NARRAGANSETT AND MOUNT HOPE BAY WATERSHEDS 2004-2008 WATER QUALITY ASSESSMENT REPORT

COMMONWEALTH OF MASSACHUSETTS
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NARRAGANSETT AND MOUNT HOPE BAY WATERSHEDS

2004 – 2008 WATER QUALITY ASSESSMENT REPORT

Prepared by:

Massachusetts Department of Environmental Protection
Division of Watershed Management

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Division of Watershed Management
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- Bureau of Waste Prevention (BWP)
- Bureau of Waste Site Cleanup (BWSC)

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Department of Fish and Game (MA MA DFG)
- Division of Fisheries and Wildlife (MDFW)
- Division of Marine Fisheries (DMF)

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- Water Resources Division

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Cover photo credit: Mount Hope Bay, Stella Kiras, MassDEP.

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LIST OF ACRONYMS AND ABBREVIATIONS

7Q10 ..... seven day, ten year low flow	MassDEP ..... Massachusetts Department of Environmental Protection
ACOE ..... Army Corps of Engineers (United States)	MassGIS ..... Massachusetts Geographic Information System
BMP ..... best management practice	MS4 ..... Municipal Separate Stormwater System
BPJ ..... best professional judgment	MWRA ..... Massachusetts Water Resources Authority
BWSC ..... Bureau of Waste Site Cleanup	NAS/NAE ..... National Academy of Sciences/National Academy of Engineering
CMR ..... Code of Massachusetts Regulations	NAWQA ..... National Water-Quality Assessment Program
CNOEC ..... chronic no observed effect concentration	NCCW ..... non-contact cooling water
CPR ..... Coastal Pollution Remediation Grant Program	NPDES ..... National Pollutant Discharge Elimination System
CSO ..... combined sewer overflow	NPS ..... non-point source pollution
CWA ..... Clean Water Act	ORS ..... Office of Research and Standards
DDD ..... dichlorodiphenyldichloroethane	PAH ..... polycyclic aromatic hydrocarbon
DDE ..... dichlorodiphenyldichloroethylene	PCB ..... polychlorinated biphenyls
DDT ..... dichlorodiphenyltrichloroethane	RBP ..... rapid bioassessment protocol
DO ..... dissolved oxygen	QAPP ..... quality assurance project plan
DPW ..... Department of Public Works	S-EL ..... severe effect level
DWM ..... Division of Watershed Management	SWQS ..... Surface Water Quality Standards
EOEEA ..... Executive Office of Energy and Environmental Affairs	TIE/TRE ..... toxicity identification evaluation/toxicity reduction evaluation
EPA ..... United States Environmental Protection Agency	TMDL ..... total maximum daily load
EPT ..... Ephemeroptera, Plecoptera, and Tricoptera	TOXTD ..... MassDEP DWM Toxicity Testing Database
FPOM ..... fine particulate organic matter	USFWS ..... United States Fish and Wildlife Service
LC_{50} ..... lethal concentration to 50% of the test organisms	USGS ..... United States Geological Survey
L-EL ..... low effect level	WBS ..... Waterbody System database
MA DCR ..... Massachusetts Department of Conservation and Recreation	WMA ..... Water Management Act
MA DFG ..... Massachusetts Department of Fish and Game	WWTP ..... wastewater treatment plant
MA DPH ..... Massachusetts Department of Public Health	

LIST OF UNITS

cfs ..... cubic feet per second	MW ..... megawatt
cfu ..... colony forming unit	NTU ..... nephelometric turbidity units
fps ..... foot per second	ppb ..... parts per billion
MG ..... million gallons	ppm ..... parts per million
MGD ..... million gallons per day	ppt ..... parts per thousand
m ..... meters	SU ..... standard units
ml ..... milliliters	µS/cm ..... micro seimens per centimeter
mg/L ..... milligram per liter	

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EXECUTIVE SUMMARY
NARRAGANSETT AND MOUNT HOPE BAY WATERSHEDS
2003-2008 WATER QUALITY ASSESSMENT REPORT

The Massachusetts Surface Water Quality Standards (SWQS) designate the most sensitive uses for which surface waters in the state shall be protected. The assessment of current water quality conditions is a key step in the successful implementation of the Watershed Approach. This critical phase provides an assessment of whether or not the designated uses are supported or impaired or are not assessed, as well as basic information needed to focus resource protection and remediation activities later in the watershed management planning process.

This report presents a summary of current (2004 through 2008) water quality data/information in the Narragansett and Mount Hope Bay Watersheds used to assess the status of the designated uses as defined in the SWQS. The designated uses, where applicable, include: *Aquatic Life, Fish Consumption, Drinking Water, Shellfishing, Primary* and *Secondary Contact Recreation* and *Aesthetics*. Each use, within a given segment, is individually assessed as ***support*** or ***impaired***. When too little current data/information exists or no reliable data are available the use is ***not assessed***. However, if there is some indication of water quality impairment, which is not "naturally-occurring", the use is identified with an "Alert Status". It is important to note that not all waters are assessed. Many small and/or unnamed rivers, lakes, and estuarine areas have never been assessed; the status of their designated uses has never been reported to the EPA in the Commonwealth's Summary of Water Quality Report (305(b) Report) nor is information on these waters maintained in the Waterbody System (WBS) or the new Assessment Database (ADB). These are considered ***not assessed other waters***.

The summary of the assessments for the *Aquatic Life, Fish Consumption, Primary* and *Secondary Contact Recreation,* and *Aesthetics* uses in the Narragansett and Mount Hope Bay Watershed segments are illustrated in Figures 1 through 5, respectively. Where sufficient data/current information were not available, the uses were not assessed. The estuarine segments are all currently prohibited for shellfish harvesting so they were all were assessed as impaired for the *Shellfishing Harvesting Use*.

The status of the *Drinking Water Use* is not assessed in this report since the most current information on drinking water source protection and finish water quality is available at http://www.mass.gov/dep/water/drinking.htm and from local public water suppliers.

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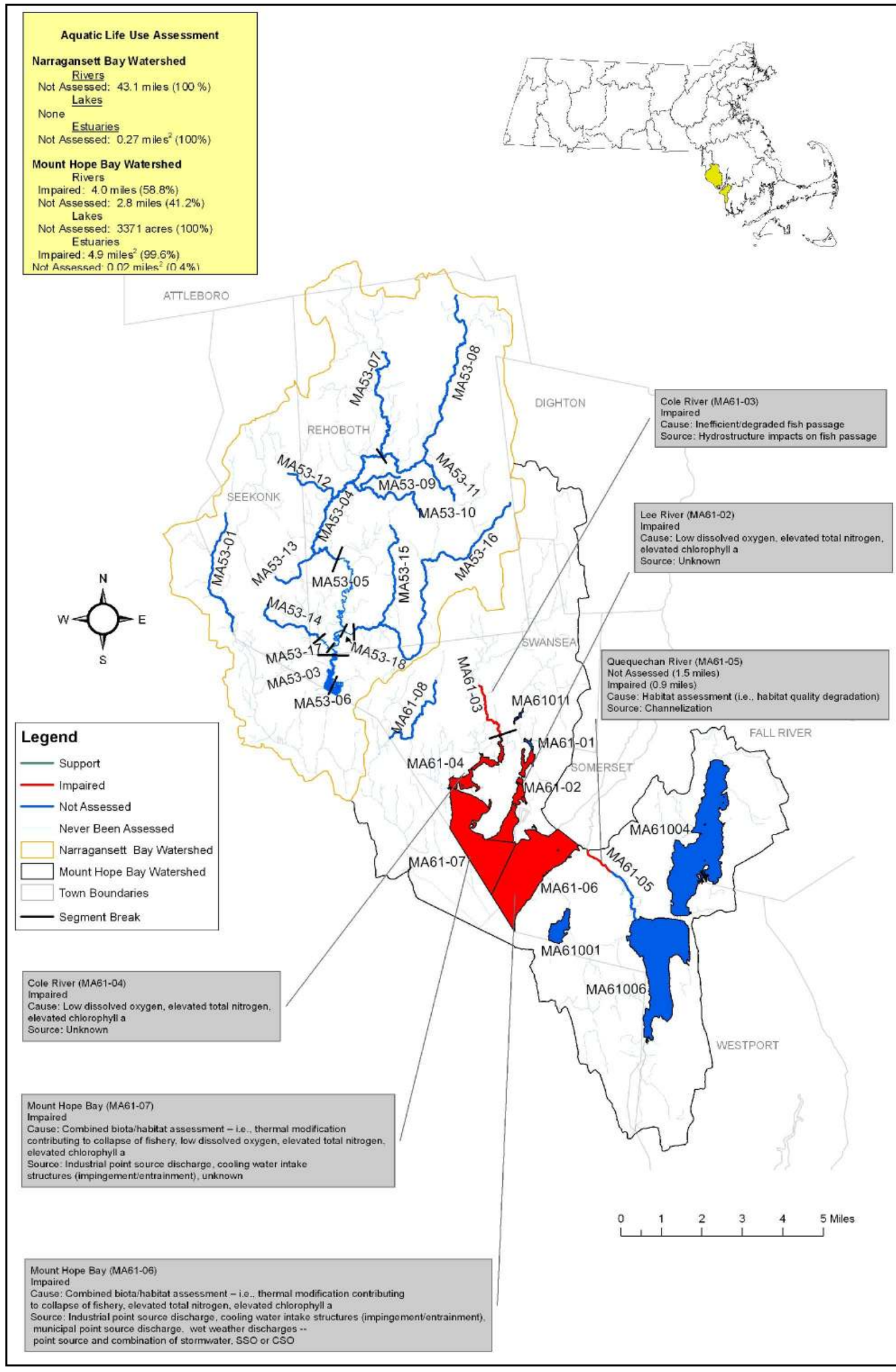

Figure 1. *Aquatic Life Use* assessment summary for rivers and lake segments in the Narragansett and Mount Hope Bay Watersheds. Note: The *Aquatic Life Use* is supported when suitable habitat (including water quality) is available for sustaining a native, naturally diverse, community of aquatic flora and fauna. Impairment of the *Aquatic Life Use* may result from anthropogenic stressors that include point and/or non-point source(s) of pollution and hydrologic modification. Causes and/or sources of impairments, when known, are noted in the callouts.

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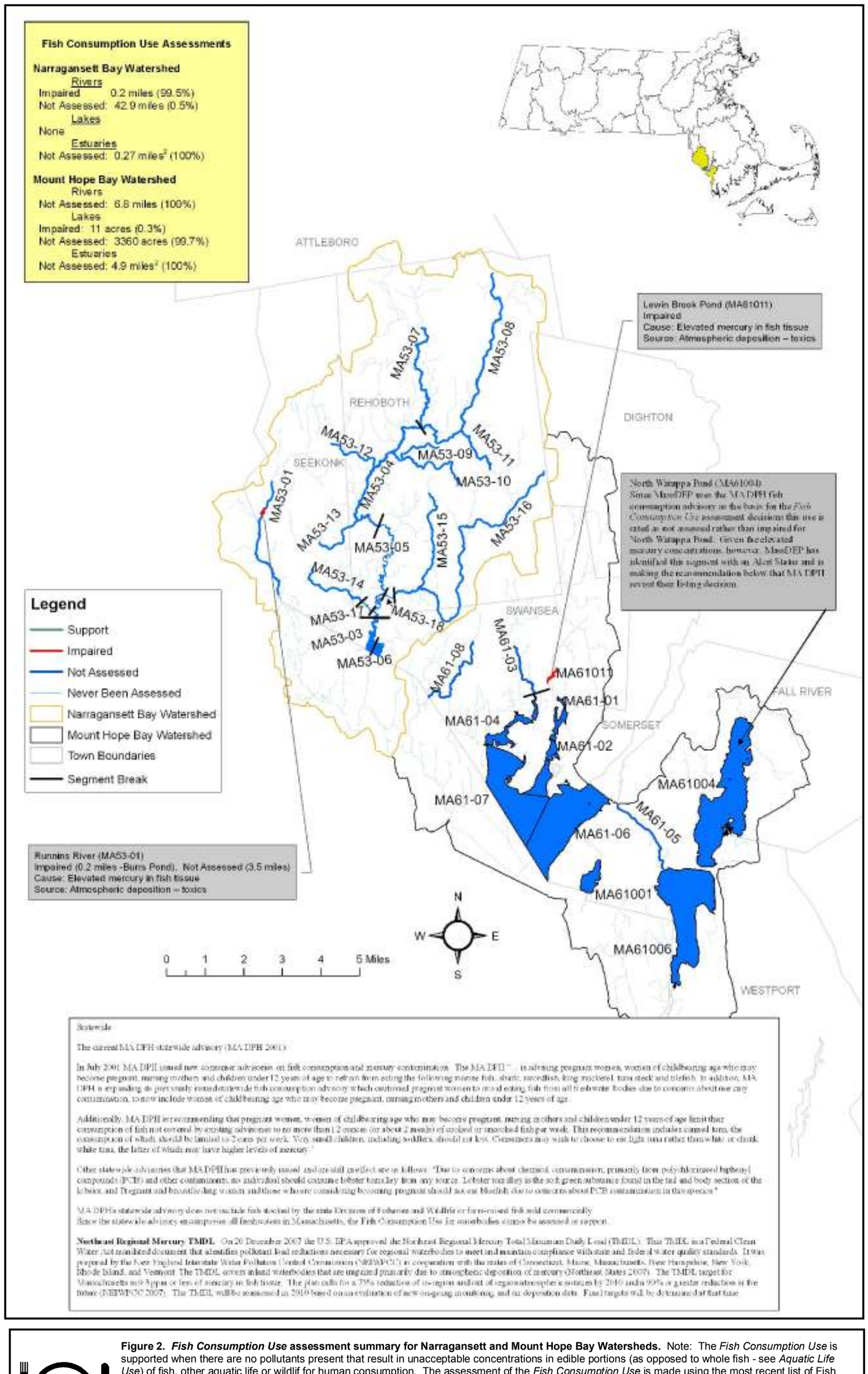

Figure 2. *Fish Consumption Use* assessment summary for Narragansett and Mount Hope Bay Watersheds. Note: The *Fish Consumption Use* is supported when there are no pollutants present that result in unacceptable concentrations in edible portions (as opposed to whole fish - see *Aquatic Life Use*) of fish, other aquatic life or wildlif for human consumption. The assessment of the *Fish Consumption Use* is made using the most recent list of Fish Consumption Advisories issued by the Massachusetts Executive Office of Health and Human Services, Department of Public Health (MA DPH), Bureau of Environmental Health Assessment (MA DPH 2008). The MA DPH list identifies waterbodies where elevated levels of a specified contaminant in edible portions of freshwater species pose a health risk for human consumption; hence, the *Fish Consumption Use* is assessed as impaired in these waters. In July 2001 MA DPH issued new consumer advisories on fish consumption and mercury contamination (MA DPH 2001). Because of these statewide advisories no waters can be assessed as support for the *Fish Consumption Use*. These waters default to "not assessed". Causes and/or sources of impairments, when known, are noted in the callouts.

