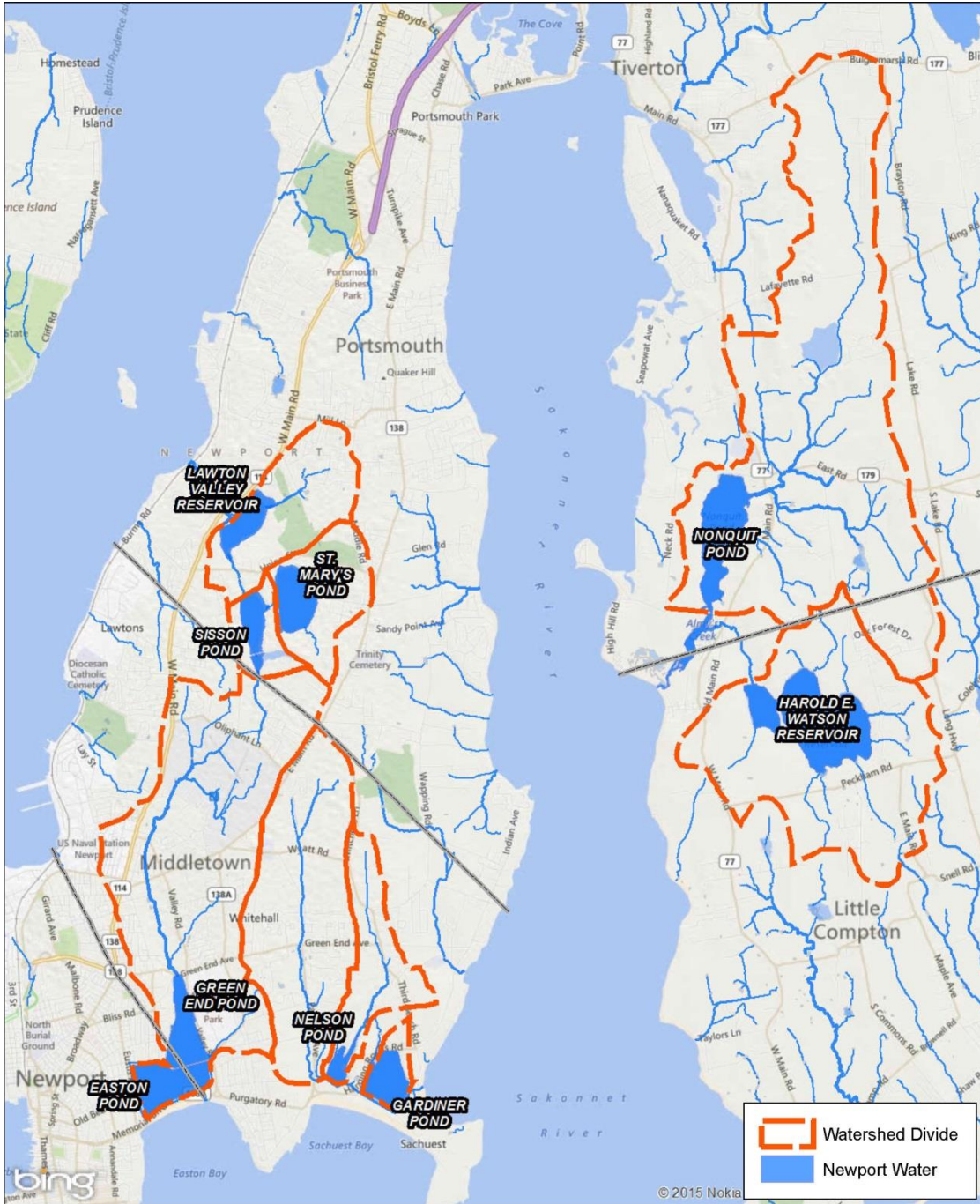


Source Water Protection Initiative for Newport Water Supply Reservoirs



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Introduction

Since construction of the new drinking water treatment facilities with advanced treatment processes was completed by the Newport Water System in the summer and fall of 2014, Aquidneck Island residents and businesses are experiencing improved quality of water flowing from their taps. Though the “finished” water has improved, the quality of the raw water that necessitated these improvements has not changed. The nine source reservoirs are nutrient enriched and experience frequent algal and cyanobacteria blooms – which impact the reservoirs’ use for drinking water purposes and their ecosystem health.

