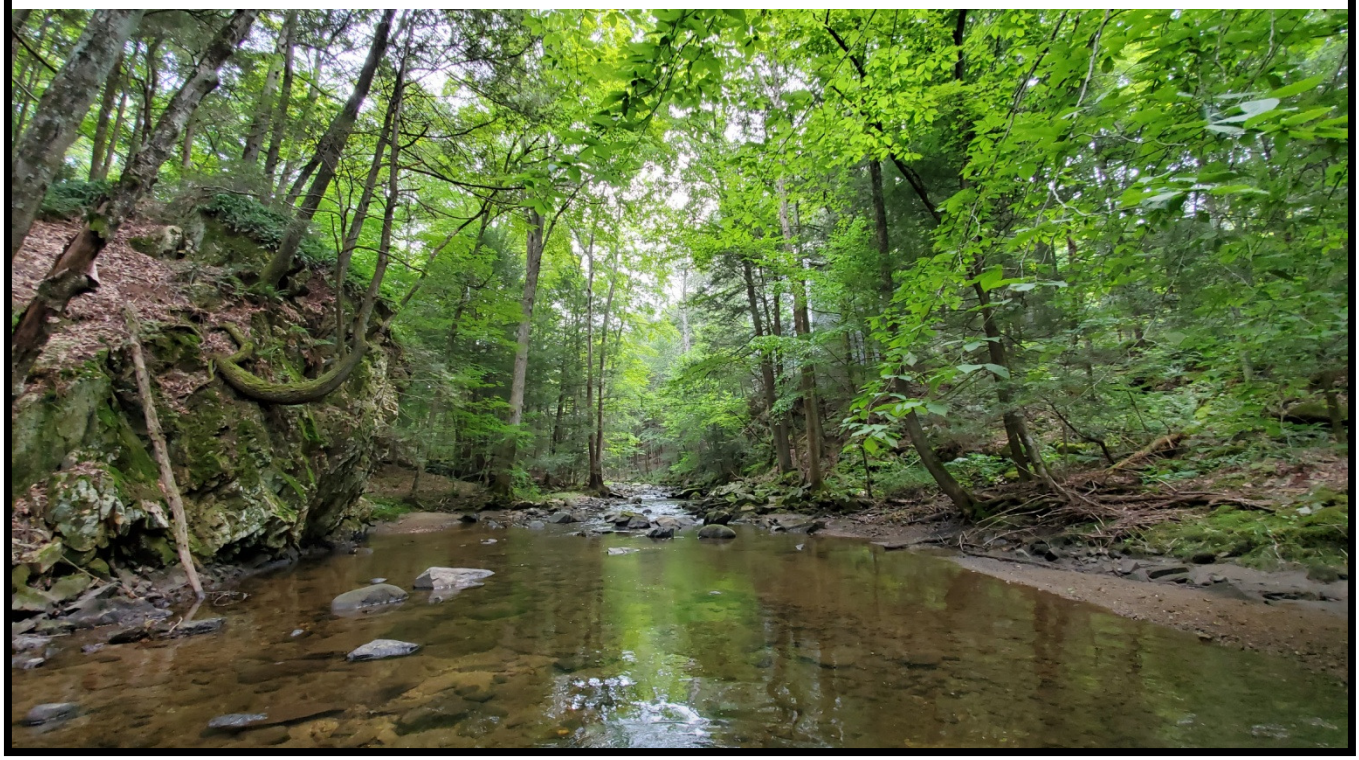
POMPERAUG RIVER WATERSHED BASED PLAN ADDENDUM

Updated Existing Conditions Report (through 2022)
& Reprioritized Best Management Practices
Implementation Strategy

Prepared by Pomperaug River Watershed Coalition



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Nathalie Guerrieri, volunteer
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Hunter Shay, Southbury Public Works, volunteer
Olivia DiPalermo, 2023 Dr. Marc J. Taylor Intern
Charlotte Zapletal, 2023 Dr. Marc J. Taylor Intern

PRWC Land Use & Science Committee Members

Vince McDermott, Committee Co-Chair, former PRWC Board Chairman
Christopher Wood, Committee Co-Chair, former PRWC Board of Directors
Aaron Budris, Senior Regional Planner, Naugatuck Valley Council of Governments
Gail McTaggart, PRWC Board Chair (through September 2020)
Susan Peterson, Watershed Manager, CT Department of Energy and Environmental Protection
Kyle Turoczi, Soil and Wetland Scientist, Earth Tones Native Plant Nursery and Landscaping
Andie Greene, PRWC Board of Directors, SLR Consulting
Dan Slywka, PRWC Board of Directors, Daffodil Hill Growers

Pomperaug River Watershed Coalition Staff

Carol Haskins, Executive Director
Anne Urkawich, Director of Development & Administration
Hailey McKeever, Outreach Coordinator
Katie Hennessy, Community Engagement Coordinator

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LIST OF ACRONYMS

APA	Aquifer Protection Areas
BMP	Best Management Practices
C	Celsius degrees
CLEAR	Center for Land use Education and Research
CFU	Colony Forming Units
CTDEEP	Connecticut Department of Energy and Environmental Protection
CTDPH	Connecticut Department of Public Health
CTDOT	Connecticut Department of Transportation
CTECO	Connecticut Environmental Conditions Online
CFS	Cubic Feet per Second
DCIA	Directly Connected Impervious Area
EQIP	Environmental Quality Incentives Program
FLRP	Farmland Restoration Program
GPD	Gallons per Day
GIS	Geographic Information Systems
GI	Green Infrastructure
HVA	Housatonic Valley Association
HVHD	Housatonic Valley Health District
IDDE	Illicit Discharge Detection and Elimination
IC	Impervious Cover
in	inches
IWQR	Integrated Water Quality Report
LID	Low Impact Development
MOA	Memorandum of Agreement
uS/mL	Micro Siemens per milliliter
MGD	Million Gallons per Day
MNP	Most Probable Number
MS4	Municipal Separate Storm Sewer System
NFWF	National Fish and Wildlife Foundation
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NWQA	National Water Quality Assessment
NWQI	National Water Quality Inventory
NRCS	Natural Resource Conservation Service
NVCOG	Naugatuck Valley Council of Governments
NEMO	Nonpoint Source Education for Municipal Officials
POCD	Plan of Conservation and Development
PPM	Parts per million
PDDH	Pomperaug District Department of Health
PRWC	Pomperaug River Watershed Coalition
QAPP	Quality Assurance Project Plan
ROW	Right-of-Way
SWP	State Water Plan
TMDL	Total Maximum Daily Load
EPA	U.S. Environmental Protection Agency
USDA	United States Department of Agriculture
USGS	United States Geologic Survey
UCONN	University of Connecticut
WBP	Watershed Based Plan
WTM	Watershed Treatment Model

SECTION 1. Introduction, Report Process, and Background

INTRODUCTION

The Pomperaug River Watershed is one of the most studied watersheds in the United States, with research dating back to 1898. The watershed has been the focus of grass-roots watershed management and water resource protection efforts over the years with initiatives led by Pomperaug River Watershed Coalition (PRWC) and its partners including university research groups, state and federal resource protection agencies, the watershed municipalities, land owners, and other local and regional groups. PRWC's approach of collecting and applying scientific data to local decision-making about how to balance conservation and development actions in the watershed over the past 20-plus years has served as a model for other organizations and watersheds throughout the region and beyond.

Historically, the Pomperaug River and its tributaries have been considered high quality water resources with ample flow to support a healthy fish community and water-based recreational opportunities. In the past decade, however, five river segments within the Pomperaug Watershed have been designated as impaired as they do not fully support uses for aquatic life and/or recreation. Rivers are designated as impaired and placed on the "303(d) List of Impaired Waters" when they do not meet State or Federal Water Quality Standards for one or more of its designated uses (typically fishing and swimming). Of the impaired river segments in the Pomperaug, most of them are attributed to high levels of bacteria that make swimming unsafe (**Table 1-2**).

When the furthest downstream segment of the Pomperaug River (2.74 miles) and the entirety of the Weekeepeemee River (9.61 miles) appeared on the impaired waters list in 2012 for not supporting recreation uses, PRWC recognized the need to look more closely at ambient water quality data and strategies for mitigating high bacteria levels (**Figure 1-2**). PRWC sought funding through the Connecticut Department of Energy and Environmental Protection's (CT DEEP) Section 319 Nonpoint Source Pollution Control Grant Program to support the development of a 9-Element Watershed Based Plan (WBP). The WBP, adopted in 2018, considered available water quality data, physical attributes of the watershed (soils, slope, land cover), a list of potential "hotspot" sources of bacteria-rich runoff, and findings from visual assessment surveys to better characterize sources of bacteria and nutrients that may be contributing to water quality concerns in the watershed and in water bodies further downstream (Housatonic River and Long Island Sound). In the process of developing the WBP, PRWC recognized that the impaired river segments were designated as such on the basis of very limited data. Unfortunately, the project budget was already set and did not allow for testing stream samples for bacteria to better understand the scope of the impairments in terms of weather conditions or seasonality that might be associated with high bacteria counts. This data would also help bracket contributing sources of pollution. The budget also did not allow for sampling stream segments that were suspected to have high bacteria levels like in the case of Nonnewaug River and portions of the Pomperaug River. Segments of these rivers had not previously been tested but have watershed characteristics very similar to impaired stream segments and/or are contiguous to impaired segments.

While the ambient water quality data were limited, information derived from the application of a pollutant load model proved very important for developing the Watershed Based Plan. The model provided estimates on the relative bacteria and nutrients loads from each subregional watershed based on their specific land use types, soils, and slopes. These pollutants are typically delivered to wetlands and water courses by way of stormwater

runoff. Stormwater runoff is generated when precipitation cannot soak into the ground and flows over the landscape (roads, parking lots, roofs, lawns, fields, forests, etc) where it may pick up pollutants including bacteria; nutrients; chemicals and other pollutants from landscaping; agriculture; automotive fluids, oils, and greases; and other human and wildlife activities. The model also provided information about how much of these pollutant loads could be reduced through the implementation of green infrastructure and other best management practices designed to infiltrate stormwater runoff. With this information, the WBP presented strategies to mitigate these sources of pollution that included underground infiltration, bio-retention, riparian buffers, rain gardens, illicit discharge detection and elimination, community education, manure management, open space conservation, and others.