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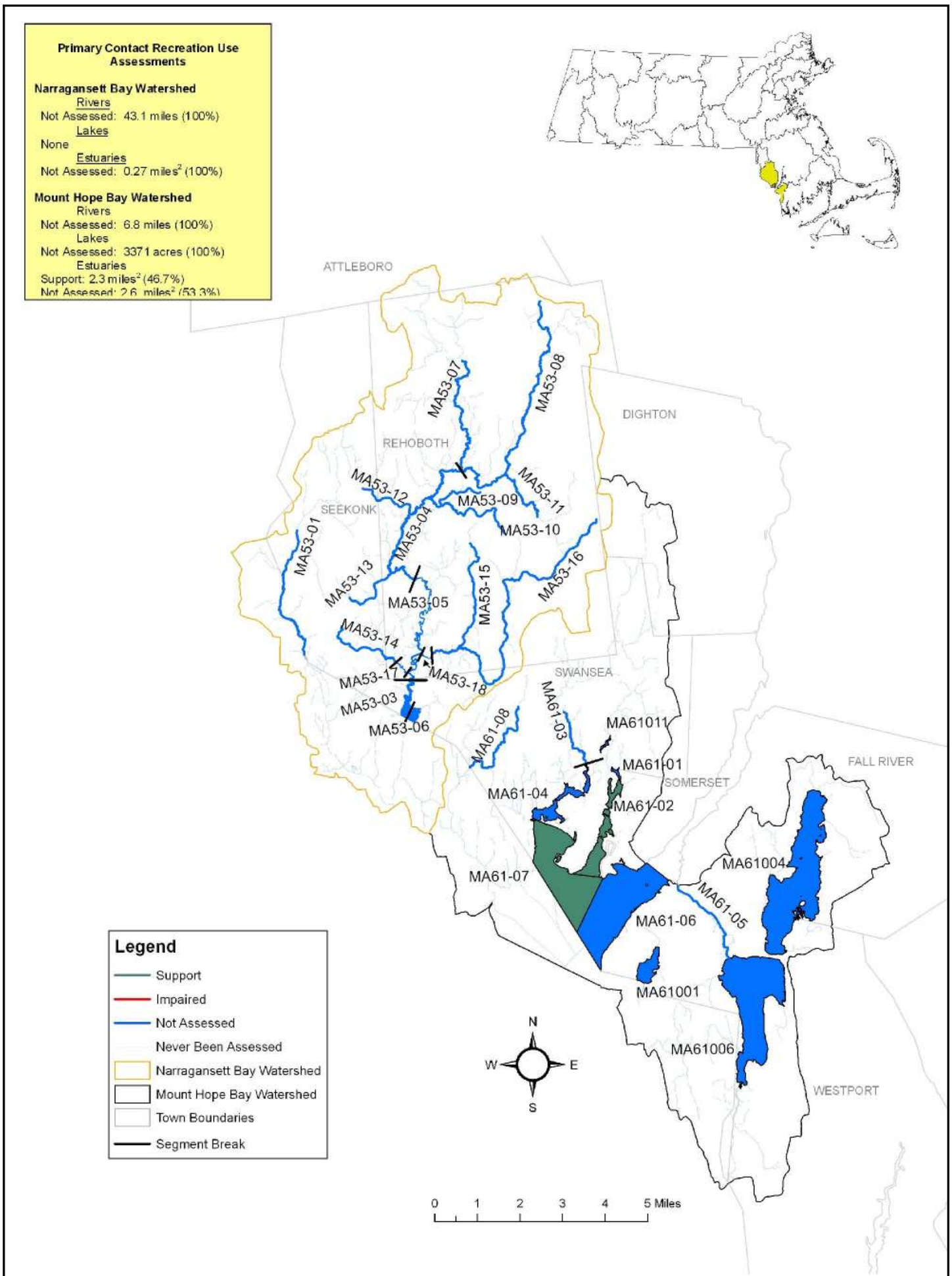

Figure 3. ***Primary Contact Recreational Use*** **assessment summary for Narragansett and Mount Hope Bay Watersheds**. Note: The *Primary Contact Recreational Use* is supported when conditions are suitable (fecal coliform bacteria densities, turbidity and aesthetics meet the SWQS and/or the MA DPH Bathing Beaches State Sanitary Code and/or guidance) for any recreational or other water related activity during which there is prolonged and intimate contact with the water and there exists a significant risk of ingestion. Activities include, but are not limited to, wading, swimming, diving, surfing and water skiing. Causes and/or sources of impairments, when known, are noted in the callouts.

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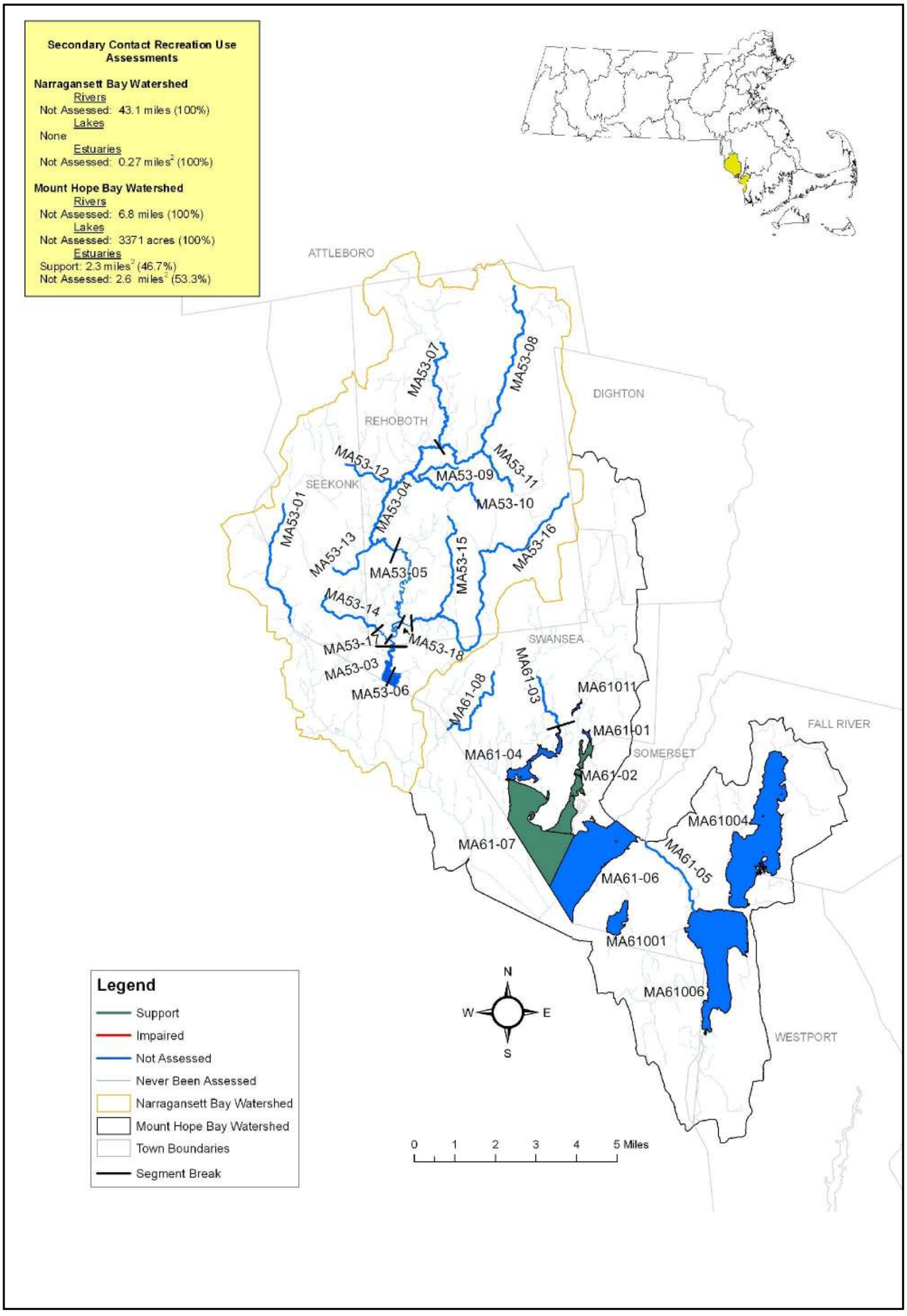

Figure 4. ***Secondary Contact Recreational Use*** **assessment summary for Narragansett and Mount Bay Watersheds**. The *Secondary Contact Recreational Use* is supported when conditions are suitable for any recreational or other water use during which contact with the water is either incidental or accidental. These include, but are not limited to, fishing, boating and limited contact related to shoreline activities. For lakes, non-native aquatic macrophyte cover and/or transparency data (Secchi disk depth) are evaluated to assess the status of the recreational uses. Causes and/or sources of impairments, when known, are noted in the callouts.

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Aesthetics Use Assessments

Narragansett Bay Watershed

Rivers
Support: 1.6 miles (3.7%)
Not Assessed: 41.5 miles (96.3%)

Lakes
None

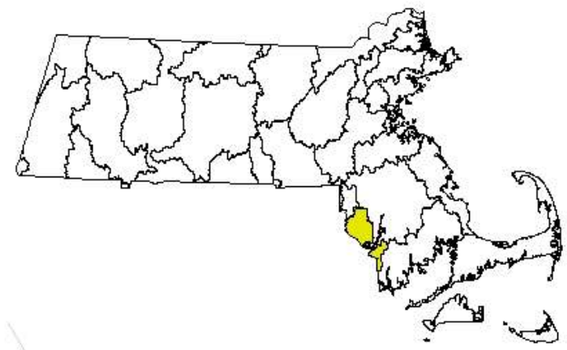
Estuaries
Not Assessed: 0.27 miles^2 (100%)

Mount Hope Bay Watershed

Rivers
Not Assessed: 6.8 miles (100%)

Lakes
Not Assessed: 3371 acres (100%)

Estuaries
Not Assessed: 4.9 miles^2 (100%)



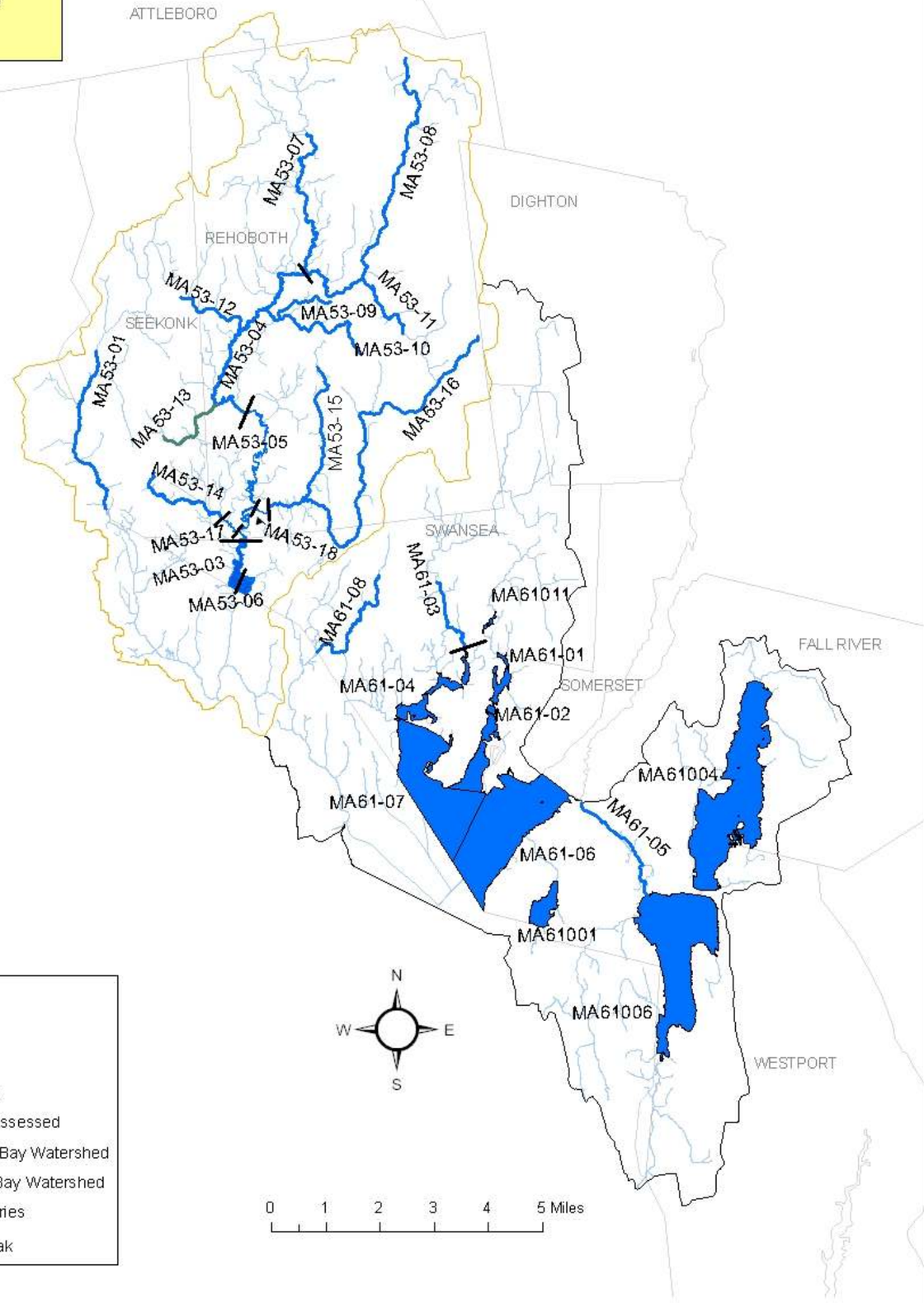


Figure 5. *Aesthetics Use* assessment summary for Narragansett and Mount Hope Bay Watersheds. Note: The *Aesthetics Use* is supported when surface waters are free from pollutants in concentrations or combinations that settle to form objectionable deposits; float as debris, scum or other matter to form nuisances; produce objectionable odor, color, taste or turbidity; or produce undesirable or nuisance species of aquatic life. Causes and/or sources of impairments, when known, are noted in the callouts.