Newport Water’s Advanced Treatment facilities are operational and drinking water quality has improved as a result.

The **Source Water Protection Initiative for Newport Water Supply Reservoirs** is an effort initiated by the RI Department of Environmental Management, in coordination with the RI Department of Health, to restore the quality of the Newport Water System’s (Newport Water) nine source reservoirs. The primary objective of the Source Water Protection Initiative is that the water quality in each of the nine reservoirs is suitable for drinking water use with conventional treatment, and supports aquatic life uses. RIDEM will be conducting bi-weekly monitoring of the nine reservoirs from May through October 2015 to gain a better understanding of the source reservoirs’ water quality. These data will be used to determine the acceptable phosphorus levels in the reservoirs to support a healthy aquatic ecosystem and that water quality is suitable for drinking water use with conventional treatment alone. Utilizing these data collected on the reservoirs along with data available on the tributary streams that flow to the reservoirs, RIDEM will determine necessary reductions in phosphorus discharged to the reservoirs. These data will also be used to identify pollution sources contributing to the degraded quality of the reservoirs and to identify watershed and stormwater management actions needed to restore the reservoirs.

Background and Responsibilities of the Newport Water System

The Newport Water System (Newport Water) is owned by the City of Newport and operated and maintained by the City’s Department of Utilities, Water Division. Newport Water’s retail service area includes Newport, Middletown, and a small section of Portsmouth. In addition, Newport Water provides water wholesale to the Portsmouth Water & Fire District and Naval Station Newport. Newport Water operates and maintains two water treatment facilities with a combined capacity of 16 MGD, 170 miles of water main and approximately 14,700 service connections. Newport Water draws its raw water supply from a system of nine surface reservoirs, which includes North and South Easton Ponds, Gardiner Pond, Paradise Pond, St Mary’s Pond, Sisson Pond, Lawton Valley Reservoir, Nonquit Pond and Watson Reservoir. The reservoirs and their associated watersheds are located in Newport, Middletown, Portsmouth, Tiverton (Nonquit Pond), and Little Compton (Watson Reservoir). The reservoirs and ponds are interconnected through a complex network of piping and pump stations.

A watershed is an area of land that drains to a body of water – like a lake, river, or wetland – and in this case, to one of Newport Water’s source reservoirs (or water supply ponds).

The quality of the raw water delivered to the treatment plants varies widely due to several factors, such as changing water quality in individual reservoirs and seasonal conditions. The relatively poor quality of the raw water has created challenges for the treatment plants to provide drinking water that meets drinking water standards on a reliable basis. While Newport Water is responsible for providing safe drinking water

for Aquidneck Island, it has little to no control over activities that may pollute the reservoirs. The water supplies for the Newport Water System are located in developed watersheds—with roadways, houses, businesses, and farms – all of which generate pollutants which may find their way into these reservoirs and ponds. Newport Water has purchased 350 acres of conservation easements, which serve as natural buffers protecting the reservoirs -in an effort to protect the raw water quality of the supply.

Because impervious surfaces (parking lots, roads, buildings) do not allow rain to infiltrate the ground, more stormwater runoff is generated on land that is developed than undeveloped. Stormwater flows over the land's surface, picking up contaminants such as animal waste, fertilizers/pesticides, automobiles, etc. – and is a significant source polluting our waters.

