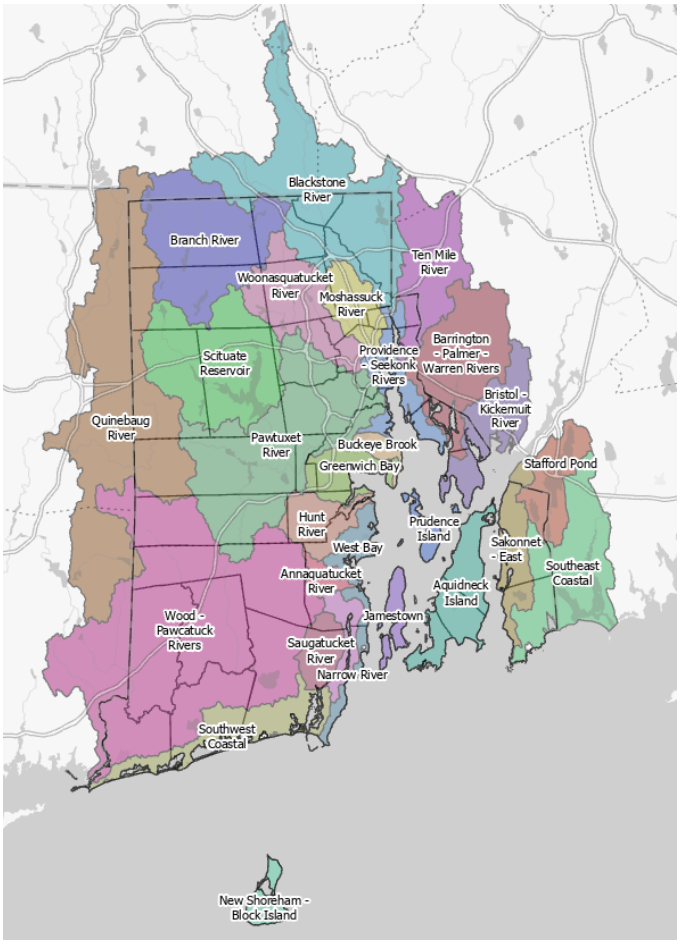
Updates to the Rhode Island Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters



Draft Report
December 2022

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1.0 Introduction

1.1 Overview of 303(d) List and TMDLs

Section 303(d) of the Federal Clean Water Act and Federal Water Quality Planning and Management Regulations (40 CFR Part 130) require states to place waterbodies that do not meet established water quality standards on a list of impaired waterbodies, commonly referred to as the '303(d) List.' In Rhode Island, the Department of Environmental Management (RIDEM) is responsible for the 303(d) listing process. The 303(d) List is updated and issued for public comment every two years with the final list submitted to the United States Environmental Protection Agency (USEPA) for final approval. Surface waters placed on the 303(d) List have one or more designated uses impaired by one or more pollutants and typically require a Total Maximum Daily Load (TMDL) study for each pollutant causing an impairment.

A TMDL establishes the allowable contributions for specific pollutants that a waterbody can receive without exceeding water quality standards (USEPA, 2001). Water quality standards include numeric and narrative criteria that must be met to protect the designated uses of the surface water, described in greater detail below. The TMDL process maps a course for states, municipalities, private landowners, and other stakeholders to follow an iterative process leading to the ultimate restoration of the impaired water and its uses.

1.2 Purpose of this Report

On September 22, 2011, RIDEM received approval from the USEPA for a Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters (2011). Bacterial contamination of surface waters may result from a variety of sources including waste from humans via failing onsite wastewater treatment systems or malfunctioning sewer infrastructure, farm animals, waterfowl, wildlife, and domestic pets. In coastal systems, illicit discharges from boat waste can also be a concern. Bacterial contamination can degrade aquatic ecosystems and negatively affect public health, and may ultimately result in closures of shellfish beds, beaches, and drinking water supplies (MADEP, 2007).

The 2011 Statewide Bacteria TMDL report established the allowable bacterial contributions for Rhode Island's surface waters, provided documentation of impairment, and specified the pollutant reductions needed to meet water quality standards. The goal of these TMDLs is attainment of water quality standards. The Statewide Bacteria TMDL addressed 57 bacteria

impaired surface water segments that were on the 2010 303(d) List of Impaired Waters, and an update to the Statewide Bacteria TMDL in 2014 addressed six impaired surface water segments.