Among the highest priority actions recommended in the Pomperaug Watershed Based Plan was implementation of an ambient water quality monitoring program (AQWM) across a network of 15 fixed monitoring stations. Bacteria and nitrate data collected from these stations would provide a better understanding of the scope of the water quality impairments, to identify where the greatest investments would be needed to implement mitigation strategies, and to generate data that could support de-listing river segments from the 303(d) impaired waters list. The WBP also recommended conducting a more thorough visual assessment for the length of the Weekeepeemee River as funding constraints had limited which areas were visually assessed during the Plan development. A streamwalk survey was conducted for only one of the impaired segments of the Pomperaug while select upland areas of the other three impaired segments were assessed through hotspot investigations and neighborhood surveys. Following these recommendations, PRWC secured additional grant funding to implement an ambient water quality monitoring program and to conduct a full streamwalk assessment survey of the Weekeepeemee River. The collection of these data was deemed essential as they would support and help better prioritize the best management practices that were recommended in the Watershed Based Plan.

The intent of this report is to present the findings of PRWC's ambient water quality monitoring program, streamwalk assessment surveys, and to consider other relevant water quality data that was not available at the time the Watershed Based Plan was developed. The latter portion of this report provides a reprioritized list of best management practices to mitigate bacteria pollution along with site specific conceptual plans for areas that had not been identified or considered high priority in the Pomperaug Watershed Based Plan.

UPDATED EXISTING CONDITIONS REPORT PROCESS

PRWC and its partners, including the watershed municipalities, land owners, and regional, state, and federal agencies, worked collaboratively to develop an EPA 9-Element Watershed Based Plan for the Pomperaug River watershed that was approved by CT DEEP in 2018. Funding for that project was provided in part by CT DEEP through an EPA Clean Water Act Section 319 Nonpoint Source Grant as well as by the Connecticut Community Foundation. Fuss & O'Neill, Inc. was retained by PRWC to lead the development of the Watershed Based Plan. Ambient Water Quality Monitoring was not included in the project budget at the time, as gaps in this dataset had not yet been identified. Accordingly, an ambient water quality monitoring was recommended as a high priority action item in the Watershed Based Plan, as were more comprehensive visual field assessments (streamwalk surveys) for impaired stream segments which were not fully surveyed when the WBP was developed. In 2019, PRWC secured another 319 NPS Management Grant from CT DEEP to support

implementation of these recommendations in order to generate this Updated Existing Conditions Report which helps better illustrate the extent of stream impairments in the Pomperaug Watershed and reprioritize where best practices are necessary to reduce bacteria levels.
Development of this Updated Existing Conditions Report & BMP Implementation Strategy consisted of the following tasks.

Quality Assurance Project Plan
A Quality Assurance Project Plan (QAPP) was developed for this project to address data quality objectives associated with visual field assessments and ambient water quality monitoring (collection of direct measurements) as well as acceptance criteria for existing data (secondary data). The QAPP was approved by CTDEEP and EPA in May 2021 and revised in March 2022. A copy of the approved QAPP revisions is provided in **Appendix 1** and **Appendix 2 (**see **Appendix A** subset in both of these Technical Memos**)**.

Project Steering Committee
PRWC's Land Use and Science Committee members provided guidance and oversight to the watershed assessments included in this project. The two committees consist of, but are not limited to, representatives from local conservation organizations, town land use departments, as well as regional, state, and federal agencies. Members of the Land Use and Science Committees and other individuals involved in the watershed assessments are listed in the Acknowledgments section at the beginning of this document. The Committee members periodically reviewed plans for and findings of the ambient water quality monitoring program and streamwalk survey and to reprioritize the list of recommended best management practices for implement.

Ambient Water Quality Monitoring
The collection of stream samples from a network of at least 15 fixed monitoring stations and analyzing the water for bacteria and nitrate was a significant component in developing the Updated Existing Conditions Report. These data were essential in identifying and understanding the nature of the water quality impairments of local river segments. Additional water quality monitoring data would provide more information about the extent of the impairments and if there are geographical and temporal changes in the water quality conditions. These data could also help track down potential pollutant sources and better prioritize opportunities for implementing best management practices to mitigate stormwater runoff and bacteria pollution. PRWC's ambient water quality monitoring program and the data collected through that program (2019 through 2022) are summarized in a supporting Technical Memorandum (**Appendix 1**).

Visual Field Assessments / Streamwalk Surveys
Visual field assessments (also known as streamwalk surveys) are performed to help track down potential sources of pollution and to identify possible restoration opportunities. A streamwalk survey of the impaired segment of the Weekeepeemee River (9.61 miles) was performed by the PRWC project manager and field technicians in July and August 2021 to evaluate conditions in this sub-regional watershed through the lens of mitigating bacteria pollution. General recommendations for site specific best management practices are described for each site observed in the visual assessment survey. The findings and BMP recommendations from these visual field assessments are documented in a separate Technical Memorandum (**Appendix 2**). If a site was considered high priority for BMP implementation and not previously included in the Watershed Based Plan, a conceptual site design plan was drafted for inclusion in the recommendations of this report.

Stormwater Outfall Monitoring Data

Core towns that make up the Pomperaug Watershed are Southbury, Woodbury, and Bethlehem. Southbury and Woodbury meet the population density requirements that make it necessary for the town to obtain and comply with the provisions of a Municipal Separated Storm Sewer System (MS4) Discharge Permit administered by CT DEEP. Under these permits, which were issued in 2016 and reissued without modification of requirements in 2021, Southbury and Woodbury are required to inventory their stormwater outfalls and monitor the corresponding discharge during both dry and wet weather conditions. The Statewide TMDL plans for bacteria had considered stormwater outfall monitoring data from the towns dating back to 2010, but no new data was available at the time the Pomperaug Watershed Based Plan was developed. Since the Plan was adopted 2018, stormwater outfall monitoring data has been collected. Outfall data from 2019 were compiled and are presented in Section 2 of this report.

Pollutant Loading Estimates

A pollutant loading model – the Watershed Treatment Model created by the Center for Watershed Protection (CWP) – was applied to the Pomperaug River watershed to estimate the quantity of pollutants that are delivered to rivers and streams in each of the subregional watershed based on various land cover characteristics, land use activities, and other physical attributes of the landscape. As these characteristics and attributes have not changed significantly since the pollutant load model was last applied to the watershed (rather no new datasets are available to demonstrate if significant changes have occurred), the estimates including in the Pomperaug Watershed Based Plan are still deemed current and relevant. The bacteria load estimates are presented for reference in Section 2 of this report.

Reprioritized Best Management Practices

Potential site-specific restoration projects or actions to address elevated bacteria levels were initially identified and included in the Watershed Based Plan. Visual assessments, pollutant load modeling, listed impairments, and input from PRWC's Land Use Committee served as the basis for the BMP matrix and conceptual plans therein. While many of the recommendations are still relevant, their priority level may have changed based on key findings from the datasets described above. Considering the datasets in combination with each other provides a clearer, big picture understanding of water quality concerns in the Pomperaug Watershed and where best management practices are most needed to maintain or restore swimmable and fishable conditions. A few new sites with opportunities for BMPs were identified through the streamwalk assessment survey while the ambient water quality monitoring and stormwater outfall data more clearly identified areas with higher and lower bacteria loads. Section 3 of this report presents the reprioritized list of actions that will help mitigate stormwater runoff and the reduce bacteria loads that contribute to local water quality impairments. The reprioritized BMP recommendations are based are the proximity of "hot spots" that were identified by overlaying the datasets. If a site was identified as high priority and did not already have a site specific conceptual BMP plan that was presented in the WBP, one was drafted included in Section 3 of this report.

BACKGROUND

Watershed Description

The Pomperaug River watershed (also referred to as the Pomperaug River Regional Basin) covers an area of approximately 90 square miles within the eight Connecticut towns of Bethlehem, Woodbury, Southbury, Washington, Roxbury, Watertown, Middlebury, and Morris in western Connecticut (**Table 1-1**). The Pomperaug River Regional Basin (#68) consists of seven Subregional Basins: Pomperaug River Subregional Basin (#6800), East Spring Brook Subregional Basin (#6801), Nonnewaug River Subregional Basin (#6802), Sprain Brook Subregional Basin (#6803), Weekeepeemee River Subregional Basin (#6804), Hesseky Brook Subregional Basin (#6805), and Transylvania Brook Subregional Basin (#6806) (**Figure 1-1**).

Table 1-1. Watershed composition by municipality.

Municipality	Acres in Watershed	Square Miles in Watershed	Percent of Watershed
Woodbury	22,536	35.2	39.6
Southbury	12,624	19.7	22.2
Bethlehem	11,975	18.7	21
Washington	3,273	5.1	5.7
Roxbury	2,982	4.7	5.2
Watertown	2,492	3.9	4.4
Morris	895	1.4	1.6
Middlebury	185	0.3	0.3
Total	**56,960**	**89**	**100**

The main stem of the Pomperaug River is approximately 13.4 miles long, winding from the confluence of the Weekeepeemee and Nonnewaug Rivers in Woodbury, south to the Housatonic River between Southbury and Newtown where it flows into Lake Zoar. The Weekeepeemee and Nonnewaug Rivers are the largest tributaries to the Pomperaug River. Transylvania Brook and Hesseky Brook also drain to the Pomperaug, while Sprain Brook drains to the Weekeepeemee River and East Spring Brook feeds the Nonnewaug River. Numerous smaller streams complete the network of waterbodies draining the Pomperaug River watershed. Major surface waterbodies in the watershed include Long Meadow Pond, Cat Swamp Pond, Judd Pond Reservoir, and Lockwood Reservoir. The watershed also features a large sand and gravel aquifer that serves as a public water supply source for three water utilities that deliver water to customers in Woodbury, Southbury, Middlebury, Watertown, and Oxford.