INTRODUCTION

The goal of the Clean Water Act (CWA) is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (Environmental Law Reporter 1988). To meet this objective, the CWA requires states to develop information on the quality of the Nation's water resources and report this information to the U.S. Environmental Protection Agency (EPA), the U.S. Congress, and the public. Together, these agencies are responsible for implementation of the CWA mandates. Under Section 305(b) of the Federal Clean Water Act, every two years MassDEP must submit a statewide report which describes the status of water quality in the Commonwealth to the EPA. Until 2002 this was accomplished as a statewide summary of water quality (the 305(b) Report). States are also required to submit, under Section 303(d) of the CWA, a list of impaired waters requiring a total maximum daily load (TMDL) calculation. In 2002, however, EPA required the states to combine elements of the statewide 305(b) Report and the Section 303(d) List of Impaired Waters into one "Integrated List of Waters" (Integrated List). This statewide list is based on the compilation of information for the Commonwealth's 27 watersheds. Massachusetts has opted to write individual watershed surface water quality assessment reports and use them as the supporting documentation for the Integrated List. The assessment reports utilize data compiled from a variety of sources and provide an evaluation of water quality, progress made towards maintaining and restoring water quality, and the extent to which problems remain at the watershed level. Quality assured in-stream biological, habitat, physical/chemical, toxicity data and other information are evaluated to assess the status of water quality conditions. This analysis follows a standardized process described in Appendix A (Assessment Methodology) of this report.

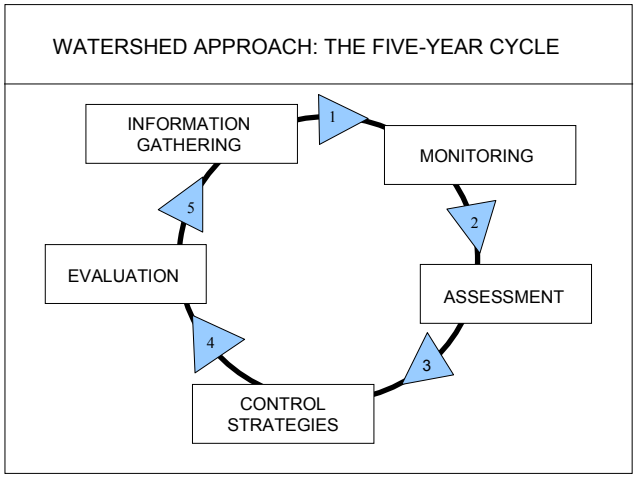


Figure 6. Five-year cycle of the Watershed Approach

This report presents the current assessment of water quality conditions in the Narragansett and Mount Hope Bay Watersheds. The assessments are based on information researched and developed by the Massachusetts Department of Environmental Protection (MassDEP) through the first three years (information gathering, monitoring, and assessment) of the five-year cycle (Figure 6) as well as more recent data collected in the watershed in partial fulfillment of MassDEP's federal mandate to report on the status of the Commonwealth's waters under the CWA. Appendix B provides a summary of fish toxics monitoring conducted in North Watuppa Pond. Appendix C contains brief information on the Water Management Act (WMA) and National Pollutant Discharge Elimination System (NPDES) permittees in these watersheds.

MASSACHUSETTS INTEGRATED LIST OF WATERS

Section 305(b) of the CWA defines the process whereby states monitor and assess the quality of their surface and groundwater and report on the status of those waters every two years. Section 303(d) of the CWA requires states to periodically identify and list those waterbodies for which existing controls on point and nonpoint sources of pollutants are not stringent enough to attain or maintain compliance with applicable surface water quality standards. Through the year 2000 the MassDEP fulfilled the 305(b) and 303(d) reporting requirements in two completely separate documents. In 2001 the EPA released guidance that provided states with the option of preparing a single Integrated List of Waters to be submitted that would meet the reporting requirements of both sections 305(b) and 303(d) of the CWA.

The Massachusetts Year 2006 Integrated List of Waters was approved by the EPA in September 2007 (MassDEP 2007). In that report each waterbody segment was placed in one of five major categories. Category 1 included those waters that were meeting all designated uses. No Massachusetts waters were listed in Category 1 because a statewide health advisory pertaining to the consumption of fish precludes any waters from being in full support of the fish consumption use. Waters listed in Category 2 were found to support some of the uses for which they were assessed but other uses were not assessed. Category 3 contained those waters for which insufficient or no information was available to assess any uses.

Waters exhibiting impairment for one or more uses were placed in either Category 4 (impaired but not requiring a TMDL) or Category 5 (impaired and requiring one or more TMDLs) according to the EPA guidance. Category 4 was further divided into three sub-categories – 4A, 4B and 4C – depending upon the reason that TMDLs were not needed. Category 4A included waters for which the required TMDL(s) had already been completed and approved by the EPA. However, since segments could only appear in one-category waters that had an approved TMDL for some pollutants, but not others, remained in Category 5. Category 4B was to include waters for which other pollution control requirements were reasonably expected to result in the attainment of the designated use before the next listing cycle (i.e., 2008). Because of the uncertainty related to making predictions about conditions in the future the MassDEP made a decision not to utilize Category 4B in the 2006 Integrated List. Finally, waters impaired by factors, such as flow modification or habitat alteration, that are not subjected to TMDL calculations because the impairment is not related to one or more pollutants were included in Category 4C.

The individual segment assessments provide the 2006 Integrated List category and causes of impairment for each segment and whether there is a TMDL.

DESCRIPTION OF NARRAGANSETT AND MOUNT HOPE BAY WATERSHEDS

The Narragansett and Mount Hope Bay Watersheds are located in southeastern Massachusetts and a small portion of eastern Rhode Island (Figure 7). Mount Hope Bay is an estuary of the larger Narragansett Bay. The Massachusetts portion of the Narragansett and Mount Hope Bay Watersheds includes an area of approximately 112 square miles, encompasses all or part of eight municipalities (Attleboro, Dighton, Fall River, Rehoboth, Seekonk, Somerset, Swansea, and Westport) and lies entirely within Bristol County. The greater Narragansett Bay drainage area is fed by the Blackstone River and Ten Mile River Watersheds to the northwest and the larger Taunton River Watershed to the northeast.

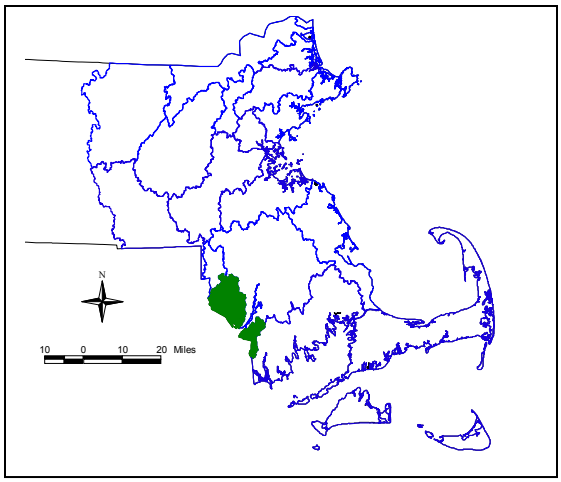


Figure 7. Location of Narragansett and Mount Hope Bay Watersheds.

The Mount Hope Bay estuary forms the northeast arm of Narragansett Bay. The Taunton River Basin also contributes fresh water to the Bay and drains a large watershed area extending through southeastern Massachusetts. The Massachusetts portion of the Mount Hope Bay Watershed drains an area of approximately 55.84 mi^2. Mount Hope Bay has a long history as a productive fishing ground for many important species, especially flounder, lobster and shellfish. The National Oceanic and Atmospheric Administration (NOAA) has designated this Bay as an Essential Fish Habitat for its function as a spawning/nursery area for many marine species.

In Massachusetts the subwatersheds of five rivers drain into Narragansett Bay. From the east to the west, these rivers are the Lees, Cole and Kickamuit – that drain into Mount Hope Bay; the Palmer – that drains into the Warren River in Rhode Island; and the Runnins – that drains into the Barrington River. The greater Narragansett Bay is approximately 25 miles long, 10 miles wide, has a surface area of 147 mi^2 and approximately 256 miles of shoreline (Save the Bay undated). Narragansett Bay has an average depth of 26 feet and a maximum depth of 184 feet. Daily freshwater input to the Bay is approximately 2.1 billion gallons. Sixty percent of the Narragansett Bay Watershed is located in Massachusetts and 40% is in Rhode Island. In 1987, the EPA designated the Narragansett Bay Estuary as an "Estuary of National Significance".

Twenty-seven streams in the Massachusetts portion of the Narragansett/Mount Hope Bay Watershed have been assigned Stream and River Inventory System (SARIS) code numbers under the Massachusetts Stream Classification Program. The rivers of this region are surrounded by low ridges and some prominent heights (200 feet above sea level) and generally flow in a southerly direction. Twenty-eight lakes have been assigned Pond and Lake Information System (PALIS) code numbers in the Massachusetts portion of the Narragansett/Mount Hope Bay Watershed. Two lakes are larger than 1,000 acres; North Watuppa Pond (1,700 acres) in Fall River and South Watuppa Pond (1,283 acres) in Westport. These two lakes account for 72% of the total surface area of lakes in the watershed (total acreage of all lakes is 4,164 acres).

The city of Fall River is the largest urban center within the Narragansett/Mount Hope Watershed (Population: 91,938 - 2000 US Census). The Quequechan River, named by the Wampanoag, runs through the City of Fall River. The word "Quequechan" translates to "Falling Water" and is the root of the city's name. The presence of waterpower and a seaport made Fall River a leader in textile production and distribution during the Industrial Revolution. Local granite quarries supplied the stone used in construction of many of the landmark buildings of this period. At its peak, in the 1910's, the city was home to more than 100 cotton mills. Today, the industrial profile of the city is much more diverse and the Port of Fall River is second only to Boston in terms of cargo volume.

According to the Narragansett Bay Estuary Program (NBEP), "*In southeastern Massachusetts, the amount of developed land is increasing at a rate of 4.1 % a year to accommodate a population growth of 1.6 %. One-third of that area's open space and agricultural lands have been lost over the past thirty years. In the past thirty years, the populations of the region's three largest cities have increased by only 3.6 %, but the rest of the region has seen population grow by 80.9 %. Adding to the growth pressure on Massachusetts watershed communities, one billion dollars in new transportation improvements are scheduled for construction (rail line extensions and expansion projects for Rte. 44, Rte. 3, and Rte. 24).*" (NBEP 2008).

OBJECTIVES

This report summarizes information generated in the Narragansett and Mount Hope Bay Watersheds since the last water quality assessment report that was published in January 2002 (Weinstein *et al.* 2002). The methodology used to assess the status of water quality conditions of rivers, estuaries and lakes in accordance with EPA's and MassDEP's use assessment methods is provided in Appendix A. Fish toxics monitoring data for North Watuppa Pond are provided in Appendix B. Appendix C provides a summary of Water Management Act (WMA) registration/permit holders and National Pollutant Discharge Elimination System (NPDES) permittees in the Narragansett and Mount Hope Bay Watersheds.

Not all waters in the Narragansett and Mount Hope Bay Watersheds are included in the MassDEP/EPA databases (either the waterbody system database -- WBS, or the newer assessment database – ADB) or this report.

The objectives of this water quality assessment report are as follows.

1. evaluate whether or not surface waters in the Narragansett and Mount Hope Bay Watersheds, defined as segments in the MassDEP/EPA databases, currently support their designated uses (i.e., meet Massachusetts Surface Water Quality Standards),
2. identify water withdrawals (habitat quality/water quantity) and/or major point (e.g., wastewater discharges, storm sewer system) and non-point (e.g., land-use practices, overland runoff, etc.) sources of pollution that may impair water quality conditions,
3. identify the presence or absence of any non-native macrophyte(s) in lakes,
4. identify waters (or segments) of concern that require additional data to fully assess water quality conditions,
5. recommend additional monitoring needs and/or remediation actions in order to better determine the level of impairment or to improve/restore water quality, and
6. provide information for the development of an action plan.

NARRAGANSETT BAY WATERSHED

RUNNINS RIVER (SEGMENT MA53-01)
Location: Route 44, Seekonk to Mobile Dam, Seekonk, MA/East Providence, RI (through Burrs Pond formerly segment MA53001)
Segment Area: 3.7 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to metals, nutrients, organic enrichment/low DO, pathogens, oil and grease, objectionable deposits (non-pollutant), and unknown causes (MassDEP 2007).

Note: Burrs Pond in Seekonk (formerly reported as segment MA53001) has an estimated retention time of approximately 2 days with a 1cfs flow. Burrs Pond is on the Massachusetts Year 2006 Integrated List of Waters – Category 4b, "Waters Expected to Attain all Designated Uses through Pollution Control Measures other than TMDL's" due to metals (MassDEP 2007).

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Four Town Farm, Inc., Seekonk (42626501) The farm is located downstream from this segment of the Runnins River.
NPDES (See Appendix C, Table C3)
Seekonk MAR041156

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Runnins River has three obstructions to fish passage along its relatively short course from wetlands in Seekonk to the Barrington River estuary. From upstream to downstream these dams include an Old Grist Mill Pond dam and Burr Pond dam (neither of which are equipped with fish passage and the cost of fishway installation isn't justified by the potential spawning area), and the Mobil dam (Reback *et al*. 2004). The most downstream obstruction, the Mobil Dam, is on the Massachusetts/Rhode Island border and situated at the upper end of the Barrington River. This dam is within the influence of tidal fluctuations and is passable at higher tidal stages. A notch in the dam crest is currently blocked with a metal plate. Replacing this with wooden stop logs or a smaller plate to lower the notch invert would allow passage under a greater range of tailwater elevations (Reback *et al*. 2004).

Biology
According to DMF, river herring and possibly shad are currently utilizing the lower sections of the Runnins River (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed (too little data). This use is identified with an Alert Status because of the impediments to fish passage.

Fish Consumption
Fish were collected from Burrs Pond (former segment MA53001) in 1999 and the edible fillets were analyzed for metals (As, Cd, Hg, Pb, Se), PCBs, and organochlorine pesticides (Maietta 2007). Due to the presence of elevated mercury in largemouth bass, MA DPH issued the following advisory (MDPH 2006) recommending:

> *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming largemouth bass from Burrs Pond" and "The general public should limit consumption of largemouth bass to two meals per month."*

Because of the site-specific fish consumption advisory for Burrs Pond due to mercury contamination, the *Fish Consumption Use* is assessed as impaired in the 0.2 mile reach through the Pond. The rest of the segment is not assessed for the *Fish Consumption Use*.

RUNNINS RIVER (MA53-01) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		IMPAIRED 0.2 mile reach through Burrs Pond Cause: Mercury in fish tissue Source: Atmospheric deposition – toxics NOT ASSESSED 3.5 miles
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

*Alert Status issue identified, see details in use assessment

RECOMMENDATIONS

Since river herring and possibly shad are currently utilizing the lower sections of the stream, the owner of Mobil Dam should be approached with suggestions for altering the crest notch configuration (Reback *et al*. 2004).

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Conduct water quality monitoring (physico-chemical and bacteria) to evaluate the status of the *Aquatic Life*, *Recreational*, and *Aesthetics* uses.

BAD LUCK BROOK (SEGMENT MA53-11)

Location: Headwaters, outlet Warren Upper Reservoir, Rehoboth to confluence with East Branch Palmer River, Rehoboth
Segment Area: 1.7 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Bristol County Water Authority (42624705)

USE ASSESSMENT
Aquatic Life
Habitat and Flow
There are two obstructions to fish passage along Bad Luck Brook, the Upper Warren Reservoir Dam and Bad Luck Brook Dam. The reservoir, which offers a substantial potential spawning area, is owned by the Anawan Club and leased to the Bristol County Water Authority for an auxiliary water supply (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed (too little data). This use is identified with an Alert Status because of the impediments to fish passage.

