



Pawcatuck River Segment 18B

Watershed Description

This **TMDL** applies to the Pawcatuck River assessment unit (RI00080439R-18B), a 2.2-mile long stream segment located in Charlestown and Richmond, RI (Figure 1). This impaired segment of the Pawcatuck River is located in Washington County in the southern section of the Town of Richmond and the northern portion of the Town of Charlestown. The Pawcatuck River watershed is presented in Figures 2 and 3 with land use types indicated.

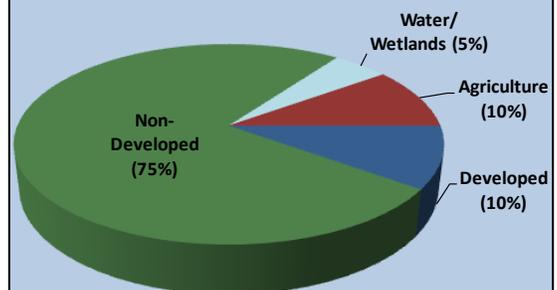
The headwaters of the Pawcatuck River are located in Wordens Pond in South Kingstown. The river primarily flows from east to west, picking up water from several rivers. The principle tributaries to the Pawcatuck River are the Shunock River, the Ashaway River, Tomaquag Brook, the Wood River, Meadow Brook, Beaver River, the Queen/Usquepaug River, and the Chipuxet River. The Pawcatuck River empties into Little Narragansett Bay in Westerly, RI (RIDEM, 2010b).

The Pawcatuck River leaves Wordens Pond and enters the Great Swamp Management Area. The impaired segment of the Pawcatuck River begins near the Village of Kenyon just west of Route 2 and Great Swamp and just east of the outlet of Beaver River in the southern portion of Richmond. The river flows west through the Village of Shannock and then flows parallel to Shannock Hill Road toward the Village of Carolina. This impaired segment of the Pawcatuck River ends just before Route 112.

This portion of the Pawcatuck River watershed covers 92 square miles. Non-developed areas occupy a large portion (75%) of the watershed. Developed uses occupy approximately 10%. Agricultural land uses occupy 10% and wetlands and other surface waters occupy 5%.

Assessment Unit Facts *(RI0008039R-18B)*

- **Towns:** Charlestown and Richmond
- **Impaired Segment Length:** 2.2 miles
- **Classification:** Class B1
- **Direct Watershed:** 92 mi² (59148 acres)
- **Impervious Cover:** 4.2%
- **Watershed Planning Area:** Wood - Pawcatuck (#23)



