in each impaired segment, a simple scheme was used to prioritize segments based on bacteria concentrations. Data for the 303d listed segments in Boston Harbor Proper, the Weir-Weymouth Sub-basin, and the Mystic Sub-basin are listed in Tables 4-7 to 4-47 in Section 4 of this report.

High priority was assigned to those segments where dry or wet weather concentrations were equal to or greater than 10,000 col/100 ml since such high levels generally indicate a direct sanitary source. Medium priority was assigned to segments where concentrations ranged from 1,000 to 9,999 col/100ml since this range of concentrations generally indicates a direct sewage source that may get diluted in the conveyance system. Low priority was assigned to segments where concentrations were observed less than 1,000 col/100 ml. The highest Fecal coliform or Enterococci counts from Table 4-7 to 4-47 of this report were used. It should be noted that in all cases, waters identified in Table 6-1 to 6-3 exceed the water quality standards for bacteria, and are thereby considered impaired.

Also, prioritization is adjusted upward based on proximity of waters, within the segment, to sensitive areas such as Outstanding Resource Waters (ORW's), or designated uses that require higher water quality standards than Class B or SB, such as public water supply intakes, public swimming areas, or shellfish areas. Best professional judgment was used in determining this upward adjustment. Generally speaking, waters that were determined to be lower priority based on the numeric range identified above were elevated up one level of priority if that segment were adjacent to or immediately upstream of a sensitive use such as an ORW or a public drinking water source. An asterisk * in the priority column of the specific segment would indicate this situation.

MassDEP believes that segments ranked as high priority in Tables ES-1 to ES-3 are indicative of the potential presence of raw sewage and therefore they pose a greater risk to the public. These segments should continue to be subject to aggressive efforts to identify and eliminate illicit wastewater connections to the stormdrain systems. CSOs and Sanitary Sewer Overflows (SSOs) have historically been a significant contributor to bacteria pollution to the Harbor area, and the MWRA CSO Program Assessment being conducted under the federal court order, together with the information being gathered under the terms and conditions of the CSO Variance should be focused on determining the impacts of remaining CSO discharges, and the feasibility of higher levels of CSO control. Eliminating illicit connections, reducing the risk of SSO events, and fixing failing infrastructure is tantamount to improving bacterial water quality. As the bacteria loads from SSOs and CSOs continue to decline it is anticipated that stormwater discharges from Phase I and Phase II regulated communities will remain the predominate source of bacteria pollution along with non-point sources such as failing septic systems.

A top priority activity for finding illicit connection sources should be bacteria source tracking activities during dry weather in those segments where sampling activities show elevated levels of bacteria during dry weather. Identification and remediation of dry weather bacteria sources is usually more straightforward and successful than tracking and eliminating wet weather sources. If illicit bacteria sources are found and eliminated it should result in a dramatic reduction of bacteria concentration in the segment in both dry and wet-weather.

Finding and fixing the bacteria related pollution sources from failed infrastructure poses real challenges for the most part. Overland stormwater runoff greatly exacerbates the pollution from failed infrastructure sources. Segments that remain impaired during wet weather should be evaluated for stormwater BMP implementation opportunities starting with less costly non-structural practices first (such as street sweeping, catch basin cleaning, and/or managerial approaches using local regulatory controls), and lastly, more expensive structural measures. Unfortunately, many failed infrastructure problems require the more expensive structural repair measures to be considered. This would require additional study to identify the most cost efficient and effective technology.

Table 6-1 Pathogen Impaired Segment Priorities- Boston Harbor Proper Sub-Watershed

Segment ID	Segment Name Waterbody Class	Segment Size(m^2)	Segment Description	Priority	Indicators
MA70-10	Winthrop Bay, Class SB	1.65 mi^2	From the tidal flats at Coleridge Street, Boston (East Boston) to a line between Logan International Airport and Point Shirley, East Boston/Winthrop	High*, Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA70-02	Boston Inner Harbor, Class SB/CSO[1]	2.56 mi^2	From the Mystic and Chelsea rivers, Chelsea/Boston, to the line between Governors Island and Fort Independence, Boston (East Boston), including Fort Point, Reserved, and Little Mystic Channels).	High*, Shellfishing	Enterococci, Fecal Coliform
MA70-11	Pleasure Bay, Class SB	0.22 mi^2	A semi-enclosed bay, the flow restricted through two channels between Castle and Head islands, Boston	High*, Shellfishing, Public Swimming	Enterococci, Fecal Coliform,
MA70-03	Dorchester Bay, Class SB	3.46 mi^2	From the mouth of the Neponset River, Boston/Quincy to the line between Head Island and the north side of Thompson Island and the line between the south point of Thompson Island, Boston and Chapel Rocks, Quincy.	High*, Shell-Fishing, Public Swimming	Enterococci, Fecal Coliform
MA70-04	Quincy Bay, Class SA	1.52 mi^2	From Bromfield Street near the Wollaston Yacht Club, Quincy, northeast to N42 17.3 W71 00.1, then southeast to Houghs Neck near Sea Street and Peterson Road (formerly referred to as the “Willows”) Quincy.	Medium* Shell-fishing	Enterococci, Fecal Coliform
MA70-05	Quincy Bay, Class SB	4.41 mi^2	Quincy Bay, north of the class SA waters (segment MA70-04), Quincy to the line between Moon Head and Nut Island, Quincy	High*, Dry Weather Problems, Shellfish, Public Swimming	Enterococci, Fecal Coliform
MA70-06	Hingham Bay, Class SB	0.96 mi^2	The area north of the mouth of the Weymouth Fore River extending on the west along the line from Prince Head just east of Pig Rock to the mouth of the Weymouth Fore River (midway between Lower Neck and Manot Beach), Quincy	Medium* Shellfish.	Fecal Coliform
MA70-07	Hingham Bay, Class SB	4.8 mi^2	The area defined between Peddocks Island and Windmill Point; from Windmill Point southeast to Bumkin Island; from Bumkin Island southeast to Sunset Point; from Sunset Point across the mouth of the Weir River to Worlds End; from Worlds End across the mouth of Hingham	Medium* Shellfish.	Fecal Coliform

Segment ID	Segment Name Waterbody Class	Segment Size(m²)	Segment Description	Priority	Indicators
			Harbor to Crow Point; from Beach Lane, Hingham across the mouth of the Weymouth Back River to Lower Neck; and from Lower Neck midway across the mouth of the Weymouth Fore River		
MA70-09	Hull Bay, Class SB	2.48 mi²	The area defined east of a line from Windmill Point, Hull to Bumpkin Island, Hingham and from Bumpkin Island to Sunset Point, Hull	Medium* Shellfish.	Fecal Coliform
MA70-01	Boston Harbor, Class SB	18.59 mi²	The area defined by a line from the southerly tip of Deer Island to Boston Lighthouse on Little Brewster Island, then south to Point Allerton; across Hull and West guts; across the mouths of Quincy and Dorchester Bays, Boston Inner Harbor and Winthrop Bay (including Presidents Roads and Nantasket Roads)	High*, Shellfish.	Fecal Coliform

[1] The remaining CSO discharges in this segment are permitted under the SB/CSO designation subject to the limitations on CSO activations and volumes in the final MWRA Long-Term CSO Control Plan.

Table 6-2 Pathogen Impaired Segment Priorities- Weir & Weymouth Sub-Watershed

Segment ID	Segment Name	Segment Size (mi or m²)	Segment Description	Priority	Indicators
MA74-06	Cochato River, Class B	4.1 mi	Outlet Lake Holbrook, Holbrook to confluence with Farm and Monatiquot Rivers, Braintree (through former pond segment Ice House Pond MA74028). (SARIS note: the upper portion of this segment is comprised of three surface waters: unnamed tributary from the outlet of Lake Holbrook, portion of Mary Lee Brook, portion of Glovers Brook).	Medium	*E. coli*
MA74-08	Monatiquot River, Class B	4.4 mi	Headwaters at confluence of Cochato and Farm Rivers, Braintree to confluence with Weymouth Fore River at Commercial Street, Braintree	Medium, Wet and Dry Weather Problems	*E. coli*
MA74-09	Town Brook, Class B/SB	3.5 mi	Outlet Old Quincy Reservoir, Braintree to confluence with Town River Bay north of Route 3A, Quincy (includes "The Canal"/Town River) (portions culverted underground).	High, Wet and Dry Weather Problems	*E. coli*
MA74-15	Town River Bay, Class SA	0.46 mi²	From the headwaters at the Route 3A bridge, Quincy to the mouth at the Weymouth Fore River between Shipyard and Germantown Points, Quincy.	High* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-14	Weymouth Fore River, Class B/SB	2.29 mi²	Commercial Street, Braintree to mouth (eastern point at Lower Neck, Weymouth and western point at Wall Street on Houghs Neck, Quincy	High* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-03	Old Swamp	5.2 mi	Headwaters just west of Pleasant Street and	High*, Public	*E. coli*,

Segment ID	Segment Name	Segment Size (mi or m^2)	Segment Description	Priority	Indicators
	River, Class A (PWS Trib)		north of Liberty Street, Rockland to inlet Whitmans Pond, Weymouth	Water Supply	Enterococci
MA74-04	Mill River, Class A (PWS Trib)	3.4 mi	Headwaters, west of Route 18 and south of Randolph Street, Weymouth to inlet Whitmans Pond, Weymouth (portions culverted underground).	High* Public Water Supply	*E. coli*
MA74-05	Weymouth Back River, Class B (ORW)	0.4 mi	Outlet Elias Pond, Weymouth to the base of the fish ladder north of Commercial Street, Weymouth	High* ORW Wet and Dry Weather Problem	*E. coli*
MA74-13	Weymouth Back River, Class SA	0.86 mi^2	From the base of the fish ladder north of Commercial Street, Weymouth to mouth between Lower Neck to the west and Wompatuck Road, Hingham.	Medium* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-18	Hingham Harbor, Class SA	1.12 mi^2	Hingham Harbor, inside a line from Crows Point to Worlds End, Hingham (formerly reported as MA70-08).	Medium* Shellfishing, Public Swimming	Enterococci, Fecal Coliform
MA74-02	Weir River, Class B/SA	2.7 mi	Headwaters at confluence of Crooked Meadow River and Fulling Mill Brook, Hingham to Foundry Pond Outlet, Hingham (through former pond segment Foundry Pond MA74011).	Medium*	*E. coli*
MA74-11	Weir River, Class SA	0.83 mi	From Foundry Pond outlet, Hingham to mouth at Worlds End, Hingham and Nantasket Road near Beech Avenue, Hull (including unnamed tributary from outlet Straits Pond, Hingham/Hull).	Medium* Shellfishing, Public Swimming	Enterococci, Fecal Coliform

Table 6-3 Pathogen Impaired Segment Priorities- Mystic River[1] Sub-basin

Segment ID	Segment Name	Segment size(mi, or m^2)	Segment Description	Priority	Indicator
MA71-01	Aberjona River, Class B	9.1 mi.	Source just south of Birch Meadow Drive, Reading to inlet Upper Mystic Lake at Mystic Valley Parkway, Winchester (portion culverted underground). (through former pond segments Judkins Pond MA71021 and Mill Pond MA71031).	High, Wet Weather	*E. coli*, Enterococci
MA71-04	Alewife Brook, Class B CSO Variance[1]	2.3 mi.	Outlet of Little Pond, Belmont to confluence with Mystic River, Arlington/Somerville (portion in Belmont and Cambridge identified as Little River with name changing to Alewife Brook at Arlington corporate boundary).	High, Dry and Wet Weather Problems	*E. coli*, Enterococci
MA71-05	Malden River, Class B	2.3 mi.	Headwaters south of Exchange Street, Malden to confluence with Mystic River, Everett/Medford.	High, Wet and Dry Weather	*E. coli*, Enterococci

Segment ID	Segment Name	Segment size(mi, or m^2)	Segment Description	Priority	Indicator
				Problems	
MA71-02	Mystic River, Class B** CSO Variance[1]	4.9 mi.	Outlet Lower Mystic Lake, Arlington/Medford to Amelia Earhart Dam, Somerville/Everett	High, CSO. Wet and Dry Weather Problems	*E. coli*, Enterococci
MA71-06	Chelsea River, Class SB/CSO[2]	0.38 mi^2	From confluence with Mill Creek, Chelsea/Revere to confluence with Boston Inner Harbor, Mystic River, Chelsea/East Boston/Charlestown	High*, Wet and Dry Weather Problems	Fecal Coliform
MA71-03	Mystic River, Class SB/CSO[2]	0.49 mi^2	Amelia Earhart Dam, Somerville/Everett to confluence with Boston Inner Harbor, Chelsea/Charlestown (Includes Island End River).	High*, Shellfishing, CSO. Wet and Dry Weather Problems	Fecal Coliform
MA71-07	Mill Brook Class B	3.9 mi	Headwaters south of Massachusetts Avenue, Lexington to inlet of Lower Mystic Lake, Arlington (portions culverted underground)	High, Wet and Dry Weather Problems	*E. coli*, Enterococci
MA71-08[3]	Mill Creek Class SB	0.02 mi^2	From Route 1, Chelsea/Revere to confluence with Chelsea River, Chelsea/Revere.	High, Wet Weather Problems	Fecal Coliform
MA71-09[3]	Winn Brook Class B	1.4 mi	Headwaters near Juniper Road and the Belmont Hill School, Belmont to confluence with Little Pond, Belmont (portions culverted underground).	High, Wet and Dry Weather Problems	*E. coli*, Enterococci
MA71-14[3]	Belle Isle Inlet Class SA	0.12 mi^2	From the Tidegate at Bennington Street, Boston/Revere to confluence with Winthrop Bay, Boston/Winthrop	High*, ORW, Wet Weather Problems, Shellfishing	Fecal Coliform
MA71-13[3]	Unnamed Tributary Class B**	0.1 mi	Unnamed tributary locally known as 'Meetinghouse Brook', from emergence south of Route 16/east of Winthrop Street, Medford to confluence with the Mystic River, Medford. (brook not apparent on the 1985 Boston North USGS quad – 2005 orthophotos used to delineate stream)	Medium*, Wet Weather Problems	*E. coli*, Enterococci
** may have salt influx					

[1] Remaining CSO discharges are permitted under a modification of water quality standards, as analyses are conducted and progress is made to improve water quality.

[2] The remaining CSO discharges in this segment are permitted under the SB/CSO designation subject to the limitations on CSO activations and volumes in the final MWRA Long-Term CSO Control Plan.

[3] New Pathogen Impaired Segments that were identified in the Integrated Report (2006 through 2014) after the public comment period for this TMDL, are included in the Boston Harbor Addendum, CN#157.2, that is in the process of being developed.

7.0 Pathogen TMDL Development

Section 303 (d) of the Federal Clean Water Act (CWA) requires states to identify waters that do not meet the water quality standards on a list of impaired waterbodies. The *2014 Integrated List of Waters* (MassDEP 2015) identifies 33 segments within the Boston Harbor Watershed, including Mystic and Weymouth-Weir subwatersheds, for use impairment caused by excessive indicator bacteria concentrations. (Four of the 33 segments will be included in the Boston Harbor, Mystic, Weymouth and Weir Addendum, CN#157.2)

The CWA requires each state to establish Total Maximum Daily Loads (TMDLs) for listed waters and the pollutant contributing to the impairment(s). TMDLs determine the amount of a pollutant that a waterbody can safely assimilate without violating the water quality standards. Both point and non-point pollution sources are accounted for in a TMDL analysis. EPA regulations require that point sources of pollution (those discharges from discrete pipes or conveyances) subject to NPDES permits receive a waste load allocation (WLA) specifying the amount of a pollutant they can release to the waterbody. Non-point sources of pollution (all sources of pollution other than point) receive load allocations (LA) specifying the amount of a pollutant that they can release to the waterbody. In the case of stormwater, it is often difficult to identify and distinguish between point source discharges that are subject to NPDES regulation and those that are not. Therefore EPA has stated that it is permissible to include all point source stormwater discharges in the WLA portion of the TMDL. MassDEP has taken this approach. In accordance with the CWA, a TMDL must account for seasonal variations and a margin of safety, which accounts for any lack of knowledge concerning the relationship between effluent limitations and water quality. Thus:

TMDL = WLAs + LAs + Margin of Safety (MOS)

Where:

WLA = Waste Load Allocation which is the portion of the receiving water's loading capacity that is allocated to each existing and future point sources of pollution.

LA = Load Allocation which is the portion of the receiving water's loading capacity that is allocated to each existing and future non-point source of pollution.

MOS = Margin of safety, either explicitly or implicitly.

This TMDL uses an alternative standards-based approach, which is based on indicator bacteria concentrations, but considers the terms of the above equation. This approach is more in line with the way bacteria pollution is regulated (i.e., according to concentrations standards), however, the standard loading approach is provided as well.

7.1 General Approach: Development of TMDL Targets

For this TMDL the MassDEP developed two types of daily TMDL targets. First, MassDEP set daily concentration TMDL targets for all potential pathogen sources by category (i.e., stormwater, NPDES, etc.) and surface water classification. Expressing a loading capacity for bacteria in terms of concentrations set equal to the Commonwealth's adopted criteria, as provided in Table 7-1, provides the clearest and most understandable expression of water quality goals to the public and to groups that conduct water quality monitoring. MassDEP recommends that the concentration targets be used as the primary guide for implementation (see Section 7.2).

Second, MassDEP estimated the total maximum daily load for each river, segment as a function of flow (19 Boston Harbor river segments). Expressing the loading capacity for bacteria in terms of loadings (e.g., numbers of organisms per day, cfu/day), although valid as a TMDL, is more difficult for the public to understand because the "allowable" loading number varies with flow over the course of the day and season. Also, the loading numbers are very large (i.e. billions or trillions of bacteria per day) and therefore difficult to interpret as they do not relate directly to the State Water Quality Standards or public health criteria.

For embayments, however, total maximum daily pathogen loads were typically calculated based on long-term average runoff volumes. Because of runoff morphology in the Boston Harbor watershed, for the purposes of this report, the loadings calculations for 14 estuary segments were estimated by using 1) the concentration allowed by appropriate criteria from the Massachusetts Water Quality Standards and 2) the estimated volume of runoff entering the embayment from each contributing watershed (See Section 7.3 for detailed methodology).

It is important to note that MassDEP realizes given the vast potential number of bacteria sources and the difficulty of identifying and removing them from sources such as stormwater require an iterative process and that will take some time to accomplish. While the stated goal in the TMDL is to meet the water quality standard at the point of discharge, it is also MassDEP's expectation that for stormwater, an iterative approach is needed that includes prioritization of outfalls and the application of BMPs to achieve water quality standards. MassDEP believes this approach is consistent with current EPA guidance and regulations as stated in a November 22, 2002 EPA memo from Robert Wayland with an addendum from Andrew Sawyers provided November 26, 2014 (see Attachment B).

7.2 Waste Load Allocations (WLAs) and Load Allocations (LAs) As Daily Concentration (CFU/100mL).

To ensure attainment with water quality standards throughout the waterbody, MassDEP emphasizes the simplest and most readily understood way of meeting the TMDL is to have a goal of bacteria sources not exceeding the WQS criteria at the point of discharge. This is also an implicit conservative approach with respect to the MOS.

Sources of indicator bacteria in the Boston Harbor Watershed are varied; however data indicate that most of the bacteria sources are likely stormwater related. (Sections 4, 5 and 6 of this document discuss in more detail the types of sources identified as well as their prioritization for implementation). Point sources within the Boston Harbor Watershed that can potentially affect bacteria pollution levels include permitted wastewater discharges, CSOs and 39 communities regulated under the Stormwater Phase I and Phase II MS4 Program.

NPDES wastewater discharge WLAs for WWTPs are set at the water quality standards. All piped discharges are, by definition, point sources regardless of whether they are currently subject to the requirements of NPDES permits. Therefore, a WLA set equal to the WQS criteria will be assigned to the portion of the stormwater that discharges to surface waters via storm drains. For any illicit sources including illicit discharges to stormwater systems and sewer system overflows (SSO's) the goal is complete elimination (100% reduction). The specific goal for controlling combined sewer overflows (CSO's) is meeting water quality standards through implementation of approved Long-Term Control Plans. It is recommended that these concentration targets be used to guide implementation. The goal to attain WQS at the point of discharge is environmentally protective, and offers a practical means to identify and evaluate the effectiveness of control measures. In addition, this approach establishes clear objectives that can be easily understood by the public and others responsible for monitoring activities. Success of control efforts and subsequent conformance with the TMDL will be determined by documenting that a sufficient number of bacteria samples from receiving water meet the appropriate indicator criteria (WQS) for the water body.

Table 7-1 presents the TMDL indicator bacteria WLAs and LAs for the various source categories as daily concentration targets for the Boston Harbor Watershed. WLAs (to address point sources of pollution) and LAs (to address non-point sources of pollution) are presented below. The full version of the current WQS can be accessed at the MassDEP website: http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-4-00-mass-surface-water-quality-standards.html

Table 7-1 Waste Load Allocations (WLAs) and Load Allocations (LAs) As Daily Concentrations (CFU/100ml).

Surface Water Classification	**Pathogen Source**	**Waste Load Allocation Indicator Bacteria (cfu/100 mL)[1]**	**Load Allocation Indicator Bacteria (cfu/100 mL)[1]**
A, B, SA, SB (prohibited)	Illicit discharges to storm drains	0	Not Applicable

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (cfu/100 mL)[1]	Load Allocation Indicator Bacteria (cfu/100 mL)[1]
	Leaking sanitary sewer lines	0	Not Applicable
	Failing septic systems	Not Applicable	0
A (Includes filtered water supply) & **B**	Any regulated discharge-including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges [7,9].	Either; *E. coli* <=geometric mean[5] 126 colonies per 100 mL; single sample <=235 colonies per 100 mL[11]; or b) Enterococci geometric mean[5] <= 33 colonies per 100 mL and single sample <= 61 colonies per 100 mL[11]	Not Applicable
	Nonpoint source stormwater runoff[4]	Not Applicable	Either *E. coli* <=geometric mean[5] 126 colonies per 100 mL; single sample <=235 colonies per 100 mL; or Enterococci geometric mean[5]<= 33 colonies per 100 mL and single sample <= 61 colonies per 100 mL
SA (Approved for shellfishing)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9].	Fecal Coliform <= geometric mean, MPN, of 14 organisms per 100 mL nor shall 10% of the samples be >=28 organisms per 100 mL	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Fecal Coliform <= geometric mean, MPN, of 14 organisms per 100 mL nor shall 10% of the samples be >=28 organisms per 100 mL
SA & SB[10] (Beaches[8] and non-designated shellfish areas)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9].	Enterococci - geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL[11]	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Enterococci -geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL
SB (Approved for shellfishing w/depuration)	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9].	Fecal Coliform <= median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be >=260 organisms per 100 mL[11]	Not Applicable

Surface Water Classification	Pathogen Source	Waste Load Allocation Indicator Bacteria (cfu/100 mL)[1]	Load Allocation Indicator Bacteria (cfu/100 mL)[1]
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Fecal Coliform <= median or geometric mean, MPN, of 88 organisms per 100 mL nor shall 10% of the samples be >=260 organisms per 100 mL
SB/CSO (segments Boston Inner Harbor(MA 71-02)[12], Chelsea River (MA 71-06), Mystic River (MA 71-03)[12]	Any regulated discharge - including stormwater runoff[4] subject to Phase I or II NPDES permits, NPDES wastewater treatment plant discharges[7,9], and combined sewer overflows[6].	**For Non-CSO Discharges:** Enterococci - geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL[11] **For CSO Discharges**: CSO activations and volumes limited to those included and identified in permitted MWRA Long-Term CSO Control Plans.[12]	Not Applicable
	Nonpoint Source Stormwater Runoff[4]	Not Applicable	Enterococci -geometric mean[5] <= 35 colonies per 100 mL and single sample <= 104 colonies per 100 mL
B/CSO Variance Alewife Brook (MA 71-04), Upper Mystic (MA71-02)	Combined Sewer Overflows	CSO activations and volumes limited to those included and identified in the permitted MWRA Long-Term CSO Control Plan.[12]	Not applicable

[1] Waste Load Allocation (WLA) and Load Allocation (LA) refer to fecal coliform densities unless specified in table.

[2] In all samples taken during any 6 month period

[3] In 90% of the samples taken in any six month period;

[4] The expectation for WLAs and LAs for stormwater discharges is that they will be achieved through the implementation of BMPs and other controls.

[5] Geometric mean of the 5 most recent samples is used at bathing beaches. For all other waters and during the non-bathing season the geometric mean of all samples taken within the most recent six months, typically based on a minimum of five samples.

[6] Or other applicable water quality standards for CSO's

[7] Or shall be consistent with the Waste Water Treatment Plant (WWTP) National Pollutant Discharge Elimination System (NPDES) permit.

[8] Massachusetts Department of Public Health regulations (105 CMR Section 445)

[9] Seasonal disinfection may be allowed by the Department on a case-by-case basis.

[10] Segments designated as CSO have a long term control plan in place.

[11] Threshold for beach closure. Beaches Environmental Assessment and Coastal Health (BEACH) Act amended the Clean Water Act in 2000.

[12] See Second Stipulation of the United States and the Massachusetts Water Resources Authority on "Responsibility and Legal Liability for Combined Sewer Overflow Control" filed in US District Court on March 15, 2006. (MWRA 2006).

Note: This table represents waste load and load allocations based on water quality standards current as of the publication date of these TMDLs. If the pathogen criteria change in the future, MassDEP intends to revise the TMDL by addendum to reflect the revised criteria.

It is recommended that these concentration targets be used to guide implementation. The goal to attain WQS at the point of discharge is environmentally protective and offers a practical means to identify and evaluate the effectiveness of control measures. In addition, this approach establishes clear objectives that can be easily understood by the public and others responsible for monitoring activities. Success of the control efforts and subsequent conformance with the TMDL can be determined by documenting that a sufficient number of valid bacteria samples from the receiving water meet the appropriate indicator criteria (WQS) for the water body. Compliance will be measured by concentrations measured in the receiving water.

Potential Sources of Bacterial Contamination

Some insight on potential sources of bacteria is gained using dry or wet weather bacteria concentrations as a benchmark for reductions. Where a segment is identified as having elevated levels during dry weather, sources such as permitted discharges, failing septic tanks, illicit sanitary sewers connected to storm drains, and/or leaking sewers, may be the primary contributors. Where elevated levels are observed during wet weather potential sources may include flooded septic systems, surcharging sewers (combined sewer overflows or sanitary sewer overflows), and/or stormwater runoff. In urban areas sources of elevated bacteria concentrations can include runoff in areas with high populations of domestic animals or pets. Other potential sources include sanitary sewer connected to storm drains that result in flow that is retarded until the storm drain is flushed during wet weather. Sections 4, 5 and 6 of this document discuss in more detail the types of sources identified as well as their prioritization for implementation.

7.3 TMDL Expressed as Daily Load (CFU/Day)

The following section describes the approach for deriving allowable daily bacteria loads for the Boston Harbor Watershed.

7.3.1 Rivers

Flow in rivers and streams are highly variable. Nearly all are familiar with seeing the same river as a raging torrent and at another time as just a trickle. In many areas, seasonal patterns are evident. A common pattern is high flow in the spring when winter snow melts and spring rains swell rivers. Summer time generally is a period of low flows except for the extreme events of heavy rainfall storms up the scale to hurricanes. Across the United States, the US Geological Survey and others maintain a network of stream gages that measure these flows on a continuous basis thus providing quantitative values to the qualitative scenes described above. These flow measurements are reported in terms of a volume of water passing the gage in a given time period. Often the reported values are in cubic feet per second. A cubic foot of water is 7.48 gallons, and flows can range from less than a cubic foot per second to many thousands of cubic feet per second depending on the time of year and the size of the river or stream. The size of the river or stream and the amount of water that it usually carries is determined by the area of land it drains (known as a watershed), the type of land in the watershed, and the amount of precipitation that falls on the watershed. A common way that USGS reports flow is the cubic feet per second (cfs) averaged over a day since flow can vary even over the course of a day.

In addition to quantity, there is of course a quality aspect to water. Most chemical constituents are measured in terms of weight per volume, generally using the metric system with milligrams (mg) per liter (L) as the units. A milligram is one thousandth of a gram, 28 of which weigh one ounce. A liter is slightly more than a quart, so there are 3.76 L in a gallon. The total amount of material is called mass and is the quantity in a given volume of water. For instance, if a liter of water had 16 milligrams of salt and one evaporated all of the water, the 16 milligrams of salt would remain. A volume of two liters with the same 16 mg/L of salt would yield 32 milligrams of salt upon evaporation of the water. So, the total amount of material in a volume of water is the combination of the amount (volume) of water and the concentration of the substance being assessed. These two characteristics, in compatible units, are multiplied to determine the quantity of the material present. In the case of a river or stream, the total amount of material passing a gaging station in a day is the total volume multiplied by the concentration of the chemical being assessed. This quantity often is referred to as "load", and if the time frame is a day, the quantity is called the "daily load". If a year is used as the time frame it is called a "yearly" or "annual" load.

Bacteria also can be discussed in terms of concentrations and loads. However, the common way of expressing concentrations of bacteria is in terms of numbers rather than weight (although one could use weight). Bacteria standards for water are written in terms of concentrations, and while the method of determining the concentrations can be by direct count or estimated through the outcome of some reaction, it is numbers that are judged to be in a given volume of water. Once again, the load is determined by the concentration multiplied by the volume of water. As can be seen, changes in concentration and/or changes in flow result in changes in the loads. Also, maximum loads can increase and if flow increases in proportion, the concentration will remain the same. For instance, if the total number of bacteria entering a section of stream doubles, but the flow also doubles, the concentration remains the same. This means that as flow increases, allowable load can increase so that concentration remains constant (or lower if dilution occurs) while continuing to meet the water quality criterion. In its simplest application, this is the concept of the flow duration curve approach. At each given flow, the maximum load that can enter and still meet the concentration criterion is set. If the numbers of bacteria entering are higher than this allowable number, then a reduction is needed. As a practical matter, determining the flow at each sampling point is resource intensive, expensive and generally is not done.

Given this, however, some estimates of flow can be derived from USGS gages in the watershed or in nearby similar watersheds if there is no gage in the impaired stream.

The pollutant loading that a waterbody can safely assimilate is expressed as either mass-per-time, toxicity or some other appropriate measure (40 CFR § 130.2). Typically, TMDLs are expressed as total maximum daily loads. Expressing stormwater pathogen TMDLs in terms of daily loads is difficult to interpret given the very high numbers of indicator bacteria and the magnitude of the allowable load is dependent on flow conditions and, therefore, will vary as flow rates change. For example, a very high load of indicator bacteria is allowable if the volume of water that transports indicator bacteria is also high. Conversely, a relatively low load of indicator bacteria may exceed the water quality standard if flow rates are low. Given the intermittent nature of stormwater related discharges, MassDEP believes it is appropriate to express stormwater-dominated indicator bacteria TMDLs proportional to flow for flows greater than 7Q10. This approach is appropriate for stormwater TMDLs because of the intermittent nature of stormwater discharges. However, the WLAs for continuous discharges are not set based on the receiving water's proportional flow, but rather, are based on the criteria multiplied by the permitted effluent flow (applying the appropriate conversion factor). Because the water quality standard is also expressed in terms of the concentration of organisms per 100 mL, the acceptable in-stream daily load or TMDL is the product of that flow and the criterion.

In recognition that bacteria loads from stormwater are flow dependent, the total TMDL can be calculated as a function of flow, and allocated to different source categories, as shown in the following equation:

$$\mathbf{TMDL = WQS \times Q_T = WLA + LA + MOS + NB}$$

Where: WLA = allowable load for point source categories (including piped stormwater)

LA = allowable load for nonpoint source categories
Q_T = stream flow on any given day when >7Q10
MOS = margin of safety
NB = natural background conditions
WQS = Massachusetts Water Quality Standard criterion

7.3.2 Embayments

For 19 of the Boston Harbor estuary- embayments, the allowable loading was estimated using the same methodology employed in the North and South Coastal and Buzzards Bay Pathogen TMDL Reports. (Mass DEP 2009, MassDEP 2012b, MassDEP 2014a). Many embayments in the Boston Harbor watershed are fed by a surface water feature such as a river or stream. The land-use, associated with many of the Boston Harbor embayment subwatersheds, is comprised largely of urbanized or heavily populated suburbanized areas, (see Figure 2-1) which represent roughly 63% of the landuse in the Boston Harbor watershed, 50% in the Mystic and 75% in the Weymouth-Weir. Many of these areas make up communities with a fairly high percentage of impervious cover. As a result, the method for estimating allowable loading for the 19 Boston Harbor estuary-embayments was calculated by multiplying the concentration allowed by the Massachusetts Water Quality Standards by the estimated volume of runoff entering from each contributing watershed. Runoff estimates for the region were extracted from historical precipitation and runoff records maintained by the USGS and the Massachusetts Department of Conservation and Recreation (DCR). DCR precipitation records from 1915-2007 for the entire Eastern Coastal Area of Massachusetts (including the Boston Harbor area) show an average precipitation for the region of 45.7 inches per year (3.8 ft/year) (DCR 2010). USGS maintains a gage network throughout the state of Massachusetts. Runoff records take into account water that is lost to evapotranspiration or infiltration processes. The average runoff for the State of Massachusetts is 2.0 feet per year based on a period of record form 1905-2007 (personal communication David Wilcock, USGS 2008). The estimated volume of runoff entering from each contributing watershed was conservatively estimated by assuming that all precipitation to impervious areas runs directly off into a local waterway (average runoff value of 45.7 inches per year or 3.8 feet). In pervious areas a conservative estimate of 24 inches per year (2.0 feet) was used which represents the 50 percentile of runoff values observed at USGS gages in New England (Hydrologic Unit 1) based on long-term records (1905-2007).

The runoff value above was multiplied by the contributing watershed acreage and the most stringent water quality standard for each segment to calculate the allowable load or total number of bacteria per year (cfu/year). The daily TMDL was then calculated by dividing the allowable annual load by the number of days, on average, that it rains. Since it rains once every three to four days the annual load was divided by 105 days per year with rainfall to calculate the daily load. Precipitation data were based on information interpreted from the National Oceanic and Atmospheric Administration (NOAA) at http://cdo.ncdc.noaa.gov/ancsum/ACS

The 105 days per year of rainfall represents an average of the total number of days of precipitation >0.01". It is assumed that precipitation less than 0.01 inches either infiltrates into the ground or evaporates and therefore does not runoff. Finally, the total daily load allocation was then split into wasteload and load allocations based on the ratio of impervious to pervious land within each watershed.

7.3.3 Water Quality Criteria

The water quality criteria used to develop the TMDL was based on the most stringent designated use identified in the Massachusetts Water Quality Standards. In the case of the Boston Harbor Watershed the principal and most sensitive uses include primary contact recreation and shellfishing use. A summary of the relevant water quality criteria that apply to the Boston Harbor Watershed are summarized in Table 7-2.

Table 7-2 Water Quality Targets for Boston Harbor Watershed.

Waterbody Use	Shellfishing Criterion		Primary Contact Recreation Criterion	
	Fecal coliform (cfu/100LmL)		*E. coli* (cfu/100mL)	Enterococci (cfu/100mL)
Waterbody Class	Geometric Mean	10% of samples not to exceed	Geometric Mean	Geometric Mean
A */B	None	None	126 [a]	33[b]
SA	14 [c]	28 [c]	None	35 [b]
SB	88 [c]	260 [c]	None	35 [b]

[a] e.coli is the indicator, [b] Enterococci is the indicator, [c] Fecal coliform is the indicator. The full version of the standards can be found at: http://www.mass.gov/eea/agencies/massdep/water/regulations/314-cmr-4-00-mass-surface-water-quality-standards.html. *Public Water Supply Tributary

Primary contact recreation criteria apply to all Class A and Class B fresh water systems and will pertain to all river segments in the Boston Harbor watershed. Shellfishing criteria are also applied to segments where shellfishing is prohibited but where there may be an approved area in an abutting or downstream segment.