BAD LUCK BROOK (MA53-11) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

*Alert Status issue identified, see details in use assessment

RECOMMENDATIONS
The need to improve passage at the Village Dam on the East Branch Palmer River, install fishways at a private dam on County Street (Bad Luck Brook Dam), and at the Upper Warren Reservoir Dam, in addition to insuring outflow from the reservoir during migration periods, make development of this system difficult and costly despite the substantial potential spawning area (Reback *et al*. 2004).

Conduct water quality monitoring (physico-chemical and bacteria) to evaluate the status of the *Aquatic Life*, *Recreational* and *Aesthetics* uses.

EAST BRANCH PALMER RIVER (SEGMENT MA53-08)

Location: Headwaters, near Stevens Corner Cemetery, Rehoboth to confluence with West Branch Palmer River (forming Palmer River), Rehoboth
Segment Area: 7.2 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152

USE ASSESSMENT
Aquatic Life
Habitat and Flow
There is one obstruction to fish passage along the East Branch Palmer River. Village Dam at Bay State Road may be passable under some flow conditions due to a bypass channel on its east side (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed (too little data). This use is identified with an Alert Status because of the impediments to fish passage.

EAST BRANCH PALMER RIVER (MA53-08) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

*Alert Status issue identified, see details in use assessment.

RECOMMENDATIONS
According to DMF there is little spawning habitat available above Village Dam at Bay State Road and further development is a low priority (Reback *et al*. 2004). However, if passage into the substantial potential spawning area of Upper Warren Reservoir ever ensues, passage at Village Dam will need to be improved.

Conduct water quality monitoring (physico-chemical and bacteria) to evaluate the status of the *Aquatic Life*, *Recreational* and *Aesthetics* uses.

WEST BRANCH PALMER RIVER (SEGMENT MA53-07)

Location: From confluence of Bliss Brook, Rehoboth to confluence with East Branch Palmer River (forming Palmer River), Rehoboth
Segment Area: 3.8 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2, "Attaining Some Uses; Other Uses Not Assessed" Attained uses include *Primary Contact*, *Secondary Contact*, And *Aesthetics* (MassDEP 2007). This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152
Attleboro MAR041087

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Perryville Dam is the one obstruction to fish passage on the West Branch Palmer River. According to DMF there is little value in providing fish passage at the Perryville Dam due to the lack of significant upstream habitat (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed (too little data).

WEST BRANCH PALMER RIVER (MA53-07) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

PALMER RIVER (SEGMENT MA53-04)

Location: From confluence of East and West Branches of the Palmer River, Rehoboth to the Shad Factory Pond dam, Rehoboth
Segment Area: 5.6 miles
Classification: B, Cold Water Fishery; Shad Factory Pond (also known as Shad Factory Pond Reservoir) is also a Treated Water Supply for the Bristol County Water Authority in Rhode Island

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to nutrients, pathogens, and flow alteration (non-pollutant) (MassDEP 2007). This waterbody is now covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Crestwood Country Club, Rehoboth (42624704)
Bristol County Water Authority (42624705)

NPDES (See Appendix C, Table C3)
Rehoboth MAR041152
Seekonk MAR041156

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The new fishway at Shad Factory Pond Dam was completed in December 2007 after seven years of planning, design, and fundraising (Save The Bay 2007).

Low flows have been raised as a concern for the Palmer River from the confluence of the East and West Branches of the Palmer River to Route 6 in Rehoboth by the Narragansett Bay Estuary Program (NBEP 2008).

Biology
The Palmer River supports one of the few small stream American shad (*Alosa sapidissima*) fisheries in the Commonwealth and the only one south of Cape Cod. In addition, an increasingly important river herring (*Alosa* sp.) fishery exists here as do rainbow smelt (*Osmerus mordax*) and white perch (*Morone americana*) populations. While herring utilize the fishway to spawn above the Shad Factory Pond dam, the other species successfully spawn in the section of river below the dam.

Too limited data are available so the *Aquatic Life Use* in not assessed.

PALMER RIVER (MA53-04) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring (fish counts and observations) should be conducted to evaluate the success of the new fish ladder at Shad Factory Pond.

Flow monitoring should be conducted to define NBEP concerns about low flows.

RUMNEY MARSH BROOK (SEGMENT MA53-09)

Location: Headwaters, east of Locust Avenue, Rehoboth to confluence with Beaverdam Brook, Rehoboth
Segment Area: 1.3 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152

USE ASSESSMENT
No data are available so all uses are not assessed.

RUMNEY MARSH BROOK (MA53-09) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

BEAVERDAM BROOK (SEGMENT MA53-10)

Location: Headwaters, southeast of Chestnut Street, Rehoboth to confluence with Palmer River, Rehoboth
Segment Area: 2.9 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152

USE ASSESSMENT
No data are available so all uses are not assessed.

BEAVERDAM BROOK (MA53-10) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

FULLERS BROOK (SEGMENT MA53-12)

Location: Headwaters in wetland north of Jacobs Street, Seekonk to confluence with Palmer River, Rehoboth
Segment Area: 1.7 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Seekonk MAR041156
Rehoboth MAR041152

USE ASSESSMENT
No data are available so all uses are not assessed.

FULLERS BROOK (MA53-12) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

CLEAR RUN BROOK (SEGMENT MA53-13)

Location: Headwaters, outlet unnamed pond northwest of Miller Street, Seekonk to confluence with Palmer River, Rehoboth
Segment Length: 1.6 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 4a, "TMDL is Completed" due to pathogens (MassDEP 2007). This waterbody is now covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152
Seekonk MAR041156

USE ASSESSMENT
Primary and Secondary Contact Recreation and Aesthetics
Bacteria source tracking work was conducted in Clear Run Brook in 2006 (Sheppard and Meek 2007). From upstream to downstream three locations were sampled:

CR01 - Below pond at Miller Street crossing nearest Fieldwood Avenue, Seekonk
CR02 - Miller Street crossing (nearest the Rehoboth town line), Seekonk
CR03 - Providence Street, Rehoboth

Table 12. *E. coli* concentrations in the Clear Run Brook Watershed (MPN/100ml) (Sheppard and Meek 2007).

Site ID	5/11/2006	6/8/2006	7/18/2006	8/3/2006	8/21/2006	9/25/06	geomean calc
CR01	28.5	>2419.6	68.9	24.3	45.7	137.4	94.78061
CR02[a]	365.4	>2419.6	1553.1	1986.3	613.1	579.4	994.7433
CR03	131.4	>2419.6	770.1	1203.9	488.4	248.9	574.1775
UN01CR01	195.6	>2419.6	123.4	*NS*	151.5	107.6	248.7313

a: Negative Optical Brightener Pads on 9/12/2006
NS: Not sampled on this day
= Dry Weather Conditions

Screening level bacteria data indicates one or more dry and wet weather sources of bacteria in the Clear Run Brook watershed between sites CR01 and CR02 (Table12). The increase in bacteria concentrations between CR01 and CR02 during dry weather was not tracked to any specific source(s). Due to the lack of storm drains and septic systems located adjacent to the brook, agriculture practices and wildlife appear to be the most likely sources. The dominant land use in this section of the watershed is cropland and forest. Cows were observed in the field southwest (upstream) of Miller Street and site CR02.

No objectionable odors were noted in Clear Run Brook at any of the three bacteria source tracking sampling locations on any of the surveys (11 May, 8 June, 18 July, 3 and 21 August and 25 September 2006 (MassDEP 2006a). The brook was noted as being either clear or slightly turbid with the exception of CR02 in September when it was described as moderately turbid. No objectionable growths of aquatic plants were observed at the most upstream sampling location and while dense/very dense growths were noted downstream (both sampling locations CR02 and CR03) these conditions are considered to be naturally occurring associated with the low gradient nature of this brook.

The *Primary* and *Secondary Contact Recreational* uses are not assessed since data validation procedures still need to be conducted on the *E. coli* dataset. These uses are both identified with an alert status, however, because of reportedly elevated *E. coli* bacteria in Clear Run Brook (Sheppard and Meek 2007). Although specific source(s) were not identified, agriculture practices (cows) appear to be the most likely source. The *Aesthetics Use* is assessed as support.

CLEAR RUN BROOK (MA53-13) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		
Aesthetics		SUPPORT

*Alert Status issues identified, see details in use assessment

RECOMMENDATIONS

Implement recommendations of Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004) that are appropriate to Clear Run Brook.

Data validation procedures should be conducted for the bacteria source tracking work conducted in 2006.

Conduct water quality monitoring (physico-chemical and bacteria) to evaluate the status of the *Aquatic Life*, *Recreational* and *Aesthetics* uses.

PALMER RIVER (SEGMENT MA53-05)

Location: From Shad Factory Pond dam, Rehoboth to the Route 6 bridge, Rehoboth
Segment Area: 0.09 square miles
Classification: SB

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to pathogens (MassDEP 2007). This waterbody is now covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152
Seekonk MAR041156

USE ASSESSMENT
Aquatic Life
Habitat and Flow
Low flows have been raised as a concern for the Palmer River from the confluence of the East and West Branches of the Palmer River to Route 6 in Rehoboth by the Narragansett Bay Estuary Program (NBEP 2008). Contributing to the low flow in this segment is the inter-basin transfer of water out of Shad Factory Pond (Segment MA53-04) to Kickemuit Reservoir in Warren, RI, where it is used by the Bristol County Water Authority.

Too limited data are available so the *Aquatic Life Use* in not assessed. This use is identified with an Alert Status however because of low flow concerns.

Shellfishing
DMF Shellfishing status of July 2000 indicates that area MHB5.0, which comprises this segment, is prohibited for shellfishing. No changes to the status have been made (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing area is prohibited.

PALMER RIVER (MA53-05) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Total fecal coliform Source: Unknown
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

*Alert Status issues identified, see details in use assessment.

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Evaluate stream flow/habitat conditions to assess the *Aquatic Life Use* and low flow concerns.

OAK SWAMP BROOK (SEGMENT MA53-15)

Location: Headwaters in Oak Swamp east of School Street, Rehoboth to confluence with Rocky Run, Rehoboth
Segment Length: 3.0 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152
Swansea MAR041163

USE ASSESSMENT
No data are available so all uses are not assessed.

OAK SWAMP BROOK (MA53-15) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

ROCKY RUN (SEGMENT MA53-16)

Location: Headwaters in wetland east of Simmonds Street, Rehoboth to approximately 0.1 mile east of Mason Street, Rehoboth
Segment Length: 8.6 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 4a, "TMDL is Completed" due to pathogens (MassDEP 2007). This waterbody is now covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Swansea Water District (9P42629201/42629201)

NPDES (See Appendix C, Tables C2 and C3)
Vinnicum Wellfield Pilot Testing Program (MAG640073)
Rehoboth MAR041152
Swansea MAR041163

USE ASSESSMENT
Aquatic Life
Habitat and Flow
There are no obstructions to fish passage along Rocky Run (Reback *et al*. 2004).

Biology
River herring and rainbow smelt have been observed in Rocky Run; however no significant spawning area exists for either species (Reback *et al*. 2004).

Too limited data are available so the *Aquatic Life Use* is not assessed.

ROCKY RUN (MA53-16) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

ROCKY RUN (SEGMENT MA53-18)

Location: Approximately 0.1 mile east of Mason Street, Rehoboth to confluence with Palmer River, Rehoboth
Segment Area: 0.002 square miles
Classification: SA

This is a new segment so does not appear on the Massachusetts Year 2006 Integrated List of Waters.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
Vinnicum Wellfield Pilot Testing Program (MAG640073)
NPDES (See Appendix C, Table C3)
Rehoboth MAR041152
Swansea MAR041163

USE ASSESSMENT
Aquatic Life
Habitat and Flow
There are no obstructions to fish passage along Rocky Run (Reback *et al*. 2004).

Biology
River herring and rainbow smelt have been observed in Rocky Run; however no significant spawning area exists for either species (Reback *et al*. 2004).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Shellfishing
DMF shellfishing status of July 2000 indicates that area MHB5.0, which comprises the lower part of this segment, is prohibited. No changes to the status have been made (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing area is prohibited.

ROCKY RUN (MA53-18) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Total fecal coliform Source: Unknown
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Monitoring to evaluate designated uses.

TORREY CREEK (SEGMENT MA53-14)

Location: Headwaters in wetland east of Benson Avenue, Seekonk to Barney Avenue, Rehoboth (includes culverted section near Seekonk Speedway, Seekonk)
Segment Area: 2.1 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007). Historically, limited bacteria sampling in this brook showed levels of concern. This waterbody is covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Seekonk MAR041156

USE ASSESSMENT
No data are available so all uses are not assessed.

Torrey Creek (MA53-14) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

TORREY CREEK (SEGMENT MA53-17)

Location: From Barney Avenue, Rehoboth to confluence with Palmer River, Rehoboth
Segment Area: 0.004 square miles
Classification: SA

This is a new segment so does not appear in the Massachusetts Year 2006 Integrated List of Waters.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Seekonk MAR041156

USE ASSESSMENT
Shellfishing
DMF shellfishing status of July 2000 indicates that area MHB5.0, which comprises the lower part of this segment area, is prohibited. No changes to the status have been made (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing area is prohibited.

Torrey Creek (MA53-17) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Total fecal coliform Source: Unknown
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Monitoring to evaluate designated uses.

PALMER RIVER (SEGMENT MA53-03)

Location: From Route 6 bridge, Rehoboth to state line, Swansea, MA/Barrington, RI
Segment Area: 0.11 square miles
Classification: SB

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to pathogens (MassDEP 2007). This waterbody is now covered under the Palmer River TMDL for Bacteria (Murphy 2004 and MassDEP 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Swansea Water District (MA0103390)
NPDES (See Appendix C, Table C3)
Seekonk MAR041156
Swansea MAR041163

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Swansea Desalination Project is being constructed now and probably will be operational in 2009. The Swansea desalination plant will siphon brackish water from the Palmer River just north of the Miles "Bungtown" Bridge to the Mason Barney site. There will be a total of two pipes leading to and from the desalination plant. A 16" pipe will send water traveling from the Palmer River to the plant for treatment and a 20" pipe will take the briny water back to the Palmer River (BlueWave Strategies 2008).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Shellfishing
DMF shellfish status of July 2000 indicates that area MHB5.0, which comprises this segment area, is prohibited. No changes to the status have been made (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing area is prohibited.

PALMER RIVER (MA53-03) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: Unknown
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Monitoring to evaluate designated uses.