The northern portion of the Pomperaug River watershed is rural in that its composition primarily features low-density residential land use and agricultural lands. Land use in the southern part of the watershed is dominated by suburban residential and commercial development. Population density is 185 people per square mile in Bethlehem, 267 people per square mile in Woodbury, and 500 people per square mile in Southbury (Advance CT and CT Data Collaborative, 2021). Together, these three towns make up 83% of the watershed area. Major roads located in the watershed include Interstate 84, U.S. Route 6, and State Routes 61, 63, 64, 67, 172, 317, 47, and 132. Other landmarks in the watershed include Heritage Village, Audubon Center at Bent of the River, Southbury Training School, Hollow Park, Flanders Nature Center and Land Trust, and the Abbey of Regina Laudis.

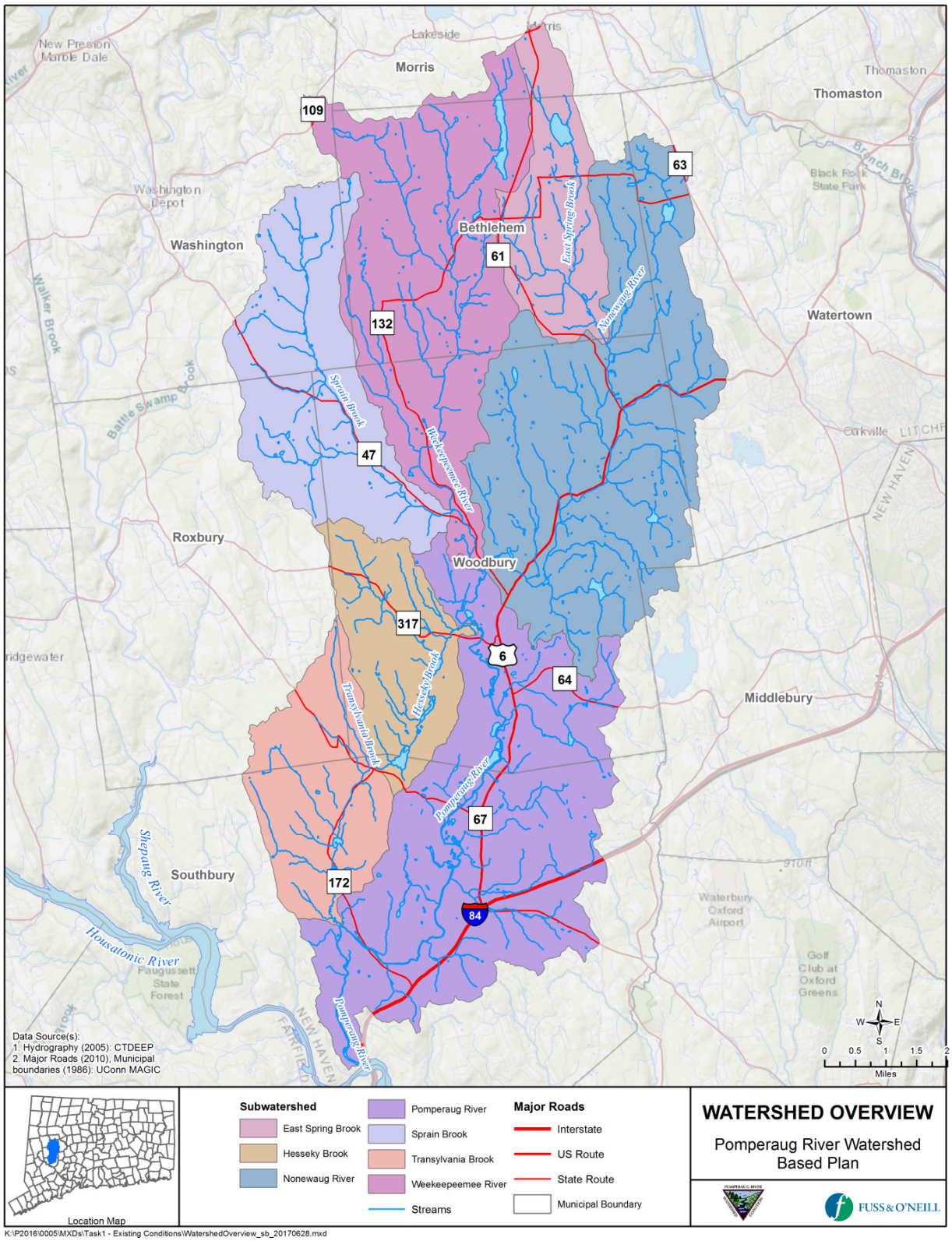

Figure 1-1. Map of the Pomperaug Regional Basin and its seven subregional basins of Transylvania Brook, Hesseky Brook, Sprain Brook, Weekeepeemee River, East Spring Brook, Nonnewaug River, and Pomperaug River.

Water Quality Classifications & Impairments
(Connecticut 305b Assessment Results for Rivers and Streams)

Water quality in the Pomperaug River and its tributaries is mixed. Some segments of the Pomperaug River have excellent water quality and support recreational activities (fishing, swimming, and boating) as well as healthy populations of resident fish species and benthic macroinvertebrates. Other segments of the Pomperaug and its tributaries have been impacted by historical development and land use activities, including portions of the Pomperaug River, Weekeepeemee River, and Transylvania Brook where in-stream fecal indicator bacteria (*Escherichia coli* or *E. coli*) levels have been measured in excess of the State water quality standard for recreation in non-designated swimming areas (410 colonies/100mL maximum for a single sample, and less than 126 colonies/100 mL for the geometric mean). Aquatic life has also been impacted in some rivers and streams as a result of man-made impoundments, groundwater withdrawals for public water supply, and land development, which has contributed to reduced streamflow, causing some streams to run dry in extreme drought conditions.

Assessments of 34 river segments within the Pomperaug River Watershed were included in Connecticut's 2022 Integrated Water Quality Report to Congress (IWQR). Of these, five river segments were listed as impaired (i.e., do not meet water quality standards) for at least one designated use category (**Figure 1-2** and **Table 1-2**). The river segments included in the 303d list of impaired waters remains unchanged since publication of the 2016 IWQR which had considered assessment data for nineteen river segments within the watershed. The 2016 IWQR served as the reference for the impaired waters list detailed in the 2018 Pomperaug Watershed Based Plan. The river segments currently included on the 303d list of impaired waters are as follows:

- **Pomperaug River.** Pomperaug River segment CT6800-00_01 ("Pomperaug River-01") is 2.74 miles long and extends from its mouth at the confluence with the Housatonic River, upstream to the confluence with Transylvania Brook in Southbury. Pomperaug River Segment CT6800-00_03 ("Pomperaug River-03") is 1.31 miles long and extends from Flood Bridge Road, upstream to the confluence with Bullet Hill Brook downstream of Heritage Road in Southbury. Both segments are fully supporting of aquatic life, but impaired for recreation. Pomperaug River-01 was listed in 2012; Pomperaug River-03 was listed in 2008. Two other Pomperaug River segments have been identified as fully supporting for aquatic life but not assessed for recreation.

- **Weekeepeemee River.** Weekeepeemee River segment CT6804-00_01 ("Weekeepeemee River-01") is 9.61 miles long and extends from its mouth at the confluence with the Nonnewaug River downstream of the Jacks Bridge Road crossing in Woodbury to its headwaters in a marsh just upstream of Bergman Hill Road crossing, east of the intersection with Todd Hill Road in Morris. The segment is fully supporting for aquatic life but is impaired for recreation. The recreational use impairment was listed in 2012.

- **Transylvania Brook.** Transylvania Brook segment CT6806-00_01 ("Transylvania Brook-01") is 1.6 miles long and extends from its mouth at the confluence with the Pomperaug River (just downstream of the East Flat Hill Road crossing), upstream to its confluence with Spruce Brook (just on the upstream side of the former Southbury Training School wastewater treatment facility) in Southbury, and is impaired for both aquatic life (listing dates back to at least 2006) and recreation uses (listed in 2012).

- **Stiles Brook.** Stiles Brook segment CT6800-03_01 ("Stiles Brook-01") is 0.25 miles long and extends from its mouth at the confluence with the Pomperaug River upstream to the Anna Stiles Pond outlet Dam adjacent to Route 6 in the northern portion of Southbury. This segment is listed in the 2022 IWQR as not assessed for recreation but impaired for aquatic life, due to flow regime alterations. The aquatic life impairment dates back to at least 2006.

Of the 34 river segments within the Pomperaug River Watershed that were assessed in the 2022 IWQR, seven river segments did not have sufficient information to determine if they were fully supporting for Aquatic Life uses and another two segments did not have sufficient information to determine if they fully supported Recreation uses (**Figure 1-2** and **Table 1-2**). Those with insufficient information for recreational use support likely had some bacteria monitoring data available, but not enough to calculate geometric means and compare to the water quality standards or were not representative of both wet and dry weather conditions. Those with insufficient information pertaining to aquatic life uses include stream segments surveyed by PRWC volunteers as part of CT DEEP's Riffle Assessment by Volunteers (RBV) program. RBV volunteers collect samples of the riffle-dwelling benthic macroinvertebrate community to provide screening level data that is used to determine aquatic life support. Typically finding 4 or more of certain species of invertebrates correlates with high quality water. Finding fewer than 4 of the "most wanted" invertebrates indicates that additional information is required to make a water quality determination for supporting aquatic life uses of the river. RBV reports can be found online at https://portal.ct.gov/DEEP/Water/Inland-Water-Monitoring/Riffle-Bioassessment-by-Volunteers-RBV.