Watershed Land Uses

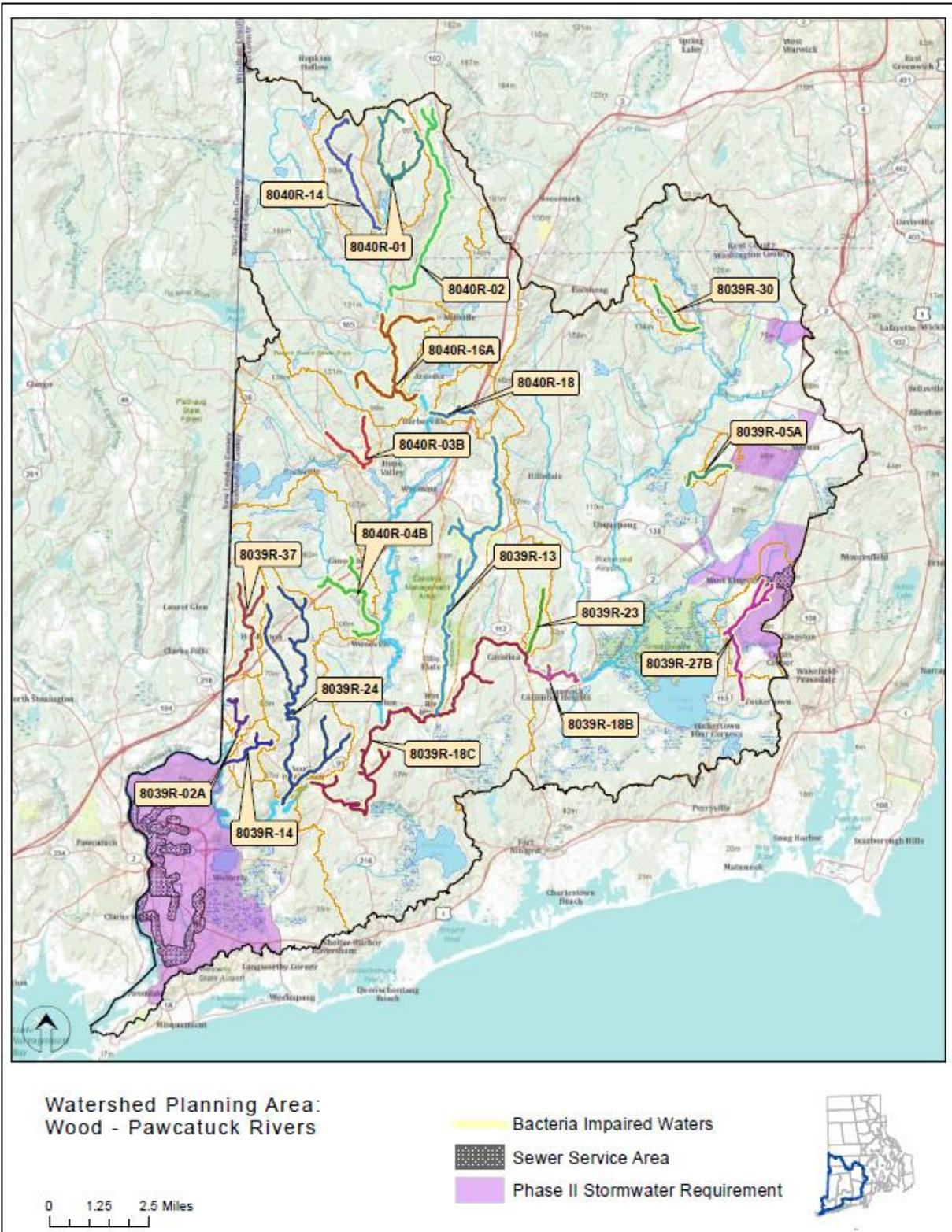


Figure 1: Map of the Wood-Pawcatuck Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewer service areas, and stormwater regulated zones.