WARREN RIVER POND (SEGMENT MA53-06)

Location: Salt pond, Swansea on MA/RI border (portion in MA only)
Segment Area: 0.06 square miles
Classification: SA

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to pathogens (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Palmer River Golf Club, Inc. (9P42629202)
NPDES (See Appendix C, Table C3)
Swansea MAR041163

USE ASSESSMENT
Shellfishing
DMF shellfish status of July 2000 indicates that area MHB5.0, which comprises this segment area, is prohibited. No changes to the status have been made (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing area is prohibited.

WARREN RIVER POND (MA53-06) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: Unknown
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Monitoring to evaluate designated uses.

MOUNT HOPE BAY WATERSHED

KICKAMUIT RIVER (SEGMENT MA61-08)

Location: Outlet Warren Reservoir, Swansea to state line, Swansea, MA/Warren, RI
Segment Area: 2.8 miles
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to pathogens (MassDEP 2007). This waterbody is now covered under the Kickamuit River TMDL for Bacteria (Murphy 2006 and RI DEM 2006).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Bristol County Water Authority (42624705)
Swansea Water District (9P42629201/42629201)

NPDES (See Appendix C, Table C3)
Swansea MAR041163

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Warren Reservoir Dam impedes fish passage into Warren Reservoir. No outflow other than seepage through the dam was observed by DMF personnel at the time of their survey suggesting that potential for development of a river herring population (Warren Reservoir is the only spawning area in the Massachusetts portion of the watershed) is severely limited (Reback *et al*. 2004). The Bristol County Water Authority (BCWA) uses it as an auxiliary water supply.

Note: There are two other obstructions to fish passage downstream from this segment of the Kickamuit River in RI. A small dam owned by BCWA is located at the head of the tide in Warren. River herring have been reported to the base of this dam. A fishway is planned for this location and a conceptual design has been developed. The second obstruction in RI is at a second dam, also owned by BCWA, and is located at the upper reaches of the first impoundment. A 48-inch diameter culvert is equipped with a clapper valve and may be impassable to fish (Reback *et al*. 2004).

The *Aquatic Life Use* is not assessed (too little data). This use is identified with an Alert Status because of the impediments to fish passage.

KICKAMUIT RIVER (MA61-08) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED*
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

*Alert Status issue identified, see details in use assessment.

RECOMMENDATIONS
Support efforts to improve fish passage in this river system.

Monitoring to evaluate designated uses.

COLE RIVER (SEGMENT MA61-03)

Location: Wood Street, Swansea to Route 6, Swansea
Segment Area: 1.6 miles
Classification: B, Warm Water Fishery

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 2, "Attaining Some Uses; Other Uses Not Assessed" Uses attained include secondary contact (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY

WMA (See Appendix C, Table C1)

M R Souza & Bros Farms (42624702) (upper subwatershed area)
Dighton Water District (42607601) (upper subwatershed area)
Swansea Water District (9P42629201/42629201)
Somerset Power, LLC (42627301)

NPDES (See Appendix C, Table C3)

Swansea MAR041163

USE ASSESSMENT

Aquatic Life

Habitat and Flow

There are two obstructions to fish passage along this segment of the Cole River. The upstream dam, the Milford Pond dam, is not equipped with any fish passage structures. The second dam, the Route 6 Dam is equipped with a notched weir-pool fishway, however fish passage at this location is inefficient. Deposited material and rooted vegetation in the tailwater area have eliminated any defined channel and most spillway flow is directed to the side of the stream opposite the ladder. With the resulting lack of attraction to the entrance, few fish actually ascend the ladder. In addition, the ladder design is inefficient and compounds the problem (Reback *et al*. 2004).

Biology

The Cole River supports a small river herring population and some smelt spawning has been observed below the Route 6 Dam owned by the Montaup Electric Company (Reback *et al*. 2004).

The *Aquatic Life Use* for this segment of the Cole River is assessed as impaired because of the impediment to anadromous fish passage because of the poor condition and/or design of the fish passage facilities.

COLE RIVER (MA61-03) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Inefficient/degraded fish passage Source: Hydrostructure impacts on fish passage
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Efforts to improve fish passage at the first dam on the Coles River should continue. A channel from the main stream to the ladder entrance should be established and the suggestions to modify the dam crest to direct flow to the fishway side of the spillway should be followed. Consideration should be given to upgrading the existing ladder through step modification or lining the existing weir-pool with an aluminum steeppass fishway (Reback *et al*. 2004).

Consideration should be given to construction of passage facilities at the Milford Pond dam which creates a relative large impoundment that could significantly increase available habitat after fish passage efficiencies are improved at Montaups Route 6 Dam (Reback *et al*. 2004).

Conduct water quality monitoring (physico-chemical and bacteria) to evaluate the status of the *Aquatic Life*, *Recreational* and *Aesthetics* uses.

COLE RIVER (SEGMENT MA61-04)

Location: Route 6, Swansea to the mouth at Mount Hope Bay at old railway grade, Swansea
Segment Area: 0.31 square miles
Classification: SA

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to nutrients, organic enrichment/low DO, and pathogens (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Swansea MAR041163

USE ASSESSMENT

Aquatic Life

Biology

MassDEP's Wetlands Conservancy Program (WCP) identified the presence of potential eelgrass (confidence indicated as low) in this segment of the Cole River from historic 1951 black and white aerial photography (Costello 2003). In 1951 there were seven areas of eelgrass along much of the shoreline in this segment of the Cole River comprising approximately 36% of the segment area. In 2000 MassDEP WCP performed extensive field surveys but no eelgrass was found (Costello 2008).

Water Chemistry

One water quality monitoring station (MHB6) located north of the railroad grade was sampled between 2003 and 2006 as part of the 604(b) project Water Quality Monitoring Program for the Mount Hope Bay Embayment System (Howes and Samimy 2007). Sample collections were timed to occur during the last three hours of an outgoing tide. The mean tide water depth at MHB6 at slack outgoing tide is 4.5 m (Howes and Samimy 2006).

The concentration of dissolved oxygen measured in the Cole River at three depths (surface, mid, and bottom) north of the railroad grade (Station MHB6) reported by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) ranged from 4.69 to 10.58 mg/L (n=46) (Howes and Samimy 2007). Eighteen (18) of 46 measurements (39%) were less than 6.0 mg/L, the water quality criterion for SA waters (MassDEP 2006c). The concentration of total nitrogen ranged from 0.38 to 1.09 mg/L (n=51 samples). Approximately 67% (34 out of 51) of the measurements exceeded 0.5 mg/L total nitrogen, a recommended long-term average total nitrogen threshold guideline developed by the Massachusetts Estuaries Project (Howes *et al.* 2003). Chlorophyll *a* concentrations ranged from 3.47 to 26.42 µg/L (n=51) with approximately 35% of the measurements above 10 µg/L. Secchi disk measurements ranged from 1.15 to 2.6 m (n=16).

The *Aquatic Life Use* for this segment of the Coles River is assessed as impaired based primarily on the evidence of enrichment (i.e., frequency of low dissolved oxygen, elevated concentrations of total nitrogen and elevated chlorophyll a concentrations).

Shellfishing

This segment area contains two DMF shellfish growing areas, MHB4.1 in the lower part of the segment and MHB4.2 in the upper part of the segment. The DMF shellfishing status of July 2000 indicates that area MHB4.2 is prohibited. No changes to the status have been made (Sawyer 2008). The DMF shellfishing status of July 2000 indicates that area MHB4.1 is a restricted area. This area's status was downgraded to prohibited status in September 2003 (Sawyer 2008). DMF identified the major sources of pollution including failed septic systems, and stormwater related runoff (Metcalf & Eddy 2005). One specific location among several areas identified by DMF as contributing to the poor water quality conditions was a 14" stormdrain with a flapper valve located at the Compton's Corner Park. In 2002 the town of Swansea applied for and received funding from the MassDEP under the 604(b) grant program to investigate the area contributing to this stormdrain (Metcalf & Eddy 2005). Generally good water quality conditions were found during limited sampling conducted in 2004 and 2005. There was no evidence of illegal or illicit connections to the stormdrain system during the investigations, although sewage odors and unusual pipes were noted at several locations (Metcalf & Eddy 2005).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing areas are prohibited.

COLE RIVER (MA61-04) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen, elevated total nitrogen, elevated chlorophyll *a* Source: Unknown (Suspected sources: discharges from municipal separate storm sewer systems, limited tidal circulation/flushing)
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: General urban stormwater, discharges from municipal separate storm sewer systems, failing septic systems, illicit connections to storm sewers
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Conduct additional biological monitoring (e.g., benthic infaunal surveys) and hydrologic studies (as needed) to provide additional information to utilize in the Massachusetts Estuaries Program. Develop site specific criteria appropriate to protecting and restoring the health of the Cole River estuary.

Determine whether or not improvements can be made to increase tidal circulation/flushing.

The Town of Swansea should implement recommendations for the Compton's Corner area in Metcalf & Eddy (2005).

LEWIN BROOK POND (SEGMENT MA61011)

Location: Swansea
Segment Area: 11 acres
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 4b, "Waters Expected to Attain All Designated Uses through Pollution Control Measures other than TMDL's" Due to metals (MassDEP 2007).

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Swansea MAR041163

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Lewin Brook Pond Dam, owned by Montaup Electric Company, obstructs fish passage to this waterbody (Reback *et al*. 2004).

Biology
There are no reports of any non-native aquatic macrophytes in this waterbody (McVoy 2008).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Fish Consumption
Fish collected from the Lewin Brook Impoundment in 1999 were analyzed for As, Cd, Hg, Pb, Se, PCBs, and organochlorine pesticides (Maietta 2007). Largemouth bass and black crappie were found to have elevated levels of mercury so MDPH issued the following advisory (MDPH 2006) recommending:

> *"Children under 12 years of age, pregnant women, nursing mothers, and women of childbearing age who may become pregnant should refrain from consuming largemouth bass and black crappie from Lewin Brook Impoundment" and "The general public should limit consumption of largemouth bass and black crappie to two meals per month."*

Because of the site-specific fish consumption advisory for Lewin Brook Impoundment due to mercury contamination, the *Fish Consumption Use* is assessed as impaired.

LEWIN BROOK POND (MA61011) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		IMPAIRED Cause: Elevated mercury in fish tissue Source: Atmospheric deposition – toxics
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Continue to conduct fish toxics monitoring for Hg to evaluate changes and success of TMDL.

Monitoring to evaluate designated uses.

LEE RIVER (SEGMENT MA61-01)

Location: From confluence with Lewin Brook, Swansea to Route 6, Swansea/Somerset
Segment Area: 0.02 square miles
Classification: SA

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to nutrients, organic enrichment/low DO, and pathogens (MassDEP 2007).

NOTE: Two dams on Lewin Brook, a tributary to the Lee River, obstruct fish passage on this stream. The dams, Lewin Brook Pond Dam and the Swan Finishing Dam, are both owned by Montaup Electric Company. According to DMF, there is a combined potential habitat of 16 impounded acres so restoration in this system is given a low priority due to the cost of providing fish passage over these relatively high dams (Reback *et al*. 2004).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Swansea MAR041163
Somerset MAR041159

USE ASSESSMENT
Shellfishing
DMF shellfishing status of July 2000 indicates that area MHB3.2, which comprises this segment, is prohibited. No changes to the status have been made (Sawyer 2008).

The Shellfish Harvesting Use is assessed as impaired because the shellfish growing area is prohibited.

LEE RIVER (MA61-01) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: Unknown
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

LEE RIVER (SEGMENT MA61-02)

Location: Route 6, Swansea/Somerset to mouth at Mount Hope Bay, Swansea/Somerset
Segment Area: 0.51 square miles
Classification: SA

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" due to pathogens, odor/taste/color, noxious aquatic plants, and objectionable deposits (non-pollutant) (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Table C3)
Swansea MAR041163
Somerset MAR041159

USE ASSESSMENT

Aquatic Life

Biology

MassDEP's Wetlands Conservancy Program (WCP) identified the presence of potential eelgrass (confidence indicated as low) in this segment of the Lee River from historic 1951 black and white aerial photography (Costello 2003). In 1951 there were eight areas of eelgrass south of the Route 6 bridge and north of Long Point in Somerset in this segment of the Lee River (three of these areas were in Fox Hill Cove) comprising approximately 6.7% of the segment area. In 2000 MassDEP WCP performed extensive field surveys but no eelgrass was found (Costello 2008).

Water Chemistry

Two water quality monitoring stations in this segment were sampled between 2003 and 2006 as part of the 604(b) project Water Quality Monitoring Program for the Mount Hope Bay Embayment System (Howes and Samimy 2007). Station MHB17 was located north of Route 195. Further out in the estuary Station MHB4 was located in the middle of the Lee River estuary between Riverview Ave in South Swansea and Brayton Point Station in Somerset. Sample collections were timed to occur during the last three hours of an outgoing tide. The mean tide water depth at MHB17and MHB4 at slack outgoing tide is 1.5 and 3.4m, respectively (Howes and Samimy 2006).

No DO measurements were taken in the Lee River north of Route 195 (Station MHB17). The concentration of dissolved oxygen measured in the Lee River at three depths (surface, mid, and bottom) further out in the estuary (Station MHB4) reported by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) ranged from 4.72 to 9.3 mg/L (n=47) (Howes and Samimy 2007). Five of 47 measurements (11%) were less than 6.0 mg/L, the water quality criterion for SA waters (MassDEP 2006c). The concentration of total nitrogen at Station MHB17 ranged from 0.5 to 1.03 mg/L (n=17 samples). Approximately 94% (16 out of 17) of the measurements exceeded 0.5 mg/L total nitrogen, a recommended long-term average total nitrogen threshold guideline developed by the Massachusetts Estuaries Project (Howes *et al.* 2003). Further out in the estuary (Station MHB4) the concentration of total nitrogen was slightly lower ranging from 0.34 to 0.78 mg/L (n=46 samples). Approximately 61% (28 out of 46) of the measurements exceeded 0.5 mg/L total nitrogen. Chlorophyll *a* concentrations at Station MHB17 ranged from 1.99 to 27.23 µg/L (n=17) with approximately 24% of the measurements above 10 µg/L. Further out in the estuary chlorophyll *a* concentrations at Station MHB4 ranged from 0.93 to 28.59 µg/L (n=46) with approximately 48% of the measurements above 10 µg/L. No Secchi disk measurements were taken at Station MHB17 but Secchi disk depths at Station MHB4 ranged from 1.1 to 2.34m (n=16).

The *Aquatic Life Use* for this segment of the Lee River is assessed as impaired based primarily on the evidence of enrichment (i.e., frequency of low dissolved oxygen, elevated concentrations of total nitrogen and elevated chlorophyll a concentrations).

Shellfishing

This segment area contains two DMF shellfish growing areas, MHB3.1 in the lower part of the segment and MHB3.2 in the upper part of the segment. The DMF shellfishing status of July 2000 indicates that area MHB3.2 is prohibited. No changes to the status have been made (Sawyer 2008). The DMF shellfishing status of July 2000 indicates that area MHB3.1 is a restricted area. This area's status was downgraded to prohibited status in September 2003 (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing areas are prohibited.