7.3.4 Calculating the TMDL as Daily Loads (Colonies/Day)

MassDEP believes it is appropriate to express indicator bacteria TMDLs proportional to flow. Because the Water Quality Standard is also expressed in terms of the concentration of organisms per 100 mL, the acceptable in-stream daily load or TMDL is the product of that flow and the water quality standard criterion. This is the same approach used for any pollutant with a numerical criterion. In the case of estuary-embayments, contributing watershed runoff is the flow that is being used to determine the maximum daily load.

The TMDL is calculated based on flow or volume and the concentration of the applicable Massachusetts water quality standard criterion for bacteria in the river. Once the flow or volume is estimated, the total maximum daily load of bacteria in numbers per day is derived by multiplying the estimated flow or runoff volume by the water quality standard criterion for the indicator bacteria. The actual allowable load of bacteria in fresh water systems where the primary contact recreation standard applies, in numbers of bacteria per day, varies with flow at or above 7Q10 in each segment (as presented in Figure 7-1). This approach sets a target for reducing the loads so that water quality criteria for indicator bacteria are met at all flows equal to or greater than 7Q10.

Example calculations for determining the TMDL are provided as follows:

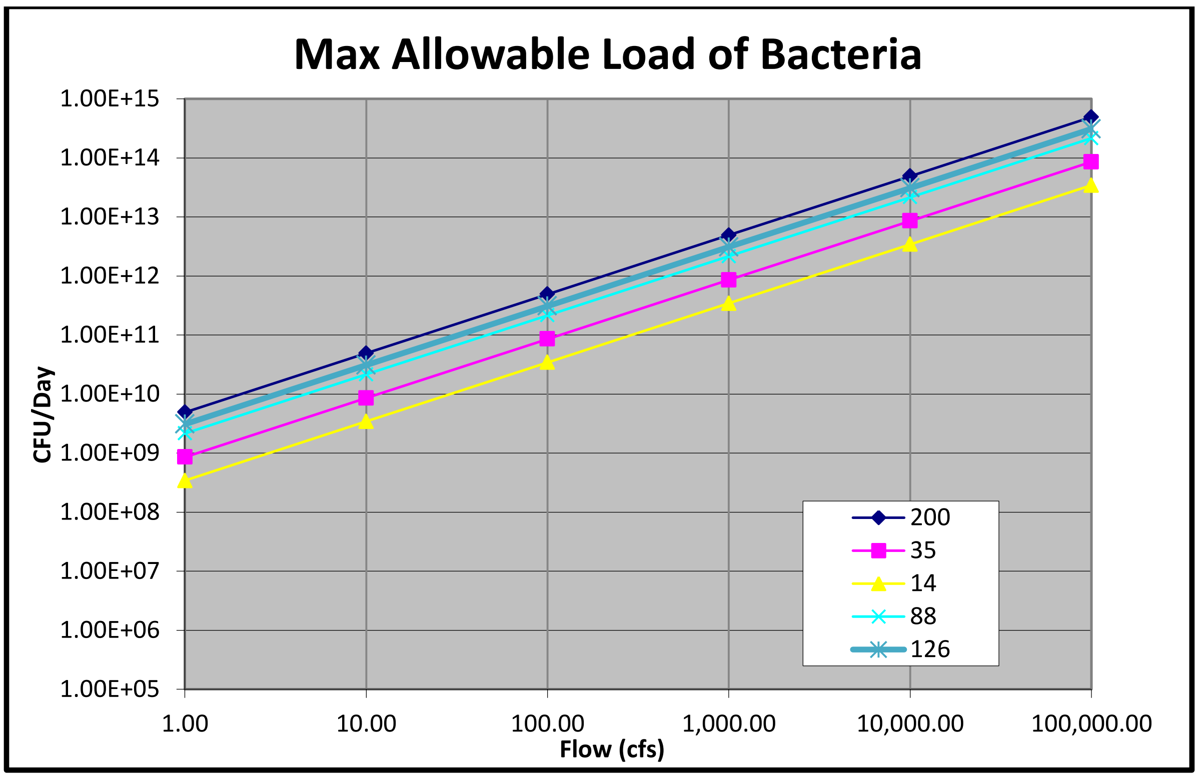
For Rivers: The TMDL associated each **1.0 cubic foot per second of flow** to meet a water quality standard of 126 cfu/100 ml (E.coli, Class A or B) or 33 cfu/100 mL (enterococci Class A or B) is derived as follows:

River Segment (*E. coli*, Class A or B) TMDL = (0.02832 m^3/sec) x (86,400 sec/day) x (1,000 liters/m^3) x (1,000 ml/liter) x (126 cfu/100ml) = 3.08 x 10^9 cfu/day.

River Segment (enterococci, Class A or B) TMDL= (0.02832 m^3/sec) x (86,400 sec/day) x (1,000 liters/m^3) x (1,000 ml/liter) x (33 cfu/100ml) = 8.07 x 10^8 cfu/day.

For River segments the TMDL is proportioned between the WLA and LA by multiplying the daily load by the percent impervious for the WLA, and by multiplying the daily load by the percent pervious for the contributing watershed for the LA. Table 7-3 summarizes the TMDL for the 14 fresh water segments (rivers) in the Boston Harbor Watershed.

Figure 7-1 River TMDL as a Function of Flow and Bacteria Indicator.



Note: Prior to 2007, the average of all samples shall not exceed 200 cfu/day, Fecal coliform, Class B
From Tables 7-1 and 7-2 Current Bacteria Standards include:
35 cfu/day; Enterococci, Primary Contact Recreation, Class SA
14 cfu/day;,Fecal coliform, Shellfishing, Class SA
88 cfu/day; Fecal coliform, Shellfishing, Class SB
126 cfu/day, *E. coli*, Primary Contact Recreation, Class B

Table 7-3 Stormwater WLA and LA TMDL by River Segment for the Boston Harbor Watershed (*E. coli* Indicator CFU/Day).

	TMDL Allocation[1]	FLOW, cfs					
Segment[2], Waterbody WQS Classification	WLA LA	**1**	**10**	**100**	**1,000**	**10,000**	**100,000**
MA74-06 Chochato River(B)	14.5%	4.48E+08	4.48E+09	4.48E+10	4.48E+11	4.48E+12	4.48E+13
	85.5%	2.64E+09	2.64E+10	2.64E+11	2.64E+12	2.64E+13	2.64E+14
MA74-08 Monatiquot River(B)	18.3%	5.65E+08	5.65E+09	5.65E+10	5.65E+11	5.65E+12	5.65E+13
	81.7%	2.52E+09	2.52E+10	2.52E+11	2.52E+12	2.52E+13	2.52E+14
MA74-09 Town Brook (B/SB)	35.9%	1.11E+09	1.11E+10	1.11E+11	1.11E+12	1.11E+13	1.11E+14
	64.1%	1.98E+09	1.98E+10	1.98E+11	1.98E+12	1.98E+13	1.98E+14
MA74-03 Old Swamp River (A)	21.8%	6.73E+08	6.73E+09	6.73E+10	6.73E+11	6.73E+12	6.73E+13
	78.2%	2.41E+09	2.41E+10	2.41E+11	2.41E+12	2.41E+13	2.41E+14
MA74-05 Weymouth Back River (B)	21.1%	6.51E+08	6.51E+09	6.51E+10	6.51E+11	6.51E+12	6.5E+13
	78.9%	2.44E+09	2.44E+10	2.44E+11	2.44E+12	2.44E+13	2.44E+14
MA74-04 Mill River (A)	20.4%	6.30E+08	6.30E+09	6.30E+10	6.30E+11	6.30E+12	6.30E+13
	79.6%	2.46E+09	2.46E+10	2.46E+11	2.46E+12	2.46E+13	2.46E+14
MA74-02 Weir River (B/SA)	9.1%	2.81E+08	2.81E+09	2.81E+10	2.81E+11	2.81E+12	2.81E+13
	90.9%	2.81E+09	2.81E+10	2.81E+11	2.81E+12	2.81E+13	2.81E+14
MA71-01 Aberjona River (B)	28.2%	8.71E+08	8.71E+09	8.71E+10	8.71E+11	8.71E+12	8.71E+13
	71.8%	2.22E+09	2.22E+10	2.22E+11	2.22E+12	2.22E+13	2.22E+14
MA71-04 Alewife Brook (B/CSO Variance)	34.9%	1.08E+09	1.08E+10	1.08E+11	1.08E+12	1.08E+13	1.08E+14
	65.1%	2.01E+09	2.01E+10	2.01E+11	2.01E+12	2.01E+13	2.01E+14
MA71-05 Malden River (B)	30.7%	9.48E+08	9.48E+09	9.48E+10	9.48E+11	9.48E+12	9.48E+13
	69.3%	2.14E+09	2.14E+10	2.14E+11	2.14E+12	2.14E+13	2.14E+14
MA71-02 Mystic River (B/CSO Variance)	26.9%	8.30E+08	8.30E+09	8.30E+10	8.30E+11	8.30E+12	8.30E+13
	73.1%	2.26E+09	2.26E+10	2.26E+11	2.26E+12	2.26E+13	2.26E+14
MA71-07 Mill Brook (B)	39.0%	1.20E+09	1.20E+10	1.20E+11	1.20E+12	1.20E+13	1.20E+14
	61.0%	1.88E+09	1.88E+10	1.88E+11	1.88E+12	1.88E+13	1.88E+14
MA71-13 Unnamed Tributary (B)	14.9%	4.60E+08	4.60E+09	4.60E+10	4.60E+11	4.60E+12	4.60E+13
	85.1%	2.63E+09	2.63E+10	2.63E+11	2.63E+12	2.63E+13	2.63E+14
MA71-09 Winn Brook (B)	29.0%	8.95E+08	8.95E+09	8.95E+10	8.95E+11	8.95E+12	8.95E+13
	71.0%	2.19E+09	2.19E+10	2.19E+11	2.19E+12	2.19E+13	2.19E+14

[1] TMDL allocation: % surface area of segment watershed for WLA (impervious) and LA (pervious), respectively
[2] All Class A/Class B segments based on 126 *E. coli*/100ml water quality standard for Primary Contact Recreation. Class A segments in these watersheds are tributaries to filtered Public Water Supplies.

<u>For Estuary- Embayments:</u> For 19 of the estuary-embayments, the size of the watershed contributing to the flow must be accounted for. The following equation illustrates the calculation that applies to the estuarine segments.

Embayment TMDL = (1 acre) x (43,560 ft^2/acre) x ((2.0 ft (% pervious area) + 3.8 ft (% impervious area)/105 days)) x (7.48 gallons/ft^3) x (3.78 liters/gallon) x (Applicable WQ Standard cfu/100 ml) x (1000 ml/l)

Similar to the River TMDL calculation the Embayment TMDL is proportioned between the WLA and LA by multiplying the daily load by the percent impervious for the WLA, and by multiplying the daily load by the percent pervious for the contributing watershed for the LA. Table 7-4 summarizes the TMDL for the marine segments in the Boston Harbor Watershed.

Table 7-4 Stormwater WLA and LA TMDL by Embayment for the Boston Harbor Watershed (CFU/Day).

			TMDL Allocation[1]	Water Quality Standard Indicator					
Segment[2],	Waterbody	WQS Classification	WLA LA	Shellfishing (cfu/100mL)	Swimming (cfu/100mL)	Watershed (Acres)	TMDL (cfu/day)	WLA	LA
MA70-10	Winthrop Bay	SB	45.3%	F. Coliform (88)		4,032	4.94E+12	2.24E+12	2.75E+12
			55.7%		Enterococci (35)		1.96E+12	8.90E+11	1.09E+12
MA70-02	Boston Inner Harbor	SB/CSO	31.0%	F. Coliform (88)		48,094	7.25E+13	2.25E+13	5.00E+13
			69.0%		Enterococci (35)		2.88E+13	8.94E+12	1.99E+13
MA70-11	Pleasure Bay	SB	19.2%	F. Coliform (88)		190,031	3.34E+14	6.42E+13	2.70E+14
			80.8%		Enterococci (35)		1.33E+14	2.55E+13	1.07E+14
MA70-03	Dorchester Bay	SB	19.2%	F. Coliform (88)		190,031	3.34E+14	6.42E+13	2.70E+14
			80.8%		Enterococci (35)		1.33E+14	2.55E+13	1.07E+14
MA70-04	Quincy Bay	SA	25.6%	F. Coliform (14)		5,422	1.40E+12	3.58E+11	1.04E+12
			74.4%		Enterococci (35)		3.50E+12	8.96E+11	2.60E+12
MA70-05	Quincy Bay	SB	25.6%	F. Coliform (88)		5,422	8.80E+12	2.25E+12	6.55E+12
			74.4%		Enterococci (35)		3.50E+12	8.96E+11	2.60E+12
MA70-06	Hingham Bay	SB	17.5%	F. Coliform (88)		38,763	6.96E+13	1.22E+13	5.74E+13
			82.5%		Enterococci (35)		2.77E+13	4.84E+12	2.28E+13
MA70-07	Hingham Bay	SB	17.5%	F. Coliform (88)		38,763	6.96E+13	1.22E+13	5.74E+13
			82.5%		Enterococci (35)		2.77E+13	4.84E+12	2.28E+13
MA70-09	Hull Bay	SB	12.0%	F. Coliform (88)		11,189	2.14E+13	2.57E+12	1.88E+13
			88.0%		Enterococci (35)		8.51E+12	1.02E+12	7.49E+12
MA70-01	Boston Harbor	SB	20.9%	F. Coliform (88)		277,785	4.79E+14	1.00E+14	3.79E+14
			79.1%		Enterococci (35)		1.90E+14	3.98E+13	1.51E+14
MA74-15	Town River Bay	SA	36.8%	F. Coliform (14)		938	2.07E+11	7.60E+10	1.31E+11
			63.2%		Enterococci (35)		5.16E+11	1.90E+11	3.26E+11
MA74-13	Weymouth Back River	SA	20.0%	F. Coliform (14)		832	2.31E+11	4.61E+10	1.84E+11
			80.0%		Enterococci (35)		5.76E+11	1.15E+11	4.61E+11
MA74-14	Weymouth Fore River	B/SB	22.3%	F. Coliform (88)		15,142	2.56E+13	5.72E+12	1.99E+13
			77.7%		Enterococci (35)		1.02E+13	2.27E+12	7.92E+12
MA74-18	Hingham Harbor	SA	12.0%	F. Coliform (14)		11,189	3.40E+12	4.08E+11	3.00E+12
			88.0%		Enterococci (35)		8.51E+12	1.02E+12	7.49E+12
MA74-11	Weir River	SA	11.4%	F. Coliform (14)		1,124	3.44E+11	3.92E+10	3.05E+11
			88.6%		Enterococci (35)		8.61E+11	9.81E+10	7.62E+11
MA71-06	Chelsea River	SB/CSO	49.2%	F. Coliform (88)		2,425	2.72E+12	1.34E+12	1.38E+12
			50.8%		Enterococci (35)		1.08E+12	5.32E+11	5.49E+11
MA71-03	Mystic River	SB/CSO	28.7%	F. Coliform (88)		41,888	5.61E+13	1.61E+13	3.44E+13
			61.3%		Enterococci (35)		2.23E+13	6.41E+12	1.37E+13
MA71-08	Mill Creek	SB	32.0%	F. Coliform (88)		1,201	1.79E+12	5.71E+11	1.21E+12
			68.0%		Enterococci (35)		7.10E+11	2.27E+11	4.83E+11
MA71-14	Belle Isle Inlet	SA	45.0%	F. Coliform (14)		4,014	7.73E+11	3.48E+11	4.25E+11
			55.0%		Enterococci (35)		1.93E+12	8.69E+11	1.06E+12

[1] TMDL allocation: % surface area of segment watershed for WLA (impervious) and LA (pervious), respectively

[2] All Class B segments based on 126 E. coli/100ml water quality standard, Class SA calculations based on 14 fecal coliform/100ml, Class SB calculations based on 88 fecal coliform/100ml, class SA no shellfishing based on 35 enterococcus.100 ml.

7.3.5 – Wasteload Allocations (WLAs) and Load Allocations (LAs)

There are several WWTPs and other NPDES-permitted wastewater discharges within the watershed. NPDES wastewater discharge WLAs are set at the WQS. In addition there are numerous stormwater discharges from storm drainage systems throughout the watershed. All piped discharges are, by definition, point sources regardless of whether they are currently subject to the requirements of NPDES permits. Therefore, a WLA set equal to the WQS will be assigned to the portion of the stormwater that discharges to surface waters via storm drains.

WLAs and LAs are identified for all known source categories including both dry and wet weather sources for Class SA, SB, A, and B segments within the Boston Harbor watershed. Establishing WLAs and LAs that only address dry weather indicator bacteria sources would not ensure attainment of standards because of the significant contribution of wet weather indicator bacteria sources to WQS exceedances. Illicit sewer connections and deteriorating sewers leaking to storm drainage systems represent the primary dry weather point sources of indicator bacteria, while failing septic systems and possibly leaking sewer lines represent the non-point sources. Wet weather point sources include discharges from stormwater drainage systems (including MS4s) and sanitary sewer overflows (SSOs). Wet weather non-point sources primarily include diffuse stormwater runoff.

7.3.6 Stormwater Contribution

Part of the stormwater contribution originates from point sources and is included in the waste load allocation, and part comes from non-point sources and is included in the load allocation of the TMDL. The fraction of the runoff load attributed to the waste load allocation is estimated from the fraction of the watershed that has impervious cover because stormwater from impervious cover is more likely to be diverted, collected and conveyed to the receiving water by stormwater collection systems than non-impervious areas. The fraction of the TMDL associated with the wasteload allocation was estimated, using MassGIS and the algorithm within it to estimate the extent of impervious surface. The wasteload allocation was then defined by multiplying the TMDL for each segment by the percent of imperviousness in each watershed. Likewise the load allocation was estimated using the percent pervious cover in each watershed. MassDEP believes this approach is conservative because it assumes that all runoff from impervious areas actually makes it to the waterbody segment in question, which may or may not always be the case.

For example, based on information from MassGIS and the algorithm within it used to estimate the extent of impervious surface, the Aberjona River, MA71-01 (part of the Mystic River Watershed) at the USGS gage, Winchester MA, on the left bank of the river, 0.5 miles upstream from head of Mystic lakes. The upstream portion of the watershed from the point of this gage is 28.2% impervious and 71.8% pervious. Thus, 28.2% of the acceptable bacteria load at a given flow is assigned as waste load allocation while 71.8% of the total load represents the load allocation. Therefore, in a segment for which the average daily flow on the Aberjona River at the USGS Gage, (Winchester MA) is 29.5 cfs, the allowable *E. coli* bacteria load for that day and location or segment is 9.09 $x10^{10}$ *E. coli*/day (from Figure 7-1). Therefore, for that flow in the Aberjona River at the USGS Gage in Winchester, the waste load allocation is 2.56 $x10^{10}$ bacteria per day (i.e., (0.282) x (8.92$x10^{10}$ bacteria/day) and the load allocation is 6.53 $x10^{10}$ bacteria per day (i.e., (0.718) x (9.09 $x10^{10}$ bacteria/day).

Also as previously indicated, the allowable stormwater load for bacteria varies with receiving water flow. In order to calculate the allowable daily load (TMDL), flow must be taken into account. To estimate the flow for an ungaged location or segment, flows at a gage in the watershed or nearby watershed can be prorated based on drainage area. The USGS also has a web-based application at water.usgs.gov/osw/streamstats/ungaged.html for Massachusetts that incorporates ungaged flow estimations.

7.4 Application of the TMDL to Unimpaired or Currently Unassessed Segments

This TMDL applies to the 33 pathogen impaired segments of the Boston Harbor Watershed that are currently listed on the 2014 CWA § 303(d) list of impaired waters. MassDEP recommends however, that the information contained in this TMDL guide management activities for all other waters throughout the watershed to help maintain and protect existing water quality. For these non-impaired waters, Massachusetts is proposing "pollution prevention TMDLs" consistent with CWA § 303(d)(3).

The analyses conducted for the pathogen-impaired segments in this TMDL would apply to the non-impaired segments, since the sources and their characteristics are equivalent. The concentration waste load and/or load allocation for each source and designated use would be the same as specified herein. Therefore, the pollution prevention TMDLs would have identical waste load and load allocations based on the sources present and the designated use of the water body segment (see Table 7.1). Any discharge would need to be consistent with the applicable waste load allocations, as well as the antidegradation provision of the Massachusetts Water Quality Standards. Any new construction that complies with state stormwater standards and permits is presumed to comply with antidegradation requirements of the state water quality standards.

This Boston Harbor Watershed TMDL may, in appropriate circumstances, also apply to segments that are listed for pathogen impairment in subsequent Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, after listing the waters for pathogen impairment and taking into account all relevant comments submitted on the CWA § 303(d) list, the Commonwealth determines with EPA approval of the CWA § 303(d) list that this TMDL should apply to future pathogen impaired segments.

7.5 Margin of Safety

This section addresses the incorporation of a Margin of Safety (MOS) in the TMDL analysis. The MOS accounts for any uncertainty or lack of knowledge concerning the relationship between pollutant loading and water quality. The MOS can either be implicit (i.e., incorporated into the TMDL analysis through conservative assumptions) or explicit (i.e., expressed in the TMDL as a portion of the loadings). This TMDL uses an implicit MOS, through inclusion of two conservative assumptions. First, the TMDL does not account for mixing in the receiving waters and assumes that zero dilution is available. Realistically, influent water will mix with the receiving water and become diluted below the water quality standard, provided that the receiving water concentration does not exceed the TMDL concentration. Second, the goal of attaining standards at the point of discharge does not account for losses due to die-off and settling of indicator bacteria that are known to occur. Third, the TMDL assumes that all the runoff from impervious areas throughout the contributing watershed actually makes it to the impaired segment, which is generally not the case especially in large watersheds where impervious surfaces are not continually connected.

7.6 Seasonal Variability

In addition to a Margin of Safety, TMDLs must also account for seasonal variability. Pathogen sources to Boston Harbor Watershed waters arise from a mixture of continuous and wet-weather driven sources, and there may be no single critical condition that is protective for all other conditions. This TMDL has set WLAs and LAs for all known and suspected source categories equal to the Massachusetts WQS independent of seasonal and climatic conditions. This will ensure the attainment of water quality standards regardless of seasonal and climatic conditions. Controls that are necessary will be in place throughout the year, protecting water quality at all times.

8.0 Implementation Plan

Setting and achieving TMDLs should be an iterative process, with realistic goals over a reasonable timeframe and adjusted as warranted based upon on-going monitoring. The concentrations set out in the TMDL represent reductions that will require substantial time and financial commitment to be attained.

CSOs and Sanitary Sewer Overflows (SSOs) have historically been a significant contributor to bacteria pollution to the Harbor area, and the MWRA CSO Program Assessment being conducted under the Federal Court Order, together with the information being gathered under the terms and conditions of the CSO Variance should be focused on determining the impacts of remaining CSO discharges, and the feasibility of higher levels of CSO control. Eliminating illicit connections, reducing the risk of SSO events, and fixing failing infrastructure is tantamount to improving bacterial water quality. As the bacteria loads from SSOs and CSOs continue to decline it is anticipated that stormwater discharges from Phase I and Phase II regulated communities will remain the predominate source of bacteria pollution along with non-point sources such fertilizer runoff.

Finding illicit connection sources through bacteria source tracking activities in those segments where sampling activities show elevated levels of bacteria during dry weather is a top priority. Identification and remediation of dry weather bacteria sources is usually more straightforward and successful than tracking and eliminating wet weather sources. If illicit bacteria sources are found and eliminated it should result in a dramatic reduction of bacteria concentration in the segment in both dry and wet-weather. Each regulated community will need to implement a comprehensive program to ensure illicit sources are identified and that appropriate actions will be taken to eliminate them.

Finding the bacteria related pollution sources from failed infrastructure and fixing these poses real challenges. Overland stormwater runoff greatly exacerbates the pollution from failed infrastructure sources. Segments that remain impaired during wet weather should be evaluated for stormwater BMP implementation opportunities starting with less costly non-structural practices first (such as street sweeping, catch basin cleaning, and/or managerial approaches using local regulatory controls), and lastly, more expensive structural measures. Unfortunately, many failed infrastructure problems require the more expensive structural repair measures to be considered. This would require additional study to identify the most cost efficient and effective technology.

Controls on several types of pathogen sources will be required as part of the comprehensive control strategy. Many of the sources in the Boston Harbor watershed including sewer connections to drainage systems, leaking sewer pipes, sanitary sewer overflows, and failing septic systems, are prohibited and must be eliminated. Individual sources must first be identified in the field before they can be abated. Pinpointing sources typically requires extensive monitoring of the receiving waters and tributary stormwater drainage systems during both dry and wet weather conditions. The MassDEP, USEPA, MWRA, MyRWA, BWSC, and DCR have been successful in carrying out such monitoring, identifying sources, and, in some cases, mobilizing the responsible municipality and other entities to begin to take corrective actions.

Stormwater runoff represents another major source of pathogens in the Boston Harbor watershed, and the current level of control is inadequate for standards to be attained. Improving stormwater runoff quality is essential for restoring water quality and recreational uses. At a minimum, intensive application of non-structural BMPs is needed throughout the watershed to reduce pathogen loadings as well as loadings of other stormwater pollutants (e.g., nutrients and sediments) contributing to use impairment in the Boston Harbor watershed. Depending on the degree of success of the non-structural stormwater BMP program, structural controls may become necessary.

For these reasons, a basin-wide implementation strategy is recommended. The strategy includes a mandatory program for implementing stormwater BMPs and eliminating illicit sources. TMDL implementation-related tasks are shown in Table 8-1. MassDEP working with EPA and other team partners shall make every reasonable effort to assure implementation of this TMDL. These stakeholders can provide valuable assistance in defining hot spots and sources of pathogen contamination as well as the implementation of mitigation or preventative measures.

Table 8-1 TMDL Implementation Related Tasks

Task	Organization
Writing TMDL	MassDEP
TMDL public meeting	MassDEP
Response to public comment	MassDEP
Organization, contacts with volunteer groups	MassDEP, MyRWA, Massachusetts Community Water Watch (MCWW) Tufts Chapter
Development of comprehensive stormwater management programs particularly in close proximity to each embayment including identification and implementation of BMPs	Boston Harbor Communities
Illicit discharge detection and elimination (where applicable)	Boston Harbor Communities with MyRWA, MCWW Tufts Chapter, where applicable
Leaking sewer pipes and sanitary sewer overflows	Boston Harbor Communities
CSO management	Boston Harbor Communities, BWSC, MWRA, where applicable
Inspection and upgrade of on-site sewage disposal systems as needed	Homeowners and Boston Harbor Communities (Boards of Health)
Organize implementation; work with stakeholders and local officials to identify remedial measures and potential funding sources	MassDEP, DCR, DPH, MyRWA, BWSC, MWRA and Boston Harbor Communities
Organize and implement education and outreach program	MassDEP, DCR, DPH, Boston Harbor Communities, Save the Harbor/Save the Bay, and MyRWA
Write grant and loan funding proposals	MassDEP, MyRWA and Boston Harbor Communities and Planning Agencies with guidance from MassDEP
Inclusion of TMDL recommendations in Executive Office of Energy and Environmental Affairs (EEA) Watershed Action Plan	EEA
Surface Water Monitoring	MassDEP, Boston Harbor Communities, DCR, and MWRA
Provide periodic status reports on implementation of remedial activities	Boston Harbor Communities, MyRWA

8.1 Summary of Organizations and Activities within the Boston Harbor Watershed

Data supporting this TMDL show that indicator bacteria enter the Boston Harbor watershed from a number of contributing sources under a variety of conditions. Activities that are ongoing and/or planned to ensure that the TMDL can be implemented are summarized in the following subsections. There are several watershed organizations focused on improving water quality within the Boston Harbor watershed, including the Mystic River Watershed Association (MyRWA), Tufts University, the Massachusetts Bays Estuary Program (MassBays), Save the Harbor/Save the Bay, The Boston Harbor Association (TBHA), the Weir River Watershed Association (WRWA), and the Fore River Watershed Association (FRWA).

Through the MassBays Program, a Massachusetts Bays Comprehensive Conservation & Management Plan (MassBays 2004) has been developed. This plan lists the following initiatives intended to protect and enhance shellfishing and the progress of these initiatives:

- Conduct three Sanitary Survey Training Sessions annually-one each on the North Shore, Metro Boston/South Shore, and Cape Cod - to educate local shellfish constables and health officers on the proper technique for identifying and evaluating pathogen inputs into shellfish harvesting areas (progress: full). Local partner: Division of Marine Fisheries.

- Develop and administer a local Shellfish Management Grants Program to help communities finance the development and implementation of affective local shellfish management plans (progress: substantial). Local partner: Division of Marine Fisheries.

- Continue and expand the Shellfish Bed Restoration Program to restore and protect shellfish beds impacted by non-point source pollution (progress: moderate). Local partner: Shellfish Bed Restoration Program.

- Through the Shellfish Clean Water Initiative, complete an Interagency Agreement defining agency roles and contributions to protect shellfish resources from pollution sources (progress: new). Local partner: Office of Coastal Zone Management.

- 2015 State of the Bays Report.

In 1990, Congress added the Coastal Nonpoint Source Pollution Control Program to the Reauthorization of the Coastal Zone Management Act. “This legislation gives states the opportunity to work with federal agencies and already existing programs to develop and implement enforceable measures to restore and protect coastal waters from NPS [nonpoint source] pollution. The legislation also gives states the flexibility to design measures that are both environmentally and economically sound. The Massachusetts Coastal Zone Management Office (CZM) and the Department of Environmental Protection (MassDEP), in cooperation with a variety of other state agencies, are responsible for developing the Coastal Nonpoint Source Pollution Control Program for the Commonwealth.“ (CZM 2005b)

Through the Coastal Nonpoint Pollution Control Program, CZM is working with federal and state agencies, local officials, industry representatives, environmentalists, and the public to develop enforceable measures to restore and protect coastal waters from nonpoint source (NPS) pollution, which is currently the number one pollution problem in U.S. coastal waters. NPS pollution occurs when contaminants are picked up by rain water and snow melt and carried over land, in groundwater, or through drainage systems to the nearest waterbody.

Two grant programs administered by CZM support the implementation of the Coastal Nonpoint Pollution Control Program.

- The Coastal Pollutant Remediation (CPR) Grant Program provides funding to municipalities in Massachusetts coastal watersheds to reduce stormwater impacts from roads, highways, or parking areas and to install municipal boat pumpout facilities.

- The Coastal Nonpoint Source Pollution (Coastal NPS) Grant Program complements CPR and addresses more general areas of nonpoint source control. These grants to municipalities, as well as other public and non-profit groups, can be used for the following types of projects: assessment, identification, and characterization of nonpoint sources; targeted assessment of the municipal stormwater drainage system (runoff from municipal roadways, parking lots and bridges); the development of transferable tools (nonstructural best management practices), such as guidance documents, model by-laws, and land use planning strategies to improve nonpoint source control and management; and the implementation of innovative and unique demonstration projects.

Both the CPR and Coastal NPS grant programs have been developed to provide resources to municipalities for assessing and managing nonpoint sources of pollution. Projects funded through these grants can stand-alone or they can be discrete components of multi-year projects. For example, a municipality might use Coastal NPS funds to identify pollution sources in a subwatershed during year one of a project, and then apply for CPR funds to develop best management practices to remediate the identified roadway related pollutants during year two. CZM encourages the incorporation of long-term, progressive pollution mitigation planning components into proposals for both programs.

Also as part of the Coastal Nonpoint Pollution Control Program, CZM developed the *Massachusetts Clean Marina Guide*. This reference for owners and operators of marine boating facilities provides information on cost-effective strategies and practices aimed at reducing marina and boating impacts on the coastal environment (CZM 2005c).

For more information regarding CZM programs and grants, please visit their website at http://www.mass.gov/czm/czm.htm

The MyRWA is a not-for-profit active steward of the Mystic River watershed. The MyRWA is a citizens group primarily focused on education, outreach, and water quality monitoring. The association has its own monitoring network (Mystic Monitoring Network (MMN)) supported by volunteers, which contributed much of the data in the Mystic River sub-basin section of this report. The association has also encouraged the development of individual stream and river groups such as the Alewife/Mystic River Advocates, the Friends of the Mystic River, and the Alewife Brook/Little River Stream Team. These groups have been involved in shoreline surveys and water quality sampling. The Alewife Stream Team has also developed an Action Plan for the sub- watershed based on their shoreline survey that included noting land use, pipes, and odors potentially caused by sewage.

The MyRWA has formed a partnership with Tufts University to conduct research on the river and promote involvement from students at the University. Tufts has been able to secure grants for research on the Mystic River and has also planned classes incorporating issues surrounding the Mystic. The MyRWA, Tufts University, and the City of Somerville have also partnered to conduct real-time water quality monitoring in the Mystic River watershed. This project was started under an EPA program known as Environmental Monitoring for Public Access and Community Tracking (EMPACT).

The Massachusetts Bays Program (MassBays) was established in 1988 with a scientific research focus to determine pollution problems in the Bays. A "Conference" of individuals from federal, state, and local government agencies, regional planning agencies, user groups, public and private institutions, and the public gathered to evaluate the research and worked together to create the Comprehensive Conservation Management Plan (CCMP). MassBays works closely with municipalities and often assists them in seeking funds and passing by-laws. MassBays is also focused on educating the local officials through technical workshops. MassBays has provided training for volunteers to monitor stormwater outfalls, and swimming beaches (EEA 2003).

Save the Harbor/Save the Bay is a nonprofit advocacy group focused on restoring and protecting Boston Harbor and Massachusetts Bay. Save the Harbor/Save the Bay aims to inform the public on the state of the harbor's water quality, beaches, and waterfront. The organization publishes a newsletter, Splash, and strives to educate and encourage the next generation of Stewards. Recent projects include educating the public on beach closings and the reasons behind them, and keeping the public informed about water quality issues related to outfall pipe in Massachusetts and Cape Cod Bays (Save the Harbor/Save the Bay 2016).

The Boston Harbor Association (TBHA) is focused on monitoring water quality in the harbor and restoring the harbor's beaches. The TBHA publishes a quarterly newsletter called "Harbor News", which gives members updates on water quality improvements and the association's programs. Promoting education and involvement in the community is of high importance to TBHA. TBHA offers several free educational programs for youths teaching students about water quality and pollution. Each year, over 1,200 high school students are taught about the Boston Harbor Project and career opportunities in the environmental and maritime fields through TBHA programs. TBHA has:

- published a Boston Harbor Curriculum Guide for middle school science teachers,

- hosted lecture series open to the public focusing on water quality and beaches,
- offered free Boston Harbor boat cruises open to the public providing speakers discussing water quality issues while cruising,
- written columns for Banker & Tradesman on issues affecting the harbor, and
- been involved in preparing a report on water quality improvements on Wollaston Beach and educating the public on beach water quality (TBHA 2016).

The Weir River Watershed Association (WRWA) promotes awareness and stewardship in the watershed. The WRWA is focused on gathering data through monitoring programs, conducting local projects to improve water quality, reporting findings on the state of the watershed to the public, governmental agencies, and others, and building partnerships with schools, businesses, community groups, and government agencies (WRWA 2016).

The Fore River Watershed Association's (FRWA) mission is to "promote, protect, restore, enhance and improve the water quality, natural resources, cultural sites, and recreational opportunities of the Fore River watershed" (FRWA 2016). The FRWA conducts shoreline and land use surveys of the river corridor, conducts a long-term water quality monitoring program, implements water quality improvement programs, educates the public, conducts river cleanups, offers educational and recreational programs for community outreach, monitors government activities, advocates the protection of open space, and works with government agencies and the public to promote more involvement.