The purpose of this document is to provide TMDLs for three bacteria impaired waterbodies on the 303(d) list by updating the Statewide Bacteria TMDL document. In the Statewide Bacteria TMDL core document, RIDEM established 24 WPAs that include all of the Rhode Island and some hydrologically-connected parts of Massachusetts and Connecticut. Some of these planning areas have been further subdivided for management and planning purposes. Figure 1 provides a map of Rhode Island with WPAs. The figure also illustrates the locations of bacteria impaired segments addressed by this update, shown as red lines. A list of Rhode Island's WPAs is provided in Table 1, along with a compilation of bacteria impaired segments in each WPA. Table 2 provides the impaired waterbody name, waterbody identification number (WBID#), water use classification, town(s), and specific indicator bacteria used for each impaired segment. All of the impaired segments in this update are fresh waterbodies.

Table 1. Number of Impaired Segments per Watershed Planning Area (WPA) in TMDL Update

WPA Name	Number of Impaired Segments	WPA Name	Number of Impaired Segments
Aquidneck Island	0	**Providence-Seekonk Rivers**	0
Barrington-Palmer-Warren Rivers	0	**Prudence Island**	0
Bristol-Kickemuit River	0	**Quinebaug River**	0
Buckeye Brook	0	**Sakonnet-East**	3
Greenwich Bay	0	**Saugatucket River**	0
Hunt River	0	**Southeast Coastal**	0
Jamestown	0	**Southwest Coastal**	0
Branch River	0	**Stafford Pond**	0
Blackstone River	0	**Scituate Reservoir**	0
Moshassuck River	0	**Ten Mile**	0
Narrow River	0	**West Passage**	0
New Shoreham-Block Island	0	**Wood-Pawcatuck Rivers**	0
Pawtuxet River	0	**Woonasquatucket River**	0