Primary and Secondary Contact Recreation and Aesthetics
The Leeside Beach at Lee River Club (at end of Sycamore Road, Swansea) is located in this segment of the Lee River (Carvalho 2008). Seven *Enterococci* bacteria samples were tested during the swimming season at Leeside Beach, Swansea in 2006. There were no reported exceedances or postings.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support based on the lack of any beach postings during the 2006 swimming season. The *Aesthetics Use* is not assessed due to the lack of data.

LEE RIVER (MA61-02) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Low dissolved oxygen, elevated total nitrogen, elevated chlorophyll *a* Source: Unknown (Suspected sources: discharges from municipal separate storm sewer systems)
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: Unknown
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Conduct a bacteria source tracking study to determine the source of bacteria causing the closure of the shellfish growing area.

Conduct additional biological monitoring (e.g., benthic infaunal surveys), to provide additional information to utilize in the Massachusetts Estuaries Program. Develop site specific criteria appropriate to protecting and restoring the health of the Lee River estuary.

MOUNT HOPE BAY (SEGMENT MA61-06)

Location: The Massachusetts portion from the Braga Bridge, Fall River/Somerset to the state border Fall River, MA/Tiverton, RI to the line from Brayton Point Somerset to the MA/RI border approximately ¾ of a mile due east of Spar Island, RI
Segment Area: 2.3 square miles
Classification: SB, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" Due to nutrients, unknown toxicity, organic enrichment/low DO, thermal modifications, and pathogens (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Tables C2 and C3)
Dominion Energy, LLC Brayton Point Station (MA0003654) intake and outfalls
http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/braytonpointfactsht2003.pdf.
Atlantic Frost Seafoods, LLC (MAG250036)
Tillotson Complex in Fall River (MA0032395)
Fall River Wastewater Treatment Plant (MA0100382) outfall and CSO outfalls
Swansea MAR041163
Somerset MAR041159
Fall River MAR041113

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Brayton Point electrogenerating station is the largest fossil-fuel electrogenerating station in New England. According to the fact sheet developed for the Brayton Point Station NPDES permit (see link above), the facility generates about 6% of the electricity consumed in New England. Each day the Station withdraws nearly one billion gallons of water from Mount Hope Bay and circulates it through the facility to condense the steam used to produce electricity. This results in the entrainment of early pelagic life stages of many organisms and the impingement of certain species on the facility's intake screens. During transit through the plant, this "cooling" water absorbs heat from the steam condensers, up to a 30°F change in the temperature of cooling water occurs in this process. Heated water is discharged to Mount Hope Bay and has been implicated in raising water temperatures beyond critical limits for certain fish species. Trillions of organisms are lost to entrainment and impingement each year, including species of commercial and recreational importance, and forage fish and other organisms integral to the food web. As of August 2008, Dominion's Brayton Point Station cooling water use has not changed from that of the last water quality assessment report (Weinstein *et al*. 2002) although the new NPDES permit calls for drastic reductions in the use of water from Mount Hope Bay for cooling.

Biology
In the last water quality assessment report reference was made to large declines in the catch rates of certain fish species including winter flounder (*Pseudopleuronectes americanus*), windowpane (*Scophthalmus aquosus*), tautog (*Tautoga onitis*) and scup (*Stenotomus chrysops*) (Weinstein *et al*. 2002). Declines in catch rates were based on bay-wide biomonitoring samples and were not specific to just this segment of Mount Hope Bay (MA61-06) but are used in the assessment of this segment. Catch-rate declines were assumed to imply population declines. As of 2006 the catch rates of the first three species have not shown substantial increases, however, catch rates of scup increased in 2000-2002, but decreased again in 2003-6 (Dominion 2007). Hogchoker (*Trinectes maculatus*) catch rates also declined in the mid-1980s and have not shown substantial increases since that time. Summer flounder (*Paralichthys dentatus)* populations have been on the rise (Dominion 2007). These fish move into near-shore areas in the warmer part of the year and overwinter in deep water. The summer flounder is more tolerant of warm water than the winter flounder and its range extends from the southern Gulf of Maine to South Carolina. Entrainment of winter flounder larvae has decreased since the early-to-mid-1990s. However, entrainment is highly correlated ($p<0.0001$) with bay-wide concentrations of winter founder larvae in Mount Hope Bay which have also decreased since that time (Dominion 2007).

Toxicity

Ambient

Survival of *Mysidopsis bahia* and *Menidia beryllina* exposed (48-hours and approximately 7-days, respectively) to water collected from Mount Hope Bay at the Brayton Point Station intake was ≥ 95% in the 13 test events conducted between March 2005 and March 2008.

Survival of *M. beryllina* exposed (7-days) to water collected from Mount Hope Bay off of the Northeast Petroleum owned pier (995 Main Road, Tiverton RI) ranged from 73 to 100%. Survival was <75% in only one of the 26 test events.

Effluent

The Fall River WWTP effluent has generally not exhibited acute whole effluent toxicity to *M. beryllina.* The LC_{50}s were all reported as >100% effluent with the exception of three of the 28 test events conducted between June 2001 and March 2008. Some acute toxicity was detected in the June 2001, June 2004, and February 2007 tests with LC_{50}s = 78.7, 77.6, and 79.6% effluent, respectively. The effluent did exhibit chronic whole effluent toxicity to *M. beryllina* with CNOEC results ranging from 6.25 to 100% effluent (n=25 valid test events). The CNOEC results were <18% effluent in four of these 25 tests (CNOECs = 6.25% effluent in June 2002, September 2002, and June 2003, and CNOEC = 12.5% effluent in September 2007). The CNOEC results for *Arbacia punctulata* testing ranged from <6.25 to 100% effluent (n= 25 test events) with four test events (March 2003, February and March 2005, and December 2007) indicating chronic whole effluent toxicity <18% effluent.

Water Chemistry

Two water quality monitoring stations in this segment were sampled between 2003 and 2006 as part of the 604(b) project Water Quality Monitoring Program for the Mount Hope Bay Embayment System (Howes and Samimy 2007). Station MHB3 was located in Mount Hope Bay south of Brayton Point and west of the shore near Kennedy Park and Christian Academy in Fall River. Station MHB-DO (also referred to as MHBMOOR) was located further south of Brayton Point and west of the shore near the Globe Village area in Fall River. Sample collections were timed to occur during the last three hours of an outgoing tide. The mean tide water depth at MHB3 and MHB-DO at slack outgoing tide is 5.0 and 5.75 m, respectively (Howes and Samimy 2006).

The concentration of dissolved oxygen measured in this segment of Mount Hope Bay at three depths (surface, mid, and bottom) reported by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) ranged from 4.83 to 9.69 mg/L (n=49) at Station MHB3 (Howes and Samimy 2007). Only one of the 49 measurements (2%) was less than 5.0 mg/L, the water quality criterion for SB waters (MassDEP 2006c). At Station MHB-DO, DO ranged from 2.7 to 10.97 mg/L with one of 51 measurements (2%) less than 5.0 mg/L. The concentration of total nitrogen at Station MHB3 ranged from 0.29 to 0.85 mg/L (n=55 samples). Approximately 47% (26 out of 58) of the measurements exceeded 0.5 mg/L total nitrogen, a recommended long-term average total nitrogen threshold guideline developed by the Massachusetts Estuaries Project (Howes *et al.* 2003). The concentration of total nitrogen at Station MHB-DO ranged from 0.28 to 1.11 mg/L (n=59 samples). Approximately 49% (29 out of 59) of the measurements exceeded 0.5 mg/L total nitrogen. Chlorophyll *a* concentrations at Station MHB3 ranged from 1.91 to 65.1 µg/L (n=55) with approximately 44% of the measurements above 10 µg/L. Chlorophyll *a* concentrations at Station MHB-DO ranged from 2.39 to 35.39 µg/L (n=59) with approximately 46% of the measurements above 10 µg/L. Secchi disk depths at Station MHB3 ranged from 0.8 to 2.95m (n=16), at Station MHB-DO ranged from 0.75 to 2.5 m (n=1).

Brayton Point has been measuring dissolved oxygen (DO) concentrations at a fixed station (termed Station C representing conditions adjacent to the thermal plume) located about 0.23 miles southeast of its discharge to Mount Hope Bay at mid-depth and near the bottom since 1972 (Dominion 2007). This sampling station is technically not within the boundary of this segment of Mount Hope Bay but is nearby. Monthly means of mid-depth DO concentrations for May over the 2000-2006 period were all ≥10 mg/L and higher than all but two means for that month over the previous 28 years that monitoring at that site was conducted. Mean bottom concentrations in May from 2001 through 2006, with the exception of 2003, were higher than almost all previous years and were all above 9.0 mg/L. In 2003 the mean bottom concentration was 7.2 mg/L. Mean June DO concentrations at mid-depth from 2001 through 2006, with the exception of 2002, were higher than any of the mean June mid-depth concentrations for the prior 29 years of record. In 2002 the mean mid-depth concentration was 7.7 mg/L. Mean June DO concentrations near the bottom at Station C in 2001 through 2006, except for 2002, were higher than mean concentrations for that month for all but one of the years of record since 1972. In 2002 the mean bottom concentration for June was 6.6 mg/L. Mean DO concentrations at mid-depth for July over the 2001 through 2006 period were among the highest of all years on record (1972-2006) and were higher than all but two of the prior

years' July means since 1972. Mean July bottom D.O. concentrations over 2001-2006 period were more variable although for two of these years mean July levels were the highest on record. Mean mid-depth August DO concentrations over the 2001-2006 period were fairly high – all above 6.9 mg/L. Mean bottom concentrations for that month in 2001, 2002, 2004 and 2005 were higher than any of the other years on record. However, the mean concentration in 2003 for that month was very low, 3.2 mg/L, one of the lowest mean August values over the entire period of record. Judging from the monthly mean values, DO in this portion of Mount Hope Bay appears to be improving. However, many of the individual DO concentrations at the bottom failed to meet the 5.0 mg/L concentration on many occasions. The percent of near-bottom DO concentrations that failed to meet the 5.0 mg/L criterion over the June-August period has steadily decreased at Station C over the 1972-2006 monitoring period. Over the 1972-1982 period 40-70% of the samples collected over June-August failed to meet 5.0 mg/L. Over the 2000-2006 period, the failure rate ranged from near-zero percent to about 50%; six of these seven values were well-under 40% (Dominion 2007).

Mean monthly surface water temperatures at Brayton Point's monitoring Station C in July and August have, for the most part, been higher than those since about the mid-1980s: $\geq$ 68% of the July and August monthly mean surface water temperature values over the 1988-2006 period exceeded the mean 1972-2006 temperatures for those months. Since 2000 the trend has been exacerbated: over 80% of the mean July values for the 2001-2006 period exceeded the long-term mean (1972-2006), and all six of the August monthly means exceeded the 1972-2006 long-term mean. Data from 2000 onwards support the idea expressed in the last assessment, i.e., that summertime water temperatures in this area of the bay have risen over those seen in the past. Brayton Point's anticipated change to near-closed cycle cooling (see below) should assist in lowering water temperatures in this segment of the bay.

Tissue Chemistry

Every year since 1979, Brayton Point reports measured tissue concentrations of various heavy metals in quahogs collected from Station A' which lies under the Brayton Point Station discharge plume about 0.2 miles south of the discharge (Dominion 2007). The report summarizes wet-tissue sample metals concentrations and compared them to FDA levels of concern for shellfish permitted for consumption by people that eat large amounts of shellfish (90^{th} percentile) assuming that they are only exposed to the contaminant through shellfish consumption. FDA levels of concern, as wet-weight, were provided for cadmium (4ppm), lead (1.7 ppm), chromium (13 ppm), nickel (80 ppm) and arsenic (86 ppm) (FDA 2001 and Dominion 2007). Wet weight concentrations for these metals in quahogs collected at Station A' in 2006 were well-below the FDA critical levels on each of the three collection dates (April, July and October) (Dominion 2007, Scherer 2009a, Scherer 2009b, and FDA 2001). The concentrations of mercury in quahogs collected from Station A' (analysis for mercury in quahogs as part of Brayton Point monitoring requirements was initiated in 1993) were below the FDA action level for methylmercury in fish and shellfish of 1 ppm wet weight as well as below the EPA recommended criterion of 0.3 ppm wet weight (FDA 2001, USEPA 2001, and Dominion 2007).

The *Aquatic Life Use* for this segment of Mount Hope Bay is assessed as impaired. Brayton Point Station's cooling water system has been implicated in the collapse of the Mount Hope Bay fishery and in inhibiting its recovery, even as steps to reduce fishing pressure and improve pollution controls are being taken. A new NPDES permit for the facility's intake and discharge requires that the facility dramatically reduce the amount of cooling water the facility uses. To meet the requirements of the permit, Brayton will be building two, 500' tall natural-draft cooling towers. These will all but eliminate: a) Brayton's intake of cooling water from Mount Hope Bay; b) impingement and entrainment associated with that intake; and c) the facility's discharge of heat to Mount Hope Bay. Upgrading the facility's cooling system will reduce the facility's harmful effects on Mount Hope Bay while continuing to allow the production of electricity for New England. These improvements are expected to assist in the recovery of the fishery within Mount Hope Bay. The additional evidence of enrichment (i.e., frequency of low dissolved oxygen, elevated concentrations of total nitrogen and elevated chlorophyll *a* concentrations) is also problematic.

Shellfishing

This segment area contains parts of four DMF shellfish growing areas, MHB1.1, in the lower part of the segment, MHB1.2 also in the lower part of the segment, MHB2.1 in the upper part of the segment and MHB2.3 also in the upper part of the segment. The DMF shellfishing status of July 2000 indicates that areas MHB1.2 and MHB2.3 are prohibited. No changes to the status have been made (Sawyer 2008). The DMF shellfishing status of July 2000 indicates that areas MHB1.1 and MHB2.1 are restricted areas. These areas were downgraded to prohibited status in September 2003 (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing areas are prohibited.

Primary and Secondary Contact Recreation and Aesthetics

There are two semi-public/public beaches along the shoreline of this segment of Mount Hope Bay.

Town Walkway and Branton beaches in Somerset - No bacteria testing has been reported for either beach (MA DPH 2003, 2004, 2005, 2006, and 2007).

No data are available so the *Primary* and *Secondary Contact Recreational* and *Aesthetics* uses are not assessed. These uses are identified with an Alert Status however because of the presence of the CSO discharges (see Appendix C.