The Neponset River Watershed Association, University of Massachusetts, Urban Harbors Institute, Boston Harbor Association, Fore River Watershed Association, and Weir River Watershed Association have prepared a "*Boston Harbor South Watersheds 2004-2009 Action Plan"* (NRWA et al. 2004). The Action Plan focuses on:

1. Sewer system improvements
2. Stormwater management and groundwater recharge
3. Septic management
4. Management of landscaped areas
5. Water supply and streamflows
6. Riverine habitat
7. Public access to waterways
8. Watershed assessment
9. Boating initiatives
10. Financing, regional collaboration, and adapting to local conditions

Items relating to water quality improvements such as sewer system improvements, stormwater management, and septic management make up a large portion of the action items in the "Common

Action Plan for all Boston Harbor South Watersheds" section. The implementation of this TMDL is consistent with the goals and objectives of the Action Plan.

Within the Boston Harbor watershed grant projects are conducted by communities under the: (1) Federal 319 Grant program; (2) Federal 604b Grant program. There have already been seven (7) 319 projects conducted, with total monies expended of $2,321,350 for all the projects, and three (3) 604b projects conducted, with a total of $139,704. Each project potentially impacts, in a positive sense, the bacteria levels in 303(d) listed segments in this report. Although the emphasis of the projects overall centers on nutrients, phosphorus, and sediment BMP controls, these types of controls no doubt have a positive effect in removing bacteria contamination as well. The projects are summarized here and the affected 303(d) listed impaired waters in this report are identified:

1. "Reducing Stormwater Pollution in an Ultra Urban Environment" (98-07/319), a $118,700, 1998-2002 project to improve the water quality of Alewife Brook (MA71-04) by treating and reducing stormwater discharges by implementing an innovative retrofit technology to one stormdrain outlet, to conduct a public survey to assess detrimental behavior contributing to nonpoint source pollution, to help identify sites where pervious cover can be increased, and to conduct a watershed-wide workshop for municipalities on how to control non- point source pollution.
2. "Telecom City: Malden, Medford, Everett" (99-05/319), a $250,000, 1999-2002 project, part of a larger effort to redevelop a 200+ acre site along the Malden River (MA71-05). This 319 project developed a model to quantify the predicted mitigation of NPS runoff impacts through implementation of specific BMPs to restore specific parcels of wetlands on site, prior to commencement of the larger industrial redevelopment on the larger brownfields site. With the BMPs selected to be installed, there will be pre and post monitoring, final calibration of the model based on monitoring results, and a public outreach effort to explain the BMPs, the model, and their effectiveness.
3. "Stormwater System Maintenance and Residuals Waste Handling" (01-24/319), a $143,389, 2001-04 project to look at the (MA70-05, Quincy Bay) negative water quality impacts from eight stormwater outfalls discharging directly to Wollaston Beach. The project developed a specific O & M plan for the collection system, particularly the storm drains, and protocols for processing catch basin residuals and making these conform to Beneficial Use Determination (BUD). Processed residuals were made available and transferable to other cities and towns in the Commonwealth.
4. "Spy Pond Stormwater Management Program" (03-10/319), a $298,100, 2003-5 project (Mystic Watershed) to design and put in place BMP's to control Category 5 impairments: sediment, phosphorus, weeds, and turbidity. Although the segment is not listed for pathogens, the installation of the BMPs (six baffled sediment tanks and sixteen deep sump/leaching catch basins) to control Route 2 stormwater discharge runoff will certainly help to remove whatever existing pathogens are in this runoff.
5. "Children's Wharf Project: Growing the Next Generation of Environmental Stewards" (05-08/319), a $833,334 2005-08 project whereby the Boston Children's Museum mitigated

pollutants going into Fort Point Channel from stormwater runoff by incorporating Best Management Practices into the design and construction of a facility expansion and renovation project. Project tasks included construction of a green roof, stormwater reclamation system, rainwater harvesting, and other low-impact development practices to encourage infiltration and reuse of stormwater. An extensive public outreach and education task included hands-on interactive displays, interpretive signage, and special programs to educate children, educators, and other adult caregivers about the new onsite stormwater management practices and the importance of individual actions and activities to improve water quality.

6. Sunset Lake Watershed Stormwater BMPs (11-10/319), a $145,510, 2010-12 project to improve the water quality of Sunset Lake by reducing NPS pollution into the lake (particularly bacterial pollution). Sunset Lake, a 57-acre lake in the center of Braintree with a town-owned swimming beach, a park and a parking lot on its eastern shore, suffers from bacterial contamination issues, eutrophication and nuisance aquatic weed growth. Two untreated stormwater discharges at the beach were retrofitted with infiltration BMPs which are known for their effectiveness at treating bacteria. Deep sump catch basins were constructed on the high school access road to replace drop inlet basins which drop directly into the culvert connecting the marsh and the lake, which currently allow sediment and pollutants to discharge directly into the lake. In addition, a kiosk was installed in the beach parking lot to provide information on the stormwater BMPs and strategies/rationales for protecting the lake environment: (1) restrictions against feeding waterfowl; (2) dogs not being permitted on the beach. Watershed property owners were mailed a brochure on discouraging Canada Geese from their lawns, the importance of picking up pet waste and reducing or eliminating fertilizer use for lawns
7. City of Boston Porous Pavement Green Alley NPS Demonstration 2007-09 Project (13-07/319), a $532,320 project resulted in the design, construction, and monitoring of a permeable pavement retrofit in the City of Boston. The project goals were to: (1) Reduce nonpoint source pollutant (NPS) contributions to water bodies by decreasing the stormwater runoff volumes and treatment via permeable pavement and sub-grade materials; (2) Increase the recharge of water in the City's Groundwater Conservation Overlay District; (3) Evaluate the potential for using permeable pavements in alleys as a standard practice for improving stormwater management in the City of Boston; (4) Quantify the benefits of the project with a monitoring program; (5) Develop design recommendations for the use of permeable pavements for retro-fitting alleys in the City of Boston; and (6) Identify areas for suggested additional research and investigation. Project tasks included: (1) Design and construct BMPs; (2) Develop a BMP Operation and Maintenance Plan; (3) Education and Outreach.
8. Green Street Demonstration Project (Section 604b, 2007-05 Project), a $44,986 project to assess the potential stormwater management and recharge benefits of Green Streets by implementing a pilot Green Street project in the City of Boston. Specific tasks completed include: (1) Assess existing conditions at an urban location; (2) Develop Source Loading and Management Model estimates of surface water runoff and nutrient loading for the selected site; (3) Evaluate Low Impact Development (LID) Best Management Practices (BMP) Opportunities; (4) Conduct

scenario modeling for various BMP's; (5) Select BMP options Streetscape Concept; (6) Conduct a Public Outreach program; (7) Prepare a final project report.

9. Mystic River Headwaters: Alewife & Mill Brook Sub-watersheds (Section 604b, 2013 project), a $48,380 project The Town of Arlington partnered with the Town of Belmont to collectively address the problem of non-point source pollution in the Alewife and Mill Brook sub-watersheds. The two municipalities identified pollution sources to reduce pollutant loading through an examination of solutions with a focus on "green" structural BMPs. The project goals included developing conceptual designs for five BMPs – three within Arlington and two in Belmont– that will reduce pollutant loading from respective sites to water bodies in the Alewife and Mill Brook sub-watersheds. This project provided the towns with the information, experience, and tools necessary to move forward with more widespread BMP implementation in the future.
10. Westwood - Green Infrastructure Planning (Section 604b, 2013 project), a $25,974 project that identified voluntary retrofitting opportunities on private property not the subject of active redevelopment as a strategy for reducing water quality, hydrologic, and habitat impacts. The goal of the project was to retrofit existing impervious surfaces on private property, using green infrastructure techniques. Once potential sites were identified and landowner interest established, the town of Westwood will work with private landowners to encourage them to implement recommended measures through a program of general education, technical assistance workshops, and other incentives. A variety of mechanisms such as water banks, tradable mitigation credits or stormwater utilities may be considered.

8.2 Illicit Sewer Connections, Failing Infrastructure, SSOs and CSOs.

Eliminating illicit sewer connections, repairing failing infrastructure, and controlling impacts associated with CSOs and SSOs are of extreme importance in eliminating and preventing bacterial pollution. Many organizations, along with at least several major programs, have been trying to address these problems, with considerable progress to date. The Massachusetts Department of Environmental Protection (MassDEP), U.S. Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), Metropolitan District Commission (MDC), Massachusetts Water Resources Authority (MWRA), Boston Water and Sewer Commission (BWSC), and Mystic River Watershed Association (MyRWA), have all been active in the identification, and mitigation of bacterial related pollution problems for many years. For instance, in the Mystic River and Alewife Brook watersheds, the Mystic River Watershed Association has for years conducted dry weather sampling of storm drains and outfalls, and has identified a number of illicit sanitary flows going into these drains, which go directly to receiving waters from the outfalls. The MassDEP has issued Notices of Noncompliance to the responsible communities within these watersheds, requiring them to create programs to identify the location of the illicit connections and to eliminate them.

Previously, wastewater was treated at the MWRA Deer Island and Nut Island primary treatment facilities until the new Deer Island Sewage Treatment Plant was completed in 2001. The Deer Island Wastewater Treatment Plant now receives sewage from 43 greater Boston communities and has a higher capacity than the combined capacities of the former Deer Island and Nut Island facilities, greatly reducing back-ups and overflows throughout the system. The sewage passes through primary and secondary treatment, sludge digestion, disinfection, eventually discharging through a 9.5 mile long tunnel into Massachusetts Bay at 100 feet below the water surface (MWRA 2004a). The switch of the Nut Island Outfall to the Deer Island Wastewater Treatment facility in 1998, and the Deer Island facility discharge to the Massachusetts Bay outfall in 2000, has greatly improved bacteria related water quality in the previous Nut island and Deer Island outfall areas of Boston Harbor (see Figure 8-1) (MWRA 2004b). MWRA is responsible for monitoring the outfall and the Outfall Monitoring Science Advisory Panel (OMSAP), an independent panel of scientists provides advice on scientific issues related to the monitoring and discharge permit (http://www.mwra.state.ma.us/harbor/enquad/pdf/2016-11.pdf).

With regard to CSO controls, in a stipulation entered in 1987 through the Boston Harbor Court Case No. 85-0489, MWRA accepted responsibility for developing a Long- Term (CSO) Control Plan (LTCP) to address discharges from all CSOs connected to the MWRA sewer system, including outfalls owned by its member communities. The Court also required the development of an implementation schedule. In 1994, MWRA submitted its Final CSO Conceptual Plan and System Master Plan, which included a long-term control plan for CSOs that recommended 25 site-specific CSO projects located in Boston, Cambridge, Chelsea, and Somerville. This recommended plan was later refined in a 1997 Facilities Plan/ EIR, and again in an agreement MRWA reached with EPA and DEP with a Second Stipulation and LTCP in March 2006 which outlined the responsibility and liability for CSOs (MWRA 2010). This Second Stipulation was subsequently amended in May, 2008. The final long- term CSO control plan includes 35 projects for which design and construction milestones have been added to the Federal Court schedule (Schedule Seven). Under the order, MWRA has until 2020 to complete all CSO work and subsequent system monitoring, which will determine whether or not the LTCP goals have been achieved (MWRA 2010). MWRA has completed all 35 projects at a cost of $891 million, which is 98% of it's CSO budget in MWRA's Proposed FY 17 Capital Improvement Program (CIP) (MWRA 2016). This Capital Improvement Program (CIP) budget figure includes all the CSO LTCP work manifested under the Original Court Order, Second Stipulation, and Amendment in 2008. Updated details on CSO progress for MWRA, BWSC and other communities: http://www.mwra.state.ma.us/annual/csoar/2015/2015csoar-r4.pdf

Since the beginning of MWRA's CSO control planning efforts in the late 1980's, MWRA and the CSO Communities have eliminated or virtually eliminated, with a 25-year storm level of control, CSO discharges at 34 of the 84 outfalls addressed in the Long-Term CSO Control Plan (LTCP), five more than the number of outfalls recommended for closure in the LTCP. On December 4, 2014, the City of Chelsea permanently closed off Outfall CHE002 to CSO discharges following the City's completion of a sewer separation project that was outside the scope of the Long-Term CSO Control Plan. The outfall now serves as a city stormwater discharge. Four outfalls were previously closed by BWSC and the City of

Cambridge – East Boston outfalls BOS006 and BOS007 to Boston Inner Harbor, and Cambridge outfalls CAM009 and CAM011 to the Charles River Basin – also through efforts outside the scope of the Long-Term Control Plan. The last outfall recommended for closure in the Long-Term Control Plan, Outfall CAM004 to Alewife Brook, was closed in December 2015 (MWRA 2016).

As shown in Figure 8-2, estimated average annual volume of CSO discharge has dropped from 3.3 billion gallons in 1988 to 0.45 billion gallons today, an 86% reduction, with 89% of the current average annual discharge volume receiving treatment at MWRA's four long-term CSO facilities at Cottage Farm, Prison Point, Somerville Marginal and Union Park (MWRA 2016). Figure 8-3 shows the decreasing volume of CSO discharge to receiving waters over time.

Major bacteria water quality improvement has occurred in the Charles River basin, where average annual CSO discharge has been drastically cut from 1.7 billion gallons in 1988, to 23 million gallons today, a greater than 98% reduction. Approximately 80% of this remaining CSO flow is treated at MWRA's Cottage Farm CSO Treatment Facility in Cambridge. Additionally, communities along the Charles have implemented programs to reduce pollution in separate stormwater discharges, and remove illicit sewer connections or cross connections to storm drain systems. All of these programs have resulted in significant water quality improvements to this particular basin[1].

In the Mystic River, Figure 8-4, "Change in Mystic River Water Quality Over Time", shows improvement in all areas of the Mystic after 2008, with the Lower Mystic and Mystic River mouth having the best water quality. These areas meet water quality limits most of the time, with more than 90% of bacteria samples meeting the *Enterococci* swimming standards of 104 cfu/100mL in all weather conditions for 2008 through 2014. Bacterial water quality in the Upper Mystic is also good, with bacteria meeting limits more than 90% of the time, except in heavy rain. While conditions worsen in heavy rain events, these rainfall conditions are relatively infrequent. Bacteria counts in Alewife Brook, where major CSO control work was undertaken in 2015, frequently fail to meet swimming limits in wet weather, with water quality being particularly poor after heavy rain. However, Alewife Brook's influence on downstream water quality conditions in the Mystic main stem is limited, with bacterial conditions downstream showing little influence from Alewife Brook.

Improvement in the quality of Boston Inner Harbor waters is also seen in (1) Figure 8-5, "Change in Inner Harbor Water Quality Over Time" and (2) Figure 8-6, "Changes in Boston Harbor *Enterococci* Bacteria in Wet Weather". Improvement was greatest in the Upper Inner Harbor and in Chelsea Creek, which have had in the past more serious wet weather pollution problems. Bacteria data indicate that water quality conditions improved greatly with the significant increase in wastewater transport and treatment

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[1] More detail on specific projects and improvements in the Charles River are available in a separate Final Bacteria TMDL Report document for the Charles River Watershed. www.mass.gov/dep/water/resources/tmdls.htm

capacity (delivery to the Deer Island Treatment Plant) since the late 1990s. This increase in delivery capacity greatly reduced CSO discharges at most outfalls. Also, the movement of the Deer Island Outfall 9.5 miles offshore in Massachusetts Bay has greatly added to pathogen level improvements. Since then, dry-weather water quality has greatly improved, and wet-weather water quality continues to improve in Boston Harbor and its tributary rivers, but at a slower pace due in part to diminishing returns on wastewater pollution investments and the dominance of other sources of pollution, including urban stormwater.

South Boston Beaches

Water quality along the beaches was excellent during the 2014 swimming season, with 100% of the Department of Conservation and Recreation's (DCR) sampling results meeting bacteria limits for swimming. The improvements in Pathogen water quality throughout the entire North-South Dorchester Bays Area are due in large part to two huge MWRA/BWSC projects which have been completed: (1) $253.9 Million North Dorchester Bay CSO/Stormwater Storage Tunnel/Facilities, and Pleasure Bay/Morrissey Blvd. Stormdrain Improvements; (2) $126.5 Million South Dorchester Bay Fox Pt./Commercial Pt. CSO closure; and in an ancillary way, (3) the Dorchester Area Sewer Separations. This Dorchester Area Sewer Separation project involved a 306 acre, $72.6 Million Sewer Separation Effort in the Reserved Channel Area, immediately adjacent to Dorchester Bays. This project, has significantly improved water quality in the beach areas.

The fraction of days failing to meet the bacteria limit at one or more beaches in South Boston dropped from an average of 18% in the five years (2005-2010) prior to opening of the storage tunnel, to an average of 4% in the years following its opening (Figure 8-7). The few remaining water quality violations and related beach closings are not CSO related, (as there have been no CSO discharges in the beaches area since May 2011), and may be caused by environmental factors such as near-field overland stormwater runoff contaminated with garbage, pet waste or bird droppings. During 2014, the storage tunnel captured approximately 203 million gallons of CSO and separate stormwater and prevented any CSO or stormwater discharge to the beaches over approximately 97 rainfall events. Since start-up in May 2011, the storage tunnel has captured 753 million gallons of CSO and stormwater, and there has been no discharge of CSO to the beaches, two discharges of stormwater to the beaches (during Hurricane Irene in August 2011 and a portion of the storm of December 9, 2014), and two transfers of stormwater to Savin Hill Cove.

Alewife Brook CSO Control Plan

The Alewife Brook CSO Control Plan minimizes CSO discharges to the Alewife Brook primarily by separating combined sewer systems in parts of Cambridge and through upgrades of the hydraulic capacities at local sewer connections to the MWRA interceptors. The plan also includes a stormwater outfall and constructed wetland to accommodate the separated stormwater flows, prevent any increase in flooding along Alewife Brook, and provide a level of stormwater treatment. Refer to the MWRA CSO web page for most current status on projects and water quality improvement: http://www.mwra.state.ma.us/03sewer/html/sewcso.htm#located

CAM004 Sewer Separation

The CAM004 Sewer Separation Project, completed in 2015, represents the largest example of the Alewife Brook CSO Control Plan effort, totaling $73.4 Million, which includes 211 acres of sewer separation, and construction of an outfall and wetlands basin. Cambridge has completed the Sewer Separation Project which involves the separation of combined sewers upstream of Outfall CAM004 in the Huron Avenue and Concord Avenue neighborhoods east of Fresh Pond Parkway.

The project included the installation of approximately 20,700 linear feet of sanitary sewers and storm drains up to 54-inch diameter along Huron Avenue and several intersecting streets in a 68-acre area immediately east of Fresh Pond Parkway. Also in the project was installation of three large storm drain vaults on Vassal Lane, 45 new or replacement catch basins with hoods and 6-foot sumps, work on the private property of 58 buildings within the project area to remove roof runoff and sump pump discharges from the sewer system, and 6,700 linear feet of replacement water main ranging from 6-inch to 12-inch diameter. Surface restoration work and environmental improvements included porous pavements, stormwater biobasins, and trees and other plantings. Finally, 21,000 linear feet of new sanitary sewers and storm drains from 8-inch to 30-inch diameter, 1,700 linear feet of trenchless pipe rehabilitation, and approximately 13,230 linear feet of ductile iron water main pipe from 4-inch to 24-inch diameter along Huron Avenue and several intersecting streets in an 83-acre area east of Contract 8A.

Weymouth-Weir Wastewater-SSO Improvements

To abate the SSO problems in the Weymouth and Weir sub-basin, the MassDEP began an initiative in 1998 to reduce the frequency, duration, and volumes of overflows from the MWRA Braintree-Weymouth Interceptor and the Braintree and Weymouth municipal sewer systems. MWRA worked to identify hydraulic deficiencies in their sewer system in 1993. MassDEP signed an Administrative Consent Order (ACO) with MWRA requiring the MWRA to construct the Braintree-Weymouth Relief Facilities on a specified schedule. This total $231 million project has increased the system's capacity and streamline the route the wastewater takes from the communities to the Deer Island Treatment Plant. As a result of the completed project, Sanitary Sewer Overflow (SSO) incidents have been reduced by well over 90%. Braintree and Weymouth both signed ACOs with MassDEP to improve their sewer systems. Weymouth will be undertaking a $15 million capital improvement project and will perform work on extensive infiltration and inflow removal. Braintree has also begun infiltration reduction projects. The towns of Braintree and Weymouth have identified and removed hundreds of illegal sump pumps. In 2002, the Clean Water State Revolving Fund (SRF) gave the Town of Randolph $210,000 to perform a sewer investigation in the Amelia Road area where severe sewer overflows had occurred in March 2001. As part of the ACO with MassDEP, Braintree and Weymouth were required to perform dry weather sampling of storm drains to identify illegal connections to the storm drain system (MWRA, 2008).

CSO Progress Highlights and Accomplishments

MWRA and its CSO communities continued to implement the Long-Term CSO Control Plan and comply with the Federal Court-ordered obligations defined in Schedule Seven and in the March 15, 2006, Second Stipulation of the United States and the Massachusetts Water Resources Authority on Responsibility and Legal Liability for Combined Sewer Overflows, as amended by the Federal District Court on May 7, 2008 (the “Second CSO Stipulation”). The MWRA and the CSO communities have eliminated CSO discharges at 34 or the 84 CSO outfalls and virtually eliminated (25 year storm level of control, CSO discharges, along with 5-year storm level of control of separate stormwater discharges) at the five remaining outfalls along the South Boston beaches. The 34 closed outfalls include five outfalls (two in Cambridge, two BWSC, and one in Chelsea) that the LTCP had assumed would remain active.

For more details on the work that has been completed and water quality improvement statistics refer to the MWRA website for the most recent annual report: http://www.mwra.state.ma.us/annual/csoar/2015/2015csoar-r4.pdf.

Figure 8-1 Approved Long-Term CSO Control Plan and Benefits (MWRA 2015)

BENEFITS

- 84 CSO Outfalls: 34 Closed
  46 Reduced to a Minimal Number of CSO Discharges per year
  4 Treated
- Eliminates or Reduces CSO Activations to Achieve a Level of CSO Control Consistent with Water Quality Standards
- Treats More Frequent Discharges
- Controls Floatable Materials at remaining active CSO Outfalls

CSO CONTROL PROJECTS

Sewer Separation
Existing CSO Treatment Facility Upgrades
New CSO Treatment Facility
CSO Consolidation /Storage Conduits
Relief Sewers
Localized Hydraulic Relief
Outfall Repairs
Region Wide Floatables Controls
System Optimization

PROGRAM SCHEDULE

Final CSO Conceptual Plan	Dec 1994
Final Facilities Plan and EIR	Jul 1997
Final Approved Plan	Apr 2006
Design and Construction	1995 - 2015
Assessment Phase	2018 - 2020

COSTS
Planning, Design & Construction
$898.3 Million
Net Annual O&M
$1.5 Million

Figure 8-2 CSO Volume Reduction by Receiving Water (MWRA 2016)

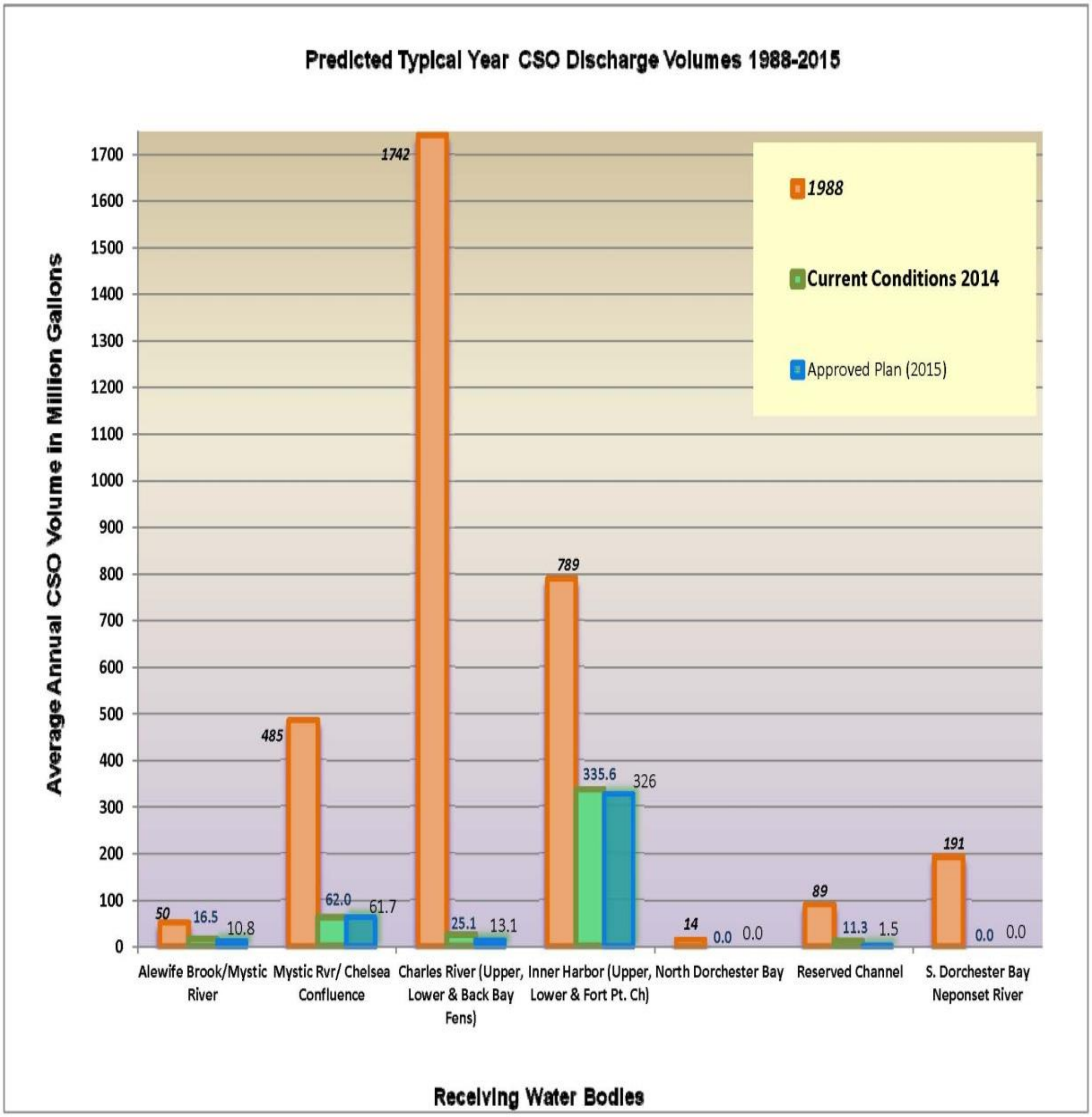


Figure 8-3 Region-wide CSO Reduction and Goal (MWRA 2015)

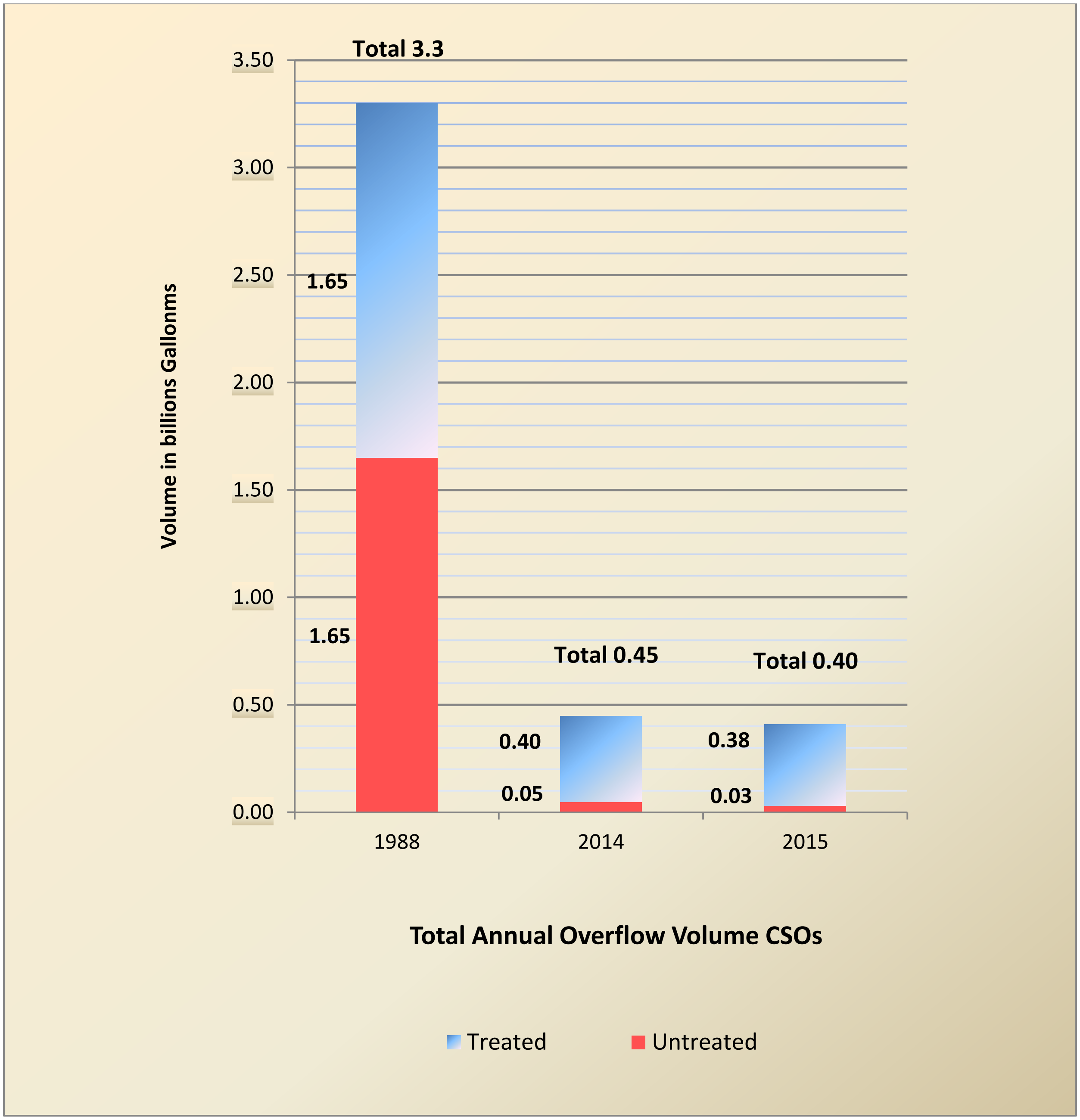
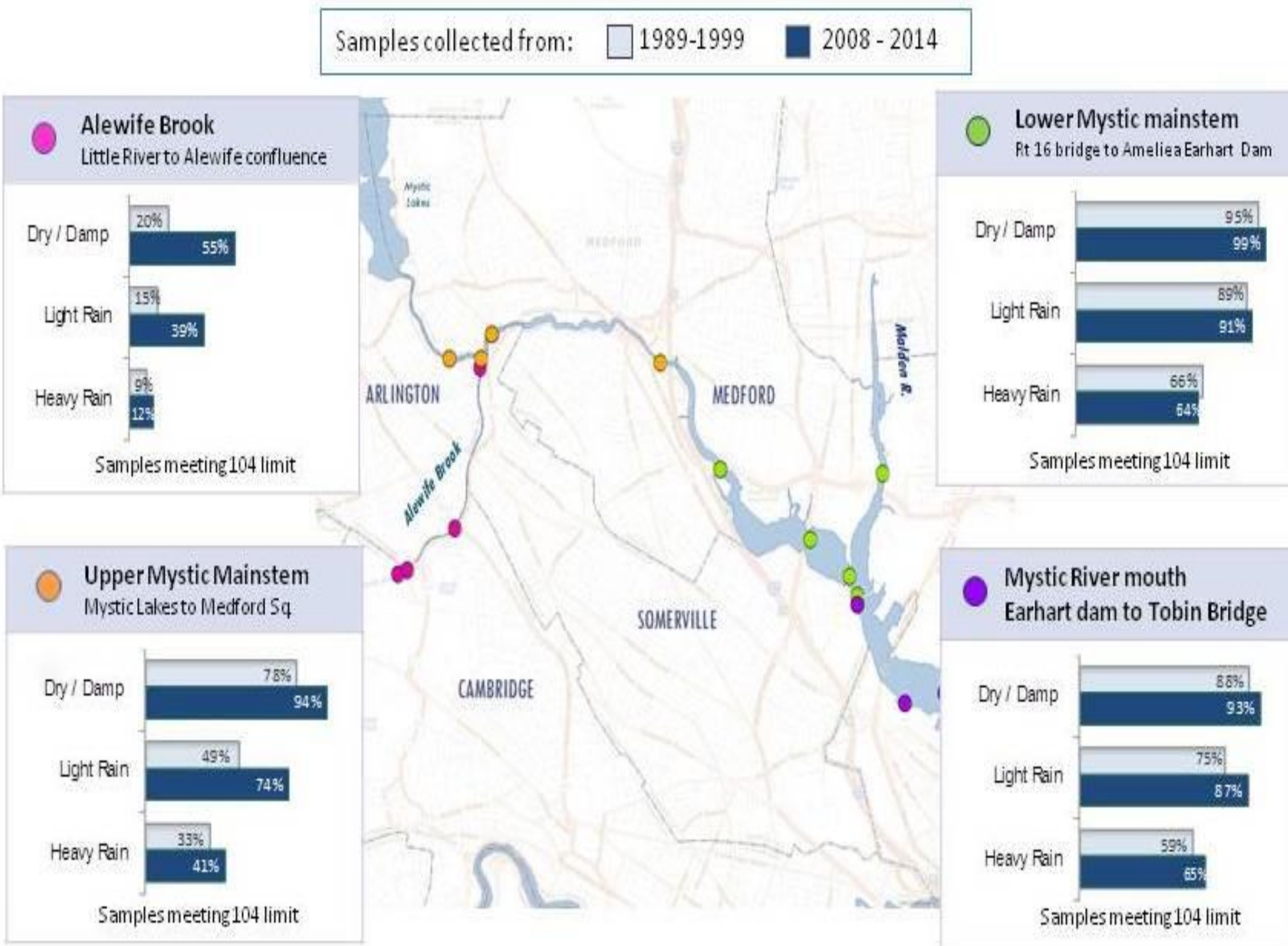


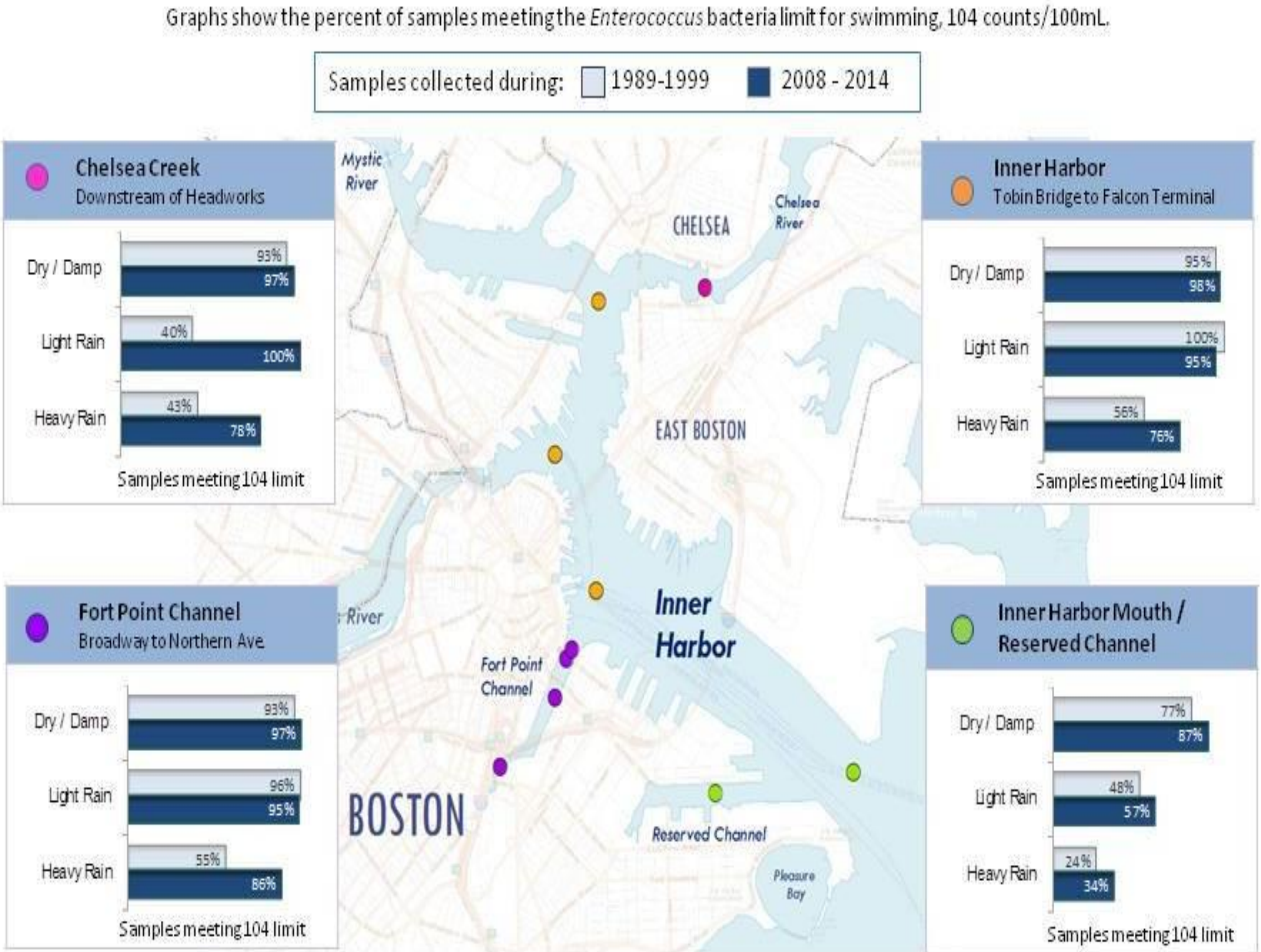
Figure 8-4 Change in Mystic River Water Quality over Time (MWRA 2015)

Graphs show the percent of samples meeting the *Enterococcus* bacteria limit for swimming, 104 counts/100mL, by river reach.