At noted above, rivers designated as impaired for recreational uses have been included on the 303(d) list for several years (added to the list between 2008 and 2012) and their inclusion was based on very limited datasets. The datasets that support impaired listings for the Pomperaug and Weekeepeemee River segments can be found in river specific appendices to the Connecticut Total Maximum Daily Load (TMDL) Plan for Bacteria. A TMDL has not yet been developed for Transylvania Brook. For the Weekeepeemee River, just 10 samples (from a combination of wet and dry weather events) collected at a single monitoring station in 2010 was enough data to add and keep the entire river on the 303d impaired waters list. While these river specific appendices of the statewide TMDL Plan for Bacteria include numeric bacteria reduction goals and recommended strategies to implement to achieve the load reduction goals for each river, the river segments will remain on the impaired waters list until there is data to demonstrate that they should be delisted. Unfortunately, widespread monitoring for indicator bacteria in rivers and stream is no longer a priority for CT DEEP due to staffing and budget constraints; priority has instead been placed on monitoring at state and town beaches, both inland and along the shore, for reasons of public safety. Thus, getting rivers like those in the Pomperaug Watershed removed from the impaired waters list requires both monitoring and stewardship efforts from the community and organizations like Pomperaug River Watershed Coalition.

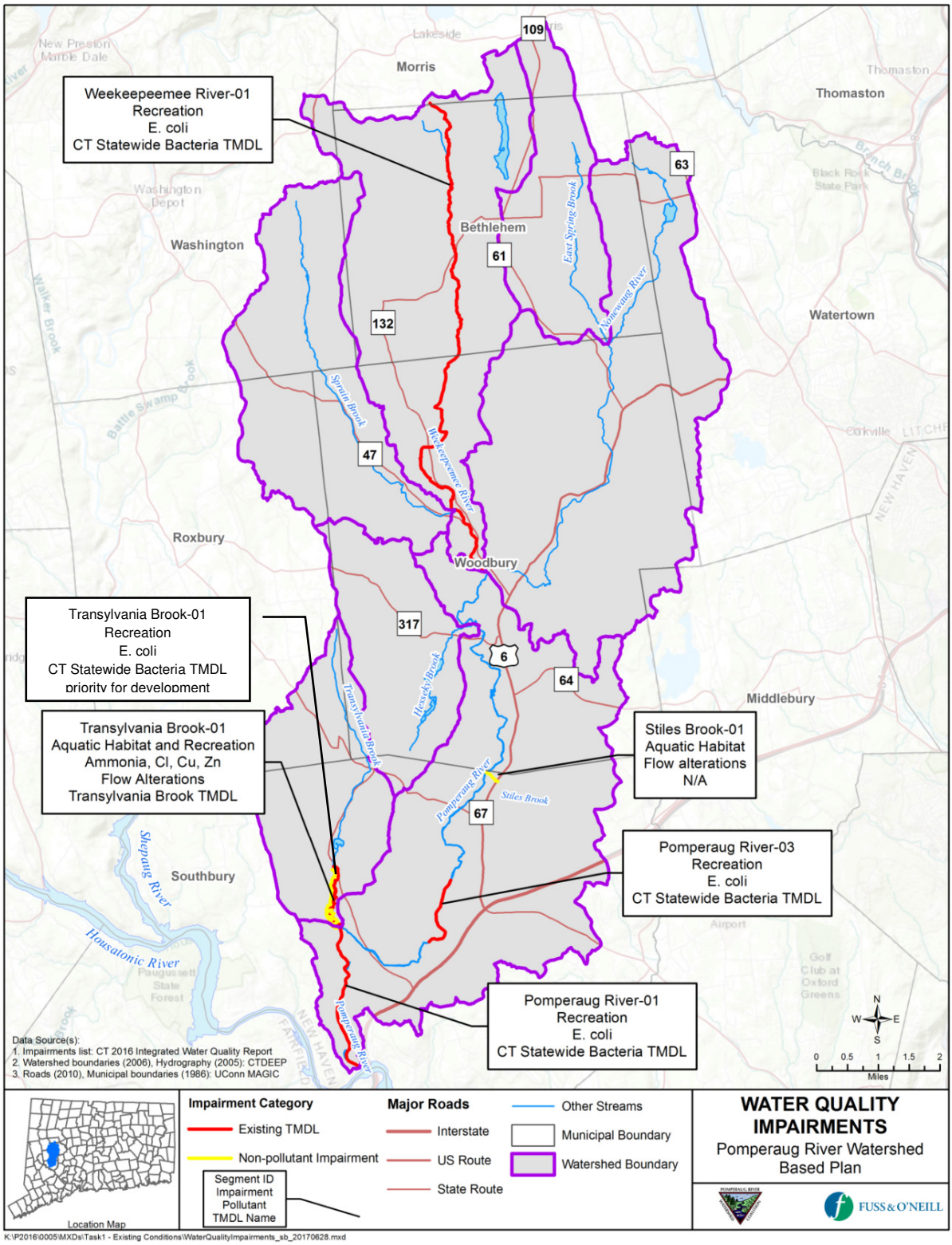

Figure 1-2. In the "Connecticut 2022 Integrated Water Quality Report to Congress," five river segments in the Pomperaug River Watershed are listed as impaired (i.e., do not meet water quality standards) for at least one designated use category. Those river segments are shown in **red.**

Table 1-2. The following data were extracted from "Appendix A-1. Connecticut 305b Assessment Results for Rivers and Streams" of the *State of Connecticut Department of Energy and Environmental Protection 2022 Integrated Water Quality Report*. Formatting emphasis was added to highlight findings for Fully Supporting, Not Supporting, Insufficient Information, and Not Assessed rankings for Aquatic Life and Recreation uses. Note that CT DEEP and USGS use one "n" in the spelling of "Nonewaug" while the local watershed community tends to spell it "Nonnewaug" as in Nonnewaug High School; both spellings are acceptable.

Waterbody Segment ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation
CT6800-00_01	Pomperaug River-01	From mouth at confluence with Housatonic River (DS of River Road crossing, near west side of I84, exit 13), US to confluence with Transylvania Brook (south side of East Flat Hill Road), Southbury.	2.74	**Fully Supporting**	**Not Supporting**
CT6800-00_02	Pomperaug River-02	From confluence with Transylvania Brook (south side of East Flat Hill Road), US to Flood Bridge Road crossing, Southbury.	1.97	**Fully Supporting**	Not Assessed
CT6800-00_03	Pomperaug River-03	From Flood Bridge Road crossing, US to confluence with Bullet Hill Brook (just DS of Heritage Road crossing), Southbury. (Segment includes Heritage Village POTW discharge)	1.31	**Fully Supporting**	**Not Supporting**
CT6800-00_04	Pomperaug River-04	From confluence with Bullet Hill Brook (just DS of Heritage Road crossing), Southbury, US to headwaters at confluence of Nonewaug River and Weekeepeemee River (just DS of Washington Road (Route 47) crossing), Woodbury.	7.38	**Fully Supporting**	*Insufficient Information*
CT6800-00-trib_01	Unnamed tributary Pomperaug River (Southbury)-01	Mouth Pomperaug River near Route 67 crossing and intersection Low Bridge Road, US to HW at several Mining holding ponds, Southbury.	0.25	*Insufficient Information*	Not Assessed
CT6800-02_01	South Brook (Woodbury)-01	Confluence with Pomperaug River, US to Main Street (Route 6) crossing, Woodbury.	0.37	**Fully Supporting**	Not Assessed
CT6800-03_01	Stiles Brook (Southbury)-01	Mouth confluence Pomperaug River, US to Anna Stiles Pond OUTLET Dam (just US Route 6 crossing), Southbury.	0.25	**Not Supporting**	Not Assessed
CT6800-03_02	Stiles Brook (Southbury)-02	Anna Stiles Pond INLET just US Route 6 crossing (includes pond), US to HW, US Beecher Drive crossing, Southbury.	2.28	**Fully Supporting**	Not Assessed
CT6800-05_01a	Bullet Hill Brook (Southbury)-01a	Mouth Pomperaug River just DS Old Field Road crossing (behind George Ewald Park), US to CULVERT ENTERANCE above Route 67 crossing behind Southbury Shopping Plaza (behind Stop and Shop), Southbury.	0.93	*Insufficient Information*	Not Assessed
CT6800-05_01b	Bullet Hill Brook (Southbury)-01b	CULVERT ENTERANCE above Route 67 crossing behind Southbury Shopping Plaza (behind Stop and Shop), US to HW along and under I84, US Old Waterbury and Bucks Hill Road crossings into Hidden Pond Park (includes the pond), Southbury.	2.63	**Fully Supporting**	Not Assessed
CT6800-08_01	Unnamed tributary Pomperaug River 6800-08 (Southbury)-01	Mouth at confluence Pomperaug River DS Main Street crossing (near Flood Bridge Road intersection), US under I84 to HW between Eagle View Drive on west and near Gray Rock Road to east, Southbury.	1	**Fully Supporting**	Not Assessed
CT6801-00_01	East Spring Brook (Woodbury/Bethlehem)-01	Mouth at Nonnewaug River (DS Nonnewaug Road crossing), Woodbury, US to HW at Watertown Reservoir outlet (start of AA water just US of Route 132 crossing), Bethlehem.	3.4	**Fully Supporting**	Not Assessed

Table 1-2 (continued). The following data were extracted from "Appendix A-1. Connecticut 305b Assessment Results for Rivers and Streams" of the *State of Connecticut Department of Energy and Environmental Protection 2022 Integrated Water Quality Report*. Formatting emphasis was added to highlight findings for Fully Supporting, Not Supporting, Insufficient Information, and Not Assessed rankings for Aquatic Life and Recreation uses. Note that CT DEEP and USGS use one "n" in the spelling of "Nonewaug" while the local watershed community tends to spell it "Nonnewaug" as in Nonnewaug High School; both spellings are acceptable.