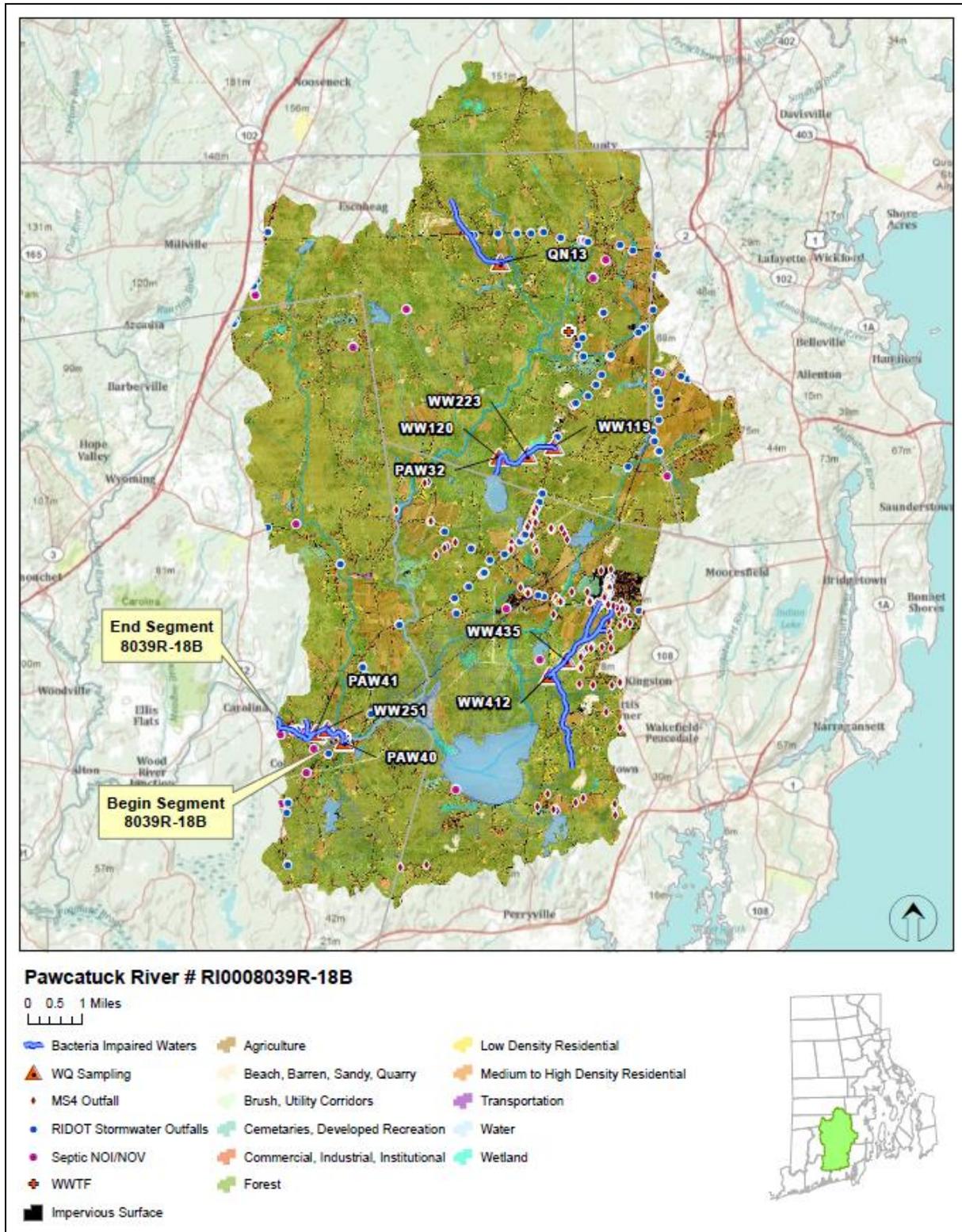


Figure 2: Map of the Pawcatuck River Segment 18B watershed with impaired segments, sampling locations, and land cover indicated.