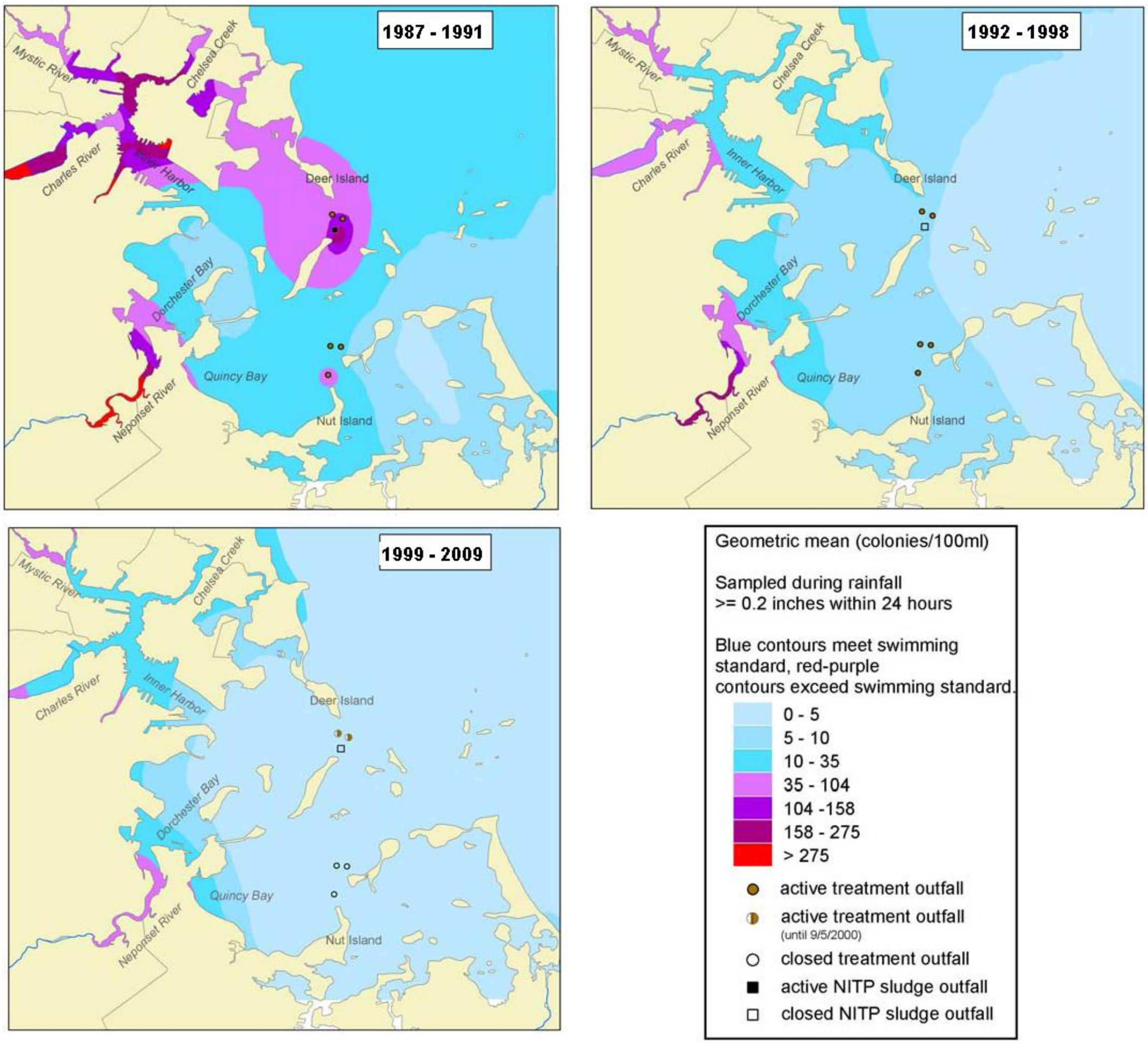
Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2014 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

Figure 8-5 Change in Inner Harbor Water Quality over Time (MWRA 2015)



Dots are MWRA sampling locations. State swimming standards for *Enterococcus* single sample limit is 104 cfu/100 mL. Rainfall: Heavy Rain is at least 0.5 inches of rain in previous 48 hours; Light Rain is between 0.1 and 0.5 inches of rainfall in previous 48 hours. 2008 – 2014 period is considered current conditions, following substantial completion of infrastructure improvements. Data from intervening years (2000 – 2007) are excluded.

Figure 8-6 Changes in Boston Harbor Enterococcus Counts in wet weather (MWRA 2010)



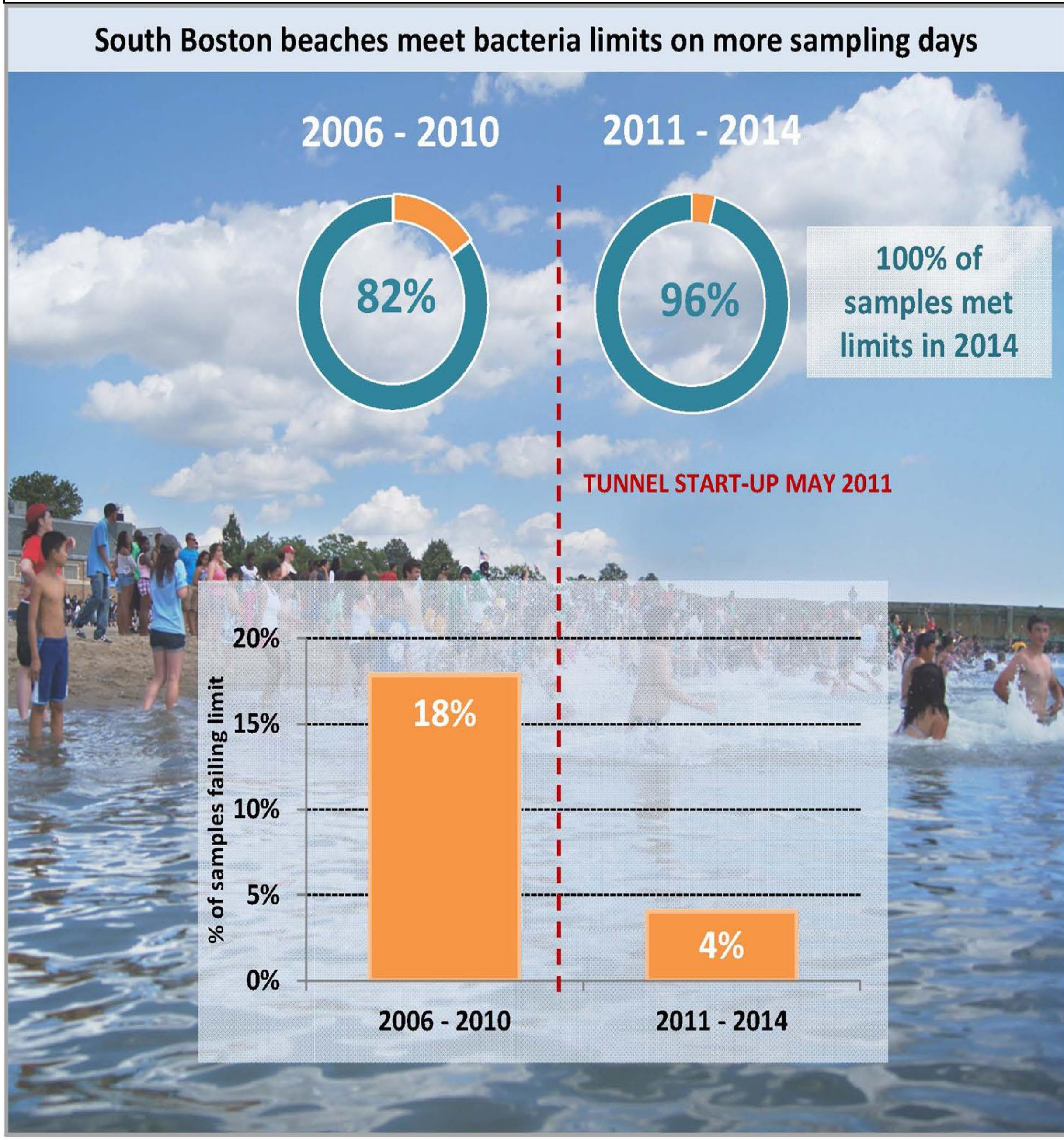
Contours show the geometric means of *Enterococcus* data collected when more than 0.2 inches of rain fell in the previous 24 hours. Blue areas meet the EPA geometric mean standard and red-purple areas exceed the standard.

1987 - 1991 This period shows data collected prior to when the Boston Harbor project and CSO plans began, through the last year that sludge was discharged (1991). In wet weather, areas affected by the discharge of sewage and sludge from the Deer Island Treatment Plant and Nut Island Treatment plant, and most of the Inner Harbor and tributary rivers, failed to meet the standard.

1992 - 1998 Data from these years reflect the effects of CSO upgrades, the ending of sludge discharge, full pumping at DITP, improved primary and beginning secondary treatment at DITP. Most of the harbor meets standards except for the tributary rivers, Fort Point Channel and along Wollaston Beach.

1999 - 2009 The current period shows continued improvement due to the closure of 22 CSO outfalls, upgrades of CSO facilities, ending of harbor treatment plant effluent discharges as the new outfall began operating in 2000, and local efforts to abate stormwater pollution.

Figure 8-7 Water Quality improvements at South Boston Beaches (MWRA 2015)



8.3 Illicit Discharge Detection and Elimination (IDDE) in the Boston Harbor Watershed

Elimination of illicit sewer connections and repairing failing infrastructure are of extreme importance. EPA's Phase II rule specifies an MS4 community must develop, implement, and enforce a stormwater management program that is designed to reduce the discharge of pollutants to the maximum extent practicable, protect water quality, and satisfy the applicable water quality requirements of the Clean Water Act. Illicit discharge detection and elimination (IDDE) is one of the six minimum control measures that must be included in the stormwater management program. The other control measures are:

- Public education and outreach on stormwater impacts
- Public involvement and participation
- Construction site stormwater runoff control
- Post-construction stormwater management in new development and redevelopment
- Pollution prevention and good housekeeping for municipal operations

As part of their applications for Phase II permit coverage, MS4 communities must identify the best management practices they will use to comply with each of these six minimum control measures and the measurable goals they have set for each measure.

In general, a comprehensive IDDE Program must contain the following four elements:

1) Develop (if not already completed) a storm sewer system map showing the location of all outfalls, and the names and location of all waters of the United States that receive discharges from those outfalls.

2) Develop and promulgate municipal regulations that require the municipality to comply with Phase II regulations including prohibition of illicit discharges and appropriate enforcement mechanisms.

3) Develop and implement a plan to detect and address illicit discharges, including illegal dumping, to the system. EPA recommends that the plan include the following four components: locating priority areas; tracing the source of an illicit discharge; removing the source of an illicit discharge; and program evaluation and assessment.

4) Inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste. IDDE outreach can be integrated into the broader stormwater outreach program for the community. Fulfilling the outreach requirement for IDDE helps the MS4 community to comply with this mandatory element of the stormwater program.

Communities that are not covered under the Phase II rule (i.e., not designated as MS4 communities) are encouraged to implement a program for detecting and eliminating sewage discharges to storm sewer systems including illicit sewer connections. Implementation of the Phase II rule, whether voluntarily or mandated will help communities achieve bacteria TMDLs.

Guidance for implementing an illicit discharge detection and elimination program is available from several documents. EPA New England developed a specific plan for the Lower Charles River (US EPA 2004c) to identify and eliminate illicit discharges (both dry and wet weather) to their separate storm sewer systems. Although originally prepared for the Charles River Watershed it may be applicable to other watersheds throughout the Commonwealth, however, it represents just one of the approved methodologies available. More generic guidance is provided in a document prepared for EPA by the Center for Watershed Protection and the University of Alabama entitled Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments (US EPA 2004). In addition, practical guidance for municipalities is provided in a New England Interstate Water Pollution Control Commission publication entitled Illicit Discharge Detection and Elimination Manual, A Handbook for Municipalities (NEIWPCC 2003). Implementation of the protocol outlined in these guidance documents satisfies the Illicit Discharge Detection and Elimination requirement of the NPDES program.

8.4 Stormwater Runoff

Stormwater runoff can be categorized in two forms 1) point source discharges and 2) non-point source discharges (includes sheet flow or direct runoff). The term "nonpoint source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act. Many point source stormwater discharges are regulated under the NPDES Phase I and Phase II permitting programs when discharged to a Waters of the United States. Municipalities that operate regulated municipal separate storm sewer systems (MS4s) must develop and implement a stormwater management plan (SWMP) which must employ, and set measurable goals for the following six minimum control measures:

1. public education and outreach,
2. public participation/involvement,
3. illicit discharge detection and elimination,
4. construction site runoff control,
5. post construction runoff control, and
6. pollution prevention/good housekeeping.

The NPDES permit does not, however, establish numeric effluent limitations for stormwater discharges. Maximum extent practicable (MEP) is the statutory standard that establishes the level of pollutant reductions that regulated municipalities must achieve. The MEP standard is a narrative effluent limitation that is satisfied through implementation of SWMPs and achievement of measurable goals. Non-point source discharges are generally characterized as sheet flow runoff and are not categorically regulated under the NPDES program and can be difficult to manage. However, some of the same principles for mitigating point source impacts may be applicable. Individual municipalities not regulated under the Phase I or II should implement the exact same six minimum control measures minimizing stormwater contamination.

Stormwater Phase II Annual Reports from the various communities were last received in May 2015 (EPA 2015). Indications are that substantial progress is being made, particularly with certain communities, on those aspects of the six point plan requirements that would address bacteria pollution. A brief review is made herein on each community covered under the Program in the watershed and their progress:

Arlington- Public education has included stormwater information on the town website, brochures on pet waste management and waterfowl management, and programs offered on Arlington Cable TV. During 2008-9, the town intensified efforts with its existing pet waste and waterfowl management program. By 2014, the town was actively maintaining dog waste receptacles in all public park areas. The Stormwater Management Plan draft has been made available on the website and Cable TV station. The town applied and got a 319 grant for a project on Spy Pond for fertilizer and waste control. This included storm drain stenciling. The town has extended these efforts to Arlington Reservoir. IIlicit connection detection efforts have included mapping the overall stormwater drainage system including outfalls, reviewing and redrafting town stormwater by-laws, and developing a pollution control plan. During 2007, a number of stormwater control projects commenced, including: sewer rehabilitation efforts at Cross, Hemlock Street, and Highland Avenue, dry weather sampling and smoke dye testing at these locations plus others, and television inspection of sewer laterals to find bacteria contamination sources. During 2008, MWRA sewer and drain rehabilitation work continued in the Mystic Bank area, Ryder Street, and on Landsdown Road. In 2009, the town conducted dye water testing of sewers serving the Ottoson Middle School as a follow up to optical brightener sampling that had been done by MassDEP during late 2008. Follow up sampling occurred in 2010-11, including 136,000 linear feet of smoke testing, and 45,000 linear feet of TV inspections. The town has developed a 15 year plan to rehab the entire town's sanitary sewer system. Housekeeping has included the effort of stormwater training for DPW personnel, annual street sweeping and catch basin cleaning, and sewer cleaning/ rehabilitation on Summer Street in the Reeds Brook area, and in the Spy Pond area. This includes a 319 Grant award to the town to install a stormceptor system in the Spy Pond area.

Belmont- Public Education efforts have included developing a webpage on the town's website for stormwater issues, developing flyers and sending them out to citizens, and sending a copy of the Stormwater Management Plan (SWMP) to all town boards, including posting it on the town website. As of 2013-14, a stormwater education brochure is distributed annually by inclusion in municipal light bills. In August 2013, a day-long public education stormwater conference was facilitated by the DPW and the Office of Community Development. A warrant article on stormwater by-laws was approved at town meeting in 2013, and was posted on the town's website. With illicit connection detection, an overall outfall map was created on GIS. This outfall map was formally revised in 2013 utilizing special sewer and stormdrain models. A city- wide sewer rehabilitation program has been underway, including TV camera investigations to help discover illicit connections. As of 2007, a number of these had been found in the

Wellington Brook area. By 2009, 'Phase III' of a stormdrain rehabilitation and CCTV inspection project was underway to fix illicit connection problems in this same area. As of 2009, over 17,000 linear feet of sewer lines and stormwater drainage systems had been dye tested &/or inspected with TV cameras for rehabilitation needs, as well as for locating illicit connections. Also by 2009, the town had an Inflow/Infiltration reduction project well underway, to identify I/I sources, and remove them. A $2.3 million SRF loan award was received in 2011-12 to rehabilitate 30,000 linear feet of stormdrain lines, plus reline 90 sewer laterals. Also, MWRA monies were utilized for I/I rehab work, which resulted in removal of 200,000 GPD. Housekeeping includes an annual DPW staff training program, street sweeping at least 2 times per year, and catch basin cleaning at least once per year. In 2006, the town received a 319 grant to install deep sump pump and baffle tanks in various catch basins around Spy Pond.

Boston- Boston is served by combined sewers, and separate sanitary and storm drain systems. The municipal sewer and storm drain systems within Boston are managed by the Boston Water and Sewer Commission (the Commission). The combined sewer system is permitted by EPA under NPDES Permit No. MA0101192, issued in March 2003. The stormwater system is permitted by EPA under NPDES Permit number MAS010001, issued in September 1999. Both permits have expired and the Commission applied for renewals as required. Their terms continue administratively as allowed by EPA regulation.

Approximately 75 percent of the sewered portion of the City, roughly 36.5 square miles, is served by separate sewers and 25 percent, approximately 12.1 square miles, is served by combined sewers. Since 1999, the Commission has spent more than $286 million to separate its combined sewers. As a result, CSO discharges from the combined system have been reduced by 124.3 million gallons per year, and water quality in Boston Harbor, and the Charles, Neponset and Mystic Rivers has substantially improved.

On August 23, 2012, the Commission entered in a Consent Decree with EPA and others in settlement of a CWA suit in the U.S. District Court. As a result, the Commission is implementing remedial measures designed to further improve the quality of discharges. These measures include implementing a Capacity, Maintenance, Operations and Management (CMOM) program; mitigating sanitary sewer overflows (SSO's); prioritizing sub-catchment areas for investigation and elimination of illicit discharges to the drainage system; improving mapping capabilities; tracking industrial facility and construction site discharges; developing a comprehensive stormwater model; implementing structural Best Management Practices (BMPs) which include green infrastructure and low impact development; and other activities.

The Commission owns 200 stormwater outfalls, consisting of 101 major outfalls (36" or more pipe diameter), and 99 non- major outfalls. The Commission's stormwater outfalls are screened annually for bacteria, ammonia, surfactants and other parameters. The Commission has a very aggressive illicit discharge identification and elimination (IDDE) program. Since 1988 the Commission has eliminated more than 1,471 illicit discharges and removed over 681,000 gallons per day of sewage from the separated storm drainage system. Illicit discharge investigation of the Commission's entire separated storm drainage system is scheduled for completion in 2019.

Under the Commission's Capital Improvement Program, since 1978, 82.8 miles of deteriorated or collapsed sanitary sewer and drains have been replaced, 54.7 miles of sewer and drain have been rehabilitated, 585 miles of sewer/drain pipe has been television inspected, 45.6 miles of large sewer and drain pipe has been cleaned and approximately 93.3 miles of new storm drain has been installed for separation purposes to reduce the volume and frequency of CSO discharges.

The Commission's 2015-2017 Capital Improvement Budget included $76.5 million for sewer and drain related projects, of which $36.3 million was earmarked for 2015.

Braintree- Public education includes partnering with the Pond Meadow Park Organization to carry out stormwater public education efforts. This has included producing 2 flyers on illicit sump pumps associated with sanitary sewer overflow problems. A SWMP was developed, and posted on the town website, with programs broadcast on the local cable TV. An educational webpage on stormwater is available on the town website. The topic of stormwater management is covered in the weekly DPW Department meetings. The town's stormwater drainage system has been mapped in autocad format, including the GPS field location of 247 outfalls. Illicit connections identification efforts have included dry weather flow monitoring and water quality sampling of 31 outfalls. Two major illicit discharges have been corrected (at Common St., and Commercial St.). In 2008, the Fore River Watershed Association discovered a raw sewage discharge, which the Water and Sewer Department corrected. A by-law final draft on illicit connections (set up as an IDDE Program) has been developed by the Engineering, Highway, and Planning/Community Development Departments, but as of 2014, had not been submitted yet to the Mayor for final approval. The plan will be submitted in 2015, with anticipation of approval during that year. Additionally, the town has set up a priority schedule where sewer service cleanouts are necessary. The town is actively involved with bacteria testing at town beaches, with data results posted on the town website.

Chelsea- Public education efforts have included city- wide distribution of stormwater material via mail twice per year (through 2013), plus instituting a stormwater webpage on the town website. Starting in 2007, the town began holding coordination meetings twice per year on stormwater related issues with Chelsea Greenspace, and the Mystic River Watershed Association. Starting in 2012, the town joined as a participating member of the MyRWA Steering Committee. Also, the town participated in storm drain stenciling and providing support for MyRWA monitoring efforts. As of January, 2012, the existing stormdrain map was updated, with additional information included on all tributary areas. The town has produced stormdrain map updates on GIS. The town has reviewed, together with DEP, Oil Terminal permits in relation to bacteria pollution. For instance in 2006, a major illicit sanitary sewer connection-outfall was found and the connection removed at the Gulf Oil Terminal. A non-stormwater ordinance for Chelsea was formally adopted in October, 2009. Also, starting in 2009, a recently adopted five- year capital plan allocated $125,000 annually to be spent on stormwater related work. Housekeeping includes street sweeping every street twice per month, and the cleaning of 500 catch basins per year up through 2014. Also, deep sump pumps have been installed in all catch basins that have been rehabilitated.

Everett- This municipality has had an excellent overall Phase II control effort ever since this program began in 2003. Stormwater information has been available on the town website, and a series of talks and news articles on the subject are regularly telecast on the local TV cable station. In addition, the city has recently been working with 'New Friends of the Malden River Group' to place stormwater related educational materials on Facebook and the Internet. Educational programs have been focused on small businesses and individuals. There has been considerable contact and cooperation with MyRWA and Mass. Riverways on various education and sampling efforts. There has been an effort to put up dog waste disposal signs, and provide pooper scooper stations in public parks in town. There has also been an education effort with businesses, particularly with illicit connection concerns. Watershed education curriculums have been infused in the K –12 public schools, and at the high school, a special science unit is taught on water quality testing in the Malden River. A stormwater task force has been formed, plus a stormwater telephone hotline set up for illicit connections.

During 2006, the town conducted a hydraulic- mapping GIS study (including modeling) involving the entire stormwater system. This included determining size of pipes, flow potential, material structure of pipes, conditions, age, manhole and catch basin locations. Also, illicit connection detection efforts have included a schedule to screen and monitor for Fecal coliform at 25 dry weather outfalls twice per year starting in 2008. There is an aggressive effort to prioritize troublesome outfalls, and to obtain funding to fix these. Also, the city wants to create electronic records of everything related to illicit connections, including field investigations, data and findings, and resultant remediation actions. A stormwater ordinance was passed in 2008-9 which was particularly aimed at dealing with illicit connections. In 2012, Beth Consultants was hired to facilitate an ongoing citywide IDDE program, update the GIS mapping of stormdrains, and to establish priority outfalls for future monitoring for illicit discharges. A monitoring program was supposedly put in place during 2013. Housekeeping has a pollution prevention program in place to address all aspects, including street sweeping and catch basin cleaning.

Hingham- Public education efforts on stormwater have included: (1) the distribution of 1,500 stormwater related door hangers during catch basin cleaning operations; (2) stormwater press releases, and a stormwater webpage on the town website; (3) the EPA stormwater program broadcast on cable TV, 'After the Storm'; (4) a telephone hotline for citizens to report illicit discharges to stormwater. By the end of 2014, 97% of the drainage system had been mapped on GIS, including all outfalls. As of 2014, illicit connection detection efforts had included the inspection of a total of 329 outfalls (141 of these were dry weather outfalls), with 3 illicit connections found and removed. Illicit discharge information has been put in at least three flyers and press releases per year, and an illicit connection reporting hotline set up through the Fire Department. In 2013, a boat waste pumping station was installed in the town pier area. Catch basins are cleaned bi-annually, with many tons of detritus collected.

Holbrook- Public education efforts have included the mailing to all residents of a professionally produced flyer on stormwater. Also, a fact sheet on dog waste disposal was mailed to residents, with signs posted in all public parks. Stormwater education modules are currently being taught in the Middle School. A stormwater management plan has been prepared, with annual updates on its progress given at a televised selectman's meeting by the Stormwater Advisory Committee. The town has mapped on GIS (with aerial photography) the stormwater collection system including all outfalls, catch basins and manholes. Dry weather outfall sampling occurred during 2007- 2008. A number of illicit connections have been found and fixed. Since 2006, housekeeping efforts have included: an illegal dumping prevention effort, annual street sweeping (includes 55 miles of streets), and annual cleaning of 50% of all catch basins.

Malden- The City continues to make significant progress towards meeting the requirements of proposed revisions to the MS4 General Permit. In support of this compliance program, the City has invested significant resources and funding to support the objectives of the Stormwater Compliance Team (SCT). As an example of the City's commitment to the MS4 Stormwater program, staffing support has been increased for Malden Department of Public Works (MDPW), who represent the major component of the Compliance Team. The systematic cleaning of catch basins, mapping of infrastructure system components, logging of component attributes, identification of infrastructure needs, and removal of illicit discharges serves to demonstrate the effectiveness of the City's stormwater management program. Through the efforts of City personnel and outside technical support, paper records have been converted into a working GIS resource. This management tool has increased the efficiency and timing of responses, while providing an in depth working knowledge of the infrastructure, major components of which date back to the late 1800s.

Of primary note is that working with representatives of the USEPA and the City's IDDE Implementation Plan, it has been quantified through flow isolation studies that Malden receives substantial dry weather flows from neighboring communities. As a "flow through community" the City has provided this information for public distribution. The City of Malden currently maintains a dedicated team of in-house staff and supporting technical services to meet the challenges of stormwater management within a highly urbanized study area. To support the removal of illicit discharges, the City has undertaken flow capacity analyses, GIS mapping of infrastructure components, dry and wet weather sampling, flow isolation studies, IDDE plan detections and removals. Building upon the results of dry weather mass balance /flow isolation studies, the City maintains a very aggressive IDDE program that has resulted in readily apparent improvement in the quality of stormwater discharges.

City representatives have been meeting with stewardship organizations such as the Mystic River Watershed Association (MyRWA) and the Friends of the Malden River throughout the last year to develop partnerships and transfer information. During this reporting period, the City continued to meet with representatives of the Department of Conversation and Recreation (DCR) in an attempt to address long needed repairs to flow conveyance channels at the along Town Line Brook and at Oak Grove. At this time, funding constraints have been indicated by DCR and conditions continue to degrade in this major flow conveyance network. As such, outside assistance from political and regulatory representatives is needed to avoid continued degradation of both surface water quality and channel integrity. Through its Capital Improvement Plan (CIP), the City has funded over 450 linear feet of bank repair and stabilization at Fellsmere Pond to improve stormwater runoff characteristics and corresponding surface water quality. In addition, two nearby areas of groundwater breakout were found to be attributable, at least in large part, to compromises to the drainage system that serves the study area, which were mitigated through manhole repairs and the installation of new piping. At South Broadway and Callahan Parks, significant improvements in the form of synthetic and grass recreational cover and infrastructure improvements were performed as a continuation of the City's commitment to improved stormwater runoff. The City is also continuing to work with and support the U.S. Amy Corps of Engineers (ACOE) National Ecosystem Restoration (NER) Plan that will enhance both habitat and surface water quality along the banks of the Malden River.

Medford- The town prepared a stormwater management plan in 2004, and held meetings to explain the plan to those in town government and the public. The town has worked with the Charles River and Neponset River(s) Watershed Associations to sample the Mill Mine Brook area. The town has a webpage on its website to describe on- going stormwater activities. The town has completed GIS mapping of 90% of the town's stormdrain network, including catch basins, and principal outfalls. Specifically, 100 outfalls have been screened and sampled for dry weather flows. Additionally, 103 outfalls have been identified on DCR properties located in town. There are plans for selected wet weather outfall screening in the future. The city's formal stormwater ordinance, including an illicit discharge control component, was approved by the City Council in March, 2010. Stormwater regulations, from that ordinance, are being promulgated by a newly formed Stormwater Board during 2010. As of 2014, these rules are under review by the Stormwater Board. The year 2014 saw considerable IDDE work, including inspection of numerous manholes, building dye tests taken, which turned up 2 illicit connections of which 1 was removed. Considerable additional inspections were planned for 2015-16. During 2009-10, 2,725 catch basins were cleaned. During 2014, the town cleaned 12,950 linear feet of stormdrain pipes. Street sweeping occurred up to two times per year on all streets during 2013-14, with 826 tons of sweepings collected.

Melrose- Public education efforts 2006-2013 have included: (1) an annual stormwater message placed in water/sewer bills; (2) distribution of stormwater brochures throughout the city; (3) a stormwater page on the town website; (4) a stormwater booth at the annual Victorian Day city fair; (5) pet waste signs in all public parks and athletic fields; (6) broadcast of the EPA program, "Reining in the Storm, One Building at a Time"; and, (7) supporting the effort in teaching classes in elementary schools on stormwater related issues. A stenciling program began in 2010 with the intention of marking 25 catch basins per year 'don't dump', etc. Illicit connection detection work has included mapping of the stormwater collection system and outfalls on GIS. There have been plans in the works to identify and remove non- stormwater discharges going into stormwater conveyances, including several illicit discharges which were removed. During 2008, the MassDEP NERO Bacteria Source Tracking Program was actively monitoring in the northern part of the Ell Pond area, and found some very high bacteria readings. The NERO has been working with the city to come up with a plan to find and fix the pollution sources. Annual cleanups have been sponsored by the Scouts for Ell and Swain's Ponds. In 2012-13, the city received a 104b grant to conduct a mapping study of the Ell Pond subwatershed. In 2008, the town and MassDEP conducted dry weather outfall sampling in the Tremont and Melrose Street areas, and discovered two suspect septic systems that exist near drain lines that connect to city stormwater lines. 2011-12 saw TV inspections of 23 sections of stormdrain piping. An illicit connection ordinance, which includes authority to access buildings to inspect for illicit connections, was approved by the city's Aldermen in April, 2008. Housekeeping includes street sweeping of all streets in the spring, plus twice weekly in commercial districts. As of 2007, up to 2/3rds of total catch basins are cleaned annually. There is concern for proper disposal of all collected residuals from catch basins, streets and municipal yards.

Quincy- Public education efforts have recently included (2011-14) a televising several times a year on QATV the program 'How Quincy Works', emphasizing the separation of sewage and stormwater lines, pet waste disposal, where stormwater goes (Quincy Harbor), etc. A stormwater newsletter model format was developed, which is updated periodically with up-to-date news and information, and mailed out twice annually to all homes. As of 2007, the city website has a stormwater webpage. A stormwater committee was set up in 2007-8, consisting of representation from three regions in the city: Monclair Bog at Wollaston Beach; Blacks Creek at Mallard Marsh; and Town Brook. Pet waste control efforts have included maintaining signs and pooper scooper stations in public parks, and plans for mailers on pet waste to all residents. Additionally, the city is looking for a location for a dog park. The city has mapped the stormwater drainage system as well as all connecting outfalls. An illicit discharge control ordinance was formally adopted in 2005. IDDE efforts have coalesced with flood control concerns since 2010. For instance in 2011-12, a $5.3 million a West Quincy Flood Relief project was conducted, which constructed a diversion and by-pass flow tunnel underneath downtown Quincy going directly to the Town River.

During 2012-14 the city's stormwater drainage system was updated using GIS mapping, showing 190 outfalls, 9,329 catch basins, manholes, ditches, and 43 tidegates. A GIS viewer is available for residents on the town website. In 2013, five I-Pads were purchased to help with catch basin cleaning in the sense of setting priorities, and keeping maintenance records. During 2009, the city conducted the Wollaston Beach Drainage Water Quality Study, which involved dye testing and sampling of outfalls, catch basins and manholes throughout this beach area. Also in 2009, the city inspected 200 sewer manholes in tidal areas, put nearly 100 of these on a construction contract (bid) list for repair, and during the inspections, discovered several illicit connections. Follow-up work (2010-13 period) has focused on beach areas, such as Wollaston and Spence Avenue areas with frequent outfall inspections and testing (including dye testing) in conjunction with regular Enterococcus testing during the beach season at these locations. Some illicit connections have been discovered and fixed as a result. The year 2014-15 saw $ 1/2 million spent on I/I control at Hough's Neck and the Adams Shore Region. As of 2014, housekeeping has included regular street sweeping once per year, catch basin cleaning (at least 1,145 tons removed/yr), and the installation of at least 3 “storm septor” retrofits in catch basins that are refurbished by the city each year.