Waterbody Segment ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation
CT6802-00_01	Nonewaug River (Woodbury)-01	Mouth Weekeepeemee River, above Pomperaug River (just DS Washington Road (Route 47) crossing), US to confluence Harvey Brook (parallel Oldtown Farm Road), Woodbury.	4.45	**Fully Supporting**	Not Assessed
CT6802-00_02	Nonewaug River (Woodbury/Watertown)-02	Confluence Harvey Brook (parallel Oldtown Farm Road), Woodbury, US to Big Meadow Pond (Judd Pond) Reservoir OUTLET Dam (just US of Guernseytown Road crossing), Watertown.	4.3	**Fully Supporting**	*Insufficient Information*
CT6802-01_01	Unnamed tributary Nonewaug River (Bethlehem)-01	Mouth Nonewaug River DS Hickory Lane crossing, US parallel along east side of Hard Hill Road to HW near Route 132, Bethlehem.	2.19	*Insufficient Information*	Not Assessed
CT6802-04_01	Frank Atwood Brook (Woodbury/Watertown)-01	Mouth Lewis Atwood Brook US side Route 6 parallel Quassapaug Road, Woodbury, US to HW US McVeigh Road crossing, Watertown.	1.3	*Insufficient Information*	Not Assessed
CT6802-06_01	Sawmill Brook (Woodbury)-01	Mouth Nonewaug River parallel between end of Old Route 6 and Mill Road, US to HW US Rowley Road and Quassapaug Road crossings to INLET to Engleke Pond, Woodbury.	1.61	*Insufficient Information*	Not Assessed
+CT6802-07_01	Reichenback Brook (Woodbury)-01	Mouth Nonewaug River DS Mill Road crossing near Route 6, US to HW OUTLET Reichenback Pond just US Pond Valley Road crossing, Woodbury.	1.04	**Fully Supporting**	Not Assessed
CT6802-10_01	Clark Brook (Woodbury/Middlebury)-01	Mouth Nonewaug River DS Minortown Road crossing, Woodbury, US to HW US Middle Road Turnpike crossing, Woodbury, into Middlebury.	2.31	*Insufficient Information*	Not Assessed
CT6802-13_01	East Meadow Brook (Woodbury)-01	Mouth Nonewaug River northside of Middle Road Turnpike near intersection with Route 6, US parallel on east side of Flanders Road to HW US Church Hill Road crossing, Woodbury.	3.97	**Fully Supporting**	Not Assessed
CT6803-00_01	Sprain Brook (Woodbury/Washington)-01	Mouth at confluence with Weekeepeemee River just DS of Washington Road (Route 47) crossing (south of Papermill Road and north of Westwood Road) Woodbury, US to HW at OUTLET of Washington Game Pond, just US of Wykeham Road crossing, Washington.	6.77	**Fully Supporting**	Not Assessed
CT6803-02_01	Unamed tributary Sprain Brook (Washington)-01	Mouth at Confluence Sprain Brook just below SA Hessel Pond, north of West Mountain Rd, US to HW US Route 47 crossing, Washington.	1.41	**Fully Supporting**	Not Assessed
CT6803-03_01	Unnamed tributary Sprain Brook (Woodbury/Roxbury)-01	Mouth at confluence Sprain Brook .5 mile DS Route 47 crossing, Woodbury, US through Roxbury and parallel to Route 47 to HW at wetland on south side of Nichols Hill Road, Washington.	2	**Fully Supporting**	Not Assessed
CT6804-00_01	Weekeepeemee River-01	From mouth at confluence with Nonewaug River, above Pomperaug River (DS of Jacks Bridge Road crossing), Woodbury, US to headwaters in marsh (just US of Bergman Hill Road crossing, east of intersection with Todd Hill Road), Morris.	9.61	**Fully Supporting**	**Not Supporting**

Table 1-2 (continued). The following data were extracted from "Appendix A-1. Connecticut 305b Assessment Results for Rivers and Streams" of the *State of Connecticut Department of Energy and Environmental Protection 2022 Integrated Water Quality Report*. Formatting emphasis was added to highlight findings for Fully Supporting, Not Supporting, Insufficient Information, and Not Assessed rankings for Aquatic Life and Recreation uses. Note that CT DEEP and USGS use one "n" in the spelling of "Nonewaug" while the local watershed community tends to spell it "Nonnewaug" as in Nonnewaug High School; both spellings are acceptable.

Waterbody Segment ID	Waterbody Name	Location	Miles	Aquatic Life	Recreation
CT6804-04_01	Wood Creek (Bethlehem)-01	From mouth at confluence with Weekeepeemee River (just DS of Guilds Hollow Road (Route132) crossing), US to headwaters at Zieglers Pond outlet dam (just US of Carmel Hill Road crossing), Bethlehem.	3.27	**Fully Supporting**	Not Assessed
CT6804-08_01	Carmel Hill Brook (Woodbury/Bethlehem)-01	Mouth Weekeepeemee River DS Peter Road crossing near Route 132, Woodbury, US to HW OUTLET Arrowhead Pond west of Carmel Hill Road near Arch Bridge Road intersection, Bethlehem.	3.56	**Fully Supporting**	Not Assessed
CT6805-00_01	Hesseky Brook (Woodbury)-01	Mouth Pomperaug River DS and parallel to Route 317 crossing, US to OUTLET Hesseky Meadow Pond, US Route 317 crossing parallel to west of Transylvania Road, Woodbury.	1.06	**Fully Supporting**	Not Assessed
CT6805-02_01	Good Hill Brook (Woodbury)-01	Mouth at outlet into Hesseky Meadow Pond (Hesseky Brook) DS Old Grassy Hill Rd crossing, US to HW US Route 317 crossing and parallel Tophet Rd, Woodbury.	2.98	**Fully Supporting**	Not Assessed
CT6806-00_01	Transylvania Brook (Southbury)-01	From mouth at confluence with Pomperaug River (just DS of East Flat Hill Road crossing), US to confluence with Spruce Brook (just US side of Southbury Training School STP), Southbury.	1.6	**Not Supporting**	**Not Supporting**
CT6806-00_02	Transylvania Brook (Southbury)-02	Confluence Spruce Brook (just US side of Southbury Training School STP), US to Gravel Pit Pond outlet dam (US of South Britian Road (Route 172) crossing), Southbury.	0.32	Not Assessed	**Fully Supporting**
CT6806-00_03	Transylvania Brook (Southbury/Woodbury/Roxbury)-03	From inlet to Gravel Pit Pond (northern side), Southbury, US to headwaters, Roxbury (near Woodbury town border).	3.81	**Fully Supporting**	**Fully Supporting**
CT6806-01_01	Unnamed tributary to Transylvania Brook (Southbury/Woodbury/Roxbury)-01-01	Mouth at Confluence Transylvania Brook north side of Route 172 near intersection with Route 67, Southbury, US through Woodbury, parallel along Route 67 to HW south of High Meadows Ln intersection with Route 67, Roxbury.	1.34	**Fully Supporting**	Not Assessed
CT6806-04_01	Unnamed tributary to Transylvania Brook (Southbury/Roxbury)-04-01	Mouth at Confluence Transylvania Brook at INLET to Gravel Pit Pond, DS of Route 172 crossing, Southbury, US parallel to Flag Swamp Rd along west into Roxbury, then turning south back into Southbury to HW at OUTLET of Cassidys Pond, Southbury.	2.51	**Fully Supporting**	Not Assessed
CT6806-05_01	Spruce Brook (Southbury)-01	Mouth Transylvania Brook between Whale Drive crossing and Route 172, US to HW US Cassidy Road crossing near Toms Hill Road, Southbury.	2.46	*Insufficient Information*	Not Assessed

SECTION 2. UPDATED EXISTING CONDITIONS

AMBIENT WATER QUALITY MONITORING DATA (2019 to 2022)

To better understand the current existing conditions of rivers listed as impaired and whether others in the Pomperaug Watershed should also be listed, PRWC collected ambient water quality monitoring data – specifically monitoring for bacteria and nitrate levels – at 15 fixed stations throughout the watershed between 2021 and 2022. A total of 18 stations were monitored between 2019 and 2022, but a few stations monitored in 2019 and 2020 were replaced by alternate stations in the monitoring efforts in 2021 and 2022. Monitoring stations were located throughout the watershed, but focused on stream segments that were listed as impaired, that were contiguous to impaired segments, or are a major tributary to an impaired river (**Table 2-1** and **Figure 2-2**). Stations were selected to help track down or bracket potential pollutant sources and to provide a better understanding of the scope of the impairments as they were based on limited datasets. One of the stations monitored in 2019 and 2020 required collecting samples from an extremely busy road (bridge) and was just downstream from the confluence of two tributaries with notable presence of livestock in each subwatershed. Based on high bacteria counts observed, PRWC decided to swap that monitoring station for a station on one of the tributaries. The other station was adjacent to the dog park in Southbury; bacteria counts here tended to be lower. For the sake of bracketing monitoring stations upstream and downstream of a waste water treatment facility, PRWC moved the station at the dog park further downstream and closer to the treatment plant. Data collected between June to October 2021 and April to May 2022 were new data collected as part of the current grant funded project and followed quality controls detailed in the Quality Assurance Project Plan (QAPP) approved by EPA and DEEP in May 2021 and subsequently modified in March 2022. Data collected in 2019, 2020, and from June 2022 on were considered as secondary data in the analysis as no other data sources were available, but the data collect protocols were well documented and were in sync with the provisions of the QAPP.

Figure 2-1. PRWC's field technicians collected ambient water quality monitoring samples at fixed stations located throughout the Pomperaug Watershed between 2019 and 2022.