The challenges of producing drinking water that consistently meets drinking water standards despite the poor quality of water brought into the plants, led Newport Water to undertake studies and eventually make significant improvements at Station 1 and construct a new Lawton Valley Treatment Plant – both of which are equipped with Advanced Water Treatment Processes. Upgrades to the Station 1 Treatment Plant went online at the end of July 2014 and the new Lawton Valley Treatment Plant came online September 17, 2014. With these improvements, the Newport Water System is the first water treatment system in New England to incorporate Advanced Treatment Processes. The improvements to the water treatment plants are funded by an \$85 million subsidized loan from the Drinking Water State Revolving Fund administered by the R.I. Clean Water Finance Agency and the RI Department of Health. Water rates for all customers of the Newport Water System have increased significantly - an investment essential to ensure safe drinking water for Aquidneck Island.

The quality of the drinking water distributed to homes and businesses on Aquidneck Island has significantly improved as a result of the new and improved treatment plants. This is evident from the sampling results of water collected from the distribution system since the new treatment facilities have gone on-line which find that concentrations of disinfection by-product (trihalomethane) are significantly lower. Improvement to the water treatment facilities alone is not considered a sufficient response to the degraded condition of the Newport source waters. Protection of a water supply's source waters is considered by the Department of HEALTH as the frontline in protecting public health, and is essential to the long term viability of Aquidneck Island's water supply.

Trihalomethanes are a group of chemicals generally referred to as disinfection by-products that may form when chlorine, used to disinfect water for drinking, reacts with organic matter present in the water being treated. Trihalomethanes have been associated through epidemiological studies with adverse health effects. To protect public health from these adverse effects, US EPA has set a trihalomethane limit, referred to as the Maximum Contaminant Level (or MCL) of 80 parts per billion in treated water.

Status of the Source Water Reservoirs' Water Quality

Newport Water's source reservoirs continue to suffer from poor water quality conditions due to excess phosphorus.

All nine water supply source reservoirs (located in Newport, Middletown, Portsmouth, Tiverton, and Little Compton) exhibit degraded water quality. Data collected in 2011 and 2012 by Newport Water's consultants reveal that all nine reservoirs experience moderate to severe nutrient enriched conditions including elevated levels of total phosphorus and chlorophyll *a*, low water clarity, frequent algal and cyanobacteria blooms, and low levels of dissolved oxygen.

Frequent algal and cyanobacteria blooms are a concern for several reasons:

- Algal blooms contribute to elevated Total Organic Carbon concentrations and periodic violations of Safe Drinking Water Act's (SDWA) Disinfection By-Product Maximum Contaminant Levels (MCLs) and taste and odor problems
- Cyanobacteria blooms may produce toxins and pose a potential public health risk

RIDEM and HEALTH join efforts to Protect Drinking Water Sources

The Clean Water Act is the principal federal law governing water pollution and establishes safeguards protecting all uses of the nation's waters. The Safe Drinking Water Act is the principal federal law intended to ensure safe drinking water quality.

On a bi-annual basis, RIDEM is required by the federal Clean Water Act to assess the quality of its surface waters and determine whether they meet uses for which they have been designated – such as swimming or drinking water use. RIDEM relies upon the RI Department of HEALTH's Office Drinking Water Quality (HEALTH) to assess the quality of the state's surface water supplies to determine their suitability as drinking water sources.

HEALTH has assessed the Newport Water System and has determined that all nine source reservoirs fail criteria determining whether the quality of the water supply sources support their use for drinking water purposes. This assessment of drinking water use impairment is based upon the fact that the Newport Water System has experienced violations of SDWA MCLs, frequent taste and odor problems, and that conventional treatment at certain times is no longer sufficient to meet Safe Drinking Water Act requirements. This finding does not require immediate action on the part of Newport or its customers, but it is a "call to action" for efforts to protect and restore the quality of these reservoirs.

RIDEM will include all nine reservoirs as impaired for drinking water and aquatic life uses in the draft 2014 303d List, which is slated for release for public review and comment in April 2015. The specific parameters causing these impairments are:

- **Total Phosphorus:** impairs aquatic life use (contributes to frequent and excessive algal growth and cyanobacteria blooms).¹
- **Total Organic Carbon (TOC):** impairs drinking water use (contributes to elevated levels of trihalomethanes in finished water).