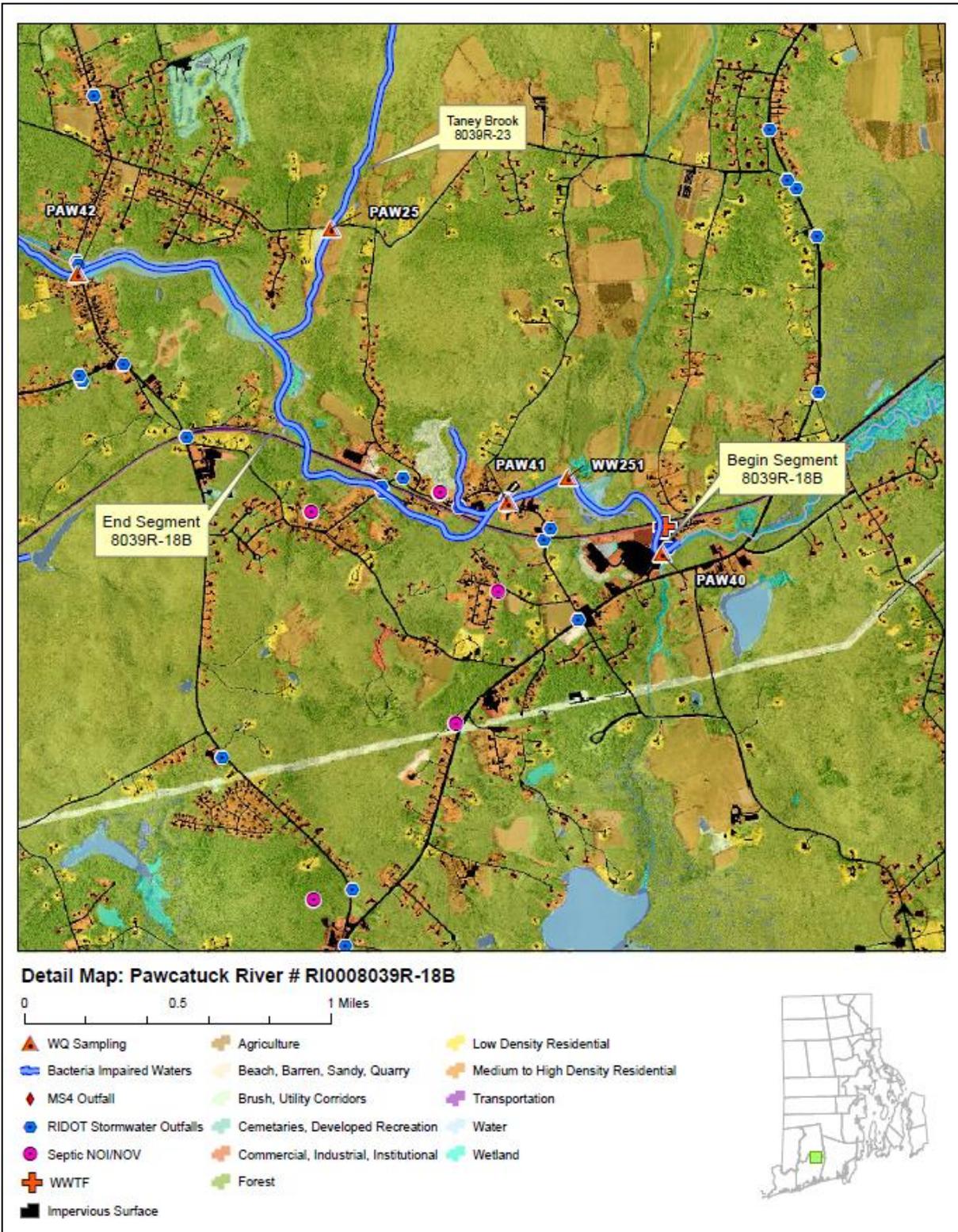


Figure 3: Zoomed map of the Pawcatuck River Segment 18B watershed with impaired segments, sampling locations, and land cover indicated.

Why is a TMDL Needed?

The Pawcatuck River Segment 18B is a Class B1 fresh water stream, and its applicable designated uses are primary and secondary contact recreation and fish and wildlife habitat. Primary recreational activities may be impacted due to pathogens from approved discharges to Class B1 waters. However, all Class B criteria must be met (RIDEM, 2009). This segment of the Pawcatuck River receives industrial effluent from Kenyon Industries, a textile manufacturing company, in the Village of Kenyon, in Richmond, RI. Until recently, Kenyon Industries also discharged its sanitary waste into the river. The plant has removed its sanitary discharge by sending all domestic wastewater (i.e., wastewater from restrooms) to an approved Onsite Wastewater Treatment System (OWTS).