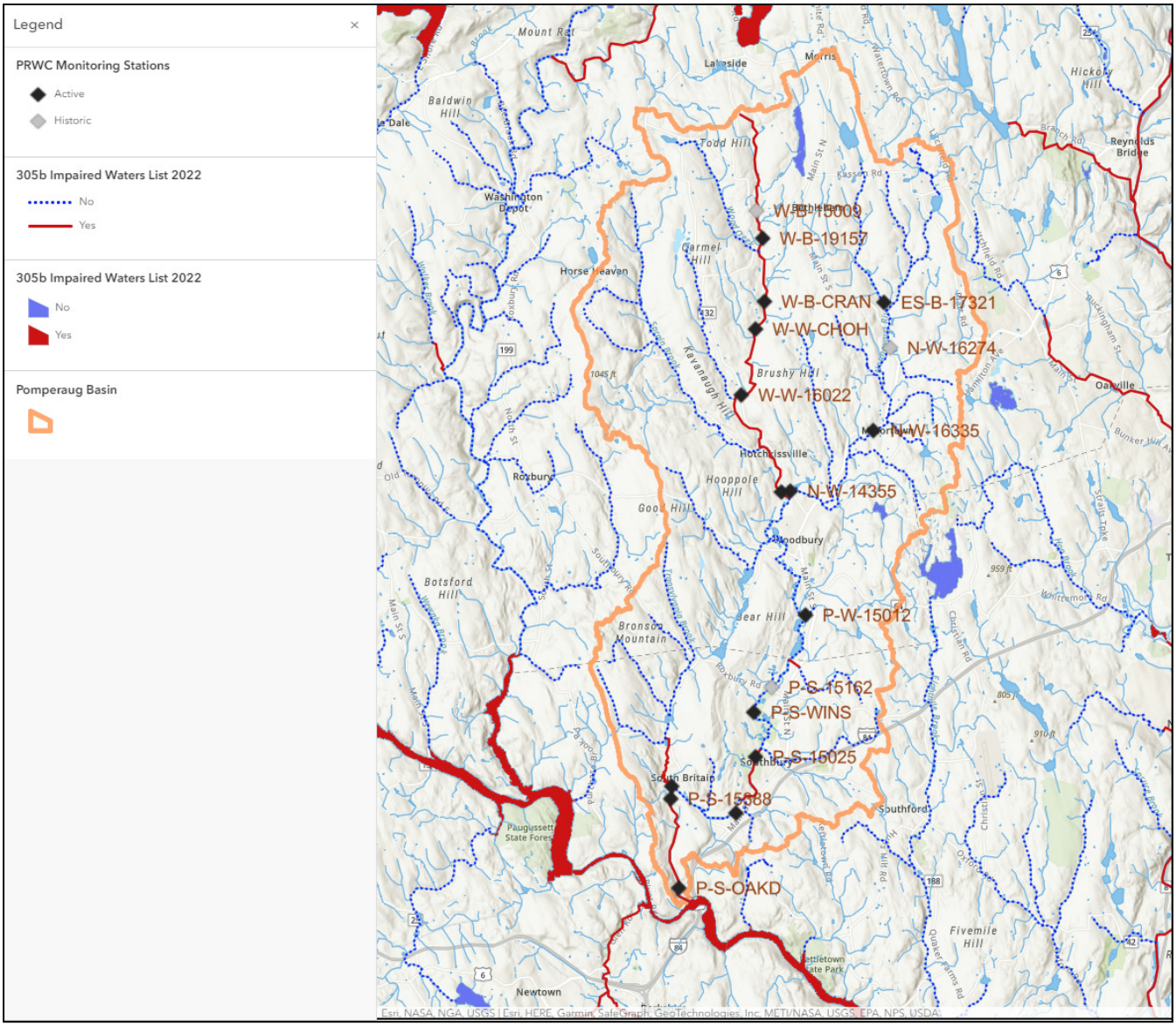

Figure 2-2. PRWC's active Ambient Water Quality Monitoring Stations for the 2021 and 2022 field seasons are shown in black. PRWC also collected ambient water quality monitoring samples from stations shaded in gray during the 2019 and 2020 field seasons.

Table 2-1. PRWC's Ambient Water Quality Monitoring Stations List.

SITE ID *(last 5 digits = DEEP AWQ ID)*	**RIVER NAME**	**SITE DESCRIPTION**	**DRIVING ADDRESS**	**TOWN**
P-S-OAKD	Pomperaug R	Oakdale Manor	190 Oakdale Manor Dr	Southbury
P-S-15388	Pomperaug R	Audubon at Bent of the River	185 East Flat Hill Rd	Southbury
T-S-14474	Transylvania Bk	Seman Park	200 East Flat Hill Road	Southbury
P-S-18395	Pomperaug R	Flood Bridge Rd	254 Flood Bridge Rd	Southbury
P-S-15025	Pomperaug R	Poverty Rd @ Ewald Park / USGS Gauge	234 Poverty Rd	Southbury
P-S-WINS*	Pomperaug R	River Gardens @ Heritage Village	447 Winship Dr	Southbury
P-W-15012 (P-W-SPAVE)	Pomperaug R	Middle Quarter / South Pomperaug Ave	CAST Preschool 124 S Pomperaug Ave	Woodbury
N-W-14355	Nonnewaug R	Route 47 Bridge @ Young's Nursery	130 Washington Rd	Woodbury
W-W-15530	Weekeepeemee R	Jacks Bridge Rd - USGS Gauge	Three Rivers Field on Jack's Bridge Rd	Woodbury
W-W-16022	Weekeepeemee R	Brushy Hill Rd @ Route 132	316 Weekeepeemee Road	Woodbury
W-W-CHOH	Weekeepeemee R	Chohees Trail @ Weekeepeemee Road	170 Chohees Trail	Woodbury
W-B-CRAN	Weekeepeemee R	Crane Hollow Road @ Weekeepeemee Road	138 Crane Hollow Road	Bethlehem
W-B-19157	Weekeepeemee R	Mill Pond Road @ Route 132 (Guilds Hollow Road)	19 Mill Pond Road	Bethlehem
ES-B-17321*	East Spring Bk	Nonnewaug Road @ Porter Hill Road	98 Porter Hill Road	Bethlehem
N-W-16335	Nonnewaug R	Mill Rd - USGS Gage	294 Minortown Rd	Woodbury
W-W-15009^	Weekeepeemee R	Woodcreek Rd	96 Woodcreek Rd	Bethlehem
N-W-16274^	Nonnewaug R	Route 61 Bridge	53 Bethlehem Rd	Woodbury
P-S-15262^	Pomperaug R	Bennett Park / Route 67 Bridge	166 Roxbury Rd	Southbury

** Monitoring by PRWC began in 2021.*
^ Sites were monitored by PRWC in 2019 and 2020 only.
All other sites were monitored by PRWC between 2019 and 2022.

AWQM data collected by Pomperaug River Watershed Coalition between 2019 and 2022 help to illustrate the variability in bacteria levels observed in the Pomperaug River and its tributaries over the course of the warm weather season from April to October (**Appendix 1**). These data also illustrate that precipitation precedent to the collection of samples influences the number of indicator bacteria (*E. coli*) present. Most notably, bacteria counts observed during dry weather sampling events typically met the single sample water quality criterion for safe recreation and wet weather events yielded higher bacteria counts that were unsafe for recreational uses throughout the Pomperaug watershed. The highest single sample event results were also of note. All but one of the monitoring sites had highest single sample event results that exceeded the water quality criteria for safe recreations (**Table 2-2** and **Figure 2-3**)

While instantaneous indicator bacteria levels detailed in **Appendix 1** were spatially important in determining if conditions are safe for recreational uses in the short-term, statistical analyses provide a broader assessment of the conditions. Accordingly, water quality criterion for safe recreation includes that for a geometric mean which adds another layer of spatial and temporal assessment. PRWC calculated geometric means for all data collected between 2019 and 2022, compared the numbers to CT's water quality criteria, and mapped the results (**Table 2-2** and **Figure 2-4).**

Table 2-2. Summary data by sample site for ambient water quality monitoring conducted from 2019-2022 detailing geometric mean (wet, dry, and all), highest single sample result, percent load reduction needed to meet water quality standards for bacteria (both geometric mean for the season and for a single sample exceedance). Geometric mean values shown in **red bold** exceed 126 CFU/100mL - the water quality limit for bacteria for safe recreational use. Highest single sample results shown in **blue bold** exceed 410 CFU/100mL water quality limits for bacteria for safe recreational use.

Station Name	Station Location	Stream	Years	Number of Samples			Geometric Mean			Highest Single	% Reduction	% Reduction
			Sampled	Wet	Dry	All	Wet	Dry	All	Sample Result	(GeoMean)	Single Sample
ES-B-17321	Nonnewaug Rd at Porter Hill Rd, Bethlehem	East Spring Brook	2021-2022	5	10	15	**205**	57	87	**816**	n/a	50
N-W-14355	Rt 47 Bridge, Youngs Nursery, Woodbury	Nonnewaug	2019-2022	9	18	27	**609**	124	**214**	**2420**	41	83
N-W-16335	Mill Rd - USGS Gauge, Woodbury	Nonnewaug	2019-2022	9	17	26	**565**	**145**	**242**	**2420**	48	83
P-S-15025	Poverty Rd - Ewald Park - USGS Gauge, Southbury	Pomperaug	2019-2022	9	18	27	**392**	104	**155**	**1986**	19	79
P-S-15388	Bent of the River, East Flat Hill Rd, Southbury	Pomperaug	2019-2022	8	18	26	**316**	81	123	**1733**	n/a	76
P-S-18395	The Gym - Flood Bridge Rd, Southbury	Pomperaug	2019-2022	9	18	27	**311**	89	**138**	**1046**	9	61
P-S-OAKD	185 Oakdale Manor, Southbury	Pomperaug	2019-2022	9	17	26	**195**	55	88	**1300**	n/a	68
P-S-WINS	Winship Drive at HV River Gardens, Southbury	Pomperaug	2021	5	10	15	**335**	63	109	**1643**	n/a	75
P-W-15012	Middle Quarter / South Pomperaug Ave, Woodbury	Pomperaug	2019-2022	9	18	27	**361**	**127**	**180**	**2420**	30	83
T-S-14474	Seman Park at East Flat Hill Rd, Southbury	Transylvania	2021-2022	5	10	15	**256**	67	104	**1300**	n/a	68
W-B-19157	Mill Pond Road, Bethlehem	Weekeepeemee	2021-2022	5	10	15	52	20	28	127	n/a	n/a
W-B-CRAN	Crane Hollow Road Bridge, Bethlehem	Weekeepeemee	2021-2022	5	10	15	**146**	52	74	**816**	n/a	50
W-W-15530	Jacks Bridge Rd, Woodbury	Weekeepeemee	2019-2022	8	17	25	**156**	75	95	**2420**	n/a	83
W-W-16022	Brushy Hill Rd, Woodbury	Weekeepeemee	2019-2022	9	18	27	**182**	98	120	**2420**	n/a	83
W-W-CHOH	Chohees Trail,Woodbury	Weekeepeemee	2019-2022	9	18	27	**207**	**134**	**155**	**2420**	19	83
N-W-16274	Rt 61 Bridge, Woodbury	Nonnewaug	2019-2020	4	8	12	**438**	**189**	**250**	**2420**	50	83
P-S-15162	Route 67 - Bennett Park, Southbury	Pomperaug	2019-2020	4	7	11	**219**	84	119	**980**	n/a	58
W-B-15009	Wood Creek Rd,Bethlehem	Weekeepeemee	2019-2020	4	8	12	57	113	90	**2420**	n/a	83