Randolph- Phase II progress in this town was delayed several years until a $150K revolving loan fund allotment to help fund the Program was awarded by the State and accepted by the town in 2007. Public education has included development of a stormwater flyer/ brochure, which was distributed once in 2006 as an accompaniment with all water bills being mailed out in town. Press releases and local newspaper articles on stormwater related issues were prepared and released during 2006. The DPW was scheduled to be conducting stormwater workshops in school curriculums in 2007-8. A town website with a stormwater related webpage was set up in 2007, along with information about an available stormwater phone/webpage hotline. A high school poster project contest on stormwater issues took place in 2007. Illicit connection detection work included the preparation of a draft by-law during 2007-8, use of State Revolving Fund monies during 2007-8 for an outfall inspection and sampling program, as well as completion of mapping on GIS of all stormwater infrastructure and outfalls in the town. During 2009, the town sampled 23 discharges and found 11 possible illicit connections. As of 2014, the town still had not finalized or passed an IDDE by-law. Since 2007, housekeeping has included a beefed- up catch basin cleaning/ prioritization effort, with an annually published schedule of upcoming efforts in this regard. All streets are swept once per year.

Reading- The town DPW has compiled a file on stormwater related education materials and a stormwater handbook, which were both made available in their main office and at the town library. A community calendar and a hotline has been established and available on the town website for stormwater issues in town. The DPW makes an annual progress report on town related stormwater activities and accomplishments at each year’s Town Meeting. A stormwater advisory committee was formed in 2006-7, but has since been dissolved, with stormwater management taken over by the Board of Selectmen. A stormwater management plan was drafted in 2007, with stormwater regulations put into effect in 2009. With respect to illicit connection detection activities, a special aerial digital mapping technology has been employed during 2009 by a contractor to assist in field identification for possible illicit connections. At the same time, a contract has been prepared to be awarded in 2010 for town-wide GIS mapping of the stormwater system to principally assist in the work of illicit connection detection, and identification of failing infrastructure. This work was completed in 2011-12, with 60% of the town’s outfalls and high risk areas screened, with some sampled, and one cross-connection discovered and repaired. An illicit connection by- law has been written for possible adoption by the town. Housekeeping activities have included the preparation of a stormwater related Operation & Maintenance (O & M) plan, along with street sweeping/catch basin cleaning occurring annually. 2012-14 saw a total of 61 catch basins repaired.

Somerville- With public education efforts, a stormwater flyer was prepared and mailed to residents near the end of 2005. The flyer was published on the Mystic River Watershed Association (MyRWA) website, along with other relevant city stormwater information. A pet waste control signage project for all public parks has occurred. An annual update on the city's stormwater management plan occurs at one of the regularly scheduled Alderman's meetings, and this update information is also broadcast on the local cable access TV station. The city has mapped the stormwater collection system with connecting outfalls in GIS. Illicit connection detection efforts include work with MyRWA on bacteria sampling at suspected outfalls (at least 3 sites per year, 2005 through 2014). Illicit connection detection work during 2008-9 included investigations in the Capen Court and Two Penny Brook areas, with one illicit connection found in the Capen Court area, and two suspected situations in the Two Penny Brook area.

A plan has been prepared by the city, with emphasis on repairing collapsed catch basins and broken storm sewers, as well as replacing twin- invert manholes. Emphasis during 2008-9 was on repairing manholes in the Alewife Bk/Mystic River areas, and the issuance of 12 new sanitary sewer connections permits (including inspections) by the city. In 2012-13, illicit connection investigation work in the Capen Court and Two Penny Brook areas discovered another illicit connection, which was removed. Housekeeping includes a staff training program on stormwater controls related to the city. City streets are swept twice yearly, and all catch basins are cleaned once every year. A new clamshell truck was purchased in 2010-11 to better assist with this cleaning effort.

Stoneham- Public education efforts include: (1) stormwater information provided on the town's new website as of 2013, which includes a special click/fix link for citizens to report problems; (2) pet waste/ pooper scooper signs placed in parks, plus a brochure produced and sent out in 2013 on pet waste management "Animal and Fowl, Duty to Dispose", which also outlines violation fines; (3) 2013-14 DPW related brochure, "After the Storm, A Citizen's Guide to Understanding Stormwater" (available at Town Hall, the Library, and DPW office); (4) 2010 DPW related brochure "Town Stormwater Rules/Regulations related to Use of Stormdrains" (updated annually through 2014). These brochures, plus other stormwater information are available on the town's website, and in the town annual report. The town has mapped all stormwater conveyances, outfalls, catch basins, and manholes. The illicit connection detection program began in 2006, with dry weather outfall screening and sampling of all known outfalls. During 2007-8, follow-up activities included identification of illicit connections and their correction. All significant illicit connections activities are recorded in a logbook. A new stormwater by-law, including control of illicit connections, was adopted by Town Meeting in May, 2010. Since 2011, the town has come under an EPA Administrative Order (c/o Todd Borci @ EPA) on illicit connections, to research and determine 'gray water sources'. A contract with Arcadis Consultants was begun to carry out this work. Infiltration and inflow (I/I) control related work has included the rehabilitation of 4 miles of sewer lines as of 2007, with another 4- 6 miles planned for rehabilitation during 2008 (from a $420,000 planned town appropriation). Additional I/I work in 2013 utilized $350,000 of town appropriations. Housekeeping activities include street sweeping and catch basin cleaning, which are done yearly.

Weymouth- In 2007, the EPA wrote an official commendation letter to the town congratulating it for stormwater related efforts over the previous five years. In 2002-3, the town had awarded a $330K contract to Beta Company to develop a draft stormwater management plan. When the plan was instituted, all catch basins were cleaned, the entire SW conveyance system was inspected including all town outfalls, catch basins, and manhole structures, and the entire stormwater conveyance system was mapped on GIS with data layers added on land- uses and soil structure. All suspect outfalls have been inspected and sampled (particularly dry weather flows). Recommendations have been made regarding possible bacteria BMPs that might be instituted in the future. As of 2013-14, public education efforts have expanded to include an environmental core in the high school environmental science class consisting of basic watershed management principles, stormwater pollution, green space LID concepts, impervious surface effects on stormwater, WWTPs versus septic systems for pollution control, eutrophication principles, and a unit on the EPA film, “Protecting WQ from Urban Runoff”. The town encourages citizen involvement in the “Greenspaces Program”, sponsored by the North- South Rivers Association.

As of 2012-13, the town worked with the North-South Rivers Watershed Association, the Whitman’s Pond Association, and the Fore River Watershed Association to sponsor cleanup days in Whitman’s Pond, Fore River, and other waters within the town. There are community hotline phone lines for reporting stormwater related pollution, as well as web- links on stormwater on town’s website, plus a stormwater related newsletter mailed out to all residents. There is an ordinance that directs all people to pick up after their dogs. The DPW, together with the North-South River Watershed Association, hold an annual workshop series on stormwater controls. Part of the town’s stormwater and related bacteria pollution control efforts involve septic system inspections, with recommendations made for repair, and actual tie- ins to existing sewers carried out where practicable (71 out of 728 in 2 years). An illicit discharge ordinance (#8-702) was formally added to the town ordinances in 2008. IDDE is a big priority under the Board of Health (BOH) which conducts bacteria testing throughout the year, with violations identified and fixed. Housekeeping consisted of 1,004 catch basins cleaned by priority plans in 2014, with all streets swept at least once per year (with 3,300 tons collected in 2014).

Winchester- Public education efforts have included: an annual article in the town’s consumer confidence report, a stormwater table display at ‘town day’ fair each year (June 14 in 2014), a stormwater education program at the Middle School, annual progress updates on the town’s stormwater management plan at Selectmens’ meetings and on the town’s website, and as of 2013-14 a stormwater program televised on cable several times per year. The town’s illicit connection detection related efforts have included: (1) completion of mapping of the stormwater collection system, including all outfalls on GIS; (2) the development of a strategy and plan to identify and remove all non-stormwater inputs discharging into MS4’s; and (3) institution of a regulation (adopted by the Board of Selectman in April, 2007) that will allow water/ sewer department personnel to enter and inspect all buildings for possible illicit connections and correct any of these found that drain into stormwater lines. During 2008-9, a number of illicit connections to the stormwater system were found and removed. This work included inspections of 89 outfalls for dry weather flows, in which 6 were found to have flows. In 2012, an aerial flyover of town was conducted to update the GIS map database. During 2011-12, the town received a 604b grant to find pollution sources in the Aberjona River and identify/locate possible

BMPs to improve water quality. As of 2014, housekeeping includes street sweeping twice per year, and the cleaning of 20% of all catch basins each year. Sensitive environmental receptors (certain ponds, wetlands, beaches, rivers, etc) have been identified and listed for future possible BMP stormwater pollution control efforts.

Winthrop- During 2004-07, a consultant for the town developed a set of non point source pollution control posters to be displayed in public buildings, including the library. During the time-period 2011-13, these posters were updated. The town hosts a 'Public Works Day' annually with over 100 attendees, which includes a table plus presentations on stormwater controls. There have been inquiries and referrals to the town's cable TV station and website for stormwater related information. The town passed and incorporated by-laws governing stormwater conveyances and illicit connections during 2009-10. As of 2013, the town's website has stormwater management program information related to impacts to water bodies in town, and the Conservation Commission has a link on illicit connection regulations that are 'on the books' and in effect. The Conservation Commission website also contains information on proper pet waste disposal, stormdrain pollution, and pollution prevention practices. As of the end of 2012, mapping of outfalls, stormwater conveyances, and receiving waters was virtually complete. Field investigations of suspect outfalls started in 2007, and have continued since. As of 2014, housekeeping activities included street sweeping at least twice per year, and 250 catch basins cleaned each year.

Woburn- Public education efforts include: (1) a stormwater poster display and pamphlet table set up at the annual April Earth & Conservation Day Celebration which has been held each year since 2005; (2) a pet waste/doggie waste collection and signage program in all public parks; (3) environmental awareness brochures on stormwater placed in town offices, schools, and special kiosks throughout town; (4) stormwater related information and links set up on the DPW page in the city's website. Illicit connection detection related work thus far has included: the mapping (with GIS) and photographing of 600 outfalls, GIS mapping updates of town conveyance infrastructure each year, inspections of all outfalls as of 2015 with screening and sampling of at least 10 outfalls each year. All screening and sampling results are made available at the town engineering offices. Since 2004, a number of the outfalls sampled had elevated bacteria counts, however further lab studies indicated that most of these were animal in origin, probably from catch basins. However, at least several, including one outfall at Ellis St., between Water St. and the Woburn Parkway, had indications of strong human markers in the samples. With this particular site, further investigations turned up a failing sewer line near the stormwater line on Ellis St. This was repaired in 2007. As of 2009, the DPW, working with Weston and Sampson, Inc., had identified illegal connections at three dry weather outfalls and was working to make sewer system improvements impacting inflow/infiltration reduction within the tributary areas of these outfalls, which should eventually have a beneficial impact on bacteria water quality at these outfalls.

As of 2008, the city had inspected and mapped on GIS over 70 miles of stormwater lines, and had incorporated a special computerized software management system for recordkeeping on fieldwork conditions recorded within this system. Along with this, TV inspection has occurred involving 2,500 linear feet of drain pipe within drainage system tributaries of suspect outfalls having illicit connections. As of 2014, computerized inspection of storm lines, along with TV inspection efforts by the town DPW and Engineering Departments were continuing each year. In 2007, a city Public Ordinance was updated to incorporate language prohibiting illicit connections. During 2011-12, a comprehensive IDDE oriented stormwater plan “IDDE, A Guidance Manual for Program Development & Technical Assessments” was developed and made available to the public. As of 2014, housekeeping included street sweeping twice per year, and catch basin cleaning consisting of 75% of the 4,100 catch basins in the city each year. The city began using I-Pad PCs during 2013 for catch basin cleaning activities, particularly for recording results of field inspections and MS4 conveyance mapping. In September- October 2014, 10,000 linear feet of stormdrain lines on Main St. were cleaned and TV screened.

A list of the municipalities in Massachusetts regulated by the Phase II Rule, as well as the Notices of Intent for each municipality can be viewed at http://www.epa.gov/region01/npdes/stormwater/ma.html.

In addition to the above, the Massachusetts Department of Environmental Protection's proposed new "Stormwater Management Regulations," that would establish a statewide general permit program aimed at controlling the discharge of stormwater runoff from certain privately-owned sites containing large impervious surfaces.

The proposed regulations would require private owners of land containing five or more acres of impervious surfaces to apply for and obtain coverage under a general permit; implement nonstructural best management practices (BMPs) for managing stormwater; install low impact development (LID) techniques and structural stormwater BMPs at sites undergoing development or redevelopment; and submit annual compliance certifications to the Department.

Where the Department has determined that stormwater runoff is causing or contributing to violations of the Massachusetts Surface Water Quality Standards, the proposed regulations would allow MassDEP to impose the same requirements on certain private owners of land with less than five acres of impervious surfaces and require the owners of such land to design and implement the LID techniques and stormwater BMPs needed to address these violations.

The DEP, Bureau of Waste Site Cleanup (BWSC) has been making efforts to improve the quality of stormwater runoff. The City of Boston has a dog fouling ordinance, the “Pooper Scooper Law”, requiring dog owners to properly dispose of pet waste. The BWSC educates people on the importance of this law and also on the importance of not dumping waste into the streets. BWSC’s storm drain stenciling program educates the public on stormwater and stencils messages next to catch basins alerting people that what is dumped in the street can end up in the waterways (BWSC 2005).

8.5 Failing Septic Systems

Septic system bacteria contributions to the Boston Harbor watershed may be reduced in the future through septic system maintenance and/or replacement. Additionally, the implementation of Title 5 (310 CMR 15.00), which requires inspection of private sewage disposal systems before property ownership may be transferred, building expansions, or changes in use of properties, will aid in the discovery of poorly operating or failing systems. The majority of the Boston Harbor watershed is on municipal sewer. Significant improvement to water quality as a result of septic system upgrades is likely to be minimal. Regulatory and educational materials for septic system installation, maintenance and alternative technologies may be found on the MassDEP website at: www.mass.gov/dep/water/wastewater/septicsy.htm.

8.6 Wastewater Treatment Plants

WWTP discharges are regulated under the NPDES program when the effluent is released to surface waters. Each WWTP has an effluent limit included in its NPDES or groundwater permit. Some NPDES permits are listed on the following website: www.epa.gov/region1/npdes/permits_listing_ma.html. Details on the Massachusetts groundwater permit program is available at: http://www.mass.gov/eea/agencies/massdep/water/wastewater/groundwater-discharge-permitting.html

8.7 Recreational Waters Use Management

Recreational waters receive pathogen inputs from swimmers and boats. To reduce swimmers' contribution to pathogen impairment, shower facilities can be made available, and bathers should be encouraged to shower prior to swimming. In addition, parents should check and change young children's diapers when they are dirty. Options for controlling pathogen contamination from boats include:

- supporting installation of pump-out facilities for boat sewage;
- educating boat owners on the proper operation and maintenance of marine sanitation devices (MSDs);
- and encouraging marina owners to provide clean and safe onshore restrooms and pump-out facilities.

Currently the area proximal to the Boston Harbor watershed has been established as a "no discharge zone" (NDZ). This designation by the Commonwealth of Massachusetts and approved by the EPA provides protection of this area by a Federal Law which prohibits the release of raw or treated sewage from vessels into navigable waters of the U.S. The law is enforced by the Massachusetts Environmental Police. Massachusetts State Representative Bill Strauss has introduced legislation that would clearly define the role of harbormasters and other coastal police officers in enforcing NDZs and would allow them to collect up to $2000 for violations in NDZs (US EPA 2010).

8.8 Funding/Community Resources

A complete list of funding sources for implementation of non-point source pollution is provided in Section VII of the Massachusetts Nonpoint Source Management Plan Volume I (MassDEP 2000) available on line at http://www.mass.gov/dep/brp/wm/nonpoint.htm. This list includes specific programs available for non-point source management and resources available for communities to manage local growth and development. The State Revolving Fund (SRF) provides low interest loans to communities for certain capital costs associated with building or improving wastewater treatment facilities. In addition, many communities in Massachusetts sponsor low cost loans through the SRF for homeowners to repair or upgrade failing septic systems.

State monies are also available through the Massachusetts Office of Coastal Zone Management: Coastal Pollution Remediation, Coastal Nonpoint Source Pollution Control, and Coastal Monitoring programs.

8.9 Mitigation Measures to Address Pathogen Pollution in Surface Water

For a more complete discussion on ways to mitigate pathogen water pollution, see the "*Mitigation Measures to Address Pathogen Pollution in Surface Water: A TMDL Implementation Guidance Manual for Massachusetts"* accompanying this document. *The guidance can be downloaded at:* http://www.mass.gov/eea/docs/dep/water/resources/a-thru-m/impguide.pdf. Also refer to information on the interactive web site, *Massachusetts Clean Water Toolkit*, http://prj.geosyntec.com/npsmanual/default.aspx.

9.0 Monitoring Plan

The long term monitoring plan for the Boston Harbor watershed includes several components:

1. continue with the current monitoring of the Boston Harbor watershed (MyRWA and other stakeholders),
2. monitor areas within the watershed where data are lacking or absent to determine if the waterbody meets the use criteria,
3. monitor areas where BMPs and other control strategies have been implemented or discharges have been removed to assess the effectiveness of the modification or elimination,
4. assemble data collected by each monitoring entity to formulate a concise report where the basin is assessed as a whole and an evaluation of BMPs can be made, and
5. add/ remove/modify BMPs as needed based on monitoring results.

The monitoring plan is an ever changing document that requires flexibility to add, change or delete sampling locations, sampling frequency, methods and analysis. At the minimum, all monitoring should be conducted with a focus on:

- capturing water quality conditions under varied weather conditions,

- establishing sampling locations in an effort to pin-point sources,
- researching new and proven technologies for separating human from animal bacteria sources, and
- assessing efficacy of BMPs.

10.0 Reasonable Assurances

Reasonable assurances that the TMDL will be implemented include both application and enforcement of current regulations, availability of financial incentives including low or no-interest loans to communities for wastewater treatment facilities through the State Revolving Fund (SRF), and the various local, state and federal programs for pollution control. Stormwater NPDES permit coverage is designed to address discharges from municipal owned stormwater drainage systems. Enforcement of regulations controlling non-point discharges includes local enforcement of the state Wetlands Protection Act and Rivers Protection Act, Title 5 regulations for septic systems and various local regulations including zoning regulations. Financial incentives may include Federal monies available under the CWA Section 319 NPS program and the CWA Section 604b and 104b programs, which are provided as part of the Performance Partnership Agreement between MassDEP and the EPA. However, 319 Nonpoint Source funds cannot be used for point source remediation, and therefore cannot be used to address the requirements of NPDES stormwater permits. Additional financial incentives include state income tax credits for Title 5 upgrades, and low interest loans for Title 5 septic system upgrades through municipalities participating in this portion of the state revolving fund program. State monies are also available through the Massachusetts Office of Coastal Zone Management's Coastal Pollutant Remediation, Coastal Nonpoint Source Pollution Control, and Coastal Monitoring grant programs. The primary goal of all three programs is to improve coastal water quality by reducing or eliminating nonpoint sources of pollution.

A brief summary of many of MassDEP's tools and regulatory programs to address common bacterial sources is presented below.

10.1 Overarching Tools

Massachusetts Clean Water Act: The MA Clean Water Act (M.G.L. Chapter 21, sections 26-53) provides MassDEP with specific and broad authority to develop regulations to address both point and non-point sources of pollution. There are numerous regulatory and financial programs, including those identified in the preceding paragraph, that have been established to directly and indirectly address pathogen impairments throughout the state. Several of them are briefly described below.

Surface Water Quality Standards (314 CMR 4.00): The MA Water Quality Standards (WQS) assign designated uses and establish water quality criteria to meet those uses. Water body classifications (Class

A, B, and C, for freshwater and SA, SB, and SC for marine waters) are established to protect each class of designated uses. In addition, bacteria criteria are established for each individual classification.

Ground Water Discharge Permit Program (314 CMR 5.00): This program regulates the discharge of pollutants to the groundwaters of the Commonwealth to assure that groundwaters are protected for their actual and potential use as a source of potable water and surface waters are protected for their existing and designated uses and to assure the attainment and maintenance of the MA WQS.

River Protection Act: In 1996 MA passed the Rivers Protection Act (MGL c 258 Acts of 1996). The purposes of the Act were to protect the private or public water supply; to protect the ground water; to provide flood control; to prevent storm damage; to prevent pollution; to protect land containing shellfish; to protect wildlife habitat; and to protect the fisheries. The provisions of the Act are implemented through the Wetlands Protection Regulations, which establish up to a 200-foot setback from rivers in the Commonwealth to control construction activity and protect the items listed above. Although this Act does not directly reduce pathogen discharges it indirectly controls many sources of pathogens close to water bodies. More information on the Rivers Protection Act can be found on MassDEPs web site.

Regulation of Plant Nutrients: In 2012, the Massachusetts Department of Agricultural Resources (MDAR) developed regulations (330 CMR 31.00) to ensure that plant nutrients are applied in an effective manner to provide sufficient nutrients for maintaining healthy agricultural lands as well as turf and lawns while minimizing the impacts of the nutrients on surface and groundwater resources to protect human health and the environment. The regulations include setbacks from surface waters, public drinking water, and wetlands and seasonal application restrictions.

10.2 Additional Tools to Address Combined Sewer Overflows (CSO's)

CSOs discharge stormwater with untreated or partially treated human and industrial waste, toxic materials and debris and as a result are a significant source of bacterial contamination. Control or reduction of CSOs will result in improvements to water quality in the receiving waters. CSO Program/Policy: Massachusetts, in concert with EPA Region 1, has established a detailed CSO abatement program and policy. CSO discharges are regulated by the Commonwealth in several ways. Like any discharge of pollutants, CSOs must have an NPDES/MA Surface Water Discharge Permit under federal and state regulations. Municipalities and districts seeking funding for wastewater treatment, including CSO abatement, must comply with the facilities planning process at 310 CMR 41.00. Entities obtaining funding or exceeding specific thresholds must also comply with the Massachusetts Environmental Policy Act (MEPA) regulations at 301 CMR 11.00. Each of these regulations contains substantive and procedural requirements. Because both MEPA and facilities planning require the evaluation of alternatives, these processes are routinely coordinated.

All permits for a CSO discharge must comply with Massachusetts Surface Water Quality Standards at 314 CMR 4.00. The water quality standards establish goals for waters of the Commonwealth, and provide the basis for water quality-based effluent limitations in NPDES permits. Any discharge, including CSO discharges, is allowed only if it meets the criteria and the antidegradation standard for the receiving segment. EPA's 1994 CSO Control Policy revised some features of its 1989 version to provide greater flexibility by allowing a minimal number of overflows, which are compatible with the water quality goals of the Clean Water Act. MassDEP's 1995 regulatory revisions correspondingly decreased reliance on partial use designation as the sole regulatory vehicle to support CSO abatement plans[1].

In all cases, NPDES/MA permits require the nine minimum controls necessary to meet technology-based limitations as specified in the 1994 EPA Policy. The nine controls may be summarized as; operate and maintain properly; maximize storage, minimize overflows, maximize flows to Publicly Owned Treatment Works (POTW), prohibit dry weather CSO's, control solids and floatables, institute pollution prevention programs, notify the public of impacts, and observe monitoring and reporting requirements. The nine minimum controls may be supplemented with additional treatment requirements, such as screening and disinfection, on a case-by-case basis. The Department's goal is to eliminate adverse CSO impacts and attain the highest water quality achievable. Separation or relocation of CSOs is required wherever it can be achieved based on an economic and technical evaluation.

As untreated CSOs cause violations of water quality standards, and thus are in violation of NPDES permits, all of the state’s CSO permittees are under enforcement orders to either eliminate the CSO or plan, design, and construct CSO abatement facilities. Each long-term control plan must identify and achieve the highest feasible level of control. The process also requires the permittee to comply with any approved TMDL. Presently, there are twenty–four (24) CSO communities in the Commonwealth.

10.3 Additional Tools to Address Failed Septic Systems

Septic System Regulations (Title 5) (310 CMR 15.00): The MassDEP has regulations in place that require minimum standards for the design of individual septic systems. Those regulations ensure, in part, protection for nearby surface and ground waters from bacterial contamination. The regulations also provide minimum standards for replacing failed and inadequate systems, and include a requirement that all septic systems must be inspected and upgraded to meet Title 5 requirements at the time of sale or transfer of the each property.

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[1] DEP's 1990 CSO Policy was based on EPA's 1989 CSO Control Policy and established the goal of eliminating adverse impacts from CSOs, using partial use designation where removal or relocation was not feasible. The three month design storm was identified as the minimum technology-based effluent limitation, which would result in untreated overflows an average of four times a year. Abatement measures to meet these minimum standards were necessary for a CSO discharge to be eligible for partial use designation. Presumably, all CSOs exceeding this standard required downgrading to Class C or SC status. No partial use designations or downgrades to Class C were actually made, because the process was perceived as administratively cumbersome.

10.4 Additional Tools to Address Stormwater

Stormwater is regulated through both federal and state programs. Those programs include, but are not limited to, the federal and state Phase I and Phase II NPDES stormwater program, and, at the state level, the Wetlands Protection Act (MGL Chapter 130, Section 40), the state water quality standards, and the various permitting programs previously identified.

Federal Phase I & 2 NPDES Stormwater Regulations: Existing stormwater discharges are regulated under the federal and state Phase I and Phase II stormwater program. In MA there are two Phase I communities, Boston and Worcester. Both communities have been issued individual permits to address stormwater discharges. In addition, 20 communities in the Boston Harbor Watershed are covered by Phase II. These include: Arlington, Belmont, Boston (covered under Phase I), Braintree, Chelsea, Everett, Hingham, Holbrook, Malden, Medford, Melrose, Quincy, Randolph, Reading, Somerville, Stoneham, Weymouth, Winchester, Winthrop, and Woburn. Phase II is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting use controls on the unregulated sources of stormwater discharges that have the greatest likelihood of causing continued environmental degradation including those from municipal separate storm sewer systems (MS4s) and discharges from construction activity. Any new construction that complies with state stormwater standards and permits is presumed to comply with antidegradation requirements of the state water quality standards.

The Phase II Final Rule, published in the Federal Register on December 8, 1999, requires permittees to determine whether or not stormwater discharges from any part of the MS4 contribute, either directly or indirectly, to a 303(d) listed waterbody. Operators of regulated MS4s are required to design stormwater management programs to 1) reduce the discharge of pollutants to the "maximum extent practicable" (MEP), 2) protect water quality, and 3) satisfy the appropriate water quality requirements of the Clean Water Act. Implementation of the MEP standard typically requires the development and implementation of BMPs and the achievement of measureable goals to satisfy each of the six minimum control measures. Those measures include 1) public outreach and education, 2) public participation, 3) illicit discharge detection and elimination, 4) construction site runoff control, 5) post-construction runoff control, and 6) pollution prevention/good housekeeping. In addition, each permittee must determine if a TMDL has been developed and approved for any water body into which an MS4 discharges. If a TMDL has been approved then the permittee must comply with the TMDL including the application of BMPs or other performance requirements. The permittee's must report annually on all control measures currently being implemented or planned to be implemented to control pollutants of concern identified in TMDLs. Finally, the Department has the authority to issue an individual permit to achieve water quality objectives. Links to the MA Phase II permit and other stormwater control guidance can be found at: http://www.mass.gov/dep/water/wastewater/stormwat.htm

EPA and MassDEP reissued the MS4 permit which became effective July 1, 2018. A full list of MS4 Phase II communities in MA can be found at on the EPA website. This TMDL forms the basis for the implementation plans to meet the Pathogen loading capacity. MS4 permittees within the Boston Harbor Watershed, are required to identify in their respective Stormwater Management Plans and Annual Reports those discharges that are subject to TMDL related requirements, as identified in part 2.2.1 of the renewal permit, and those that are subject to additional requirements to protect water quality, as identified in part 2.2.2. of the renewal permit. The Boston Harbor communities are required to comply with the applicable provisions in Appendix H to address their respective bacteria discharges to the maximum extent practicable, as required by CWA Section 402(p)(3)(B)(iii). Although EPA's Phase II MS4 regulations only require a small MS4 to implement its program in the urbanized area subject to permitting, EPA and MassDEP nonetheless encourage permittees, to update and implement their respective SWMPs jurisdiction-wide to further water quality improvements.

The MassDEP Wetlands regulations (310 CMR 10.0) direct issuing authorities to enforce the MassDEP Stormwater Management Policy, place conditions on the quantity and quality of point source discharges, and to control erosion and sedimentation. The Stormwater Management Policy was issued under the authority of the 310 CMR 10.0. The policy and its accompanying Stormwater Performance Standards apply to new and redevelopment projects where there may be an alteration to a wetland resource area or within 100 feet of a wetland resource (buffer zone). The policy requires the application of structural and/or non-structural BMPs to control suspended solids, which have associated co-benefits for bacteria removal. The Massachusetts Stormwater Handbook was developed to promote consistent interpretation of the Stormwater Management Policy and Performance Standards: Volumes 1 through 3, can be found at: http://www.mass.gov/eea/agencies/massdep/water/regulations/massachusetts-stormwater-handbook.html, as well as, the Stormwater Policy at http://www.mass.gov/eea/agencies/massdep/water/regulations/water-resources-policies-and-guidance-documents.html#11.

10.5 Financial Tools

Nonpoint Source Control Program: MassDEP has established a non-point source program and grant program to address non-point source pollution sources statewide. The Department has developed a Nonpoint Source Management Program Plan, http://www.mass.gov/eea/docs/dep/water/resources/n-thru-y/npsmp.pdf, that sets forth an integrated strategy and identifies important programs to prevent, control, and reduce pollution from nonpoint sources and more importantly to protect and restore the quality of waters in the Commonwealth. The Clean Water Act, Section 319, specifies the contents of the management plan. The plan is an implementation strategy for BMPs with attention given to funding sources and schedules. Statewide implementation of the Management Plan is being accomplished through a wide variety of federal, state, local, and non-profit programs and partnerships. It includes partnering with the Massachusetts Coastal Zone Management on the implementation of Section 6217 program. That program outlines both short and long term strategies to address urban areas and stormwater, marinas and recreational boating, agriculture, forestry, hydromodification, and wetland restoration and assessment. The CZM 6217 program also addresses TMDLs and nitrogen sensitive embayments and is crafted to reduce water quality impairments and restore segments not meeting state standards.

In addition, the state is partnering with the Natural Resource Conservation Service (NRCS) to provide implementation incentives through the national Farm Bill. As a result of this effort, NRCS now prioritizes its Environmental Quality Incentive Program (EQIP) funds based on MassDEP's list of impaired waters. The program also provides high priority points to those projects designed to address TMDL recommendations. Over the past several years EQIP funds have been used throughout the Commonwealth to address water quality goals through the application of structural and non-structural BMPs.

MassDEP, in conjunction with EPA, also provides a grant program to implement nonpoint source BMPs that address water quality goals. The section 319 funding provided by EPA is used to apply needed implementation measures and provide high priority points for projects that are designed to address 303d listed waters and to implement TMDLs. MassDEP has funded numerous projects through 319 that were designed to address stormwater and bacteria related impairments. It is estimated that 75% of all projects funded since 2002 were designed to address bacteria related impairments. Under new EPA guidance issued in 2003, 319 funds cannot be used to address the requirements of NPDES permits, including MS4, Residual Designation, Phase I and Phase II permits. This severely curtails eligibility of most urban implementation work that had previously been accomplished using 319 funds.

The 319 program also provides additional assistance in the form of guidance. The Massachusetts Clean Water Toolkit (http://prj.geosyntec.com/npsmanual/default.aspx) will provide detailed guidance in the form of BMPs by landuse to address various water quality impairments and associated pollutants.

State Revolving Fund: The State Revolving Fund (SRF) Program provides low interest loans to eligible applicants for the abatement of water pollution problems across the Commonwealth. MassDEP has issued millions of dollars in loans for the planning and construction of CSO facilities and to address stormwater pollution.

Loans have also been distributed to municipal governments statewide to upgrade and replace failed Title 5 systems. These programs all demonstrate the State's commitment to assist local governments in implementing the TMDL recommendations. Additional information about the SRF Program may be found on the MassDEP website at: http://www.mass.gov/dep/water/wastewater/wastewat.htm#srf.

In summary, MassDEP's approach and existing programs set out a wide variety of tools both MassDEP and communities can use to address pathogens, based on land use and the commonality of pathogen sources (e.g., combined sewer overflows (CSOs), failing septic systems, stormwater and illicit connections, pet waste, etc.) Since there are only a few categories of sources of pathogens, the necessary remedial actions to address these sources are well established. MassDEP's authority combined with the programs identified above provide sufficient reasonable assurance that implementation of remedial actions will take place.

11.0 Public Participation

Two public meetings were held at 2 p.m. and 7 p.m. at Tufts University, Medford on August 30, 2005 to present the Bacteria TMDL and to collect public comments. The public comment period began on August 10, 2005 and closed on September 15, 2005. The attendance list, public comments, and the MassDEP responses are attached as Appendix B.

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APPENDIX A

Public Meeting Information and Response to Comments
Pathogen TMDL for the Boston Harbor Watershed

Public Meeting Announcement Published in the Monitor	8/10/2005
Date of Public Meeting	8/30/2005
Location of Public Meeting	Tufts University Medford / Somerville Campus Medford, MA
Times of Public Meeting	2 P.M. and 7 P.M.

Public Meeting Attendees

Date 8/30/2005 Time 2 P.M.

Name	Organization
1. Jan Dolan	Mystic River Watershed Association
2. Nancy Hammett	Mystic River Watershed Association
3. Jenny Birnbaum	Mystic River Watershed Association
4. Lisa Boukelab	Tufts University
5. Paul Kirshen	Tufts University
6. Rachel Szyman	Tufts University
7. Andrew B. DeSantis	City of Chelsea-DPW
8. Mike Hill	EPA Region 1
9. Ted Lavery	EPA Region 1
9. Russell Isaac	MassDEP
10. Eben Chesebrough	MassDEP

Date 8/30/2005 Time 7 P.M.

Name	Organization
1. Alison Field-Juma	Mystic River Watershed Association

2. Jenny Birnbaum | Mystic River Watershed Association
3. Russell Isaac | MassDEP
4. Eben Chesebrough | MassDEP

Boston Harbor Watershed Comments / Responses

This appendix provides detailed responses to comments received during the public comment process. MassDEP received many comments/questions that were of a general nature (i.e. related to terminology, statewide programs, the TMDL development process and regulations, etc.) while others were watershed specific. Responses to both are presented in the following sections.

General Comments:

1. Question: On the slide titled "components of a TMDL" what does "WLA" and "LA" stand for.

Response: Waste load allocation (WLA) refers to pollutants discharged from pipes and channels that require a discharge permit (point sources). Load allocation (LA) refers to pollutants entering waterbodies through overland runoff (non point sources). A major difference between the two categories is the greater legal and regulatory control generally available to address point sources while voluntary cooperation added by incentives in some cases is the main vehicle for addressing non-point sources.

2. Question: What is the Septic System Program?

Response: Cities and Towns can establish a small revolving fund to help finance repairs and necessary upgrades to septic systems. The initial funding is from the Commonwealth's State, Revolving Fund Program (SRF). These programs generally offer reduced interest rate loans to homeowners to conduct such improvements. Many communities have taken advantage of this effort. A discussion of the septic system programs may be seen in the TMDL companion document "A TMDL Implementation Guidance Manual for Massachusetts" under Section 3.2.