MOUNT HOPE BAY (MA61-06) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Combined biota/habitat assessment – i.e., thermal modification contributing to collapse of fishery, elevated total nitrogen, elevated chlorophyll *a* Source: Industrial point source discharge, cooling water intake structures (impingement/entrainment), municipal point source discharge, wet weather discharges --point source and combination of stormwater, SSO or CSO
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: Unknown
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED*

* Alert Status issues identified, see details in use assessment section

RECOMMENDATIONS

Brayton Point Station (excerpted from http://www.epa.gov/region1/braytonpoint/index.html)

On 17 December 2007 EPA and Dominion Energy reached agreement to end all NPDES permit litigation regarding Dominion's Brayton Point Station power plant in Somerset, MA and for Dominion Energy to fully implement the contested heat and flow limits required in the Stations' NPDES permit. The company agreed to retrofit Brayton Point Station's existing "open-cycle" cooling system with a "closed-cycle" cooling system to fully comply with the strict limits specified in the October 2003 final NPDES permit (approximately 95% reductions in flow and heat from current operations) (EPA 2007).

The 2003 permit (see http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/braytonpointfactsht2003.pdf EPA 2007) was developed consistent with the Clean Water Act, requiring thermal discharge limits that protect the marine life that should thrive in Mount Hope Bay. In addition, EPA set cooling water intake flow limits so that Brayton Point Station's cooling system reflected the best technology available to minimize the facility's adverse environmental impacts. The permit specifically required Brayton Point Station to:

Reduce total annual heat discharge to the bay by 96%, from 42 trillion British Thermal Units (BTUs) a year to 1.7 trillion BTUs a year, and Brayton Point Station's cooling water system has contributed to the collapse of the fishery and inhibited its recovery, even as steps to reduce fishing pressure and improve pollution controls are being taken to facilitate the bay's recovery.

Strict commercial and recreational fishing limits have been imposed in Massachusetts and Rhode Island for Mount Hope Bay in an effort to help restore fish stocks. Mount Hope Bay, and most areas of upper Narragansett Bay, is closed to commercial trawlers. In addition, recreational fishing for winter flounder is closed for 10 months of the year. A small recreational fishing effort is allowed for two months of the year.

While many federal, state and local efforts have been underway to protect Mount Hope Bay and the larger Narragansett Bay estuary, Brayton Point Station has continued to operate with nearly the same "once-through" cooling technology that was installed almost 40 years ago. Requiring the power plant to meet limits consistent with modern cooling system equipment complements these other efforts, which include:

Reduce water withdrawal from the bay by approximately 94%, from nearly 1 billion gallons a day to 56 million gallons a day. This flow requirement is consistent with well-established closed-cycle cooling technology using wet, mechanical draft cooling towers for generating units 1 through 4.

Compliance with these permit limits will eliminate annual fishery losses by an estimated 94% and improve habitat quality, thereby helping to give the bay an opportunity to recover.

Conduct any additional monitoring necessary to complete the Massachusetts Estuaries Project (MEP) analysis. Once all data are available, complete the MEP analysis for the Mount Hope Bay embayment system to develop the site-specific nutrient threshold.

The City of Fall River Sewer Commission NPDES permit should be reissued with appropriate limits (including nitrogen) and monitoring requirements. Modified acute and chronic whole effluent toxicity tests should continue to be conducted. If acute and/or chronic whole effluent toxicity problems become either more persistent or severe, a toxicity identification/toxicity reduction evaluation (TIE/TRE) should be conducted. The city should also continue to implement sewage treatment improvements in Fall River, including a $115 million combined sewer overflow abatement program, to meet state and federal water quality requirements.

MOUNT HOPE BAY (SEGMENT MA61-07)
Location: The Massachusetts portion from mouth of Cole River (at old railway grade), Swansea to state border, Swansea, MA/Warren, RI to the line from Brayton Point Somerset to MA/RI border approximately ¾ of a mile due east of Spar Island, RI to the line between Bay Point, Swansea and Brayton Point, Somerset (the mouth of the Lee River)
Segment Area: 1.8 square miles
Classification: SA

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 5, "Waters Requiring a TMDL" Due to nutrients, unknown toxicity, organic enrichment/low DO, thermal modifications, and pathogens (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
NPDES (See Appendix C, Tables C2 and C3)
Dominion Energy, LLC Brayton Point Station (MA0003654)
http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/braytonpointfactsht2003.pdf
Swansea MAR041163
Somerset MAR041159

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Brayton Point electrogenerating station is the largest fossil-fuel electrogenerating station in New England. According to the fact sheet developed for the Brayton Point Station NPDES permit (see link above), the facility generates about 6% of the electricity consumed in New England. Each day the Station withdraws nearly one billion gallons of water from Mount Hope Bay and circulates it through the facility to condense the steam used to produce electricity. This results in the entrainment of early pelagic life stages of many organisms and the impingement of certain species on the facility's intake screens. During transit through the plant, this "cooling" water absorbs heat from the steam condensers, up to a 30°F change in the temperature of cooling water occurs in this process. Heated water is discharged to Mount Hope Bay and has been implicated in raising water temperatures beyond critical limits for certain fish species. Trillions of organisms are lost to entrainment and impingement each year, including species of commercial and recreational importance, and forage fish and other organisms integral to the food web. As of August 2008, Dominion's Brayton Point Station cooling water use has not changed from that of the last water quality assessment report (Weinstein *et al*. 2002) although the new NPDES permit calls for drastic reductions in the use of water from Mount Hope Bay for cooling.

Biology
MassDEP's Wetlands Conservancy Program (WCP) identified the presence of potential eelgrass (confidence indicated as low) in this segment of Mount Hope Bay from historic 1951 black and white aerial photography (Costello 2003). In 1951 there were three areas of eelgrass west of Gardners Neck in South Swansea in this segment of Mount Hope Bay: just north of Cedar Cove Beach, just south of Sandy Beach, and in the cove east of Mildred Avenue comprising approximately 1.8% of the segment area. In 2000 MassDEP WCP performed extensive field surveys but no eelgrass was found (Costello 2008).

In the last water quality assessment report reference was made to large declines in the catch rates of certain fish species including winter flounder (*Pseudopleuronectes americanus*), windowpane (*Scophthalmus aquosus*), tautog (*Tautoga onitis*) and scup (*Stenotomus chrysops*) (Weinstein *et al*. 2002). Declines in catch rates were based on bay-wide biomonitoring samples and were not specific to just this segment of Mount Hope Bay (MA61-07) but are used in the assessment of this segment. Catch-rate declines were assumed to imply population declines. As of 2006 the catch rates of the first three species have not shown substantial increases, however, catch rates of scup increased in 2000-2002, but decreased again in 2003-6 (Dominion 2007). Hogchoker (*Trinectes maculatus*) catch rates also declined in the mid-1980s and have not shown substantial increases since that time. Summer flounder (*Paralichthys dentatus)* populations have been on the rise (Dominion 2007). These fish move into near-shore areas in the warmer part of the year and overwinter in deep water. The summer flounder is more tolerant of warm water than the winter flounder and its range extends from the southern Gulf of Maine to South Carolina. Entrainment of winter flounder larvae has decreased since the early-to-mid-1990s. However, entrainment is highly correlated ($p<0.0001$) with bay-wide concentrations of winter founder larvae in Mount Hope Bay which have also decreased since that time (Dominion 2007).

Toxicity

Effluent

No acute or chronic whole effluent toxicity to either *Mysidopsis bahia* or *Menidia beryllina* was detected in the 13 test events conducted between March 2005 and March 2008 on the Brayton Point Station Outfall #001 effluent. The CNOEC results for *Arbacia punctulata* testing were also reported as 100% effluent (n=13) during the same timeframe.

Water Chemistry

Three water quality monitoring stations (Stations MHB7, MHB8, and MHB5) were located in this segment of Mount Hope Bay and were sampled between 2003 and 2006 as part of the 604(b) project Water Quality Monitoring Program for the Mount Hope Bay Embayment System (Howes and Samimy 2007). Station MHB7 was located south of Town Beach and northwest of Cedar Cove in Swansea, Station MHB8 was located southwest of Bay Point near the Rhode Island Border in Swansea, and Station MHB5 was located due east from Station MHB8 south of the Lee River and southwest from Brayton Point at Swansea/Somerset line. Sample collections were timed to occur during the last three hours of an outgoing tide. The mean tide water depth at MHB7, MHB8, and MHB5 at slack outgoing tide is 4.0, 4.5, and 5.0 m, respectively (Howes and Samimy 2006).

The concentration of dissolved oxygen measured in this segment of Mount Hope Bay at three depths (surface, mid, and bottom) reported by the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) ranged from 3.4 to 12.41 mg/L (n=47) at Station MHB7 (Howes and Samimy 2007). Five of 47 measurements (11%) were less than 6.0 mg/L, the water quality criterion for SA waters (MassDEP 2006c). At Station MHB8, DO ranged from 2.56 to 11.88 mg/L with eight of 51 measurements (16%) less than 6.0 mg/L. At Station MHB5, DO ranged from 4.64 to 10.74 mg/L with 12 of 50 measurements (24%) less than 6.0 mg/L. The concentration of total nitrogen at Station MHB7 ranged from 0.29 to 1.05 mg/L (n=58 samples). Approximately 47% (27 out of 58) of the measurements exceeded 0.5 mg/L total nitrogen, a recommended long-term average total nitrogen threshold guideline developed by the Massachusetts Estuaries Project (Howes *et al.* 2003). The concentration of total nitrogen at Station MHB8 ranged from 0.33 to 0.74 mg/L (n=56 samples). Approximately 36% (20 out of 56) of the measurements exceeded 0.5 mg/L total nitrogen. The concentration of total nitrogen at Station MHB5 ranged from 0.29 to 1.05 mg/L (n=59 samples). Approximately 49% (29 out of 59) of the measurements exceeded 0.5 mg/L total nitrogen. Chlorophyll *a* concentrations at Station MHB7 ranged from 3.87 to 37.24 µg/L (n=58) with approximately 71% of the measurements above 10 µg/L. Chlorophyll *a* concentrations at Station MHB8 ranged from 3.21 to 38.83 µg/L (n=56) with approximately 52% of the measurements above 10 µg/L. Chlorophyll *a* concentrations at Station MHB5 ranged from 2.52 to 29.66 µg/L (n=59) with approximately 51% of the measurements above 10 µg/L. Secchi disk depths at Station MHB7 ranged from 0.95 to 2.7m (n=13), at Station MHB8 ranged from 0.85 to 2.27 m (n=15), and at Station MHB5 ranged from 1.00 to 2.34 (n=16).

Brayton Point has also been measuring dissolved oxygen (DO) concentrations at a fixed station (termed Station C representing conditions adjacent to the thermal plume) located about 0.23 miles southeast of its discharge to Mount Hope Bay at mid-depth and near the bottom since 1972 (Dominion 2007). Monthly means of mid-depth DO concentrations for May over the 2000-2006 period were all $\geq$10 mg/L and higher than all but two means for that month over the previous 28 years that monitoring at that site was conducted. Mean bottom concentrations in May from 2001 through 2006, with the exception of 2003, were higher than almost all previous years and were all above 9.0 mg/L. In 2003 the mean bottom concentration was 7.2 mg/L. Mean June DO concentrations at mid-depth from 2001 through 2006, with the exception of 2002, were higher than any of the mean June mid-depth concentrations for the prior 29 years of record. In 2002 the mean mid-depth concentration was 7.7 mg/L. Mean June DO concentrations near the bottom at Station C in 2001 through 2006, except for 2002, were higher than mean concentrations for that month for all but one of the years of record since 1972. In 2002 the mean bottom concentration for June was 6.6 mg/L. Mean DO concentrations at mid-depth for July over the 2001 through 2006 period were among the highest of all years on record (1972-2006) and were higher than all but two of the prior years' July means since 1972. Mean July bottom D.O. concentrations over 2001-2006 period were more variable although for two of these years mean July levels were the highest on record. Mean mid-depth August DO concentrations over the 2001-2006 period were fairly high – all above 6.9 mg/L. Mean bottom concentrations for that month in 2001, 2002, 2004 and 2005 were higher than any of the other years on record. However, the mean concentration in 2003 for that month was very low, 3.2 mg/L, one of the lowest mean August values over the entire period of record. Judging from the monthly mean values, DO in this portion of Mount Hope Bay appears to be improving. However, many of the individual DO concentrations at the bottom failed to meet the 5.0 mg/L concentration on many occasions. The percent of near-bottom DO concentrations that failed to meet the 5.0 mg/L criterion over the June-August period has steadily decreased at Station C over the 1972-2006 monitoring period. Over the 1972-1982 period 40-70% of the samples collected over June-August failed to meet 5.0 mg/L. Over the

2000-2006 period, the failure rate ranged from near-zero percent to about 50%; six of these seven values were well-under 40% (Dominion 2007).

Mean monthly surface water temperatures at Brayton Point's monitoring Station C in July and August have, for the most part, been higher than those since about the mid-1980s: ≥ 68% of the July and August monthly mean surface water temperature values over the 1988-2006 period exceeded the mean 1972-2006 temperatures for those months. Since 2000 the trend has been exacerbated: over 80% of the mean July values for the 2001-2006 period exceeded the long-term mean (1972-2006), and all six of the August monthly means exceeded the 1972-2006 long-term mean. Data from 2000 onwards support the idea expressed in the last assessment, i.e., that summertime water temperatures in this area of the bay have risen over those seen in the past. Brayton Point's anticipated change to near-closed cycle cooling (see below) should assist in lowering water temperatures in this segment of the bay.

Tissue Chemistry

Every year since 1979, Brayton Point reports measured tissue concentrations of various heavy metals in quahogs collected from Station A' which lies under the Brayton Point Station discharge plume about 0.2 miles south of the discharge (Dominion 2007). The report summarizes wet-tissue sample metals concentrations and compared them to FDA levels of concern for shellfish permitted for consumption by people that eat large amounts of shellfish (90th percentile) assuming that they are only exposed to the contaminant through shellfish consumption. FDA levels of concern, as wet-weight, were provided for cadmium (4ppm), lead (1.7 ppm), chromium (13 ppm), nickel (80 ppm) and arsenic (86 ppm) (FDA 2001 and Dominion 2007). Wet weight concentrations for these metals in quahogs collected at Station A' in 2006 were well-below the FDA critical levels on each of the three collection dates (April, July and October) (Dominion 2007, Scherer 2009a, Scherer 2009b, and FDA 2001). The concentrations of mercury in quahogs collected from Station A' (analysis for mercury in quahogs as part of Brayton Point monitoring requirements was initiated in 1993) were below the FDA action level for methylmercury in fish and shellfish of 1 ppm wet weight as well as below the EPA recommended criterion of 0.3 ppm wet weight (FDA 2001, USEPA 2001, and Dominion 2007).

The *Aquatic Life Use* for this segment of Mount Hope Bay is assessed as impaired. Brayton Point Station's cooling water system has been implicated in the collapse of the Mount Hope Bay fishery and in inhibiting its recovery, even as steps to reduce fishing pressure and improve pollution controls are being taken. A new NPDES permit for the facility's intake and discharge requires that the facility dramatically reduce the amount of cooling water the facility uses. To meet the requirements of the permit, Brayton will be building two, 500' tall natural-draft cooling towers. These will all but eliminate: a) Brayton's intake of cooling water from Mount Hope Bay; b) impingement and entrainment associated with that intake; and c) the facility's discharge of heat to Mount Hope Bay. Upgrading the facility's cooling system will reduce the facility's harmful effects on Mount Hope Bay while continuing to allow the production of electricity for New England. These improvements are expected to assist in the recovery of the fishery within Mount Hope Bay. The additional evidence of enrichment (i.e., elevated concentrations of total nitrogen and elevated chlorophyll *a* concentrations) is also problematic.