¹ North Easton's Pond was previously identified as impaired for aquatic life use (total phosphorus) and is included as part of the Eutrophic Pond TMDL completed in 2007

As mandated by the federal Clean Water Act, RIDEM has begun steps to develop water quality restoration plans (called Total Maximum Daily Loads or TMDLs) to establish acceptable pollutant loads for the nine source reservoirs.

A TMDL is a plan that determines the acceptable amount of pollutants that can be discharged into a waterbody and still support uses such as drinking water or aquatic life use.

The primary objective of the Newport Water Supply Reservoirs TMDL is to restore the source waters to a condition that supports their designated uses and protects them from future degradation. RI's Water Quality Regulations classify all nine reservoirs as Class AA waters designated for use as a public drinking water supply source, primary and secondary contact recreational activities² and fish and wildlife habitat. The TMDL will establish nutrient reduction targets to control algal abundance, which will benefit the reservoirs' use as public drinking water sources and their aquatic life. Improving the quality of the source waters will enhance protection of public health, and is expected to lessen Newport Water's use of the Advanced Treatment Processes and thus associated operational costs.

Proposed Approach to Establish “Allowable Phosphorus Loads”

RIDEM plans to study Newport Water's source reservoirs (water supply ponds) and their watersheds to identify pollution sources and the steps needed to improve water quality.

Using the data collected in 2011, 2012, and 2015, RIDEM will **evaluate the causative relationships** between nutrients and algal growth and total organic carbon, which when brought into the treatment plants and chlorinated, results in formation of trihalomethane. The intended outcome of this evaluation is to **establish a target phosphorus concentration** for the reservoirs such that algal growth and total organic carbon concentrations are reduced to a level that supports drinking water and aquatic life uses.

The next steps entail applying this target phosphorus concentration in various desktop models to calculate an **allowable phosphorus load** to each reservoir. The **existing phosphorus load** to each reservoir will be estimated using available water quality data and various desktop

watershed models. Data collected from the reservoirs will be used to estimate the portion of the existing load which comes from the **internal cycling of phosphorus from sediments**. From these technical underpinnings, the **necessary reductions in phosphorus loading** to each reservoir can be determined. The TMDL will identify **watershed and stormwater management actions needed** to reduce phosphorus loads.

² RI's Water Quality Regulations require that the quality of Class AA waters be suitable for primary and secondary contact recreational activities, however notes that Class AA waters used for public drinking water supply are subject to restricted recreational use by State and local authorities

RIDEM's Proposed Water Quality Monitoring of the Reservoirs

RIDEM's Office of Water Resources proposes to undertake bi-weekly monitoring of the nine source reservoirs from May – October 2015 to collect additional data necessary to develop the TMDLs. At RIDEM's request, the Environmental Protection Agency (EPA) Atlantic Ecology Division (AED) and Mid Continent Ecology Division (MED) will provide analytical laboratory support. The collected data will be used to evaluate:

- the water supply reservoirs' current water quality condition;
- relationships between concentrations of nutrients, chlorophyll a, total organic carbon, and trihalomethane formation potential;
- algal and cyanobacteria abundance, bloom frequency and severity, and toxin formation, and
- internal cycling of nutrients (from sediments) within the reservoirs.

Ongoing Water Quality Monitoring and Watershed Protection Activities

Efforts are underway by island communities and organizations to enhance watershed management to protect Newport's water supply ponds.

RIDEM is committed to work collaboratively with island communities and organizations in developing its water quality restoration plans. RIDEM has been working closely with the City of Newport and other Aquidneck Island communities and organizations on several water quality monitoring and/or watershed management initiatives within Newport Water's Water Supply Reservoirs' watersheds. These efforts are seen as essential parts of the overall plan to protect these valuable source reservoirs. The various water quality monitoring and/or watershed management initiatives are described below.