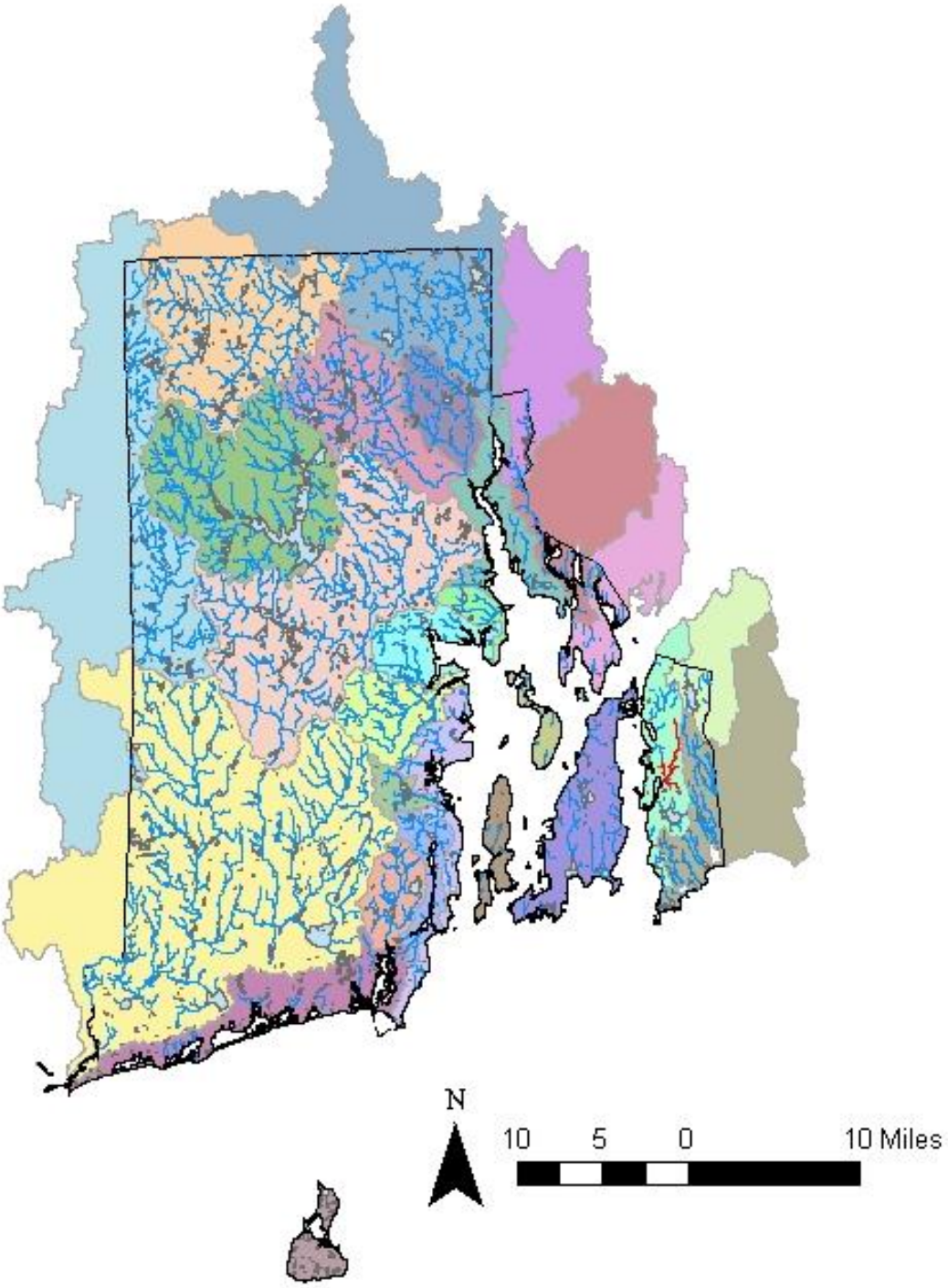

Figure 1. Rhode Island Watershed Planning Areas with Bacteria Impaired Waters Addressed in this TMDL in Red

Table 2. Bacteria Impaired Segments Included in the Statewide Bacteria TMDL Update

Waterbody Name	Waterbody ID	Class	Towns	Impairment
WPA: Sakonnet - East				
Borden Brook	RI0010031R-01	AA	Tiverton, Little Compton	Enterococci
Quaker Creek	RI0010031R-04	AA	Tiverton	Enterococci
Tributary to Nonquit Pond	RI0010031R-20	AA	Tiverton	Enterococci

1.3 Where to Find TMDL Information for the 3 Impaired Waterbodies

This report for three bacteria TMDLs serves as an extension of the approved Statewide Bacteria TMDL. It relies, in part, on portions of the 2011 Statewide Bacteria TMDL to satisfy federal TMDL requirements. A list of the various TMDL elements and where they are addressed is provided in Table 3.

Table 3. Where to Find Information for Each TMDL Element

TMDL Element	Location
Water Quality Standards for Bacteria - Includes an overview of potential pathogenic impacts of bacteria; the selection of indicator bacteria to assess pathogen levels in waterbodies; and a brief summary of Rhode Island bacteria standards for surface waters.	Statewide Bacteria TMDL - Section 2
Bacteria Pollution Sources - Defines point and non-point sources of bacteria pollution and provides examples of bacteria sources that affect Rhode Island's waterbodies	Statewide Bacteria TMDL - Section 3
Bacteria Impaired Waters - Provides a brief introduction to bacteria impaired waters in Rhode Island (based on the *2008 303(d) List*). This section also includes an overview of the 303(d) listing process; a summary of agencies that collect bacteria data in Rhode Island; and, a description of the TMDL prioritization process.	Statewide Bacteria TMDL - Section 4
TMDL Development - Provides a description of the TMDL calculation process including the key required elements for TMDL development and includes concentration-based TMDLs and associated wasteload and load allocations for freshwaters (primary contact recreation) and tidal waters (primary contact recreation and shellfish consumption). The TMDL goal is set to the water quality criteria.	Statewide Bacteria TMDL - Section 5
Implementation Plan - Provides a description of the implementation process, including coordination with local stakeholders and development of watershed based plans, and a menu of mitigative actions (organized by type of source) to reduce bacteria loadings.	Statewide Bacteria TMDL - Section 6 This document – Section 6
Funding and Community Resources - Provides a description of funding sources available to address impaired waters in Rhode Island.	Statewide Bacteria TMDL - Section 7
Watershed-Specific Bacteria Data Summaries, Reductions, and Implementation - Organized by Watershed Planning Area, this section and the appendices include available bacteria data, reductions needed for each impaired segment, and GIS maps of watersheds and land cover.	This document - Section 2 Statewide Bacteria TMDL - Appendix O
Public Participation - Includes a review of the process used to solicit public comment and DEM's response to comments.	This document - Section 3
TMDL Expressed as a Daily Load	Statewide Bacteria TMDL - Appendix M

2.0 Watershed-Specific Bacteria Data Summaries and Reduction Estimates

This section provides an overview of Rhode Island's Watershed Planning Areas (WPAs) and its bacteria impaired segments. The specific reductions required for each of the three impaired segments are presented.