Shellfishing

This segment area contains parts of three DMF shellfish growing areas, MHB1.1, MHB3.1, and MHB4.1. The DMF shellfishing status of July 2000 indicates that all areas are restricted. All three areas were downgraded to prohibited status in September 2003 (Sawyer 2008).

The *Shellfish Harvesting Use* is assessed as impaired because the shellfish growing areas are prohibited.

Primary and Secondary Contact Recreation and Aesthetics

There are four semi-public/public beaches along the shoreline of this segment of Mount Hope Bay.

Town Beach in Swansea: One *Enterococci* bacteria sample was collected in 2003, while weekly *Enterococci* samples were collected during the summers of 2004, 2005, and 2006 (n= 13, 12, and 13 samples, respectively) (MA DPH 2003, 2004, 2005, 2006, and 2007). There was only one reported exceedance and the beach was posted for two days in June 2006.

Sandy Beach in Swansea: Seven *Enterococci* bacteria samples were collected in 2003, while weekly *Enterococci* samples were collected during the summers of 2004, 2005, and 2006 (n= 13, 12, and 14 samples, respectively) (MA DPH 2003, 2004, 2005, 2006, and 2007). There were two reported exceedances in 2003 but no postings (MA DPH 2004). There were no exceedances or postings in 2004 or 2005 and two reported exceedances and postings at this beach in 2006 (two days in June and one day in August).

Cedar Cove Beach in Swansea: Seven *Enterococci* bacteria samples were collected in 2003, two *Enterococci* samples were collected in 2004 and 10 samples were collected during the summer of 2006 (MA DPH 2003, 2004, 2005, 2006, and 2007). There were no reported exceedances or postings in 2003 or 2004 and two reported exceedances and postings at this beach in 2006 (two days in June and one day in August).

Coles River Club in Swansea (Harbor and Cedar Cove Ave) (Carvalho 2008): One *Enterococci* bacteria sample was collected in 2003, two *Enterococci* samples were collected in 2004 and weekly *Enterococci* samples were collected in 2005 and 2006 (n=10 both years) (MA DPH 2003, 2004, 2005, 2006, and 2007). There were no reported exceedances or postings.

The *Primary* and *Secondary Contact Recreational* uses are assessed as support for this segment of Mount Hope Bay based on the lack or limited frequency/duration of beach closures. The *Aesthetics Use* is not assessed (lack of data).

MOUNT HOPE BAY (MA61-07) Use Summary Table

Designated Uses		Status
Aquatic Life		IMPAIRED Cause: Combined biota/habitat assessment – i.e., thermal modification contributing to collapse of fishery, low dissolved oxygen, elevated total nitrogen, elevated chlorophyll *a* Source: Industrial point source discharge, cooling water intake structures (impingement/entrainment), unknown (Suspected sources: discharges from municipal separate storm sewer systems)
Fish Consumption		NOT ASSESSED
Shellfish Harvesting		IMPAIRED Cause: Elevated total fecal coliform bacteria Source: Unknown
Primary Contact		SUPPORT
Secondary Contact		SUPPORT
Aesthetics		NOT ASSESSED

RECOMMENDATIONS

Brayton Point Station (excerpted from http://www.epa.gov/region1/braytonpoint/index.html)

On 17 December 2007 EPA and Dominion Energy reached agreement to end all NPDES permit litigation regarding Dominion's Brayton Point Station power plant in Somerset, MA and for Dominion Energy to fully implement the contested heat and flow limits required in the Stations' NPDES permit. The company agreed to retrofit Brayton Point Station's existing "open-cycle" cooling system with a "closed-cycle" cooling system to fully comply with the strict limits specified in the October 2003 final NPDES permit (approximately 95% reductions in flow and heat from current operations) (EPA 2007).

The 2003 permit (see http://www.epa.gov/region1/braytonpoint/pdfs/finalpermit/braytonpointfactsht2003.pdf EPA 2007) was developed consistent with the Clean Water Act, requiring thermal discharge limits that protect the marine life that should thrive in Mount Hope Bay. In addition, EPA set cooling water intake flow limits so that Brayton Point Station's cooling system reflected the best technology available to minimize the facility's adverse environmental impacts. The permit specifically required Brayton Point Station to:

> *Reduce total annual heat discharge to the bay by 96%, from 42 trillion British Thermal Units (BTUs) a year to 1.7 trillion BTUs a year, and Brayton Point Station's cooling water system has contributed to the collapse of the fishery and inhibited its recovery, even as steps to reduce fishing pressure and improve pollution controls are being taken to facilitate the bay's recovery.*

Strict commercial and recreational fishing limits have been imposed in Massachusetts and Rhode Island for Mount Hope Bay in an effort to help restore fish stocks. Mount Hope Bay, and most areas of upper Narragansett Bay, is closed to commercial trawlers. In addition, recreational fishing for winter flounder is closed for 10 months of the year. A small recreational fishing effort is allowed for two months of the year.

While many federal, state and local efforts have been underway to protect Mount Hope Bay and the larger Narragansett Bay estuary, Brayton Point Station has continued to operate with nearly the same "once-through" cooling technology that was installed almost 40 years ago. Requiring the power plant to meet limits consistent with modern cooling system equipment complements these other efforts, which include:

Reduce water withdrawal from the bay by approximately 94%, from nearly 1 billion gallons a day to 56 million gallons a day. This flow requirement is consistent with well-established closed-cycle cooling technology using wet, mechanical draft cooling towers for generating units 1 through 4.

Compliance with these permit limits will eliminate annual fishery losses by an estimated 94% and improve habitat quality, thereby helping to give the bay an opportunity to recover.

• Sewage treatment improvements in Fall River, including a $115 million combined sewer overflow abatement program, being implemented to meet state and federal water quality requirements.

Conduct any additional monitoring necessary to complete the Massachusetts Estuaries Project (MEP) analysis. Once all data are available, complete the MEP analysis for the Mount Hope Bay embayment system to develop the site-specific nutrient threshold.

NORTH WATUPPA POND (SEGMENT MA61004)

Location: Fall River/Westport
Segment Area: 1730 acres
Classification: A, Public Water Supply, Outstanding Resource Water

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 4b, "Waters Expected to Attain all Designated Uses through Pollution Control Measures other than TMDL's" Due to metals (MassDEP 2007).

The Northeast Regional Mercury Total Maximum Daily Load (TMDL) was prepared by the New England Interstate Water Pollution Control Commission (NEIWPCC) in cooperation with the states of Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The TMDL covers waterbodies that are impaired primarily due to atmospheric deposition of mercury (Northeast States 2007). The TMDL target for Massachusetts is 0.3 ppm or less of mercury in fish tissue. The plan calls for a 75% reduction of in-region and out of region atmospheric sources by 2010 and a 90% or greater reduction in the future (NEIWPCC 2007). The TMDL will be reassessed in 2010 based on an evaluation of new on-going monitoring and air deposition data. Final targets will be determined at that time.

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Fall River Water Department (42609501)
NPDES (See Appendix C, Table C3)
Fall River MAR041113

USE ASSESSMENT
Aquatic Life
Biology
There are no reports of any non-native aquatic macrophytes in this waterbody (McVoy 2008).

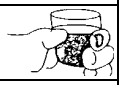
Too limited data are available so the *Aquatic Life Use* is not assessed for North Watuppa Pond.

Fish Consumption
MassDEP conducted sampling of fish from North Watuppa Pond in June 1989 (Maietta 1990 and Weinstein *et al*. 2002). Subsequent sampling of fish from North Watuppa Pond was conducted in 1994 (analysis of edible fillets conducted for As, Cd, Hg, Pb, Se, PCBs, organochlorine pesticides) as part of a mercury research project (MassDEP 1997). Fish toxics monitoring in 2001, 2002, 2004, 2005, and 2007 has also been conducted as part of the MassDEP ORS Mercury Research Project (analysis of edible fillets conducted for Hg) (Maietta 2007 and MassDEP 2006b). Fish were also collected from North Watuppa Pond in September 2000 and analyzed for residues for a group of target analytes (e.g., persistent, bioaccumulative, and toxic pollutants (PBTs) such as mercury, dioxins, PAHs, other semivolatile organics, PCBs) as part of the National Fish Tissue Study (EPA 2002 and Tetra Tech, Inc. 2000).

A summary of the fish toxics monitoring data for North Watuppa Pond can be found in Appendix B. Mean concentrations of mercury in both yellow perch and largemouth bass from the pond exceed the Hg TMDL target of 0.3 ppm wet weight. MA DPH, however, does not presently have a site-specific advisory for North Watuppa Pond because fishing is not allowed.

Since MassDEP uses the MA DPH fish consumption advisory as the basis for the *Fish Consumption Use* assessment decisions this use is rated as not assessed rather than impaired for North Watuppa Pond. Given the elevated mercury concentrations, however, MassDEP has identified this segment with an Alert Status and is making the recommendation below that MA DPH revisit their listing decision.

NORTH WATUPPA POND (MA61004) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED*
Drinking Water**		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

* Alert Status issues identified, see details in use assessment

** The MassDEP Drinking Water Program maintains current drinking water supply data.

RECOMMENDATIONS

MA DPH should reevaluate the fish toxics monitoring data for this waterbody and issue a site specific fish consumption advisory due to elevated mercury if deemed necessary to protect public health.

MassDEP should also continue to conduct fish toxics monitoring for Hg to evaluate changes and any reductions that may occur as a result of implementation of the statewide Mercury TMDL.

SOUTH WATUPPA POND (SEGMENT MA61006)

Location: Fall River/Westport
Segment Area: 1473 acres
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
WMA (See Appendix C, Table C1)
Fall River Water Department (42609501 Emergency Source only)

NPDES (See Appendix C, Tables C2 and C3)
Fall River Tool & Die Company (MAG250017) discharge to Sucker Brook, a tributary to South Watuppa Pond.
Kerr Mill Associates in Fall River (MA0034240)
Roadway Express (MAG910025)
Fall River MAR041113
Westport MAR041174

USE ASSESSMENT
Aquatic Life
Biology
There are no reports of any non-native aquatic macrophytes in this waterbody (McVoy 2008).

Too limited data are available so the *Aquatic Life Use* is not assessed for South Watuppa Pond.

Fish Consumption
Fish were collected from South Watuppa Pond in 1999 and the edible fillets were analyzed for metals (Al, Cu, Fe, Hg, Mg, Ni, Pb, and Zn) and PCBs (Maietta 2007). No MA DPH site-specific fish consumption advisory was issued for South Watuppa Pond.

Since no site-specific fish consumption advisory was issued by MA DPH for South Watuppa Pond, the *Fish Consumption Use* is not assessed.

Primary and Secondary Contact Recreation and Aesthetics
There is one beach along the shoreline of South Watuppa Pond (South Watuppa Pond Beach) in Westport. Currently there is uncertainty associated with the accurate reporting of freshwater beach closure information to the MA DPH which is required as part of the Beaches Bill. Therefore, no *Primary Contact Recreational Use* assessments (either support or impairment) decisions are being made using Beaches Bill data for this waterbody.

SOUTH WATUPPA POND (MA61006) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
The Fall River Tool & Die Company permit (MAG250017) should be reissued with appropriate monitoring requirements/limits for TRC.

Monitoring to evaluate designated uses.

QUEQUECHAN RIVER (SEGMENT MA61-05)

Location: Outlet of South Watuppa Pond, Fall River to confluence with the Taunton River/Mount Hope Bay (at Braga Bridge), Fall River
Segment Area: 2.4 miles
Classification: B, Warm Water Fishery, CSO

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 4c, "Impairment Not Caused by a Pollutant" Due to other habitat alterations (non-pollutant) (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
City of Fall River Sewer Commission (MA0100382) CSO Outfalls

NPDES (See Appendix C, Table C3)
Fall River MAR041113
Westport MAR041174

USE ASSESSMENT
Aquatic Life
Habitat and Flow
The Quequechan River is impounded from the outlet of South Watuppa Pond to just southeast of the Route 195/Route 81 interchange. From this interchange the River is culverted and/or underground to its confluence with Mount Hope Bay (0.9 miles) thereby reducing /eliminating viable habitat for aquatic life.

The *Aquatic Life Use* is not assessed for the upstream 1.5 miles but is assessed as impaired for the lower 0.9 miles based on the loss of habitat for aquatic life.

Primary and Secondary Contact Recreation and Aesthetics
No data are available to assess these uses however they are identified with an Alert Status because of the presence of CSO discharges (see Appendix C).

QUEQUECHAN RIVER (MA61-05) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED upper 1.5 miles IMPAIRED lower 0.9 miles Cause: Habitat assessment (i.e., habitat quality degradation) Source: Channelization
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED*
Secondary Contact		NOT ASSESSED*
Aesthetics		NOT ASSESSED*

* Alert Status issues identified, see details in use assessment

RECOMMENDATIONS
Continue to implement CSO abatement activities.

Collect bacteria data to evaluate the effectiveness of CSO abatement activities as well as to assess the status of the recreational uses.

Support habitat restoration for the river.

Monitoring to evaluate designated uses.

COOK POND (SEGMENT MA61001)

Location: Fall River, MA/Tiverton, RI
Segment Area: 157 acres
Classification: B

This segment is on the Massachusetts Year 2006 Integrated List of Waters – Category 3, "No Uses Assessed" (MassDEP 2007).

WMA WATER WITHDRAWAL AND NPDES WASTEWATER DISCHARGE SUMMARY
Fall River permit #MAR041113 issued 9/12/2003

NPDES (See Appendix C, Table C3)
Fall River MAR041113

USE ASSESSMENT
Aquatic Life
Biology
There are no reports of any non-native aquatic macrophytes in this waterbody (McVoy 2008).

Too limited data are available so the *Aquatic Life Use* is not assessed.

Fish Consumption
Fish were collected from Cook Pond in 1994 and the edible fillets were analyzed for metals (As, Cd, Hg, Pb, Se), PCBs, and organochlorine pesticides (Maietta 2007). None of the analytes exceeded trigger levels for advisories (Weinstein *et al*. 2002).

Since no site-specific fish consumption advisory was issued by MA DPH for Cook Pond, the *Fish Consumption Use* is not assessed.

COOK POND (MA61001) Use Summary Table

Designated Uses		Status
Aquatic Life		NOT ASSESSED
Fish Consumption		NOT ASSESSED
Primary Contact		NOT ASSESSED
Secondary Contact		NOT ASSESSED
Aesthetics		NOT ASSESSED

RECOMMENDATIONS
Monitoring to evaluate designated uses.

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