URI – Salve Regina University: Real Time Water Quality Monitoring

- Begun in 2014, data is being collected on Bailey Brook and Maidford River as part of National Science Foundation funded project to collect real-time water quality data on three RI streams using in-stream water quality sensors.
- Water quality sensors have been deployed on each river to measure: water depth, conductivity, temperature, dissolved oxygen, pH, turbidity, dissolved organic matter, and nitrate-N and dissolved organic carbon concentrations.
- Staff-gauges installed at each monitoring site support development of stage-discharge relationships over time, and thus will provide flow data that can be used to estimate nutrient loads to the reservoirs.

Newport Water: Source Water Phosphorus Reduction Study - St. Mary's Pond and Watson Reservoir

- Funded by EPA's Southern New England Coastal Watershed Restoration Program, the study aims to protect watershed health, assess pollutant sources, and restore degraded water quality of St. Mary's Pond and Watson Reservoir
- Targeted field assessments will be performed in the two selected watersheds to assess watershed conditions, critical resource areas, and sediment and nutrient sources. The study also includes monitoring of tributary streams, in-lake water quality sampling, and in-lake sediment sampling.

Natural Resources Conservation Service (NRCS)/EPA/RIDEM: National Water Quality Initiative

- Prioritizes funding for agricultural best management practices within the watersheds of the Newport Water Supply Reservoirs
- The National Water Quality Initiative (NWQI) was established as a partnership between US Environmental Protection Agency, NRCS and state agencies such as RIDEM to restore water quality affected by agricultural nonpoint sources.
- In Rhode Island, the priority watersheds selected to participate in the NWQI are Tomaquag Brook – Pawcatuck River, Sakonnet River, and Upper East Passage. The Newport Water Supply Reservoirs are located in the latter two larger watersheds.
- Between 2009 and 2013, four producers have participated in the NWQI program in the Maidford River and Paradise Brook watersheds. Eleven conservation BMPs, having a potential impact on water quality, have been initiated.
- A key element of NWQI is to assess potential water quality improvements resulting from focused conservation actions. As part of the formal agreement, RIDEM is responsible for in-stream monitoring to assess whether water quality conditions have improved, and if so whether this can be associated with agricultural conservation practices installed using NWQI funding.
- RIDEM has established five sampling stations on both the Maidford River and Paradise Brook - all bracketing agricultural areas. The streams will be sampled for turbidity, total suspended solids, nutrients, and pathogens. Six surveys are scheduled for 2014 and 2015.

Town of Middletown: Maidford River Watershed Assessment Study

- In June 2014, Middletown was awarded funding from the U.S. Dept. of Interior and National Fish & Wildlife Foundation for the Sachuest Bay Coastal Resiliency Project, a comprehensive effort to prepare for climate change while improving the ecological and economic value of the Maidford River watershed and nearby coastlines.
- A major component of the Sachuest Bay Coastal Resiliency Project is the Maidford River Watershed Assessment and BMP design project. This project will contribute to coastal resiliency by developing a comprehensive understanding of water quality problems in the Maidford River Watershed by:
 - identifying high-priority opportunities for water quality improvement through development of best management practices (BMPs) in the watershed
 - completing conceptual design for 5-10 high-priority BMPs in the watershed; and
 - providing necessary information for the development of a permanent green infrastructure land conservation plan of the Maidford River Watershed for the Aquidneck Land Trust (ALT).

Development of an Island-wide “Watershed” Plan

RIDEM will work with Aquidneck Island communities and organizations to develop an island wide “watershed” plan

Complementary to the TMDL development efforts, RIDEM will also develop a **watershed plan for Aquidneck Island** over the next 2 years. The watershed plan will serve to **integrate the full range of actions recommended for protecting and restoring water quality and aquatic habitat on Aquidneck Island**. DEM will work to identify partners and to collaborate across all levels of the public and private sectors to determine and implement actions that are supported by sound science. This approach provides a process for government and other stakeholders to prioritize nonpoint source pollution and other water quality problems, and work collaboratively on a watershed basis to optimize results in terms of environmental outcomes and the other societal benefits associated with improved water quality and habitat.