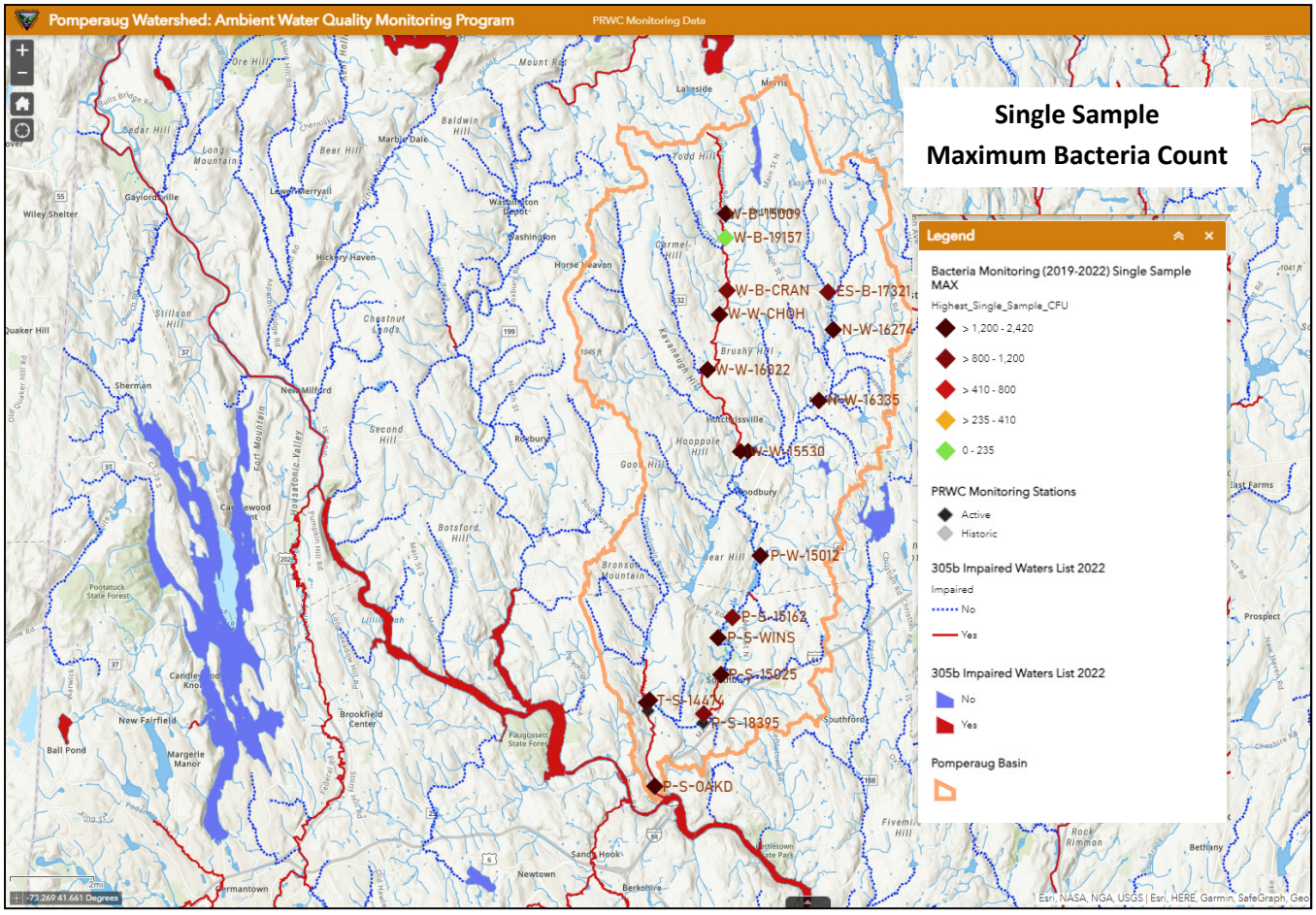

Figure 2-3. Summary data by sample site for ambient water quality monitoring conducted 2019-2022 detailing highest single event sample result. Sites shown in **green** meet the water quality limit for bacteria for safe recreational use in Connecticut with a single event result less than 410 CFU/100mL. Sites shown in varying shades of **red** are locations where the single event result exceeded the water quality limit for bacteria for safe recreational use.

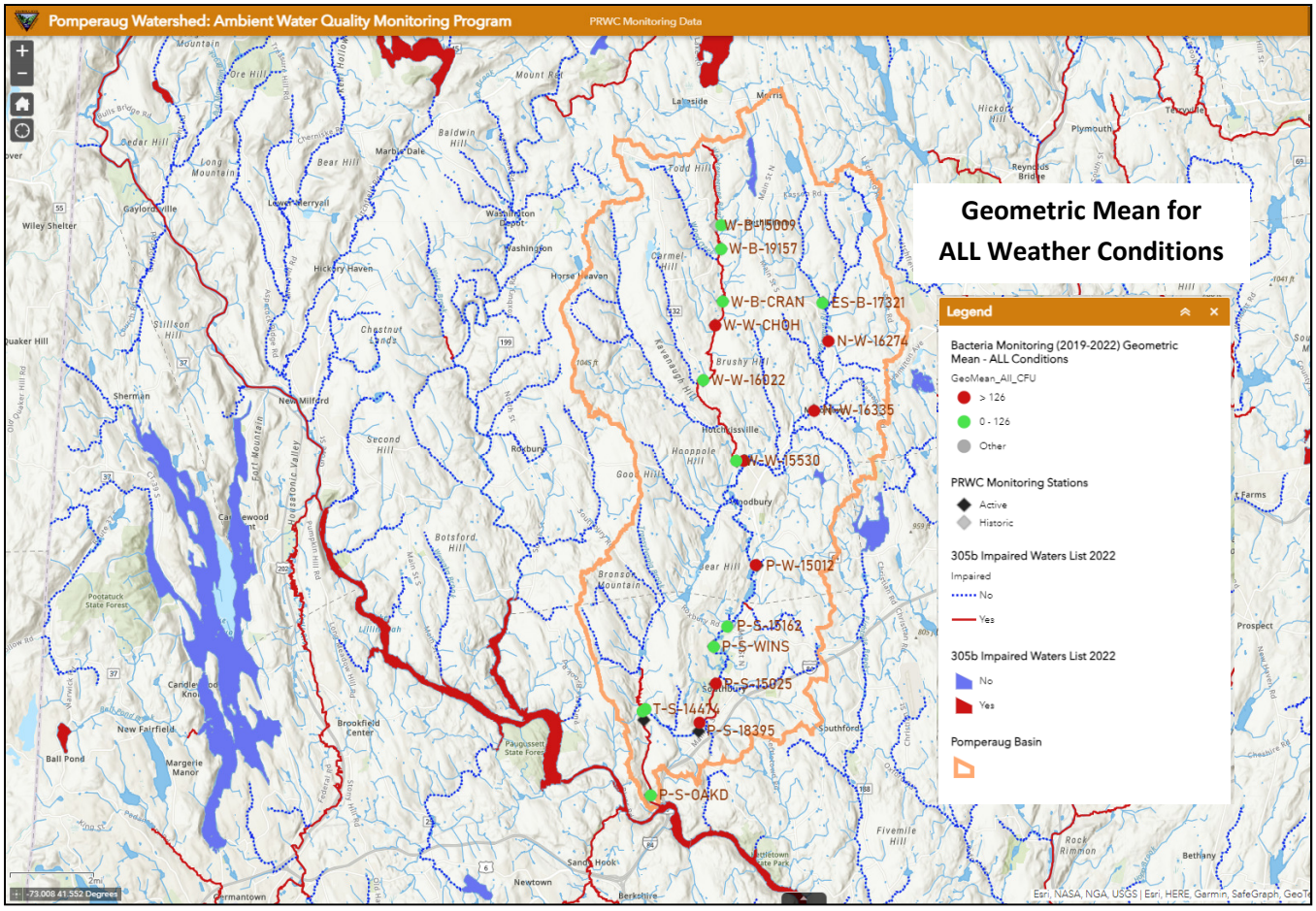

Figure 2-4. Summary data by sample site for ambient water quality monitoring conducted 2019-2022 detailing the geometric mean for all weather conditions. Sites shown in **green** meet the water quality limit for bacteria for safe recreational use in Connecticut with a result less than 126 CFU/100mL. Sites shown in **red** are locations where the geometric mean exceeded the water quality limit for bacteria for safe recreational use.

In comparing the geometric means calculated for each site to the water quality criterion, 7 of 18 monitoring stations monitored between 2019 and 2022 had bacteria levels that exceeded the limit for safe recreational use (>126 CFU/100mL). Of these sites, one was located on the Weekeepeemee River, three were located on the Nonnewaug River, and three were located on the Pomperaug River. In general, bacteria counts were lower at sites located farther upstream towards the headwaters of the Nonnewaug and Weekeepeemee Rivers.