2.1. Bacteria Impaired Segments

Table 4 provides the waterbody name, ID, the endpoint needed to meet criteria and the required percent reduction. All of the impaired segments in this are fresh waterbodies that are impaired for enterococci bacteria.

Table 4. Summary of Estimate Percent Reductions for Bacteria Impaired Segments

Waterbody Name	Waterbody ID	Class	Impairment	Geometric Mean TMDL Endpoint*†	Percent Reduction to meet TMDL Endpoint^
WPA: Sakonnet - East					
Borden Brook	RI0010031R-01	AA	Enterococci	54	78%
Quaker Creek	RI0010031R-04	AA	Enterococci	54	98%
Tributary to Nonquit Pond	RI0010031R-20	AA	Enterococci	54	77%

*Enterococci (colonies/100 mL)

† TMDL endpoint is set to the water quality standard

^ Includes Margin of Safety

2.2 Watershed-Specific Bacteria Data Summaries

Appendices A through L of the Statewide Bacteria TMDL were organized by WPA. Each of the appendices provided bacteria data and information for each of the impaired segments. The following Appendix will be added with specific information concerning the three impaired waterbodies included in this update.

Appendix O – Sakonnet - East

Each appendix contains segment-specific summaries for all of the bacteria impaired segments in that WPA.

Each segment-specific summary provides the following information:

- A description of the watershed for each impaired segment (size, location, and major features) and an overview of available information related to bacteria;
- A watershed map showing the locations of impaired segments and the land area draining to the impaired segment (i.e., the watershed);
- A land cover map showing land cover types within the watershed; and
- Data tables with recent (within 10 years) bacteria data for each impaired segment, with geometric mean and 90th percentile calculations (as appropriate) and reductions needed to meet water quality standards.

3.0 Public Participation

USEPA regulations require that calculations to establish TMDLs be subject to public review as defined in the State Continuing Planning Process (40 CFR 130.7 (c) (1) (ii)). In 2023, RIDEM hosted a public meeting to present the draft updates to the Rhode Island Statewide TMDL for Bacteria Impaired Waters for public review and comment. Presentations included information about the development of the core document and appendices, data sources and calculations, and the implementation requirements of the TMDL. The meeting was held virtually on XXXX. Approximately XXXX people representing the general public and the following organizations attended the meetings:

XXXXXX

The public meetings began the public comment period, which ended on XXXX. The meeting was publicized in a press release and public notices, and an email with the press release was sent to key stakeholders, such as municipal officials and local organizations. RIDEM posted the draft TMDL on its website more than two weeks before the public meeting. RIDEM received comments from XXXX during the public comment period. The RIDEM response to these comments is found in Section 5. Where appropriate; the document was revised in response to comments received.

4.0 References

MADEP (2007). *Final Pathogen TMDL for the Charles River Watershed*. January, 2007. Massachusetts Department of Environmental Protection, Division of Watershed Management. CN 0156.0.

RIDEM (2011). *Rhode Island Statewide Total Maximum Daily Load (TMDL) for Bacteria Impaired Waters.* September 2011. Rhode Island Department of Environmental Management.

USEPA (2001). Protocol for Developing Pathogen TMDLs. January 2001. United States Environmental Protection Agency. EPA 841-R-00-002.

Section 5.0 Response to Comments Received During the Public Comment Period

The following comments were received by RIDEM during the public comment period for the 2022 Updates to the 2011 Rhode Island Statewide Bacteria Total Maximum Daily Load (TMDL). The complete text of all comments received is on file in the Office of Water Resources at DEM.

Section 6.0 Additional TMDL Implementation for Nonquit Reservoir Tributaries

In Section 6.0, the core document of the Statewide Bacteria TMDL describes implementation activities addressing common sources of bacterial pollution including onsite wastewater management, MS4-specific requirements, waterfowl, wildlife, domestic animals, and agriculture. Those pollution abatement strategies may be apply to the waterbodies included in this update. As supplemental information, this Implementation Section of this TMDL describes water quality improvement activities in the Newport reservoir watersheds, specifically Nonquit Reservoir and its tributaries that have been or are being implemented by various agencies/entities. This section also outlines additional required and recommended best management practices (BMP's) that will need to be implemented to meet the water quality targets established in this TMDL. Existing water quality improvement activities/plans are described in further detail in Section 6.1 below and include:

- Nonquit Pond Watershed Plan – Prepared by Atlantic States Rural Water and Wastewater Association for The Tiverton Conservation Commission https://dem.ri.gov/sites/g/files/xkgbur861/files/programs/benviron/water/quality/nonpoint/pdfs/nonquit-wsp.pdf

6.1 Agricultural Best Management Strategies

Well managed farms can operate with minimal adverse impacts on water resources. However, agricultural operations have the potential to adversely impact the state's water resources (surface water, groundwater and wetlands) and aquatic environment. The potential water quality contaminants associated with agricultural operations include nutrients (from fertilizers and animal wastes), pathogens and organic materials (primarily from animal wastes), sediment (from field erosion), pesticides, and petroleum products. In addition, the need for irrigation water can place high demands on local groundwater or surface water supplies which, in turn, can cause a low flow condition in streams potentially resulting in dramatic negative impacts on stream ecology. Further details on agricultural activities in each tributary watershed are included in the associated watershed appendix.

Table 5 summarizes the agricultural-related sources of pollutants, including enterococcus, to the major tributaries to Nonquit Pond. As documented in the table and the watershed-specific appendices, agricultural runoff and erosion have been documented at many sites within the sampled watersheds. The impact of these observed pollution sources on water quality are confirmed by the results of sampling conducted up- and down- stream of these sites.

Beginning in 2014, RIDEM OWR partnered with the Rhode Island Natural Resources Conservation Service (NRCS) to focus NWQI water quality investigations in several tributaries within the Newport reservoir watersheds. These included: 1) the Maidford River (tributary to Paradise Pond and Gardiner Pond), 2) Paradise Brook (tributary to Paradise

Pond), and 3) Quaker and Borden Brook and two other unnamed tributaries (all tributaries to Nonquit Pond).

The streams were sampled for turbidity, total suspended solids, nutrients, and pathogens under both dry and wet weather conditions. Six surveys were conducted-three wet weather and three dry weather surveys. Sampling stations were located upstream and downstream of agricultural areas, to help identify agricultural sources of pollution. In addition, DEM staff field inspected the entire length of all of the tributaries, to visually identify potential sources of pollution. The main pollutant sources identified were excessive erosion from farm fields and livestock access to streams, adjacent wetland areas, or areas subject to flooding. Agricultural sources of pollution, field observations, and existing and proposed best management practices for all reaches of Quaker Creek, Borden Brook, and unnamed tributaries to Nonquit Pond, are shown in Table 5. It should be noted that the information contained in Table 5 reflects improvements and proposed improvements as of 2019. Additional improvements may have been made in 2020 and beyond. Individual watershed appendices detail visual surveys conducted in September 2022 to confirm any changes in potential bacteria sources in readily accessible locations.

Table 5. Agricultural-Related Sources of Pollutants and Proposed and Existing BMPs

	River Reach	Downstream Station *	Exceedances of Criteria/Guidance (Most Upstream Station) and Significant (>20%) Pollutant Increases (Downstream Stations)		Potential Agricultural Sources	Field Observations	Existing or Proposed BMPs	Comments
			Dry Weather	Wet Weather				
Quaker Creek	Q2 to Q3	Station Q3 Downstream of Dairy Farm	Enterococci	Dissolved Organic Carbon Turbidity Total Phosphorus Enterococci	Equestrian Center	Livestock have access to Stream	Owner has indicated he will establish 50-foot vegetated buffers along the resource areas on his property. As part of establishing the buffer he intends to remove a chicken coop which is located within the proposed buffer area. Horses are currently kept out of these areas. Intends on erecting fencing along buffer.	Owner working with NRCS
						Flooded Paddocks on both sides of stream		Owner working with NRCS
						Erosion from paddocks sand parking area/drive, and bus depot		Owner working with NRCS
					Equestrian Center	Uncovered Manure Pile		Need a site visit by RIECD and Division of Ag.
					Dairy Farm	Livestock have access to Stream	The livestock are watered via a well fed watering tough further upslope. Proposing a 50-75 ft. vegetated buffer along the stream including fencing. Working on grazing plan with NRCS.	Working with NRCS.
	Q3 to Q4	Station Q4 East Road	Organic Nitrogen	Total Phosphorus	Dairy Farm,	Cows have access to Western Farm Pond	The Pond on the property is no longer accessed by livestock. The field surrounding the pond is proposed to be fenced off from the cows. The livestock are watered via a well fed watering tough. Working on grazing plan with NRCS.	Working with NRCS.