3. Question: What is the WQS for non-contact recreation in terms of bacteria?

Response: The Massachusetts Surface Water Quality Standards, 314 CMR 4.00 (WQS), do not have any waters designated for "non-contact recreation." All Massachusetts surface waters currently are designated in the WQS for both primary and secondary contact recreation, among other uses. The bacteria criteria protect waters for their most sensitive uses, accordingly, the recreation based bacteria criteria for all Class A, SA, B and SB waters are protective of primary contact recreation. While the WQS do contain C and SC water classifications, with associated criteria, which are described to include waters designated for secondary contact recreation, there are no waters assigned to these classes. The bacteria criteria for Class C fresh waters are: "The geometric mean of all *E. coli* samples taken within the most recent six months shall not exceed 630 colonies per 100 ml, typically based on a minimum of five samples, and 10% of such samples shall not exceed 1260 colonies per 100 ml. This criterion may be applied on a seasonal basis at the discretion of the Department."

The Class C geometric mean bacteria criterion is five times the Class A and B geometric mean bacteria criterion for primary contact recreation. The WQS take the same approach with the Class SC bacteria criteria, that is, the SC geometric mean is five times that for SA and SB waters. With respect to bacteria criteria for secondary contact recreational waters, EPA has guidance that "states and authorized tribes may wish to adopt a criterion five times that of the geometric mean component of the criterion adopted to protect primary contact recreation, similar to the approach states and authorized tribes have used historically in the adoption of secondary contact criterion for Fecal coliforms." Note that in the Massachusetts WQS, secondary contact recreation is defined to include water contact that is "incidental" so that contact incidental to such activities as boating and fishing would be anticipated.

4. Question: On the topic of DNA testing for bacterial source tracking what is MassDEP doing or planning to do?

Response: DNA testing is a promising but as yet not fully reliable tool in distinguishing between human and other sources of fecal bacteria. When perfected, this tool will be extremely valuable in helping target sources of pathogens and remedial actions. At the same time, one needs to recognize that even if the source of the bacteria is identified as non-human, any concentrations exceeding the criteria still impair the use, such as swimming or shellfishing, associated with those criteria. MassDEP is already working with our Wall Experiment Station to help develop reliable techniques to address this issue. Once developed MassDEP will include those techniques into our sampling programs, however, we hope local monitoring programs will also benefit from them.

5. Question: What is the current thought on *E. coli* / entero bacteria survival and reproduction in the environment, especially in wetlands?

Response: There are reports that indicator bacteria can survive in sediment longer than they can in water. This may be a result of being protected from predators. Also, there is some indication that reproduction may occur in wetlands, but until wildlife sources can be ruled out through, for example, a reliable DNA testing, this possibility needs to be treated with caution. Also, die off of indicator bacteria tends to be more rapid in warm water than in cold.

6. Question: For the implementation phase of TMDLs who will do the regular progress reporting and who will pay for it?

Response: Phase I and Phase II municipalities already do regular reporting and provide annual status reports on their efforts. Any additional information can be coupled with existing reporting requirements and monitoring results to determine the success and failure of implementation measures. For non-Phase II municipalities it gets more difficult and MassDEP may have to work directly with each community or possibly add communities with known impairments to the Phase II list. The TMDL does not require volunteer groups, watershed organizations or towns to submit periodic reports - it is not mandatory. The MassDEP is relying on self interest and a sense of duty for communities to move ahead with the needed controls facilitated by some state aid. The MassDEP feels that the cooperative approach is the most desirable and effective but also believes that we possess broad regulatory authority to require action if and when it is deemed appropriate.

7. Question: How does the Phase II program and TMDL program coordinate with each other?

Response: The National Pollutant discharge Elimination System (NPDES) Stormwater Phase II General Permit Program became effective in Massachusetts in March 2003. The municipal separate storm sewer systems

(MS4) general permit, was reissued April 2016 and became effective July 1, 2018. The permit requires the regulated entities to develop, implement and enforce a stormwater management program (SWMP) that effectively reduces or prevents the discharge of pollutants into receiving waters to the Maximum Extent Practicable (MEP). Stormwater discharges must also comply with meeting state water quality standards. The Phase II permit uses a best management practice framework and measurable goals to meet MEP and water quality standards. If there is a discharge from the MS4 to a waterbody that is subject to an approved TMDL identified in part 2.2.1 of the re-issued permit, the permittee shall comply with all applicable schedules and requirements for that TMDL listed in Appendix F. If there is a discharge from the MS4 to a waterbody that is water quality limited identified in part 2.2.2 of the re-issued permit, the permittee shall comply with all applicable schedules and requirements for that water quality limited waters listed in Appendix H. A permittees' compliance with its requirements in Appendix F and/or H shall constitute compliance with its requirement to ensure that its discharges do not cause or contribute to an exceedance of water quality standard. As TMDLs are developed and approved, permittees' stormwater management programs and annual reports must include a description of the BMPs that will be used to control the pollutant(s) of concern, to the maximum extent practicable. Annual reports filed by the permittee should highlight the status or progress of control measures currently being implemented or plans for implementation in the future. Records should be kept concerning assessments or inspections of the appropriate control measures and how the pollutant reductions will be met.

8. Question: Will Communities be liable for meeting bacteria water quality standards for bacteria at the point of discharge?

Response: No. While this is the goal stated in the TMDL, compliance with the water quality standards is judged by in-stream measurements. For instance, in an extreme case, it could be possible for a community to meet water quality standards in their storm drains and yet still be responsible for reducing the impacts of overland runoff if the in-stream concentrations of bacteria exceeded the water quality standard. So no matter how the TMDL is expressed, compliance is measured by the concentrations in the ambient water.

This approach is consistent with current EPA guidance and regulations. As stated in the November 22, 2002 Wayland/Hanlon memorandum (TMDL Appendix B, Attachment A), "WQBELs for NPDES-regulated stormwater discharges that implement WLAs in TMDLs may be expressed in the form of best management practices (BMPs) under specified circumstances. See 33 U.S.C. 1342(p)(3)(B)(iii); 40 C.F.R. 122.44(k)(2)&(3)" (TMDL Appendix B, Attachment A Wayland/Hanlon memo, page 2). This memorandum goes on to state:

"...because stormwater discharges are due to storm events that are highly variable in frequency and duration and are not easily characterized, only in rare cases will it be feasible or appropriate to establish numeric limits for municipal and small construction stormwater discharges. The variability in the system and minimal data generally available make it difficult to determine with precision or certainty actual or projected loadings for individual dischargers or groups of dischargers. Therefore, EPA believes that in these situations, permit limits typically can be expressed as BMPs, and that numeric limits will be used only in rare instances" (TMDL Appendix B, Attachment A Wayland, Hanlon memorandum, November 22, 2002, page 4).

The TMDL attempts to be clear on the expectation that BMPs will be used to achieve WQS as stated in the Wayland/Hanlon memorandum: "If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the stormwater component of the TMDL, EPA recommends that the TMDL reflect this." (TMDL Appendix B, Attachment A Wayland, Hanlon memorandum, page 5). Consistent with this, the Massachusetts' pathogen TMDLs state that BMPs may be used to meet WQS. The actual WLA and LA for stormwater will still be expressed as a concentration-based/WQS limit which will be used to guide BMP implementation. The attainment of WQS, however, will be assessed through ambient monitoring.

In stormwater TMDLs, the issue of whether WQSs will be met is an ongoing issue and can never be answered with 100% assurance. MassDEP believes that the BMP-based, iterative approach for addressing pathogens is appropriate for stormwater. Indeed, "[t]he policy outlined in [the Wayland/Hanlon] memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address stormwater discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality" (TMDL Appendix B, Attachment A Wayland, Hanlon memorandum, page 5).

A more detailed discussion / explanation of this response can be found in TMDL Appendix B, Attachment A, a memorandum titled “Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Sources and NPDES Permit Requirements Based on Those WLAs” by Robert H. Wayland and James A. Hanlon of EPA (11/22/02)..

9. Question: What are the regulatory hooks for this TMDL in regards to non-point sources?

Response: In general, the MassDEP is pursuing a cooperative approach in addressing non-point sources of contamination by bacteria. A total of 247 cities and towns in Massachusetts do have legal requirements to implement best management practices under their general NPDES storm-water permits. In addition, failing septic systems are required to be corrected once the local Board of Health becomes aware of them and at the time of property transfer should required inspections reveal a problem. Other activities, such as farming involving livestock, are the subject of cooperative control efforts through such organizations as the Natural Resources Conservation Service (NRCS) which has a long history of providing both technical advice and matching funds for instituting best management practices on farms. While MassDEP has broad legal authority to address non-point source pollution and enforcement tools available for use for cases of egregious neglect, it intends to fully pursue cooperative efforts which it feels offer the most promise for improving water quality.

10. Question: Why is there little mention in the draft TMDL reports on incorporation of LID (Low Impact Development) principles as a way through implementation to control Bacteria pollution?

Response: Part of the Statewide TMDL project was to produce an accompanying TMDL implementation guidance document for all the TMDL reports, “Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Document for MA”. There is an entire section in that document (Section D.4) that discusses LID principles and TMDL implementation in detail. There is additional information on LID on the interactive web site for non-point source pollution, *Massachusetts Clean Water Toolkit*, http://prj.geosyntec.com/npsmanual/default.aspx.

11. Question: What about flow issues and TMDL requirements?

Response: Although flow can have both positive and negative impacts on water quality, flow is not a pollutant and therefore is not covered by a TMDL. TMDLs are required for each “pollutant” causing water quality impairments.

12. Question: Is there a way that the TMDL can be integrated with grants, and can the grants be targeted at TMDL implementation?

Response: The 319 Grant program is a major funding program providing up to $2 million per year in grants in MA. TMDL implementation is a high priority in the 319 program. In fact, projects designed to address TMDL requirements are given higher priority points during project evaluation.

The 319 grant program RFP Includes this language: "Category 4a Waters: TMDL and draft TMDL implementation projects – The 319 program prioritizes funding for projects that will implement Massachusetts' Total Maximum Daily Load (TMDL) analyses. Many rivers, streams and water bodies in the Commonwealth are impaired and thus do not meet Massachusetts' Surface Water Quality Standards. The goal of the TMDL Program is to determine the likely cause(s) of those impairments and develop an analysis (the TMDL) that lists those cause(s)."

Several comments were also directed towards the complications associated with applying for and reporting details that are required with state grant programs. The MassDEP is sympathetic to the paper work requirements of State and Federal grant programs. The MassDEP will review the body of requirements to assess what streamlining may be possible. At the same time, the MassDEP underscores that accountability for spending public funds continues to be an important and required component of any grant program.

13. Question: How will implementation of the TMDL address the major problem of post- construction run-off?

Response: Proper design and implementation of stormwater systems during construction will address both pre and post-construction runoff issues and thus eliminate future problems. Post-construction runoff is also one of the six minimum control measures that Phase II communities are required to include in their stormwater management program in order to meet the conditions of their National Pollutant Discharge Elimination System (NPDES) permit. In short, Phase II communities are required to:

- Develop and implement strategies which include structural and/or nonstructural best management practices (BMPs);
- Have an ordinance or other regulatory mechanism requiring the implementation of post-construction runoff controls to the extent allowable under State or local law;
- Ensure adequate long-term operation and maintenance controls; and
- Determine the appropriate best management practices (BMPs) and measurable goals for their minimum control measure.

The general permit implementing the Phase II requirements also contains requirements for permittees that discharge into receiving waters with an approved TMDL. In summary, municipalities covered under Phase II are required to incorporate and implement measures and controls into their plans that are consistent with an established TMDL and any conditions necessary for consistency with the assumptions and requirements of the TMDL.

It should be noted that there are a number of other permitting programs that regulate pre/post construction run-off including the construction general permit, wetlands requirements and the Mass DEP General Stormwater permit. EPA and MassDEP reissued the MS4 permit in April 2016 with an effective date of July 1, 2018. A full list of MS4 Phase II communities in MA can be found at on the EPA website. This TMDL forms the basis for the implementation plans to meet the Pathogen loading capacity. Although EPA's Phase II MS4 regulations only require a small MS4 to implement its program in the urbanized area subject to permitting, EPA and MassDEP nonetheless encourage permittees, to update and implement their respective SWMPs jurisdiction-wide to further water quality improvements.

14. Question: How does a pollution prevention TMDL work?

Response: MassDEP recommends that the information contained in the pathogen TMDLs guide management activities for all other waters throughout the watershed to help maintain and protect existing water quality. For non-impaired waters, Massachusetts is proposing “pollution prevention TMDLs” consistent with CWA s. 303(d)(3). Pollution prevention TMDLs encourage the Commonwealth, communities and citizens to maintain and protect existing water quality. Moreover it is easier and less costly in the long term to prevent impairments rather than retrofit controls and best management practices to clean up pollution problems. The goal of this approach is take a more proactive role to water quality management.

The analyses methods employed for the pathogen impaired segments in this TMDL would apply to the non-impaired segments, since the sources and their characteristics are similar. The waste load and/or load allocation for each source and designated use would be the same as specified in the TMDL documents. Therefore, the pollution prevention TMDLs would have comparable waste load and load allocations based on the sources present and the designated use of the waterbody segment.

The TMDLs may, in appropriate circumstances, also apply to segments that are listed for pathogen impairment in subsequent Massachusetts CWA s. 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, after listing the waters for pathogen impairment and taking into account all relevant comments submitted on the CWA’s 303(d) list, the Commonwealth determines with EPA approval of the CWA’s 303(d) list that this TMDL should apply to future pathogen impaired segments.

Pollution prevention best management practices form the backbone of stormwater management strategies. Operation and maintenance should be an integral component of all stormwater management programs. This applies equally well with the Phase II Program as well as TMDLs. A detailed discussion of this subject and the BMPs involved can be found in the TMDL companion document “Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Document for Massachusetts” in Section 3.

It should also be noted that sometimes the MassDEP will develop a “preventative“ TMDL. Preventative TMDLs are not required by Federal law, however, MassDEP does establish them on occasion to prevent waters from becoming impaired or where it is necessary to maintain waters at a certain level of water quality to meet the goals of a TMDL where the impaired water body is downstream from a non-impaired segment. In simple terms a preventative TMDL establishes goals to prevent degradation of good water quality.

15. Comment: The TMDL methodology uses concentrations based on water quality standards to establish TMDL loads, not traditional “loads”.

Response: The TMDL has been revised to provide not only a concentration based approach but also a loading approach. It should be noted, however, that MassDEP believes that a concentration-based approach is consistent with EPA regulations and more importantly more understandable to the public and easier to assess through monitoring activities. Clean Water Act Section 130.2(i) states that “TMDLs can be expressed in terms of either mass per time, toxicity, or other appropriate measure”. The TMDL in this case is set at the water quality standard. Pathogen water quality standards (which are expressed as concentrations) are based on human health, which is different from many of the other pollutants. It is important to know immediately when monitoring is conducted if the waterbody is safe for human use, without calculating a “load” by multiplying the concentration by the flow – a complex function involving variable storm flow, dilution, proximity to source, etc.

The expectation to attain water quality standards at the point of discharge is conservative and thus protective, and offers a practical means to identify and evaluate the effectiveness of control measures. In addition, this approach establishes clear objectives that can be easily understood by the public and individuals responsible for monitoring activities.

MassDEP believes that it is difficult to provide accurate quantitative loading estimates of indicator bacteria contributions from the various sources because many of the sources are diffuse and intermittent, and flow is highly variable. However, based on public comment we have included loads for each segment based on variable flow conditions and the water quality standards. Because of the high variability of bacteria and flows experienced over time, loads are extremely difficult to monitor and model. Therefore, "loadings" of bacteria are less accurate than a concentration-based approach and do not provide a way to quickly verify if you are achieving the TMDL.

16. Comment: There is concern with the "cookie-cutter" nature of the draft TMDL. Particularly the lack of any determination about the causes and contributions to pathogen impairment for specific river and stream segments.

Response: The MassDEP feels the pathogen TMDL approach is justified because of the commonality of sources affecting the impaired segments and the commonality of best management practices used to abate and control those sources. The MassDEP monitoring efforts are targeted towards the in-stream ambient water quality and not towards tracking down the various sources causing any impairments. It should be noted however that MassDEP has conducted additional efforts to try to identify sources where information was available. Based on this additional information, MassDEP added tables to help identify and prioritize important segments and sources where that information was known. Also MassDEP revised Section 7 of the document to include segment-by-segment load allocations required to meet standards. All of these actions were intended to provide additional guidance on potential sources and areas of concern and to help target future activities.

17. Comment: While Table 8-1 of each TMDL lists the Tasks that the agencies (MassDEP/EPA) believe need to be achieved, it isn't clear exactly how these tasks line up with and address the eight sources of impairment listed in Table 7-1. CZM recommends that the final TMDL be more specific and couple the Implementation Plan tasks with the known or expected sources of contamination. This would make the document more useful to a community

Response: Because Table 7-1 and 8-1 serve significantly different purposes it was not intended that the tasks needed to align with and exactly address the eight sources of impairment. With regard to pollution sources, it might be more pertinent to compare Table 7-1 with Table 5-1, where it would be appropriate according to geographic location of known potential sources in Table 5-1. Table 8-1 is more of a suggested possible planning tool, matching tasks with potential organizations for action.

18. Comment: While the text in sections 8.1-8.7 of each TMDL describe some actions that can address the sources in Table 7-1, the issue of failing infrastructure is only mentioned in a sub-section title and in the text, but not addressed in any detail.

Response: Failing infrastructure is a very broad term, and is addressed, in part in such discussions as those on leaking sewer pipes, sanitary sewer overflows, and failed septic systems. It should be mentioned that in the Final TMDL reports, information on infrastructure rehabilitation efforts and progress has been expanded in Section 8. It is outside of the scope of the TMDL documents to detail every possible type of infrastructure failure. Nonetheless, additional information is provided in the TMDL companion document titled: "Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Document for Massachusetts."

19. Comment: There is a need for more specific information about what individual communities are currently doing and how much more effort is required (e.g., how many more miles of pipe need to be inspected for illegal connections in a specific community).

Response: MassDEP and the EPA recognize that the municipalities have done, and are continuing to do, a tremendous amount of work to control bacterial contamination of surface waters. The TMDL has been expanded to provide additional examples of that overall effort. However, the additional discussion is not designed nor intended to include an exhaustive listing of all the work required by each municipality to finalize this effort and provide as status of that work. Programs, such as Phase II Stormwater, require such status reports, and those will be very valuable in assessing priorities and future work. Phase II reports for each community are available on EPAs website: https://www.epa.gov/npdes-permits/2003-small-ms4-general-permit-archives-massachusetts-new-hampshire

20. Comment: There are no milestones to which individual communities should aim (e.g., all stormwater lines upstream of known contamination inspected for illegal connections in five years). As another example, Sections 7 and 8 of each TMDL state that "The strategy includes a mandatory program for implementing stormwater BMPs and eliminating illicit sources" but it is not clear over what timeframe a community should be acting.

Response: MassDEP recognizes that the addition of timelines in the TMDLs would appear to strengthen the documents; however, the complexity of each source coupled with the many types of sources which vary by municipality simply does not lend itself to the TMDL framework and therefore must be achieved through other programmatic measures.

For example, the Phase II stormwater program, revised permit effective July 1, 2018, establishes a 10-year timeline for each regulated community with specific goals related to the identification and control of illicit pollution sources. A second example would be the control of combined sewer overflows (CSOs). Many municipalities are required by NPDES permits to develop and implement initial measures (commonly referred to as the Nine Minimum Controls (NMCs) and long-term control plans to address the issue. Since CSO discharges are defined as a point source under the Clean Water Act, an NPDES permit must be jointly issued by EPA and MassDEP for those discharges. The permit sets forth the requirements for implementation and assessment of the EPA mandated NMCs and the requirement for developing a long-term CSO control strategy. CSOs within the Boston Harbor and Mystic watersheds have Long Term Control Plans in place. There are no CSOs within the Weymouth-Weir watersheds.

21. Comment: Under "Control Measures" does "Watershed Management" include NPDES permitting?

Response: Stormwater management includes NPDES Phase I and II and could include additional permitting actions where deemed necessary and appropriate. Properly functioning wastewater treatment plants already have permit limitations equal to the water quality standards and as such are not generally a source of bacteria that would result in water quality exceedences therefore they are not included as a control measure.

22. Comment: Absent from each report under “Who should read this document?” are the government agencies that provide planning, technical assistance, and funding to groups to remediate bacterial problems.

Response: The TMDL report has been edited to include groups and individuals that can benefit from the information in this report. It is beyond the scope of the TMDL to provide an exhaustive list of agencies that provide funding and support. Chapter 8.0, however, includes a link to this information, which is provided in the Massachusetts Nonpoint Source Strategy.

23. Comment: For coastal watersheds the section that describes funding sources should include grant programs available through the Massachusetts Office of Coastal Zone Management.

Response: Please see response to comment #22.

24. Comment: Table ES-1 and the similar tables throughout the report do not list B,or SB(CSO) or as a surface water classification – this classification and its associated loadings allocations are missing. Although the footnote to the table refers to Long term CSO Control Plans, the relationship between the TMDL, LTCP, and the B(CSO) water classification are unclear.

Response: The 1995 revisions to the MA Water Quality Standards created a B,or SB (CSO) water quality category by establishing regulatory significance for the notation “CSO” shown in the “Other Restriction” column at 314 CMR 4.06 for impacted segments. The B, or SB (CSO) designation was given, after public review and comment, to those waters where total elimination of CSOs was not economically feasible and could lead to substantial and widespread economic and social impact and the impacts from remaining CSO discharges were minor. Although a high level of control must be achieved, Class B standards may not be met during infrequent, large storm events.

The goal of the TMDL and the long-term control plan is to minimize impacts to the maximum extent feasible, attain the highest water quality achievable, and to protect critical uses. Given this, the TMDL establishes in Table ES-1 (as well as other tables) the goal of meeting class B, or SB standards in CSO impacted waters but recognizes that this criteria cannot be met at all times and therefore defers to the EPA and MassDEP approved MWRA Long-Term CSO Control Plan to define the infrequent occasions when the criteria may not be met.

25. Comment: The implementation of new bacteria water quality criteria into NPDES permits should be determined during the permit writing process rather than by the TMDL process – and that should be made clear in the TMDL document.

Response: MassDEP agrees that implementation of new bacteria water quality criteria should be incorporated into the permitting process as well as the state Water Quality Standards. This is already the case. The criteria are also being included in the TMDL because it is a required element of the TMDL process. Readers / users of the bacteria TMDL reports should be aware that new water quality standards were developed and included in the December 29, 2006 revisions to 314 CMR 4.00: Massachusetts Surface Water Quality Standards. These standards have been included in the final Pathogen TMDL for the Boston Harbor Watersheds.

26. Comment: Coastal resources are significantly impacted from the stormwater run-off from Mass Highway roads. This goes beyond the control of municipalities to upgrade and is often beyond the capability of local groups to monitor. MHD (Massachusetts Highway Department (Mass Highway)) continues to evade stormwater standards and it is thus our opinion that MHD deserves special recognition, complete with implementation strategy to upgrade the drainage systems along its web of asphalt.

Response:

The Mass Highway Department, now officially known as the Massachusetts Department of Transportation (MassDOT), has not been included in the new MS4 permit which became effective 7/1/2018. They are currently covered under the 2003 MS4 permit, and have requested that EPA issue an individual MS4 permit to DOT. EPA plans to include MassDOT under the umbrella of individually issued permittees for facilities such as transportation depots, airports, military facilities and other such enterprise operations. Each of these facility permittees has separate requirements depending on the particular operations that occur at that facility. EPA anticipates a draft permit will go out for public review later this year.

27. Comment: What is the current 303d list of impaired waters?

Response: This TMDL was written to reflect the 2014 303d list, however, the analyses conducted for the bacteria impaired segments in this TMDL would apply to the non-impaired segments, since the sources and their characteristics are equivalent. The concentration waste load and/or load allocation for each source and designated use would be the same as specified in this TMDL. Therefore, the pollution prevention TMDLs would have identical waste load and load allocations based on the sources present and the designated use of the water body segment (see ES-4 and Table 7.1). This Boston Harbor watershed TMDL may, in appropriate circumstances, also apply to segments that are listed for bacteria impairment in future Massachusetts CWA § 303(d) Integrated List of Waters. For such segments, this TMDL may apply if, after listing the waters for bacteria impairment and taking into account all relevant comments submitted on the CWA § 303(d) list, the Commonwealth determines with EPA approval of the future CWA § 303(d) Integrated List of Waters that this TMDL should apply to newly listed bacteria impaired segments.

28. Comment: Does the NPDES non-delegated state status of Massachusetts affect the TMDLs in any way?

Response: No. The MassDEP and EPA work closely together and the non-delegated status will not affect the TMDLs. The EPA has not written any of the pathogen TMDLs but has helped fund them.

29. Comment: The TMDL report does not tell the watershed associations anything they didn't already know.

Response: True. The MassDEP is taking a cooperative approach and by working together as a team (federal, state, local, watershed groups) we can make progress in addressing bacterial problems – especially stormwater related bacterial problems.

30. Comment: What will the MassDEP do now for communities that they have not already been doing?

Response: Grants that can be used for implementation (such as the 319 grants) will be targeted toward TMDL implementation. Also, the more TMDLs a state completes and gets approved by EPA the more funding it will receive from EPA and thus the more TMDL implementation it can initiate.

31. Comment: The State Revolving Fund (SRF) should support municipalities with TMDLs and Phase II status a lot more.

Response: As with any grant program, there are some very competitive projects looking for funds from the SRF. A lot of these are the traditional sewage treatment plants and sewering projects which are very expensive. The SRF currently does allocate funds to stormwater related projects and gives higher priority points to projects developed in response to TMDLs.

32. Comment: Who will be doing the TMDL implementation?

Response: Each pathogen TMDL report has a section on implementation which includes a table that generally lists the various tasks and the responsible entity. Most of the implementation tasks will fall on the authority of the municipalities. Probably two of the larger tasks in urban areas include implementing stormwater BMPs and eliminating illicit sources. The MassDEP working with EPA and other team partners shall make every reasonable effort to assure implementation of the TMDLs.

33. Comment: Several watershed groups believe that active and effective implementation and enforcement is essential to carry out the objectives in the pathogen TMDLs. They define effective implementation as the MassDEP partnering with them and municipalities to identify funding opportunities to develop stormwater management plans, implement Title 5 upgrades, and repair failing sewer infrastructure. The groups define effective enforcement as active MassDEP application of Title 5 regulations and implementation of Stormwater Phase II permitting requirements for Phase II municipalities.

Response: The MassDEP has every intention of assisting watershed groups and municipalities with implementing the high priority aspects of the pathogen TMDLs, including identification of possible funding sources. With respect to Title 5 regulations and the Phase II program requirements, the MassDEP will continue to emphasize and assist entities with activities that lead to compliance with those program requirements.

34. Comment: The MassDEP Division of Watershed Management (DWM) should network implementation planning efforts in the coastal watersheds with the Coastal Zone Management's (CZM) Coastal Remediation Grant Program and the EPA Coastal Nonpoint Source Grant Program. Also, the DWM should make the pathogen TMDL presentation to the Mass Bays Group, and network with them in regards to coordinating implementation tasks.

Response: This is a good comment. The MassDEP DWM intends, through its basin planning program, to do both.

35. Comment: Why are specific segments or tributaries of watersheds addressed in the Draft TMDL but not all of the segments?

Response: In accordance with the EPA regulations governing TMDL requirements, only segments that are included on the state's 303(d) list of impaired waterbodies need to be included in any TMDL. An addendum TMDL will be issued at a later date that will include segments that have been listed as impaired for pathogens after the public notification period.

36. Comment: When a TMDL is developed for waters impaired by both point and nonpoint sources, and the WLA is based on an assumption that nonpoint source reductions will occur; EPA's 1991 TMDL Guidance states that the TMDL should provide reasonable assurances that nonpoint source control measures can achieve expected load reductions in order for the TMDL to be approvable.

Response: Section 10.0, Reasonable Assurances, should provide these assurances. This section has been drastically expanded in the Final version of the Draft Pathogen TMDL reports. The revised section 10.0 describes all of the appropriate state programs and their enabling statutes and relevant regulations which actively address nonpoint source pollution impacting waters of the Commonwealth. Many of these programs involve municipality first line defense mechanisms such as the Wetlands Protection Act (which includes the Rivers Protection Act). This expanded section also covers grant programs available to municipalities to control and abate nonpoint source pollution such as 319 grants, 604b grants, 104b(3) funds, 6,217 coastal nonpoint source grants, low interest loans for septic system upgrades, state revolving fund grants, and many others.

37. Comment: The Draft TMDLs indicate that for non-impaired waters the TMDL proposes "pollution prevention BMPs". The term is not defined in any state regulation and the origin of the term is unclear.

Response: An explanation of pollution prevention BMPs can be found in the pathogen TMDL companion document "Mitigation Measures to Address Pathogen Pollution in Surface Waters: A TMDL Implementation Guidance Manual for Massachusetts". Section 3.1 of that manual describes pollution prevention as one of the six control measures for minimizing stormwater contamination under the EPA Phase I or II Stormwater Control Program. Control Measure #6, "Pollution Prevention / Good Housekeeping" involves a number of activities such as maintenance of structural and nonstructural stormwater controls, controls for reducing pollutants from roads, municipal yards and lots, street sweeping and catch basin cleaning, and control of pet waste. Also, the term "pollution prevention" can include a far wider range of pollution control activities to prevent bacterial pollution at the source. For instance, under Phase I and II, minimum control measures #4 and #5, construction site and post construction site runoff controls, would encompass many pollution prevention type BMP measures. Proper septic system maintenance and numerous agricultural land use measures can also be considered pollution prevention activities. Further information may be found in Sections 3.0, 4.0, and 5.0 in the Guidance Manual.

38. Comment: EPA regulations require that a TMDL include Load Allocations (LAs) which identify the portion of the loading capacity attributed to existing and future nonpoint sources and to natural background. Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. s.130.2(g)). Where possible, load allocations should be described separately for natural background and nonpoint sources. The Draft TMDL makes no such allocation. Also, EPA regulations require that a TMDL include Waste Load Allocations (WLAs) which identify the portion of the loading capacity allocated to individual existing and future point sources. The Draft TMDL makes no such allocation. Because it makes no estimate of the TMDL, it makes no WLA for point sources.

Response: This comment (and several others which addressed the same topic) relates to the establishment and allocation of an acceptable pollutant load so that water quality standards can be met and maintained (see response to comment 9 & 16). As touched upon elsewhere in this document, TMDLs can be expressed in a variety of ways so long as they are rational. MassDEP has chosen to use concentration as the metric for bacteria TMDLs for several reasons. First, there is a numeric standard that can be used. Second, and more important, bacteria, unlike some other pollutants, can increase with flow rather than decrease. As such, the bacteria load applicable at low flow (7Q10) would be very stringent if applied to higher flows. In essence, this TMDL recognizes that higher loads are likely at higher flows and therefore the emphasis is on meeting the in-stream water quality.

Watershed Specific Comments

MYSTIC RIVER WATERSHED ASSOCIATION COMMENTS:

1. Comment- The Mystic River Watershed Association in a formal, detailed, letter to Russell Isaac, September 15, 2005, requested that the DEP elect to take one of two approaches to assure that the pathogen TMDL will accomplish the goal of restoring pathogen impaired waters: (A) either conduct further monitoring and assessment to characterize the specific contributors to pathogen contamination in each impaired water body, and set specific performance targets and deadlines for each party responsible for each source, consistent with a traditional TMDL approach; *or* (B) Commit to specific actions DEP will take as part of the TMDL implementation, and specify deadlines and specific actions municipalities and other responsible stakeholders must take, consistent with their existing obligations. After a four- year implementation period, DEP needs to assess the need for additional actions in specific waterbodies to address remaining impairments.

Response- In the Mystic River watershed, each of the communities is subject to Phase II stormwater requirements. As such, each community has obligations under that program to accomplish the tasks set forth. Once those efforts are completed, MassDEP will evaluate whether more controls are needed to meet water quality standards. Monitoring will be conducted as part of the basin cycle. In the meantime, MassDEP welcomes the efforts of both the communities and others to put in implementation controls, and continue monitoring water quality in the Mystic River.

The Final Report has been greatly expanded from the original Draft TMDL. Section 4, Problem Assessment, has been substantially updated with current DEP, MWRA, MyRWA, and CZM data, along with information on all important NPDES dischargers. Sections 5 and 6 have been reworked to give more information on both possible and actual sources of pathogen pollution. Section 7 has been modified to include giving WLA and LA loadings calculations for each segment. Section 8, Implementation, has been rewritten to include detailed up-to- date information on CSO and SSO dischargers, along with progress on CSO and SSO control efforts. Also added to Section 8 is a detailed update on activities and progress of each community in the watershed under the Phase II Stormwater Program. Section 10, Reasonable Assurances has been expanded to give details on various tools and resources that are potentially available to communities and organizations for pathogen pollution controls.

2. Comment- This TMDL bypasses the task of establishing the total loadings that could be discharged from various sources while still meeting water quality standards in different water bodies. Instead, DEP proposes to make the TMDL equal to the water quality standards from all sources. The TMDL document and the accompanying Implementation Guidance provide a useful compendium of information on bacterial sources and pollution control methods. Given the wide range of options presented, the wide variation in their effectiveness in reducing loadings, and the lack of any specific deadlines, however, the proposed TMDL does little to ensure that reasonable progress will be made in practice to address pathogen impairments.

Response- With regard to establishing total loadings, **s**ee Comment #15 and its response under general comments above. The Final Report contains total loadings calculations for both WLA and LA. With regard to the TMDL providing assurance for reasonable progress to address pathogen impairments, see Section 10, Reasonable Assurances in this Final Report.

3. Comment- In presenting the proposed TMDL at public meetings, DEP staff have emphasized the agency's preference to proceed quickly to implementation of the TMDLs, rather than spending the time and resources required to do a fuller evaluation of bacteria sources and allocate loads to specific sources. DEP has also emphasized its expectation that the TMDLs will encourage other stakeholders (municipalities and watershed associations) to better understand and take action to reduce bacterial loadings. Finally, DEP notes that they want to work cooperatively with other stakeholders to achieve the goals of the TMDLs. Laudable as these goals and expectations are in theory, the effect is a TMDL approach that lacks any real assurance that progress will be made.

Response- MassDEP has both the intention of implementation of the TMDLs in segments and areas where sources of bacteria pollution are known, and doing a fuller evaluation of bacteria sources in segments and areas where specific sources are less known. Comments #32- 34, and 37 outlines steps stakeholders (municipalities and watershed associations) can take to better understand and take action to reduce bacterial loadings. With regard to the concern that the TMDL approach lacks any real assurance of tools and resources available, and that progress will be made in reducing loadings, see the expanded Section 10, Reasonable Assurances in this Final Report.

4. Comment- The TMDL notes that municipalities will be responsible for taking action to address many of the likely sources that contribute pathogens to Mystic Watershed waters. These include illicit discharges to storm drains and leading sanitary sewer lines (both violations of the state's regulations), and stormwater runoff (addressed under the Phase I and Phase II stormwater permits.) Absent strong DEP and EPA enforcement of existing requirements, and specific schedules for meeting concrete performance targets, MyRWA is concerned that many municipalities' efforts will fall far short of what would be required to make a significant improvement in water quality. Most communities are struggling with reduced budgets, and the demands of repairing and upgrading sewer and stormwater infrastructure often lose out in the local budget process to investments with more visible benefits (like schools, fire departments, police and fixing potholes). It will take specific requirements and deadlines, as well as expanded funding resources, to encourage real action at the municipal level.

Response- See Questions 6, 7, and 20, with responses under general comments above. This addresses the concern about DEP and EPA enforcement (under the Phase II Stormwater Program), and explains both this program itself and the 'six points of controls', as well as this program's relationship to the TMDL process. See Comments #19, 20 with responses under general comments above for information on required progress reports under the Phase II Program, and goal/milestone setting. See Section 10 in this Final Report for assurances of available tools and funding resources potentially available.