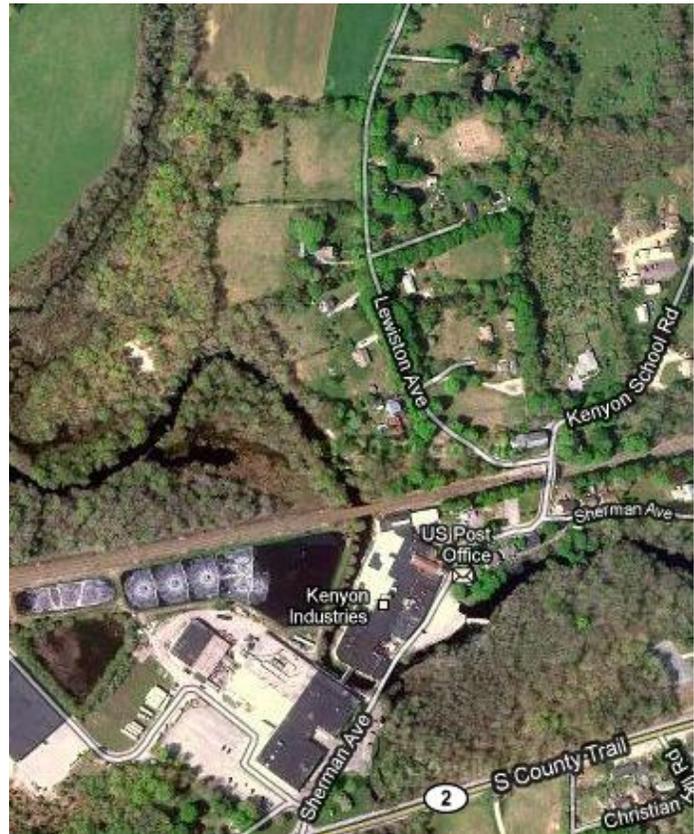


Figure 4: *Partial aerial view of the Pawcatuck River Segment 18B watershed (Source: Google Maps)*

In 2005, 2006, and 2008, water samples were collected from three sampling locations (PAW40, PAW41, and WW251) and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2005, 2006, and 2008 and associated statistics are presented in Table 1. The geometric mean was calculated for all stations and exceeded the water quality criteria for enterococci at Station PAW41. To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sample days, where appropriate. These calculations were limited to station WW251, as the two other stations only had dry-weather data. The wet-weather geometric mean exceeded the water quality criteria for enterococci at station WW251.

Due to the elevated bacteria measurements presented in Table 1, the Pawcatuck River Segment 18B does not meet Rhode Island's bacteria water quality standards, was identified as impaired and was placed on the 303(d) list (RIDEM, 2008). The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

This segment of the Pawcatuck River has also been assessed by RIDEM as impaired for an unknown toxicity. No TMDL has been completed for this impairment (Fuss and O'Neill, 2006).

Potential Bacteria Sources

There are several potential sources of bacteria in the Pawcatuck River watershed including discharges from Kenyon Industries, malfunctioning onsite wastewater treatment systems, agricultural activities, waterfowl and wildlife waste, and stormwater runoff from developed areas.

Kenyon Industries

Kenyon Industries is a commercial textile mill located in Richmond and Charlestown, RI along this impaired segment of the Pawcatuck River. Kenyon Industries performs the scouring, dyeing, printing, finishing, and coating of woven fabrics. The discharge historically consisted of treated domestic and industrial wastewater effluent. Treatment of industrial wastewater was accomplished through the use of two treatment lagoons, and was discharged to the Pawcatuck River through an effluent diffuser. Treatment of domestic wastewater was accomplished through the use of a package of Sanitary Wastewater Treatment Facilities, which then discharged to the industrial treatment lagoons. Though Kenyon Industries recently removed its domestic wastewater from its wastestream, its industrial waste discharge remains and it is still currently regulated under the RIPDES program (RIPDES permit RIR0000131). Kenyon Industries is in the process of confirming that all domestic wastewater has been removed from its discharge.

Onsite Wastewater Treatment Systems

All residents in the Towns of Charlestown and Richmond and the Pawcatuck River Segment 18B watershed rely on onsite wastewater treatment systems (OWTS) such as septic systems and cesspools. Failing OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003). If systems are improperly sized, malfunctioning, or in soils poorly suited for septic waste disposal, microorganisms such as bacteria, can easily enter surface water (USEPA, 2002). As shown in Figures 2 and 3, multiple OWTS Notices of Violation/Notices of Intent to Violate (NOV/NOI) has been issued by the RIDEM Office of Compliance and Inspection in the Pawcatuck River watershed, and three NOV/NOIs have been issued to residents near this impaired segment of the Pawcatuck River.

Agricultural Activities

The Pawcatuck River watershed has multiple agricultural operations, including multiple horse and dairy farms in the town of Richmond (Fuss and O'Neill, 2007). However, agricultural operations are an important economic activity and landscape feature in the state's rural areas. Agricultural runoff may contain multiple pollutants, including bacteria. Agricultural practices such as allowing livestock to graze near streams, crossing livestock through waterbodies, spreading manure as fertilizer, and improper disposal of manure can contribute to bacterial contamination. The portion of the Pawcatuck River just downstream from Kenyon Industries has multiple farms near the banks of the river.