Tributary to Borden Brook	Headwaters to Bt	**Bt Terminus of Tributary**	Total Nitrogen Organic Nitrogen	Total Nitrogen Organic Nitrogen	Cow Farm	Large Silage Pile adjacent to headwaters	Silage pile cannot be moved without ruining the silage through oxidation. Silage pile will be reduced by feeding cows onsite and looking for buyers in the local area. Intends to invest in bagging system for silage. NRCS to suggest covering existing silage pile.	Has met with Ken Ayars and is working with NRCS.
						Cow Access at Headwaters	NRCS to finish the fencing to restrain cow access by 10/18/18.	OK. Fencing will be completed by 10/18/18.
					Livestock Pen	Fenced pens at least 70 ft. from stream, however livestock have access to stream) as evidenced by manure on stream banks. Site inspection revealed the presence of goats, chickens, and a pig	All of these animals were fenced in their respective areas with no access to stream during subsequent field inspection.	Need a manure management plan.
	Headwaters to Bth	**Bth Headwaters of tributary** Wet-Weather Targeted Sample Taken Immediately Downstream of Silage Pile Adjacent to Stream		Turbidity Total Phosphorus Ammonia Organic Nitrogen Enterococci	Cow Farm	Dense Growth of Filamentous Algae with White Scum Downstream of Silage	Silage pile cannot be moved without ruining the silage through oxidation. Silage pile will be reduced by feeding cows onsite and looking for buyers in the local area. Intends to invest in bagging system for silage. NRCS to suggest covering existing silage pile.	Has met with Ken Ayars and is working with NRCS.

	River Reach	Downstream Station *	Exceedances of Criteria/Guidance (Most Upstream Station) and Significant (>20%) Pollutant Increases (Downstream Stations)		Potential Agricultural Sources	Field Observations	Existing or Proposed BMPs	Comments
			Dry Weather	Wet Weather				
Borden Brook	B1 TO B2	**B2 East Road**	No Significant Pollutant Increases	No Significant Pollutant Increases	Silage Pile	Silage Pile adjacent to East Road	The majority of this material has been removed. Bobby Carr advised us in the field the remainder of the material will be removed shortly.	Ok. No further action needed.
					Chicken Pen	Chicken Coop adjacent to East Road Ditch	This coop has been removed from the area of concern.	Ok. No further action needed.
					Dairy Farm	Livestock Access to Stream		Owner is going to meet with NRCS to discuss fencing the cows out of the stream.
	B2 to B3	**B3 Main Road**	Total Phosphorus Total Nitrogen Organic Nitrogen	Total Nitrogen Organic Nitrogen	Small Livestock Farm	Livestock access to stream		Have spoken with owner to set up meeting. Needs followup.
						Manure Pile 30 ft. from Stream		Have spoken with owner to set up meeting. Needs followup.
						Erosion		Have spoken with owner to set up meeting. Needs followup.

Unnamed Tributary to Nonquit Pond	Headwaters to N1	**N1 Northeastern Fork at Barnswallow Street**	Total Phosphorus Total Nitrogen Organic Nitrogen	Total Phosphorus Total Nitrogen Organic Nitrogen	Dairy Farm	Cows Have Access to Flooded Areas Adjacent to Stream and Stream Itself		OK. Fencing will be completed by 10/18/18.
	N1 to N2	**N2 Peaceful Way**	Nitrate	Turbidity Total Nitrogen Organic Nitrogen Enterococci	Crop Field	Western Fork: Bisects Crop Field with Inadequate Buffer (15 ft.)	The field has been seeded in hay. Provided the field is stable with grasses and not subject to plowing/disturbance and regular fertilizing the site is not expected to significantly contribute to after quality concerns. If the site is returned to regular field production I would recommend a vegetated buffer be established.	OK. No further action needed.
						Eastern Fork: Flows along Border of Hay Field and Crop Field	The field has been seeded in hay. Provided the field is stable with grasses and not subject to plowing/disturbance and regular fertilizing the site is not expected to significantly contribute to after quality concerns. If the site is returned to regular field production I would recommend a vegetated buffer be established.	OK. No further action needed.
						Erosion especially at northern end of cropfield	The field has been seeded in hay. Provided the field is stable with grasses and not subject to plowing/disturbance and regular fertilizing the site is not expected to significantly contribute to after quality concerns. If the site is returned to regular field production I would recommend a vegetated buffer be established.	OK. No further action needed.