5. Comment- MyRWA is also concerned that simply setting the TMDL at the water quality standard for every source will reinforce the perception that little will in practice be required of municipalities and other responsible stakeholders. The requirements of the Phase II stormwater permit for MS4s are vague, and do not hold municipalities to very high standards in controlling stormwater. It is hard to imagine that DEP will be willing or able to take widespread enforcement action against sources whose discharges do not meet the water quality standards anytime soon. Setting an unrealistically high standard without any concrete interim schedules and requirements does not achieve anything in practice.

Response- The response to Question #8 in the general comments section above answers the concern about meeting water quality standards at every source. Comments #19 and 20 with responses in the general comments above gives information on the structure and expectations of communities under the Phase II Stormwater Program.

6. Comment- To ensure that this TMDL achieves its goals, MyRWA recommends that the TMDL implementation strategy include the following commitments by DEP:

(A) Sufficient bacteria monitoring of all pathogen-impaired waterbodies over the next three years to characterize the relative contributions of different sources to total bacteria loadings. Monitoring should be sufficient to identify specific sources, not just categories of sources – e.g. a particular town's sewers rather than "municipal sewers" as a general category. The monitoring could be performed by DEP, performed by MyRWA under grants from the state or other funders, or required of municipalities, the MWRA, and other responsible stakeholders. It should be DEP's responsibility to ensure that the required monitoring is accomplished, however.

Response- MassDEP will continue its Basin Cycle Monitoring Program on a 5 year basis in the Mystic, Neponset, and Weymouth- Weir sub- watersheds. We generally do not have the resources to conduct extensive monitoring for every potential pathogen problem in all the communities in the watershed. Currently, MassDEP does not conduct sampling in the open ocean waters of Boston Harbor, however, considerable monitoring is conducted by MWRA, CZM, and MyRWA in these waters. We have greatly expanded the available pathogen data- base in Section 4 of the Final Report. This is comprised of data from MassDEP, MWRA, CZM, MyRWA, various communities, and other entities. MassDEP relies on all these agencies to provide a reasonable pathogen data- base. Section 10 of this Final Report gives tools and resources potentially available to help communities and other entities obtain possible funding for further monitoring efforts.

(B) Appropriate enforcement action taken in all cases of violations of pathogen water quality standards identified by this monitoring. Graduated responses, including requests for information, notices of non-compliance, and administrative orders (consent or unilateral), can be used as appropriate. DEP should commit to reviewing and taking some action with each responsible party on a regular basis, however. For example, we request that DEP review the performance of each municipality and take appropriate action based on progress no less often than twice a year. In addition, DEP should not allow continued non-action over time, but should increase the severity of enforcement action after a specified period of time. The results of these reviews should be available to the public.

Response: MassDEP takes pride with its past and present program emphasis in overall pollution related enforcement efforts. This has largely been carried out through its Regional Offices. Graduated responses, including requests for information, notices of non-compliance, and administrative orders (consent or unilateral), have been used as appropriate on a regular basis when required. Both DEP and EPA Region I staff regularly review and refer to the Phase II Stormwater Annual Reports which are maintained on the publicably accessible EPA Stormwater website: http://www.epa.gov/NE/npdes/stormwater/2003-permit-archives.html. MassDEP will continue all of these efforts as a top program priority in the future.

(C) Convening meetings of relevant state agencies, municipalities, and community stakeholders for each impaired water body, to review the evidence on the level and sources of bacteria contamination, to discuss the steps being taken by various parties to address the contamination, and to establish schedules and commitments for further actions. Such meetings should be held for all of the impaired waterbodies within two years, and the results accumulated into a detailed Implementation Plan for the watershed as a whole.

Response: MassDEP has been and continues to do this. The Department was a principal player in the Massachusetts Watershed Initiative, 1995- 2003, which facilitated major stakeholder involvement in water quality improvement actions throughout the Commonwealth. In this regard, in the present sense with the Mystic watershed, the Department has actively supported EPA Region I efforts to hold watershed- wide ½ day seminars twice yearly on the water quality situation and implementation improvement program being coordinated by agencies, organizations, and municipalities throughout that watershed. All stakeholders have been invited to attend and participate in each of these meetings, which have been held at the EPA Region I Headquarters in Boston. The last meeting was held on January 11, 2011. Additionally, MassDEP has been instrumental in recent years in supporting or facilitating similar water quality related meetings and workshops in other watersheds and forums throughout the Commonwealth. For instance, it has actively supported the Annual Water Conference which is held in April each year at the Water Resources Center at the University of Massachusetts, Amherst Campus.

MASSACHUSETTS WATER RESOURCES AUTHORITY COMMENTS:

General comments:

1. Comment: MWRA believes that this TMDL is fundamentally flawed because it is not supported by data. The purpose of a TMDL is to use monitoring data to allocate load reductions among pollution sources. TMDLs establish the allowable pollutant loadings, thereby providing the basis for states to establish water-quality based controls. This TMDL does not do that. It does not provide the basis for equitable and effective permit limits. It makes assumptions that lead to unrealistic goals.

Response: Section 4 in the Final Report has been substantially expanded as far as data is concerned. This includes recent MassDEP, MWRA, and other agencies' water quality pathogen data. WLA and LA bacteria pollution reduction loading targets for each segment have been added to Section 7 (see Comment #15 and its response in general comments above). Information, by impaired segment, on principal permits and their various discharges has been added in Section 4.

2. Comment: The load allocations for stormwater, which are the same as the standard for the ambient receiving water, are unrealistic and likely to be impossible to achieve through BMP's except in the most pristine areas. Such an unrealistic goal confuses the process of prioritizing and addressing the most significant sources.

Response: see response to Question #8 in the general comments section above.

3. Comment: Although expressing the TMDL as a concentration (and the same concentration for all point sources to a particular segment) rather than an allowed loading has the virtue of simplicity, and must, if successful, theoretically result in meeting water quality standards, it is not helpful in a practical sense. The volume and flow of a discharge are as important as the concentration of a pollutant in determining the ultimate impact on the receiving water. The TMDL therefore doesn't help communities to determine where to focus their efforts, nor how to measure when the stormwater is as clean as practicable. Communities *will* need to determine relative loadings, not just concentrations.

Response: see response to Comment #15 in the general comments section above.

4. Comment: The TMDL tables do not include a classification for B or SB (CSO). Therefore, there are no WLA's shown for segments with this classification, although there is a footnote that is related. MWRA recommends that DEP state that waste loads to B or SB (CSO) waters are based on approved CSO control plans, because water quality classifications in Boston Harbor were changed as a result of MWRA's LTCP.

Response: see response to Comment #24 in the general comments section above.

5. Comment: The relationship between the TMDL process and the NPDES permitting process is unclear.

Response: see responses to Comments #7, 9, 13, 20, and 21 in the general comments section above.

6. Comment The implementation of new bacteria water quality criteria into NPDES permits should be determined during the permit writing process rather than by the TMDL process-and that should be made clear in the TMDL document. (e.g. single sample maxima).

Response: see response to Comment #25 in the general comments section above.

7. Comment The description of the monitoring plan (section 9) is slim. It mentions MADEP's five-year water quality monitoring, but there is no reference to a monitoring plan in the reference section, and no monitoring plan or Quality Assurance Project Plan for the Boston Harbor Watershed is available on MADEP's website. There doesn't appear to be an MADEP overall plan (apart from MyRWA and MWRA) for monitoring water quality in the Boston Harbor watershed in order to either detect the relative importance of sources or to measure the effectiveness of TMDL implementation. This is crucial, as the TMDL emphasizes the difficulties of knowing the sources of pathogen contamination. EPA's Protocol for Developing Pathogen TMDLs emphasizes that the more uncertainty exists about the source of a pollutant, the more monitoring should be done.

Response: MassDEP continues its five year cycle monitoring program in each area (basin) throughout the Commonwealth. The Mystic, Neponset, and Weymouth-Weir subwatersheds were sampled at numerous points for bacteria in 2009. MassDEP currently does not have the resources to conduct monitoring in salt water areas of the Commonwealth, and therefore, does not monitor in the salt water portions of Boston Harbor, but instead depends on other agencies such as the MWRA, BWSC, CZM, MDPH, and local communities beaches data for bacteria monitoring and reporting.

Specific comments:

1. Comment: In Figure 1-1, the legend doesn't indicate how the divisions between segments are drawn on the map. Since the report is organized by segment, it's important to know where the divisions are. Are segments indicated by red lines? VERY hard to see in Boston Harbor with the red cross-hatching- suggest using black lines to delineate segments. Do the green lines signify DMF shellfishing designations? The legend should make this clear. Figure 1-1 does not show that Dorchester Bay is conditionally restricted for shellfishing.

Response: MassDEP has attempted to improve the accuracy and readability of Figure 1-1 in the Final Report. Geographic segment descriptions are presented in Section 4 with each sub- part for each segment where water quality data and NPDES information are presented. This is far more descriptive and precise than can be indicated on any map.

2. Comment: On Pg. 29**,** In the Pleasure Bay Segment MA70-11 subsection, mention that MWRA project beginning to be completed by May 2006 in compliance with the Court-ordered schedule, will eliminate stormwater discharges to Pleasure Bay.

Response: This was corrected in the Final Report.

3. Comment: On Pg. 30, in the Dorchester Bay-Segment MA070-03 subsection, it is erroneously stated that it is classified as SB, Shellfishing Restricted, CSO—it is not CSO. Carson and L-Street Beaches have 6 CSO outfalls, not 7 (BOS-087 is now a storm drain). Add "MWRA projects will eliminate CSO to Dorchester Bay by 2011."

Response: This was corrected in the Final Report: (1) CSO removed after Shellfishing Restricted; (2) "MWRA projects will eliminate CSO discharges to Dorchester Bay by 2011" was added; (3) BOS-087 was converted to a stormdrain as of 9/2005, was added.

4. Comment: On Pg 31 Quincy Bay Segment MA70-04, it is erroneously stated that it is classified as SA, Shellfishing Open, CSO—it is not CSO.

Response: Mention of CSO was removed for Quincy Bay MA70-04 in the Final Report.

5. Comment: On Page 31 Quincy Bay Segment MA70-05 it is erroneously stated that it is classified as SB, Shellfishing Restricted, CSO—it is not CSO.

Response: Mention of CSO was removed for Quincy Bay MA70-04 in the Final Report.

6. Comment: On Pg. 32 Hingham Bay Segment MA70-06 Class SB Shellfishing Restricted. The text says there are 9 wastewater discharge permits to MWRA. This should be corrected to show that MWRA has only one NPDES discharge to this segment, the Nut Island Emergency Spillway. Other NPDES discharges to this segment were construction-related permits for discharges that no longer exist. Other NPDES-permitted emergency discharges from Nut Island headworks are to Boston Harbor segment MA70-01.

Response: These have all been corrected in the Final Report.

7. Comment: On Pg. 34 Boston Harbor Segment MA70-01. MWRA has 3 permitted emergency outfalls from the Nut Island Headworks and 4 permitted emergency outfalls from the Deer Island Treatment Plant that discharge to this segment.

Response: This was corrected in the Final Report.

8. Comment: On Pg. 36, Town River Bay it is described as Class SA, but it is not indicated that it is classified by DEP for shellfishing (although there is a DMF designation).

Response: This was corrected in the Final Report.

9. Comment: On Pg. 36, it Refers to MWRA dewatering construction permit for inter-island tunnel-this discharge no longer exists.

Response: This was corrected in the Final Report.

10. Comment: On Pg. 39 Alewife Brook segment MA71-04 the text reads: "MWRA Deer Island WWTP discharges treated wastewater via an outfall and 15 CSOs into Alewife Brook, Inner Harbor, Mystic River, Charles River, and Dorchester Bay. Somerville previously discharged combined sewage through their six CSOs but have eliminated five. Cambridge discharges via seven CSOs into the brook." Substitute the following text. Should be "There are 8 CSO outfalls discharging to Alewife Brook, two are slated to be closed by 2013.

Response: This was corrected in the Final Report.

11. Comment: On Pg. 53, **c**hange the text "The Weymouth Fore River and Back River watersheds have chronic problems with SSOs in both their municipal sewer systems and the MWRA interceptor system", to "The Weymouth Fore River and Back River watersheds have chronic problems with SSOs in both their municipal sewer systems. Problems with the and the MWRA interceptor system are being alleviated by the new Intermediate Pumping Station".;

and, change:

"The MWRA regional sewer system discharges overflows into the Fore River, Monatiquot River and Smelt Brook. The MWRA Smelt Brook Siphon overflows several times each year for periods up to 11 days because of excessive wet weather flows contributed by Weymouth, Braintree, Randolph, Holbrook, and Hingham." to: "The MWRA regional sewer system can discharge overflows into the Fore River, Monatiquot River and Smelt Brook. In the past, the MWRA Smelt Brook Siphon overflowed several times each year for periods up to 11 days because of excessive wet weather flows contributed by Weymouth, Braintree, Randolph, Holbrook, and Hingham. However, MWRA's Intermediate Pumping Station, which went on-line in December 2004, has alleviated most of these discharges."

Response: Both of these suggested statement changes have been put in the Final Report.

<u>COASTAL ZONE MANAGEMENT COMMENTS:</u>

1. Comment: p. iii, Under "Control Measures," does "Watershed Management" include NPDES permitting? If not, NPDES stormwater and point source permitting are certainly valuable bacterial control measures and should be included under "Control Measures."

Response: See response to Comment #21 in the general comments section above.

2. Comment: p. iv, First Paragraph, Executive Summary, "Illicit discharges of boat waste" should be changed to "Discharges of inadequately treated boat waste" because people using small boats (those under 65') with a Type I Marine Sanitation Device attached to the head can legally discharge waste with up to 1000 CFU/100 ml, well above the state standard for SA and SB waters. A similar change should be made to p. 51 (Section 5.0) where illicit boat discharges are mentioned as a dry weather source.

Response: MassDEP has made the suggested changes in the Final Report.

3. Comment: p. iv, Absent from the "Who should read this document?" are the governmental agencies that provide planning, technical assistance, and funding to groups to remediate these problems. CZM recommends adding such language.

Response: The following has already been added to the Final Report document on p. iii: "(e) government agencies that provide planning, technical assistance, and funding to groups for bacterial remediation".

4. Comment: p. vii, Table ES-1, It isn't clear what the difference is between "Waste Load Allocation" and "Load Allocation." The distinction is not made until p. 57 (Section 6). CZM suggests making this distinction earlier (e.g., in footnote 1 of Table ES-1).

Response: First of all, Table ES-1 that you refer to in the Draft Report has been changed to Table ES-4 in the Final Report. For the definitions of Waste Load Allocation and Load Allocation, please refer to Comment #1 and its response in the General Comments Section just above. In direct response to your comment, we have added brief statement definitions of WLA and LA to the first paragraph, pp xiv, following the footnote explanations for Table ES-4, and in Table 7.1 in Section 7 of the Final Report. Additionally, these terms are defined and discussed in much greater detail in Section 7, Pathogen TMDL Development.

5. Comment: Please note that some figures did not display in the PDF format: Figs. 1-1, 2-1, 2-2, and 7-2, did not appear.

Response: The Final Report has been checked to insure that figures are legible in both the pdf and word versions.

6. Comment: pp. 27-39, Sections 4.1, 4.2, There are several vessel sewage pumpout facilities that are located in the Boston Harbor watershed but that are not referenced in this section. For a list of pumpout facilities, please see http://www.mass.gov/czm/potoc.htm.

Response: Where appropriate, when sewage pumpout facilities are located in a particular segment, these are mentioned in the Final submittal.

7. Comment: p. 42, Mystic River Segment MA71-03, This paragraph states that there are no permitted withdrawals in this section, however, the Mystic Station power plant is permitted to withdraw cooling water from this area (see http://www.epa.gov/region1/npdes/permits/mysticpermit.pdf).

Response: MA0004740, Mystic Station Power Plant (now the Mystic Exelon Station) has been added as a permittee to that section in the Final Report.

8. Comment: p. 54, fourth paragraph (Section 5.0), In the discussion of boat waste disposal, CZM suggests changing "…MSDs may discharge sewage in concentrations higher than allowed in ambient water for fishing or shellfishing" to "…MSDs may discharge sewage in concentrations higher than allowed in ambient water for shellfishing or primary and secondary contact recreational activities." Swimming and other primary contact activities should be included as activities that may be impaired by boat sewage disposal.

Response: We have made that change in the Final Report.

9. Comment: pp. 57-63 (Section 6.1), There is no discussion of load allocations to SB-CSO waters or waters that are under a variance. If a waterbody is currently under a variance from water quality standards for bacteria, will the TMDL standards laid out in this document on p. 58 nullify the variance? Regarding this issue, the following sentence from p. 59 (last sentence) should probably be noted on p. 58 "The specific goal for controlling discharges from combined sewer overflows (CSOs) will be based on the site specific studies embodied in the Long Term Control Plan being developed by each community with combined sewers."

Response: Please note that Section 6 of the Draft Report has been changed to Section 7 in the Final Report. Also, this section in the Draft report has been reorganized in the Final Report, with Water Quality Standards information from the Draft Report (pp 34) incorporated into Table 7-1 (as well as Table ES-4), 'Waste Load Allocations (WLAs) and Load Allocations (LAs)' in the Final Report. In Table 7-1 (and Table ES-4), under column "Surface Water Classification", footnote SB[10] refers to your comment above, "The specific goal for controlling discharges from combined sewer overflows (CSOs) will be based on the site specific studies embodied in the Long Term Control Plan". Footnote SB[10], in Table 7-1, refers to (at the bottom of the page): 'SB segments designated as CSO, as having a long term control plan in place that is compatible with water quality goals'. Water bodies covered by this TMDL will not require a variance. Please also refer to Comment # 24 and its response in the General Comments Section just above for further explanation on the variance issue of B or SB (CSO).

10. Comment: p. 64, Section 6.3 "Seasonal Variability," last sentence, The following sentence suggests that primary contact does not take place in winter months: "However, for discharges that do not affect shellfish beds, intakes for water supplies and primary contact recreation is not taking place (i.e., during the winter months) seasonal disinfection is permitted for NPDES point source discharges." However, surfing occurs in many of the Commonwealth's waters year-round. CZM suggests removing this sentence (i.e., the last sentence of Section 6.3 on p. 64) or editing it to: "However, for discharges that do not affect shellfish beds, intakes for water supplies and where primary contact recreation does not take place, seasonal disinfection is permitted for NPDES point source discharges."

Response: Please note that the section on "Seasonal Variability" is Section 7.6 in the Final Report. We have edited this last sentence in the Final Report.

11. Comment: p. 66, Table 7-1, While this table lists the tasks that the agencies (DEP/EPA) believe need to be achieved, it isn't clear exactly how these tasks line up with and address the eight sources of impairment listed in Table 6-1. While some of the text in sections 7.1-7.7 describes actions that can address the sources in Table 6-1, again there is no direct connection. CZM recommends that the final TMDL be more specific and couple the Implementation Plan tasks with the known or expected sources of contamination. This would make the document more useful to a community. For example, it could be stated that the task “illicit discharge detection and elimination” from Table 7-1 addresses the pathogen source “illicit discharges to storm drains” found in Table 6-1.

There is also a need for more specific information about what individual communities are currently doing and how much more effort is required (e.g., how many more miles of pipe need to be inspected for illegal connections in a specific community). In addition there are no milestones to which individual communities should aim (e.g., all stormwater lines upstream of known contamination inspected for illegal connections in five years). As another example, on p. 65 (Section 7.0, fourth paragraph) it is stated that “The strategy includes a mandatory program for implementing stormwater BMPs and eliminating illicit sources” but it is not clear over what timeframe a community should be acting.

It would be helpful to the communities trying to implement this plan if the Department were to provide a short list of probable sources of impairment in each community for each of the impaired segments so that funds could be allocated to specific BMPs or other remedial actions in those segments. For example, Table 5-1 should be expanded to include the responsible entities (e.g., community or MWRA) and should be referenced in the Implementation section. Suggesting that more data be collected in certain areas would also be helpful.

Response: With regard to issues raised in paragraph # 1 of this comment, (i.e., Tasks in Table 7-1 lining up with sources of impairment listed in Table 6-1), please refer to Comment # 17 and its response in the General Comments Section just above. Additionally, for known sources of contamination, please refer to the expanded data and permit information in Section 4, and the greatly expanded information given related to sources in Sections 8.2 and 8.3 of the Final Report. Please note that the Table 7-1 and Table 6-1 that you refer to in the Draft Report, have been changed to Table 8-1 and Table 7-1 in the Final Report.

With regard to specific milestones to be achieved, as well as infrastructure and implementation activities in specific communities mentioned in paragraph #1 and paragraph 2 of this comment, please refer to the next five paragraphs below.

First, with regard to infrastructure and implementation activities, it should be pointed out that Section 8, Implementation, has been significantly updated and expanded in the Final Report submittal as compared to the original Draft Report. Specifically, considerable discussion has been added in Section 8, Subsections 8.1 and 8.2, on the vast amount of grant and infrastructure bacteria pollution control improvement activities and accomplishments that have been achieved to date in the immediate Boston Harbor watershed.

Subsection 8.1 discusses in detail recent water quality related activities of various active organizations in the Boston Harbor watershed who are concerned about pathogen pollution, including the Mystic River Watershed Association (MyRWA), Tufts University, the Massachusetts Bays Program (MassBays), Save the Harbor/Save the Bay, The Boston Harbor Association (TBHA), the Weir River Watershed Association (WRWA), and the Fore River Watershed Association (FRWA). This subsection also outlines numerous grant assessment and implementation projects that have been carried out under the Massachusetts Watershed Initiative, the 319 and 604b Grant programs, CZM Coastal Remediation Programs, as well as Division of Marine Fisheries Studies. Additionally, this section discusses significant bacteria pollution findings under the newly established DEP NERO Bacteria Source Tracking Program.

Section 8.2 in the Final Report covers infrastructure improvements such as fixing illicit sewer connections, failing infrastructure, SSOs and CSOs. Many organizations, along with at least several major programs, have been trying to address these problems, with considerable progress to date. The Massachusetts Department of Environmental Protection (MassDEP), U.S. Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), Metropolitan District Commission (MDC), Massachusetts Department of Conservation and Recreation (DCR), Massachusetts Water Resources Authority (MWRA), Boston Water and Sewer Commission (BWSC), Mystic River Watershed Association (MyRWA), Save the Harbor/Save the Bay, have all been active in the identification, and mitigation of bacterial related pollution problems for many years. For instance, in the Mystic River and Alewife Brook watersheds, the Mystic River Watershed Association has for years conducted dry weather sampling of storm drains and outfalls, and has identified a number of illicit sanitary flows going into these drains, which go directly to receiving waters from the outfalls. The MassDEP has issued Notices of Noncompliance to the responsible communities within these watersheds, requiring them to create programs to identify the location of the illicit connections and to eliminate them.

Subsection 8.2 of the Final Report also discusses in great detail the problems associated with CSOs, SSOs, failing infrastructure, and illicit sewer connections. It outlines the history of increased control efforts with these problems, starting with the forming of the Massachusetts Water Resources Authority in 1982, as well as the beginning of the massive $5 Billion Boston Harbor Project, including the upgrading of the Deer Island WWTP. This project is now virtually complete, and it has already resulted in substantial improvement of water quality, including pathogens throughout the Harbor area. Along with this, the Boston Harbor Court Case No. 85-0489, resulted in the order to set up a CSO implementation and elimination plan. Section 8.2 details the whole story of its progress to the present, including several amendments to the original plan. This also includes bringing in a number of communities into this overall CSO Control Plan program,(e.g., Cambridge, City of Boston (through the BWSC), Brookline, Winthrop and Chelsea). Schedules, and details of accomplishments are fully explained in this section. Illiicit discharges are also discussed, with goals for developing Illicit Discharge Detection and Elimination (IDDE) programs, including EPA and MassDEP policies, and protocols, as well as suggested steps for municipalities to develop and activate effective control plans in this regard. Subsection 8.3 on Stormwater Runoff contains detailed updates of the implementation activities and accomplishments for each MS4 community included under the Phase II Stormwater Program. Additionally, Section 10, Reasonable Assurances, provides supportive information on financial resources and tools available for addressing pollution problems once these are identified in the communities.

In addition to then above specifics on implementation progress in Boston Harbor watershed, please refer to Comments # 19 and #20 and their responses in the General Comments Section just above. Please note that Section 7.0 that you refer to in the Draft Report has been changed to Section 8.0 in the Final Report.

With regard to the concern in the third paragraph of this particular comment, that more data should be gathered in certain areas, please refer to Section 9, 'Monitoring Plan', of the Final Report. This outlines suggestions for future monitoring efforts, and what the monitoring goals should be. The MassDEP depends on many other agencies and organizations besides itself for production of water quality data. Available data from various agencies and groups, utilized for this particular TMDL report has been expanded, and is outlined in Section 4, 'Problem Assessment', along with suggested links where additional data in the watershed can be accessed. In Section 8, 'Implementation', Table 8-1 outlines possible organizations besides MassDEP who could potentially gather data. Other parts of Section 8 suggest the need for additional monitoring following the incorporation of pollution reduction implementation BMPs in specific communities in the watershed. Also, the Department has engaged in the new bacteria Source Tracking Program in its NERO and SERO offices, which gathers bacteria data in areas where there have been documented bacteria related pollution problems.

12 Comment: p. 76, Section 7.6, last sentence, Please change this sentence to read "Massachusetts State Representative Bill Strauss has introduced legislation that would clearly define the role of harbormasters and other coastal police officers in enforcing NDZs and would allow them to collect up to $2000 for violations in NDZs."

Response: We have made that change in the Final Report. Please note that Section 7.6, 'Recreational Waters Use Management' in the Draft Report has been changed to Section 8.6 in the Final Report.

13. Comment: p. 77, Section 8, item 5, It isn't clear who is expected to collate the data collected throughout Boston Harbor and where the data would be stored. Is the Department expected to fill this role?

Response: Section 9 of the Final Report refers to MassDEP collecting data for Water Quality Assessment and related planning purposes (such as TMDL reports). MassDEP periodically monitors (on a five year rotating basis) the Waters of the Commonwealth. The MassDEP generated data will be stored in its own specifically developed and maintained data base. MassDEP does not anticipate fulfilling the role of gathering, and storing and maintaining data generated by other organizations and entities. Data outside of MassDEP are generally maintained by the particular organization that generates the data. Subject to the degree of QA/QC and QAPP followed with this outside data, MassDEP will access and utilize this data for various purposes.

14. Comment: p. 77, Section 9, After the sentence "Financial incentives include Federal monies available under the CWA Section 319 NPS program and the CWA Section 604 and 104b programs, which are provided as part of the Performance Partnership Agreement between MADEP and the EPA," CZM requests that the following be added: "State monies are also available through the Massachusetts Office of Coastal Zone Management's Coastal Pollutant Remediation, Coastal Nonpoint Source Pollution Control, and Coastal Monitoring grant programs. The primary goal of all three programs is to improve coastal water quality by reducing or eliminating nonpoint sources of pollution."

Response: We have added those two sentences to that paragraph in the Final Report. Please note that Section 9, Reasonable Assurances in the Draft Report has been changed to Section 10 in the Final Report, and that this section has been significantly expanded.

CONSERVATION LAW FOUNDATION COMMENTS:

1. Comment: A TMDL proposal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and description of the sources. This Draft (like all the other 14 Draft Pathogen reports) has identically the same core narrative sections, with only brief summaries of existing data in Section 4 of each report. This is DEP's statewide, "cookie- cutter" approach to Statewide Pathogen TMDLs. These reports should have specifics of pathogen impairment, including an inventory of contributing sources.

Response: See Comment #16 and its response in General Comments above. MassDEP has greatly expanded many sections in the Final Report. For instance, in Section 4, much recent data from MassDEP, MWRA, MyRWA, various communities, and other sources has been added, which gives much more perspective on actual principal pathogen pollution sources. Sections 5, 6, and particularly 8, have been expanded to give more specifics on point and nonpoint pathogen pollution sources. In section 6, pollution prioritization, based on water uses, for each segment has been added. In section 8, detailed information and analysis has been added on the principal pathogen pollution sources related to WWTPs, CSOs, SSOs, as well as MS4 programs in each community, and specifically what each community is doing to satisfy the "six points' required, particularly in regards to illicit connection controls. Also, Section 10, Reasonable Assurances, has been expanded to give a more comprehensive presentation of tools and resources available to communities and organizations for pollution reduction implementation programs. MassDEP is of the opinion that we have satisfied as much as possible what is required under 40CFR Section 130.7(c)(1)(i) in this regard.

2. Comment: MassDEP's Draft Pathogen Report is unconventional in that it simply sets an end-of-pipe limit equal to the water quality standard for bacteria (a concentration of so many organisms per 100mL for Class B waters), rather than actually calculating the allowable loading to a receiving water and the allocation of the allowable load to point sources, nonpoint sources and background, plus a margin of safety.

Response: See Comment #15 and its response in General Comments above. Also refer to Section 7 in the Final Report for the inclusion of loadings calculations, WLA and LA, for each impaired segment.

3. Comment: Perhaps if MassDEP insists on this sole unconventional end-of-pipe approach, rather than the allowable loadings calculations in the Final TMDL submittal to EPA, it should seriously consider another approach suggested by EPA, whereby controls to achieve water quality standards in certain water bodies are developed without TMDLs, namely the "4b Alternative". In such instances, states may exclude certain water bodies from Category 5 (the 303(d) list), and instead list them in Category 4b, a use impairment caused by a pollutant that is being addressed by the state through other pollution control requirements for which no TMDL is required. If this course were chosen, DEP and EPA would have to make a binding agreement on commitments dealing with bacteria minimization plans to be adopted by all NPDES facilities, Phase I and II permits, annual water quality management plans in the pathogen- impaired segments, and a definitive implementation plan with a schedule to incorporate pollution controls necessary to attain water quality standards.

Response: Since Section 7 in the Final Report has WLA and LA loadings calculations for each impaired segment, MassDEP will continue on the path of utilizing the TMDL process, and will not be considering the utilization of the "4b Alternative" for pathogen controls in this particular watershed.

APPENDIX B

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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OFFICE OF WATER

MEMORANDUM
SUBJECT: Revisions to the November 22, 2002 Memorandum "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Sources and NPDES Permit Requirements Based on LAs"
FROM: Andrew D. Sawyers, Director
Office of Wastewater Management
Benita Best-Wong, Director
Office of Wetlands, Oceans and Water
TO: Water Division Directors
Regions 1 - 10

This memorandum updates aspects of EPA's November 22, 2002 memorandum from Robert H. Wayland, III, Director of the Office of Wetlands, Oceans and Watersheds, and James A. Hanlon, Director of the Office of Wastewater Management, on the subject of "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Sources and NPDES Permit Requirements Based on Those WLAs" (hereafter "2002 memorandum' '). Today's memorandum replaces the November 12, 2010, memorandum on the same subject; the Water Division Directors should no longer refer to that memorandum for guidance. This memorandum is guidance. It is not a regulation and does not impose legally binding requirements on EPA or States. EPA and state regulatory authorities should continue to make permitting and TMDL decisions on a case-by-case basis considering the particular facts and circumstances and consistent with applicable statutes, regulations, and case law. The recommendations in this guidance may not be applicable to a particular situation. EPA may change or revoke this guidance at any time.

Background

Stormwater discharges are a significant contributor to water quality impairment in this country, and the challenges from these discharges are growing as more land is developed and more impervious surface is created. Stormwater discharges cause beach closures and contaminate shellfish and surface drinking water supplies. The increased volume and velocity of stormwater discharges causes streambank erosion, flooding, sewer overflows, and basement backups. The decreased natural infiltration of rainwater reduces groundwater recharge, depleting our underground sources of drinking water.[1] There are stormwater management solutions, such as green infrastructure, that can protect our waterbodies from stormwater discharges and, at the same time, offer many other benefits to communities.

Section III of the 2002 memorandum recommended that for NPDES-regulated municipal and small construction stormwater discharges, effluent limits be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. The 2002 memorandum went on to provide guidance on using "an iterative, adaptive management BMP approach" for improving stormwater management over time as permitting agencies, the regulated community, and other involved stakeholders gain more experience and knowledge. EPA continues to support use of an iterative approach, but with greater emphasis on clear, specific, and measurable permit requirements and, where feasible, numeric NPDES permit provisions, as discussed below.

Since 2002, States and EPA have obtained considerable experience in developing TMDLs and WLAs that address stormwater sources (see Box 1 in the attachment for specific examples). Monitoring of the impacts of stormwater discharges on water quality has become more sophisticated and widespread.[2] The experience gained during this time has provided better information on the effectiveness of stormwater controls to reduce pollutant loadings and address water quality impairments. In many parts of the country, permitting agencies have issued several rounds of stormwater permits. Notwithstanding these developments, stormwater discharges remain a significant cause of water quality impairment in many places, highlighting a continuing

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[1] See generally Urban Stormwater Management in the United States (National Research Council, 2009), particularly the discussion in Chapter 3, Hydrologic, Geomorphic, and Biological Effects of Urbanization on Watersheds.

[2] Stormwater discharge monitoring programs have expanded the types pollutants and other indices (e.g., biologic integrity) being evaluated. This information is being used to help target priority areas for cleanup and to assess the effectiveness of stormwater BMPs. There are a number of noteworthy monitoring programs that are ongoing, including for example those being carried out by Duluth, MN, Capitol Region Watershed District, MN, Honolulu, HI, Baltimore or Montgomery County, MD, Puget Sound, WA, Los Angeles County, CA, and the Alabama Dept. of Transportation, among many others. See also Section 4.2 (Monitoring/Modeling Requirements) of EPA's Municipal Separate Storm Sewer System Permits: Post-Construction Performance Standards & Water Quality-Based Requirements – A Compendium of Permitting Approaches (EPA, June 2014), or "MS4 Compendium" available at http://water.epa.gov/polwaste/npdes/stormwater/upload/sw_ms4_compendium.pdf, for other examples of note.

need for more meaningful WLAs and more clear, specific, and measurable NPDES permit provisions to help restore impaired waters to their beneficial uses.

With this additional experience in mind, on November 12, 2010, EPA issued a memorandum updating and revising elements of the 2002 memorandum to better reflect current practices and trends in permits and WLAs for stormwater discharges. On March 17, 2011, EPA sought public comment on the November 2010 memorandum and, earlier this year, completed a nationwide review of current practices used in MS4 permits[1] and industrial and construction stormwater discharge permits. As a result of comments received and informed by the reviews of EPA and state-issued stormwater permits, EPA is in this memorandum replacing the November 2010 memorandum, updating aspects of the 2002 memorandum and providing additional information in the following areas:

- Including clear, specific, and measurable permit requirements and, where feasible, numeric effluent limitations in NPDES permits for stormwater discharges;
- Disaggregating stormwater sources in a WLA; and
- Designating additional stormwater sources to regulate and developing permit limits for such sources.

Including Clear, Specific, and Measurable Permit Requirements and, Where Feasible, Numeric Effluent Limitations in NPDES Permits for Stormwater Discharges

At the outset of both the Phase I and Phase II stormwater permit programs, EPA provided guidance on the type of water quality-based effluent limits (WQBELs) that were considered most appropriate for stormwater permits. See Interim Permitting Policy for Water Quality-Based Limitations in Stormwater Permits [61 FR 43761 (August 26, 1996) and 61 FR 57425 (November 6, 1996)] and the Phase II rulemaking preamble 64 FR 68753 (December 8, 1999). Under the approach discussed in these documents, EPA envisioned that in the first two to three rounds of permit issuance, stormwater permits typically would require implementation of increasingly more effective best management practices (BMPs). In subsequent stormwater permit terms, if the BMPs used during prior years were shown to be inadequate to meet the requirements of the Clean Water Act (CWA), including attainment of applicable water quality standards, the permit would need to contain more specific conditions or limitations.