Developed Area Stormwater Runoff

Approximately 10% of the Pawcatuck River watershed is developed and most of the development is concentrated along major roads in the watershed. The Pawcatuck River watershed has an impervious cover of approximately 4.2%. Impervious cover is defined as land surface areas, such as roofs and roads that force water to run off land surfaces, rather than infiltrating into the soil. Impervious cover provides a useful metric for the potential for adverse stormwater impacts. While runoff from impervious areas in these portions of the watershed may be contributing bacteria to the Pawcatuck River, as discussed in Section 6.3 of the Core TMDL Document, as a general rule, impaired streams with watersheds having less than 10% impervious cover are assumed to be caused by sources other than urbanized stormwater runoff.

The Rhode Island Department of Transportation (RIDOT) has identified and mapped stormwater outfalls in the Pawcatuck River watershed. As shown in Figures 2 and 3, multiple outfalls are found in the watershed, particularly along major highways.

Wildlife and Waterfowl Waste

Approximately 75% of the Pawcatuck River watershed is undeveloped. Wildlife, including waterfowl, may be a significant bacteria source to surface waters. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. As such these physical land alterations can exacerbate the impact of these natural sources on water quality.

Existing Local Management and Recommended Next Steps

Additional bacteria data collection would be beneficial to support identification of sources of potentially harmful bacteria in the Pawcatuck River watershed. These activities could include sampling at several different locations and under different weather conditions (e.g., wet and dry). Field reconnaissance surveys focusing on stream buffers, stormwater runoff, and other source identification may also be beneficial.

Based on existing ordinances and previous investigations, the following steps are recommended to support water quality goals.

Kenyon Industries

Available water quality data from station WW251, located downstream of Kenyon Industries, do not exceed the water quality criteria for enterococci. However, it has been previously documented that Kenyon Industries' effluent did not meet its permitted bacteria concentrations. Now that an OWTS has been installed to handle its sanitary waste, sampling is necessary to confirm that the problem has been

resolved. Once it has been confirmed that all domestic wastewater has been removed, Kenyon Industries' permit will be modified to replace its bacteria limits with "monitor only" requirements.

Onsite Wastewater Management

All residents of the Towns of Charlestown and Richmond and the Pawcatuck River watershed rely on OWTS (septic systems or cesspools). Charlestown has an approved Onsite Wastewater Management Plan and Richmond has a draft plan. Both plans provide a framework for managing the OWTS. As part of the onsite wastewater planning process, Charlestown formed a Wastewater Management Commission in 1993 and adopted an OWTS ordinance in 1994 that initially required OWTS to be pumped once every three years. This ordinance was revised in 1998 to provide for inspection-based pumping (Dillmann, 1999). RIDEM recommends that all communities, including Richmond, create an inventory of onsite systems through mandatory inspections. Inspections encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard OWTS within a reasonable time frame should be adopted. The Rhode Island Wastewater Information System (RIWIS) can help develop an initial inventory of OWTS and can track voluntary inspection and pumping programs (RIDEM, 2010b).

The Town of Charlestown is eligible for Rhode Island's Community Septic System Loan Program (CSSLP) and has received 1.1 million dollars from the program since 1999. CSSLP allows towns to assist citizens with the replacement of older and failing systems through low-interest loans. Though the Town of Richmond is not currently eligible for CSSLP, it is recommended that the town develop a program to assist citizens with the replacement of older and failing systems.

Agricultural Activities

If not already in place, agricultural producers, particularly near Shannock Road, should work with the RIDEM Division of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) to develop conservation plans for their farming activities within the watershed. NRCS and the RIDEM Division of Agriculture should ensure that all agricultural operations within the watershed have sufficient stream buffers, have fencing to restrict access of livestock and horses to streams and wetlands, and have animal waste handling, disposal, and other appropriate BMPs in place.

Stormwater Management

RIDOT (RIPDES permit RIR040036) is a municipal separate storm sewer (MS4) operator in the Pawcatuck River watershed and has prepared a Phase II Stormwater Management Plan (SWMPP) for state-owned roads. Though the Town of Charlestown (RIPDES permit RIR040040) is regulated under the Phase II program, the Pawcatuck River watershed is outside of the regulated area. The Town

of Richmond is not currently regulated under the Phase II Program. However, it is anticipated that Richmond will be regulated within the next few years.

The Town of Richmond has developed an initial Phase II SWMPP in anticipation of Phase II regulations in the future (Fuss and O'Neill, 2007). Richmond's SWMPP outlines existing stormwater programs and notes goals for these programs in the future. Richmond currently has an annual cleaning and inspection program for its 450 catch basins, and an annual street sweeping program. The town has not mapped or identified their stormwater outfalls or adopted an IDDE ordinance.

The Towns of Charlestown and Richmond do not currently have ordinances to address illicit discharges. This type of ordinance prohibits illicit discharges to the storm drain system and provides an enforcement mechanism. It is recommended that any stormwater outfalls discharging in the vicinity of the sampling locations be monitored to check for illicit discharges. Illicit discharges can be identified through continued dry weather outfall sampling and microbial source tracking.

RIDOT's SWMPP and its 2011 Compliance Update outline its goals for compliance with the General Permit statewide. It should be noted that RIDOT has chosen to enact the General Permit statewide, not just for the urbanized and densely populated areas that are required by the permit. RIDOT has finished mapping its outfalls throughout the state and is working to better document and expand its catch basin inspection and maintenance programs along with its BMP maintenance program. SWMPPs are being utilized for RIDOT construction projects. RIDOT also funds the University of Rhode Island Cooperative Extension's Stormwater Phase II Public Outreach and Education Project, which provides participating MS4s with education and outreach programs that can be used to address TMDL public education recommendations.

As it is assumed that stormwater runoff is not the major contributor of bacteria to the Pawcatuck River based on the watershed's imperviousness, RIDOT and Charlestown will have no changes to their Phase II permit requirements and no TMDL Implementation Plan (TMDL IP) will be required at this time.

Wildlife and Waterfowl Waste

The towns should develop education and outreach programs to highlight the importance of picking up after dogs and other pets and not feeding waterfowl. Animal waste should be disposed of away from any waterway or stormwater system. The towns should work with volunteers to map locations where animal waste is a significant and a chronic problem. The town should also evaluate strategies to reduce the impact of animal waste on water quality. This may include installing signage, providing pet waste receptacles or pet waste digester systems in high-use areas, enacting ordinances requiring clean-up of pet waste, and targeting educational and outreach programs in problem areas.

Towns and residents can take several measures to minimize the impacts of wildlife and waterfowl to the Pawcatuck River. They can allow tall, coarse vegetation to grow in areas along the shores of the

Pawcatuck River that are frequented by waterfowl and wildlife. Waterfowl, especially grazers like geese, prefer easy access to the water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. With few exceptions, Part XIV, Section 14.13 of Rhode Island's Hunting Regulations prohibits feeding wild waterfowl at any time in the state of Rhode Island. Educational programs should emphasize that feeding waterfowl, such as ducks, geese, and swans, contributes to water quality impairments in the Pawcatuck River and can harm human health and the environment.

Land Use Protection

Woodland and wetland areas within the Pawcatuck River watershed absorb and filter pollutants from stormwater runoff, and help protect both water quality in the stream and stream channel stability. As these areas represent the majority of the land use in the Pawcatuck River watershed, it is important to preserve these undeveloped areas, and institute controls on development in the watershed.

The steps outlined above will support the goal of mitigating bacteria sources and meeting water quality standards in the Pawcatuck River.