There are many ways to include more effective WQBELs in permits. In the spring of 2014, EPA published the results of a nationwide review of current practices used in MS4 permits in Municipal Separate Storm Sewer Systems Permits: Post-Construction Performance Standards & Water Quality-Based Requirements – A Compendium of Permitting Approaches (June 2014). This MS4 Compendium demonstrates how NPDES authorities have been able to effectively

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[1] See EPA's MS4 Permit Compendium, referenced in the above footnote.

establish permit requirements that are more specifically tied to a measurable water quality target, and includes examples of permit requirements expressed in both numeric and non-numeric form. These approaches, while appropriately permit-specific, each share the attribute of being expressed in a clear, specific, and measurable way. For example, EPA found a number of permits that employ numeric, retention-based performance standards for post-construction discharges, as well as instances where permits have effectively incorporated numeric effluent limits or other quantifiable measures to address water quality impairment (see the attachment to this memorandum).

EPA has also found examples where the applicable WLAs have been translated into BMPs, which are required to be implemented during the permit term to reflect reasonable further progress towards meeting the applicable water quality standard (WQS). Incorporating greater specificity and clarity echoes the approach first advanced by EPA in the 1996 Interim Permitting Policy, which anticipated that where necessary to address water quality concerns, permits would be modified in subsequent terms to include "more specific conditions or limitations [which] may include an integrated suite of BMPs, performance objectives, narrative standards, monitoring triggers, numeric WQBELs, action levels, etc."

EPA also recently completed a review of state-issued NPDES industrial and construction permits, which also revealed a number of examples where WQBELs are expressed using clear, specific, and measurable terms. Permits are exhibiting a number of different approaches, not unlike the types of provisions shown in the MS4 Compendium. For example, some permits are requiring as an effluent limitation compliance with a numeric or narrative WQS, while others require the implementation of specific BMPs that reduce the discharge of the pollutant of concern as necessary to meet applicable WQS or to implement a WLA and/or are requiring their permittees to conduct stormwater monitoring to ensure the effectiveness of those BMPs. EPA intends to publish a compendium of permitting approaches in state-issued industrial and construction stormwater permits in early 2015.

Permits for MS4 Discharges

The CWA provides that stormwater permits for MS4 discharges "shall require controls to reduce the discharge of pollutants to the maximum extent practicable … and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants." CWA section 402(p)(3)(B)(iii). Under this provision, the NPDES permitting authority has the discretion to include requirements for reducing pollutants in stormwater discharges as necessary for compliance with water quality standards. Defenders of Wildlife v. Browner, 191 F.3d 1159, 1166 (9th Cir. 1999).

The 2002 memorandum stated "EPA expects that most WQBELs for NPDES-regulated municipal and small construction stormwater discharges will be in the form of BMPs, and that numeric limitations will be used only in rare instances." As demonstrated in the MS4 Compendium, NPDES permitting authorities are using various forms of clear, specific, and measurable requirements, and, where feasible, numeric effluent limitations in order to establish a more objective and accountable means for reducing pollutant discharges that contribute to water quality problems.[1] Where the NPDES authority determines that MS4 discharges have the reasonable potential to cause or contribute to a water quality standard excursion, EPA recommends that the NPDES permitting authority exercise its discretion to include clear, specific, and measurable permit requirements and, where feasible, numeric effluent limitations[2] as necessary to meet water quality standards.

NPDES authorities have significant flexibility in how they express WQBELs in MS4 permits (see examples in Box 1 of the attachment). WQBELs in MS4 permits can be expressed as system-wide requirements rather than as individual discharge location requirements such as

effluent limitations on discharges from individual outfalls. Moreover, the inclusion of numeric limitations in an MS4 permit does not, by itself, mandate the type of controls that a permittee will use to meet the limitation.

EPA recommends that NPDES permitting authorities establish clear, specific, and measurable permit requirements to implement the minimum control measures in MS4 permits.

With respect to requirements for post-construction stormwater management, consistent with guidance in the 1999 Phase II Rule, EPA recommends, where feasible and appropriate, numeric

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[1] The MS4 Compendium presents examples of different permitting approaches that EPA has found during a nationwide review of state MS4 permits. Examples of different WQBEL approaches in the MS4 Compendium include permits that have (1) a list of applicable TMDLs, WLAs, and the affected MS4s; (2) numeric limits and other quantifiable approaches for specific pollutants of concern; (3) requirements to implement specific stormwater controls or management measures to meet the applicable WLA; (4) permitting authority review and approval of TMDL plans; (5) specific impaired waters monitoring and modeling requirements; and (6) requirements for discharges to impaired waters prior to TMDL approval.

[2] For the purpose of this memorandum, and in the context of NPDES permits for stormwater discharges, "numeric" effluent limitations refer to limitations with a quantifiable or measurable parameter related to a pollutant (or pollutants). Numeric WQBELs may include other types of numeric limits in addition to end-of-pipe limits. Numeric WQBELs may include, among others, limits on pollutant discharges by specifying parameters such as on-site stormwater retention volume or percentage or amount of effective impervious cover, as well as the more traditional pollutant concentration limits and pollutant loads in the discharge.

requirements that attempt to maintain pre-development runoff conditions (40 CFR § 122.34(b)(5)) be incorporated into MS4 permits. EPA's MS4 Compendium features examples from 17 states and the District of Columbia that have already implemented retention performance standards for newly developed and redeveloped sites. See Box 2 of the attachment for examples.

Permits for Industrial Stormwater Discharges

The CWA requires that permits for stormwater discharges associated with industrial activity comply with section 301 of the Act, including the requirement under section 301(b)(1)(C) to contain WQBELs to achieve water quality standards for any discharge that the permitting authority determines has the reasonable potential to cause or contribute to a water quality standard excursion. CWA section 402(p)(3)(A), 40 CFR § 122.44(d)(1)(iii). When the permitting authority determines, using the procedures specified at 40 CFR § 122.44(d)(1)(ii), that the discharge causes or has the reasonable potential to cause or contribute to an in-stream excursion of the water quality standards, the permit must contain WQBELs as stringent as necessary to meet any applicable water quality standard for that pollutant. EPA recommends that NPDES permitting authorities use the experience gained in developing WQBELs to design effective permit conditions to create objective and accountable means for controlling stormwater discharges. See box 3 in the attachment for examples.

Permits should contain clear, specific, and measurable elements associated with BMP implementation (e.g., schedule for BMP installation, frequency of a practice, or level of BMP performance), as appropriate, and should be supported by documentation that implementation of selected BMPs will result in achievement of water quality standards. Permitting authorities should also consider including numeric benchmarks for BMPs and associated monitoring protocols for estimating BMP effectiveness in stormwater permits. Benchmarks can support an adaptive approach to meeting applicable water quality standards. While exceeding the benchmark is not generally a permit violation, exceeding the benchmark would typically require the permittee to take additional action, such as evaluating the effectiveness of the BMPs, implementing and/or modifying BMPs, or providing additional measures to protect water quality.[1] Permitting authorities should consider structuring the permit to clarify that failure to implement required corrective action, including a corrective action for exceeding a benchmark, is

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[1] For example, Part 6.2.1 of EPA's 2008 MSGP provides: "This permit stipulates pollutant benchmark concentrations that may be applicable to your discharge. The benchmark concentrations are not effluent limitations; a benchmark exceedance, therefore, is not a permit violation. Benchmark monitoring data are primarily for your use to determine the overall effectiveness of your control measures and to assist you in knowing when additional corrective action(s) may be necessary to comply with the effluent limitations …"

a permit violation. EPA notes that, as many stormwater discharges are authorized under a general permit, NPDES authorities may find it more appropriate where resources allow to issue individual permits that are better tailored to meeting water quality standards for large industrial stormwater discharges with more complex stormwater management features, such as multiple outfalls and multiple entities responsible for permit compliance.

All Permitted Stormwater Discharges

As stated in the 2002 memorandum, where a State or EPA has established a TMDL, NPDES permits must contain effluent limits and conditions consistent with the assumptions and requirements of the WLAs in the TMDL. See 40 CFR § 122.44(d)(1)(vii)(B). Where the TMDL includes WLAs for stormwater sources that provide numeric pollutant loads, the WLA should, where feasible, be translated into effective, measurable WQBELs that will achieve this objective. This could take the form of a numeric limit, or of a measurable, objective BMP-based limit that is projected to achieve the WLA. For MS4 discharges, CWA section 402(p)(3)(B)(iii) provides flexibility for NPDES authorities to set appropriate deadlines for meeting WQBELs consistent with the requirements for compliance schedules in NPDES permits set forth in 40 CFR § 122.47.

The permitting authority's decision as to how to express the WQBEL(s), either as numeric effluent limitations or as BMPs, with clear, specific, and measurable elements, should be based on an analysis of the specific facts and circumstances surrounding the permit, and/or the underlying WLA, including the nature of the stormwater discharge, available data, modeling results, and other relevant information. As discussed in the 2002 memorandum, the permit's administrative record needs to provide an adequate demonstration that, where a BMP-based approach to permit limitations is selected, the BMPs required by the permit will be sufficient to implement applicable WLAs. Permits should also include milestones or other mechanisms where needed to ensure that the progress of implementing BMPs can be tracked. Improved knowledge of BMP effectiveness gained since 2002[1] should be reflected in the demonstration and supporting rationale that implementation of the BMPs will attain water quality standards and be consistent with WLAs.

EPA's regulations at 40 CFR § 122.47 govern the use of compliance schedules in NPDES permits. Central among the requirements is that the effluent limitation(s) must be met "as soon as possible." 40 CFR § 122.47(a)(1). As previously discussed, by providing discretion

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[1] See compilation of current BMP databases and summary reports available at http://water.epa.gov/infrastructure/greeninfrastructure/gi_performance.cfm, which has compiled current BMP databases and summary reports.

to include "such other provisions" as deemed appropriate, CWA section 402(p)(3)(B)(iii) provides flexibility for NPDES authorities to set appropriate deadlines towards meeting WQBELs in MS4 permits consistent with the requirements for compliance schedules in NPDES permits set forth in 40 CFR § 122.47. See Defenders of Wildlife v Browner, 191 F.3d at 1166. EPA expects the permitting authority to document in the permit record the basis for determining that the compliance schedule is "appropriate" and consistent with the CWA and 40 CFR § 122.47. Where a TMDL has been established and there is an accompanying implementation plan that provides a schedule for an MS4 to implement the TMDL, or where a comprehensive, integrated plan addressing a municipal government's wastewater and stormwater obligations under the NPDES program has been developed, the permitting authority should consider such schedules as it decides whether and how to establish enforceable interim requirements and interim dates in the permit.

EPA notes that many permitted stormwater discharges are covered by general permits. Permitting authorities should consider and build into general permits requirements to ensure that permittees take actions necessary to meet the WLAs in approved TMDLs and address impaired waters. A general permit can, for example, identify permittees subject to applicable TMDLs in an appendix, and prescribe the activities that are required to meet an applicable WLA.

Lastly, NPDES permits must specify monitoring requirements necessary to determine compliance with effluent limitations. See CWA section 402(a)(2); 40 CFR 122.44(i). The permit could specify actions that the permittee must take if the BMPs are not performing properly or meeting expected load reductions. When developing monitoring requirements, the NPDES authority should consider the variable nature of stormwater as well as the availability of reliable and applicable field data describing the treatment efficiencies of the BMPs required and supporting modeling analysis.

Disaggregating Stormwater Sources in a WLA

In the 2002 memorandum, EPA said it "may be reasonable to express allocations for NPDES-regulated stormwater discharges from multiple point sources as a single categorical wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs." EPA also said that, "[i]n cases where wasteload allocations are developed for categories of discharges, these categories should be defined as narrowly as available information allows." Furthermore, EPA said it "recognizes that the available data and information usually are not detailed enough to determine waste load allocations for NPDES-regulated stormwater discharges on an outfall-specific basis."

EPA still recognizes that "[d]ecisions about allocations of pollutant loads within a TMDL are driven by the quantity and quality of existing and readily available water quality data," but has noted the difficulty of establishing clear, specific, and measurable NPDES permit limitations for sources covered by WLAs that are expressed as single categorical or aggregated wasteload allocations. Today, TMDL writers may have more information—such as more ambient monitoring data, better spatial and temporal representation of stormwater sources, and/or more permit-generated data—than they did in 2002 to develop more disaggregated TMDL WLAs.

Accordingly, for all these reasons, EPA is again recommending that, "when information allows," WLAs for NPDES-regulated stormwater discharges be expressed "as different WLAs for different identifiable categories" (e.g., separate WLAs for MS4 and industrial stormwater discharges). In addition, as EPA said in 2002, "[t]hese categories should be defined as narrowly as available information allows (e.g., for municipalities, separate WLAs for each municipality and for industrial sources, separate WLAs for different types of industrial stormwater sources or dischargers)." EPA does not expect states to assign WLAs to individual MS4 outfalls; however, some states may choose to do so to support their implementation efforts. These recommendations are consistent with the decision in Anacostia Riverkeeper, Inc. v. Jackson, 2011 U.S. Dist. Lexis 80316 (July 25, 2011).

In general, states are encouraged to disaggregate the WLA when circumstances allow to facilitate implementation. TMDL writers may want to consult with permit writers and local authorities to collect additional information such as sewer locations, MS4 jurisdictional boundaries, land use and growth projections, and locations of stormwater controls and infrastructure, to facilitate disaggregation. TMDLs have used different approaches to disaggregate stormwater to facilitate MS4 permit development that is consistent with the assumptions and requirements of the WLA. For example, some TMDLs have used a geographic approach and developed individual WLAs by subwatershed[1] or MS4 boundary (i.e., the WLA is subdivided by the relative estimated load contribution to the subwatershed or the area served by the MS4). TMDLs have also assigned percent reductions[2] of the loading based on the estimated wasteload contribution from each MS4 permit holder. Where appropriate, EPA encourages permit writers to identify specific shares of an applicable wasteload allocation for specific permittees during the permitting process, as permit writers may have more detailed information than TMDL writers to effectively identify reductions for

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[1] Wissahickon Creek Siltation TMDL (Pennsylvania) www.epa.gov/reg3wapd/tmdl/pa_tmdl/wissahickon/index.htm.

[2] Liberty Bay Watershed Fecal Coliform Bacteria TMDL (Washington). https://fortress.wa.gov/ecy/publications/SummaryPages/1310014.html and Upper Minnehaha Creek Watershed Nutrients and Bacteria TMDL (Minnesota) http://www.pca.state.mn.us/index.php/view-document.html?gid=20792

specific sources.

Designating Additional Stormwater Sources to Regulate and Developing Permit Limits for Such Sources

The 2002 memorandum states that "stormwater discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL." Section 402(p)(2) of the Clean Water Act (CWA) requires industrial stormwater sources, certain municipal separate storm sewer systems, and other designated sources to be subject to NPDES permits. Section 402(p)(6) provides EPA with authority to identify additional stormwater discharges as needing a permit.

In addition to the stormwater discharges specifically identified as needing an NPDES permit, the CWA and the NPDES regulations allow for EPA and NPDES authorized States to designate additional stormwater discharges for regulation. See:
40 CFR §§122.26 (a)(9)(i)(C), (a)(9)(i)(D), (b)(4)(iii), (b)(7)(iii), (b)(15)(ii) and 122.32(a)(2). Accordingly, EPA encourages permitting authorities to consider designation of stormwater sources in situations where coverage under NPDES permits would, in the reasonable judgment of the permitting authority and, considering the facts and circumstances in the waterbody, provide the most appropriate mechanism for implementing the pollution controls needed within a watershed to attain and maintain applicable water quality standards.

If a TMDL had previously included a newly permitted source as part of a single aggregated or gross load allocation for all unregulated stormwater sources, or all unregulated sources in a specific category, the NPDES permit authority could identify an appropriate allocation share and include a corresponding limitation specific to the newly permitted stormwater source. EPA recommends that any additional analysis used to identify that share and develop the corresponding limit be included in the administrative record for the permit. The permit writer's additional analysis would not change the TMDL, including its overall loading cap.

In situations where a stormwater source addressed in a TMDL's load allocation is not currently regulated by an NPDES permit but may be required to obtain an NPDES permit in the future, the TMDL writer should consider including language in the TMDL explaining that the allocation for the stormwater source is expressed in the TMDL as a "load allocation" contingent on the source remaining unpermitted, but that the "load allocation" would later be deemed a "wasteload allocation" if the stormwater discharge from the source were required to obtain NPDES permit coverage. Such language would help ensure that the allocation is properly characterized by the permit writer should the source's regulatory status change. This will help the permit writer develop limitations for the NPDES permit applicable to the newly permitted source that are consistent with the assumptions and requirements of the TMDL's allocation to that source.

If you have any questions please feel free to contact us or Deborah Nagle, Director of the Water Permits Division, or Tom Wall, Director of the Assessment and Watershed Protection Division.

cc: Association of Clean Water Administrators
TMDL Program Branch Chiefs, Regions 1 – 10
NPDES Permits Branch Chiefs, Regions 1 – 10

Attachment: MS4 and Industrial Stormwater Permit Examples

ATTACHMENT: MS4 and Industrial Stormwater Permit Examples

BOX 1. Examples of WQBELs in MS4 Permits:

1. Numeric expression of the WQBEL: The MS4 Permit includes a specific, quantifiable performance requirement that must be achieved within a set timeframe. For example: - Reduce fine sediment particles, total phosphorus, and total nitrogen loads by 10 percent, 7 percent, and 8 percent, respectively, by September 30, 2016 (2011 Lake Tahoe, CA MS4 permit) Restore within the 5-year permit term 20 percent of the previously developed impervious land (2014 Prince George's County, MD MS4 permit) - Achieve a minimum net annual planting rate of 4,150 planting annually within the MS4 area, with the objective of an MS4-wide urban tree canopy of 40 percent by 2035 (2011 Washington, DC MS4 permit) - Discharges from the MS4 must not cause or contribute to exceedances of receiving water limits for Diazinon of 0.08µg/L for acute exposure (1 hr averaging period) or 0.05µg/L for chronic exposure (4-day averaging period), OR must not exceed Diazinon discharge limits of 0.072 µg/L for acute exposure or 0.045µg/L for chronic exposure (2013 San Diego, CA Regional MS4 permit)
2. Non-numeric expressions of the WQBEL: The MS4 Permit establishes individualized, watershed-based requirements that require each affected MS4 to implement specific BMPs within the permit term, which will ensure reasonable further progress towards meeting applicable water quality standards. - To implement the corrective action recommendations of the Issaquah Creek Basin Water Cleanup Plan for Fecal Coliform Bacteria (part of the approved Fecal Coliform Bacteria TMDL for the Issaquah Creek Basin), King County is required during the permit term to install and maintain animal waste education and/or collection stations at municipal parks and other permittee owned and operated lands reasonably expected to have substantial domestic animal use and the potential for stormwater pollution. The County is also required to complete IDDE screening for bacteria sources in 50 percent of the MS4 subbasins, including rural MS4 subbasins, by February 2, 2017 and implement the activities identified in the Phase I permit for responding to any illicit discharges found (2013 Western Washington Small MS4 General Permit) - For discharges to Segment 14 of the Upper South Platte River Basin associated with WLAs from the approved *E. coli* TMDL, the MS4 must identify outfalls with dry weather flows; monitor priority outfalls for flow rates and *E. coli* densities; implement a system maintenance program for listed priority basins (which includes storm sewer cleaning and sanitary sewer investigations); install markers on at least 90% of storm drain inlets in areas with public access; and conduct a public outreach program focused on sources that contribute *E. coli* loads to the MS4. By November 30, 2018, dry weather discharges from MS4 outfalls of concern must not contribute to an exceedance of the *E. coli* standard (126 cfu per 100 ml for a geometric mean of all samples collected at a specific outfall in a 30-day period) (2009 Denver, CO MS4 Permit)
3. Hybrid approach with both numeric and non-numeric expressions of the WQBEL: - Discharges of trash from the MS4 to the LA River must be reduced to zero by Sept. 2016. Permittees also have the option of complying via the installation of defined "full capture systems" to prevent trash from entering the MS4 (2012 Los Angeles County, CA MS4 Permit). - To attain the shared, load allocation of 27,000 metric tons/year of sediment in the Napa River sediment TMDL, municipalities shall determine opportunities to retrofit and/or reconstruction of road crossings to minimize road-related sediment delivery (≤ 500 cubic yards/mile per 20-year period) to stream channels (2013 CA Small MS4 General Permit).

Box 2. Examples of Retention Post Construction Standards for New and Redevelopment in MS4 Permits - 2009 WV small MS4 permit: Keep and manage on site the first one inch of rainfall from a 24-hour storm preceded by 48 hours of no measurable precipitation.

- 2011 DC Phase I MS4 permit: Achieve on-site retention of 1.2" of stormwater from a 24-hour storm with a 72-hour antecedent dry period through evapotranspiration, infiltration and/or stormwater harvesting.
- 2012 Albuquerque, NM Phase I MS4 permit: Capture the 90th percentile storm event runoff to mimic the predevelopment hydrology of the previously undeveloped site.
- 2010 Anchorage, AK Phase I MS4 permit: Keep and manage the runoff generated from the first 0.52 inches of rainfall from a 24 hour event preceded by 48 hours of no measureable precipitation. - 2013 Western WA small MS4 permit: Implement low impact development performance standards to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year flow to 50% of the 2-year flow.

BOX 3. Examples of WQBELs in Industrial (including Construction) Stormwater Permits:

1. Numeric expression of the WQBEL: The permit includes a specific, quantifiable performance requirement that must be achieved:

- Pollutant concentrations shall not exceed the stormwater discharge limits specified in the permit (based on state WQS), including (for example): Cadmium-0.003 mg/l; Mercury-0.0024 mg/l; Selenium-0.02 mg/l (2013 Hawaii MSGP)
- Beginning July 1, 2010, permittees discharging to impaired waters without an EPA-approved TMDL shall comply with the following effluent limits (based on state WQS), including (for example):

Turbidity-25 NTU; TSS-30 mg/l; Mercury-0.0021 mg/l; Phosphorus, Ammonia, Lead, Copper, Zinc-site-specific limits to be determined at time of permit coverage (2010 Washington MSGP) - If discharging to waters on the 303(d) list (Category 5) impaired for turbidity, fine sediment, or phosphorus, the discharge must comply with the following effluent limit for turbidity: 25 NTU (at the point of discharge from the site), or no more than 5 NTU above background turbidity when the background turbidity is 50 NTU or less, or no more than a 10% increase in turbidity when background turbidity is more than 50 NTU. Discharges to waterbodies on the 303(d) list (Category 5) for high pH must comply with the numeric effluent limit of pH 6.5 to 8.5 su (2010 Washington CGP) (2010 Washington CGP)

2. Narrative expression of the WQBEL: The permit includes narrative effluent limits based on applicable WQS:

- New discharges or new dischargers to an impaired water are not eligible for permit coverage, unless documentation or data exists to show that (1) all exposure of the pollutant(s) of concern to stormwater is prevented; or (2) the pollutant(s) of concern are not present at the facility; or (3) the discharge of the pollutant(s) of concern will meet instream water quality criteria at the point of discharge (for waters without an EPA-approved TMDL), or there is sufficient remaining WLAs in an EPA-approved TMDL to allow the discharge and that existing dischargers are subject to compliance schedules to bring the waterbody into attainment with WQS (2011 Vermont MSGP; similar requirements in RI, NY, MD, VA, WV, SC, AR, TX, KS, NE, AZ, CA, AK, OR, and WA permits)

- In addition to other applicable WQBELs, there shall be no discharge that causes visible oil sheen, and no discharge of floating solids or persistent foam in other than trace amounts. Persistent foam is foam that does not dissipate within one half hour of point of discharge (2014 Maryland MSGP)

3. Requirement to implement additional practices or procedures for discharges to impaired waters:

- For sediment-impaired waters (without an approved TMDL), the permittee is required to maintain a minimum 50-foot buffer zone between any disturbance and all edges of the receiving water (2009 Kentucky CGP)
- For discharges to impaired waters, implement the following: (1) stabilization of all exposed soil areas immediately, but in no case later than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased (as compared to 14 days for no-impaired waters); (2) temporary sediment basins must meet specified design standards if they will serve an area of 5 or more acres (as compared to 10 or more acres for other sites); (3) retain a water quality volume of 1 inch of runoff from the new impervious surfaces created by the project (though this volume reduction requirement is for discharges to all waters, not just impaired waters) (2013 Minnesota CGP).
- If the site discharges to a water impaired for sediment or turbidity, or to a water subject to an EPA-approved TMDL, the permittee must implement one or more of the following practices: (1) compost berms, compost blankets, or compost socks; (2) erosion control mats; (3) tackifiers used with a perimeter control BMP; (4) a natural buffer of 50 feet (horizontally) plus 25 feet (horizontally) for 5 degrees of slope; (5) water treatment by electro-coagulation, flocculation, or filtration; and/or (6) other substantially equivalent sediment or turbidity BMP approved by the state (2010 Oregon CGP)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460
OFFICE OF
WATER
MEMORANDUM
SUBJECT: Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Stormwater Sources and NPDES Permit Requirements Based on Those WLAs
FROM: Robert H. Wayland, III, Director
Office of Wetlands, Oceans and Watersheds
James A. Hanlon, Director
Office of Wastewater Management
TO: Water Division Directors
Regions 1 - 10

This memorandum clarifies existing EPA regulatory requirements for, and provides guidance on, establishing wasteload allocations (WLAs) for stormwater discharges in total maximum daily loads (TMDLs) approved or established by EPA. It also addresses the establishment of water quality-based effluent limits (WQBELs) and conditions in National Pollutant Discharge Elimination System (NPDES) permits based on the WLAs for stormwater discharges in TMDLs. The key points presented in this memorandum are as follows:

NPDES-regulated stormwater discharges must be addressed by the wasteload allocation component of a TMDL. See 40 C.F.R. § 130.2(h).

NPDES-regulated stormwater discharges may not be addressed by the load allocation (LA) component of a TMDL. See 40 C.F.R. § 130.2 (g) & (h).

Stormwater discharges from sources that are not currently subject to NPDES regulation may be addressed by the load allocation component of a TMDL. See 40 C.F.R. § 130.2(g).

It may be reasonable to express allocations for NPDES-regulated stormwater discharges from multiple point sources as a single categorical wasteload allocation when data and information are insufficient to assign each source or outfall individual WLAs. See 40 C.F.R. § 130.2(i). In cases where wasteload allocations are developed for categories of discharges, these categories should be defined as narrowly as available information allows.

The WLAs and LAs are to be expressed in numeric form in the TMDL. See 40 C.F.R. § 130.2(h) & (i). EPA expects TMDL authorities to make separate allocations to NPDES- regulated stormwater discharges (in the form of WLAs) and unregulated stormwater (in the form of LAs). EPA recognizes that these allocations might be fairly rudimentary because of data limitations and variability in the system.

NPDES permit conditions must be consistent with the assumptions and requirements of available WLAs. See 40 C.F.R. § 122.44(d)(1)(vii)(B).

WQBELs for NPDES-regulated stormwater discharges that implement WLAs in TMDLs may be expressed in the form of best management practices (BMPs) under specified circumstances. See 33 U.S.C. §1342(p)(3)(B)(iii); 40 C.F.R. §122.44(k)(2)&(3). If BMPs alone adequately implement the WLAs, then additional controls are not necessary.

EPA expects that most WQBELs for NPDES-regulated municipal and small construction stormwater discharges will be in the form of BMPs, and that numeric limits will be used only in rare instances.

When a non-numeric water quality-based effluent limit is imposed, the permit's administrative record, including the fact sheet when one is required, needs to support that the BMPs are expected to be sufficient to implement the WLA in the TMDL. See 40 C.F.R. §§ 124.8, 124.9 & 124.18.

The NPDES permit must also specify the monitoring necessary to determine compliance with effluent limitations. See 40 C.F.R. § 122.44(i). Where effluent limits are specified as BMPs, the permit should also specify the monitoring necessary to assess if the expected load reductions attributed to BMP implementation are achieved (e.g., BMP performance data).

The permit should also provide a mechanism to make adjustments to the required BMPs as necessary to ensure their adequate performance.

This memorandum is organized as follows:

(I). Regulatory basis for including NPDES-regulated stormwater discharges in WLAs in TMDLs;

(II). Options for addressing stormwater in TMDLs; and

(III). Determining effluent limits in NPDES permits for stormwater discharges consistent with the WLA

I). Regulatory Basis for Including NPDES-regulated Stormwater Discharges in WLAs in TMDLs

As part of the 1987 amendments to the CWA, Congress added Section 402(p) to the Act to cover discharges composed entirely of stormwater. Section 402(p)(2) of the Act requires permit coverage for discharges associated with industrial activity and discharges from large and medium municipal separate storm sewer systems (MS4), i.e., systems serving a population over 250,000 or systems serving a population between 100,000 and 250,000, respectively. These discharges are referred to as Phase I MS4 discharges.

In addition, the Administrator was directed to study and issue regulations that designate additional stormwater discharges, other than those regulated under Phase I, to be regulated in order to protect water quality. EPA issued regulations on December 8, 1999 (64 FR 68722), expanding the NPDES stormwater program to include discharges from smaller MS4s (including all systems within "urbanized areas" and other systems serving populations less than 100,000) and stormwater discharges from construction sites that disturb one to five acres, with opportunities for area-specific exclusions. This program expansion is referred to as Phase II.

Section 402(p) also specifies the levels of control to be incorporated into NPDES stormwater permits depending on the source (industrial versus municipal stormwater). Permits for stormwater discharges associated with industrial activity are to require compliance with all applicable provisions of Sections 301 and 402 of the CWA, i.e., all technology-based and water quality-based requirements. See 33 U.S.C. §1342(p)(3)(A). Permits for discharges from MS4s, however, "shall require controls to reduce the discharge of pollutants to the maximum extent practicable ... and such other provisions as the Administrator or the State determines appropriate for the control of such pollutants." See 33 U.S.C. §1342(p)(3)(B)(iii).

Stormwater discharges that are regulated under Phase I or Phase II of the NPDES stormwater program are point sources that must be included in the WLA portion of a TMDL. See 40 C.F.R. § 130.2(h). Stormwater discharges that are not currently subject to Phase I or Phase II of the NPDES stormwater program are not required to obtain NPDES permits. 33 U.S.C. §1342(p)(1) & (p)(6). Therefore, for regulatory purposes, they are analogous to nonpoint sources and may be included in the LA portion of a TMDL. See 40 C.F.R. § 130.2(g).

(II). Options for Addressing Stormwater in TMDLs

Decisions about allocations of pollutant loads within a TMDL are driven by the quantity and quality of existing and readily available water quality data. The amount of stormwater data available for a TMDL varies from location to location. Nevertheless, EPA expects TMDL authorities will make separate aggregate allocations to NPDES-regulated stormwater discharges (in the form of WLAs) and unregulated stormwater (in the form of LAs). It may be reasonable to quantify the allocations through estimates or extrapolations, based either on knowledge of land use patterns and associated literature values for pollutant loadings or on actual, albeit limited, loading information. EPA recognizes that these allocations might be fairly rudimentary because of data limitations.

EPA also recognizes that the available data and information usually are not detailed enough to determine waste load allocations for NPDES-regulated stormwater discharges on an outfall-specific basis. In this situation, EPA recommends expressing the wasteload allocation in the TMDL as either a single number for all NPDES-regulated stormwater discharges, or when information allows, as different WLAs for different identifiable categories, e.g., municipal stormwater as distinguished from stormwater discharges from construction sites or municipal stormwater discharges from City A as distinguished from City B. These categories should be defined as narrowly as available information allows (e.g., for municipalities, separate WLAs for each municipality and for industrial sources, separate WLAs for different types of industrial stormwater sources or dischargers).

(III). Determining Effluent Limits in NPDES Permits for Stormwater Discharges Consistent with the WLA

Where a TMDL has been approved, NPDES permits must contain effluent limits and conditions consistent with the requirements and assumptions of the wasteload allocations in the TMDL. See 40 CFR § 122.44(d)(1)(vii)(B). Effluent limitations to control the discharge of pollutants generally are expressed in numerical form. However, in light of 33 U.S.C. §1342(p)(3)(B)(iii), EPA recommends that for NPDES-regulated municipal and small construction stormwater discharges effluent limits should be expressed as best management practices (BMPs) or other similar requirements, rather than as numeric effluent limits. See Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits, 61 FR 43761 (Aug. 26, 1996). The Interim Permitting Approach Policy recognizes the need for an iterative approach to control pollutants in stormwater discharges. Specifically, the policy anticipates that a suite of BMPs will be used in the initial rounds of permits and that these BMPs will be tailored in subsequent rounds.

EPA's policy recognizes that because stormwater discharges are due to storm events that are highly variable in frequency and duration and are not easily characterized, only in rare cases will it be feasible or appropriate to establish numeric limits for municipal and small construction stormwater discharges. The variability in the system and minimal data generally available make it difficult to determine with precision or certainty actual and projected loadings for individual dischargers or groups of dischargers. Therefore, EPA believes that in these situations, permit limits typically can be expressed as BMPs, and that numeric limits will be used only in rare instances.

Under certain circumstances, BMPs are an appropriate form of effluent limits to control pollutants in stormwater. See 40 CFR § 122.44(k)(2) & (3). If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the stormwater component of the TMDL, EPA recommends that the TMDL reflect this.

EPA expects that the NPDES permitting authority will review the information provided by the TMDL, see 40 C.F.R. § 122.44(d)(1)(vii)(B), and determine whether the effluent limit is appropriately expressed using a BMP approach (including an iterative BMP approach) or a numeric limit. Where BMPs are used, EPA recommends that the permit provide a mechanism to require use of expanded or better-tailored BMPs when monitoring demonstrates they are necessary to implement the WLA and protect water quality.

Where the NPDES permitting authority allows for a choice of BMPs, a discussion of the BMP selection and assumptions needs to be included in the permit's administrative record, including the fact sheet when one is required. 40 C.F.R.§§ 124.8, 124.9 & 124.18. For general permits, this may be included in the stormwater pollution prevention plan required by the permit. See 40 C.F.R. § 122.28. Permitting authorities may require the permittee to provide supporting information, such as how the permittee designed its management plan to address the WLA(s). See 40 C.F.R. § 122.28. The NPDES permit must require the monitoring necessary to assure compliance with permit limitations, although the permitting authority has the discretion under EPA's regulations to decide the frequency of such monitoring. See 40 CFR § 122.44(i). EPA recommends that such permits require collecting data on the actual performance of the BMPs. These additional data may provide a basis for revised management measures. The monitoring data are likely to have other uses as well. For example, the monitoring data might indicate if it is necessary to adjust the BMPs. Any monitoring for stormwater required as part of the permit should be consistent with the state's overall assessment and monitoring strategy.

The policy outlined in this memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address stormwater discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality. This approach is further supported by the recent report from the National Research Council (NRC), Assessing the TMDL Approach to Water Quality Management (National Academy Press, 2001). The NRC report recommends an approach that includes "adaptive implementation," i.e., "a cyclical process in which TMDL plans are periodically assessed for their achievement of water quality standards" ... and adjustments made as necessary. NRC Report at ES-5.

This memorandum discusses existing requirements of the Clean Water Act (CWA) and codified in the TMDL and NPDES implementing regulations. Those CWA provisions and regulations contain legally binding requirements. This document describes these requirements; it does not substitute for those provisions or regulations. The recommendations in this memorandum are not binding; indeed, there may be other approaches that would be appropriate in particular situations. When EPA makes a TMDL or permitting decision, it will make each decision on a case-by-case basis and will be guided by the applicable requirements of the CWA and implementing regulations, taking into account comments and information presented at that time by interested persons regarding the appropriateness of applying these recommendations to the particular situation. EPA may change this guidance in the future.

If you have any questions please feel free to contact us or Linda Boornazian, Director of the Water Permits Division or Charles Sutfin, Director of the Assessment and Watershed Protection Division.

cc:
Water Quality Branch Chiefs
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