Table 1: Pawcatuck River Segment 18B Bacteria Data

Waterbody ID: RI0008039R-18B

Watershed Planning Area: 23 – Wood-Pawcatuck

Characteristics: Freshwater, Class B1, Primary and Secondary Contact Recreation, Fish and Wildlife Habitat

Impairment: Enterococci (colonies/100mL)

Water Quality Criteria for Enterococci: Geometric Mean: 54 colonies/100 mL

Percent Reduction to meet TMDL: 75% (Includes 5% Margin of Safety)

Data: 2005, 2006, and 2008 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for the Pawcatuck River Segment 18B (2005, 2006, and 2008) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
PAW40	Upstream of Kenyon Industries, Sherman Rd	7/31/2008	173	Dry	52
PAW40	Upstream of Kenyon Industries, Sherman Rd	7/10/2008	126	Dry	
PAW40	Upstream of Kenyon Industries, Sherman Rd	10/27/2006	1	Dry	
PAW40	Upstream of Kenyon Industries, Sherman Rd	8/9/2006	170	Dry	
PAW40	Upstream of Kenyon Industries, Sherman Rd	5/31/2006	33	Dry	
PAW40	Upstream of Kenyon Industries, Sherman Rd	9/21/2005	170	Dry	
WW251	Pawcatuck River below Kenyon Industries	10/25/2008	24	Dry	45
WW251	Pawcatuck River below Kenyon Industries	9/20/2008	39	Dry	
WW251	Pawcatuck River below Kenyon Industries	8/16/2008	117	Dry	
WW251	Pawcatuck River below Kenyon Industries	6/7/2008	43	Wet	
WW251	Pawcatuck River below Kenyon Industries	5/10/2008	40	Wet	
WW251	Pawcatuck River below Kenyon Industries	10/20/2007	58	Wet	49
WW251	Pawcatuck River below Kenyon Industries	9/15/2007	413	Wet	
WW251	Pawcatuck River below Kenyon Industries	7/21/2007	26	Dry	
WW251	Pawcatuck River below Kenyon Industries	6/16/2007	34	Dry	
WW251	Pawcatuck River below Kenyon Industries	5/12/2007	14	Dry	

Single Sample Enterococci (colonies/100 mL) Results for the Pawcatuck River Segment 18B (2005, 2006, and 2008) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WW251	Pawcatuck River below Kenyon Industries	11/1/2006	21	Dry	50
WW251	Pawcatuck River below Kenyon Industries	9/30/2006	148	Wet	
WW251	Pawcatuck River below Kenyon Industries	8/26/2006	179	Wet	
WW251	Pawcatuck River below Kenyon Industries	7/27/2006	41	Dry	
WW251	Pawcatuck River below Kenyon Industries	6/17/2006	43	Dry	
WW251	Pawcatuck River below Kenyon Industries	5/20/2006	16	Wet	
PAW41	Shannock Road (Horseshoe Falls Dam)	7/31/2008	397	Dry	179 [†] (75%)*
PAW41	Shannock Road (Horseshoe Falls Dam)	10/27/2006	79	Dry	
PAW41	Shannock Road (Horseshoe Falls Dam)	8/9/2006	110	Dry	
PAW41	Shannock Road (Horseshoe Falls Dam)	5/31/2006	170	Dry	
PAW41	Shannock Road (Horseshoe Falls Dam)	9/21/2005	310	Dry	
Shaded cells indicate an exceedance of water quality criteria *Includes a 5% Margin of Safety † Geometric Mean used to calculate percent reduction					

Wet and Dry Weather Geometric Mean Enterococci Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
PAW40	Upstream Kenyon Industries, Sherman Rd	2005-2008	0	6	52	NA	52
WW251	Pawcatuck River below Kenyon Industries	2006-2008	7	9	48	78	33
PAW41	Shannock Road (Horseshoe Falls Dam)	2005-2008	0	5	179	NA	179
Shaded cells indicate an exceedance of water quality criteria Weather condition determined from the rain gage at URI in Kingston, RI							

References

- Dillmann, Brenda (1999). Town of Charlestown Onsite Wastewater Management Plan. March 15, 1999. Online: <http://www.charlestownri.org/vertical/Sites/%7BDF68A5B8-A4F3-47A1-AE87-B411E21C6E1C%7D/uploads/%7BF36E34D7-D57F-4ED4-98D0-0B72189B4D0A%7D.PDF>.
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