To further interpret the ambient water quality monitoring data, PRWC compared the geometric means calculated for wet weather sampling event results to the geometric mean calculated for dry weather sampling event results from every site. Each set of results was compared against the water quality criteria. In this analysis, nearly all sites demonstrated a water quality exceedance for wet weather events (**Figure 2-5**). The exceptions were the two most upstream sites on the Weekeepeemee River – Wood Creek Road, Bethlehem (W-B-15009) and Mill Pond Road, Bethlehem (W-B-19157). This was not surprising given the smaller, less developed watershed areas that contribute to these stations.

The geometric mean calculations for dry weather event sampling revealed a handful of sites with water quality exceedances which suggested more bacteria pollution sources near these sites (**Figure 2-6**) and that higher priority should be given to implementing best practices in these areas. The sites with dry weather water quality exceedances were: W-W-CHOH (Weekeepeemee at Chohees Trail, Woodbury), N-W-16274 (Nonnewaug at Route 61 Bridge, Woodbury), N-W-16355 (Nonnewaug at Mill Road, Woodbury), and P-W-15012 (Pomperaug at Middle Quarter, Woodbury).

The dry weather water quality exceedance for P-W-15012 (Pomperaug at Middle Quarter, Woodbury) was minimal – just 1 CFU/100mL higher than the acceptable level. The slightly elevated bacteria counts here were generally attributed the presence of wildlife as evidenced by field observation notes regularly detailing the presence of animal tracks and scat (beaver, deer, raccoon, squirrel, coyote, etc.) along the stream bank.

The dry weather exceedance for W-W-CHOH (Weekeepeemee River at Chohees Trail, Woodbury) seemed to be skewed by the results for two sampling events in 2020 (**Appendix 1**). On September 2, 2020 the sampling conditions were entered as wet weather, but precipitation data defined the conditions as dry weather. Field observation notes and current weather entries for this date indicated steady rain was falling at the time of the sample and that the water had a fishy odor. On July 21, 2020, high bacteria levels were also recorded during dry weather conditions and could not be explained based on details in the field observations, corresponding nitrate monitoring results, or follow-up visual inspection for potential sources of bacteria. When the results from September 2, 2020 are recoded to wet weather and the geometric mean for dry weather is recalculated (geometric mean drops from 134 CFU/mL to 113 CFU/mL), W-W-CHOH meets the water quality criterion for safe recreation.

Dry weather water quality exceedances at N-W-16355 (Nonnewaug River, USGS Gage, Woodbury) and N-W-16274 (Nonnewaug River at Route 61 Bridge, Woodbury) are partially explained by results from September 2, 2020 where conditions were entered as wet weather, but precipitation data defined the conditions as dry weather. Field observation notes and current weather entries for this date indicated steady rain was falling at the time of the sample and that the water had a fishy odor. When data from this date are omitted in the geometric mean calculations for both sites, the result for site N-W-16335 drops from 145 CFU/100mL to 120 CFU/100mL to meet the water quality criteria. The result for site N-W-16274 it drops from 189 CFU/100mL to 154 CFU/100mL, which still exceeds the water quality criteria.

Nitrate monitoring data showed that the bacteria pollutant loads were associated with non-point sources of pollution. Nitrate levels consistently ranged between not detected (ND) and 1.07 mg/L (**Appendix 1**). Results greater than 10 mg/L are typically indicative of a point source pollutant such as an illicit discharge, failing septic system, or significant animal

waste in or near the river close to the sampling station (MNDH-EHD, 2021). Finding a nitrate result greater than 10 mg/L along with high bacteria counts would have more clearly identified high priority areas for bacteria load reduction efforts.

Overall, PRWC's ambient water quality monitoring data illustrate that the *E. coli* indicator bacteria counts in the rivers and streams throughout the Pomperaug Watershed generally support recreational uses during dry weather and that recreational contact should be avoided during and immediately following wet weather. All but one of the sites monitored between 2019 and 2022 had at least one event where the instantaneous bacteria levels exceeded limits for safe recreation (**Figure 2-2**). Evaluating the geometric mean data for the Weekeepeemee River in all weather indicates that almost all monitoring stations along this river meet this particular water quality criterion for safe recreation (**Figure 2-4** and **Table 2-2**). The same data analysis indicates that the geometric mean of bacteria counts along the Nonnewaug typically exceed the water quality criteria when considering all weather conditions, and that exceedances also occur at some sites in dry weather conditions. As such, the Nonnewaug River will likely be added to the 303(d) impaired waters list and be listed as "not supporting" for designated recreational uses. The Pomperaug River shows stations where the geometric mean of bacteria counts when all weather conditions are considered, but that they met water quality criteria for safe recreation in dry conditions (**Figures 2-5** and **2-6**).

Taken as a whole, the ambient water quality monitoring data suggest that more actions are needed to reduce contributing sources of bacteria in the Nonnewaug subregional watershed than in the Weekeepeemee and Pomperaug subregional watersheds in order to meet the geometric mean criteria for safe recreation. Nonetheless, the instantaneous event water quality exceedances throughout the watershed suggest that widespread implementation of pollution prevention and runoff reduction actions remain important and necessary to prevent high concentrations of bacteria from flowing into the rivers in order to support safe recreational uses.

Lastly, the AWQM data show that bacteria levels need to be reduced by 50% and 83% to meet the instantaneous sampling result criterion for safe recreation (**Figure 2-7** and **Table 2-2**) and reduced by 9% to 50% to meet the geometric mean criterion for safe recreation (**Figure 2-8** and **Table 2-2**). As highlighted in the Pomperaug Watershed Based Plan and noted in the Pollutant Load Estimates that follow, these bacteria reduction goals vary from those estimated by the Watershed Treatment Model which estimated bacteria pollutant load reduction goals by subregional watershed based on the annual load of bacteria that would be delivered into the associated river system (**Figure 2-22**). The AWQM provide an estimate for how much the bacteria count in the river water needs to be reduced to meet water quality criteria for safe recreation.

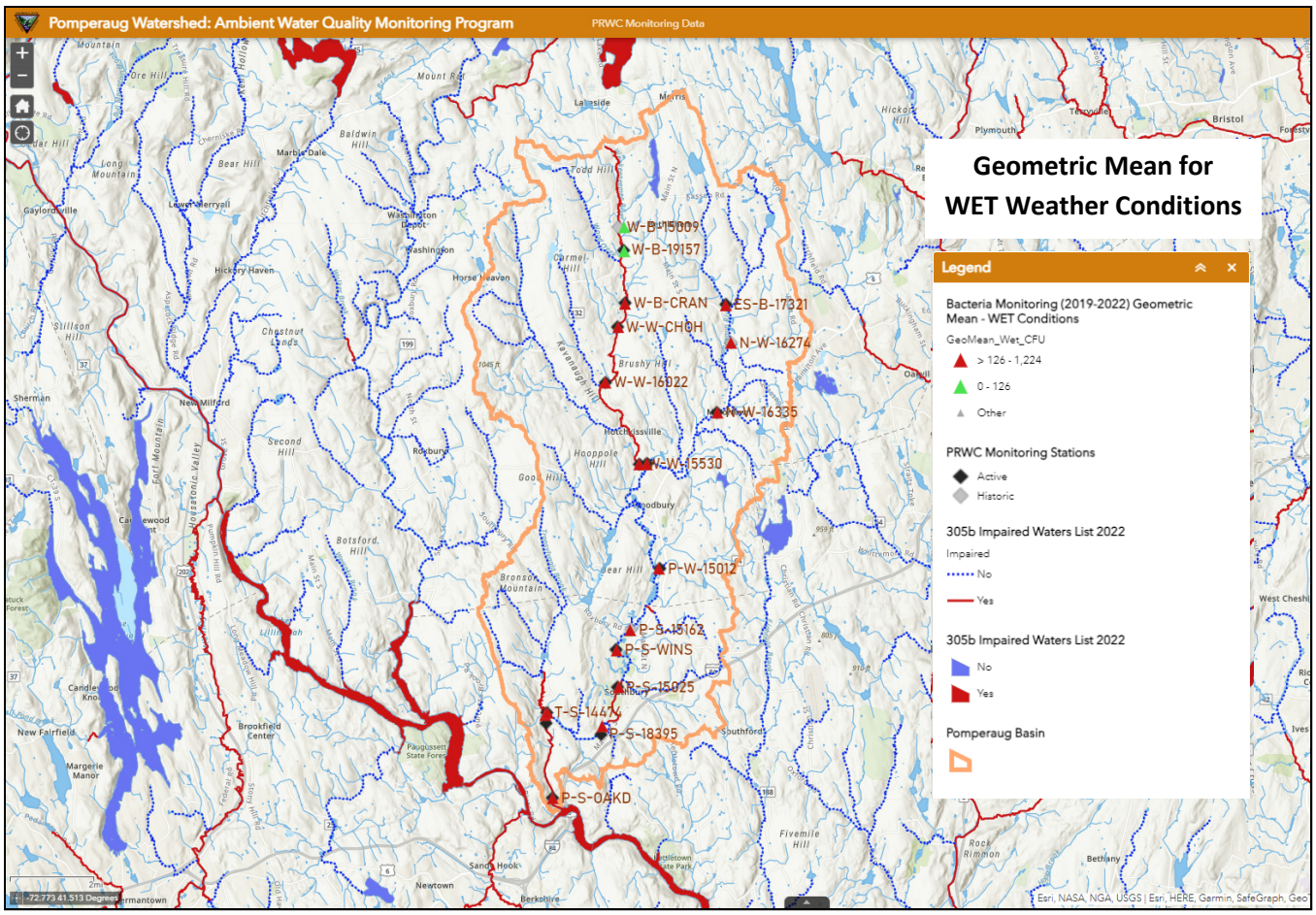

Figure 2-5. Summary data by sample site for ambient water quality monitoring conducted 2019-2022 detailing the geometric mean for wet weather conditions. Sites shown in **green** meet the water quality limit for bacteria for safe recreational use in Connecticut with a result less than 126 CFU/100mL. Sites shown in **red** are locations where the geometric mean exceeded the water quality limit for bacteria for safe recreational use.

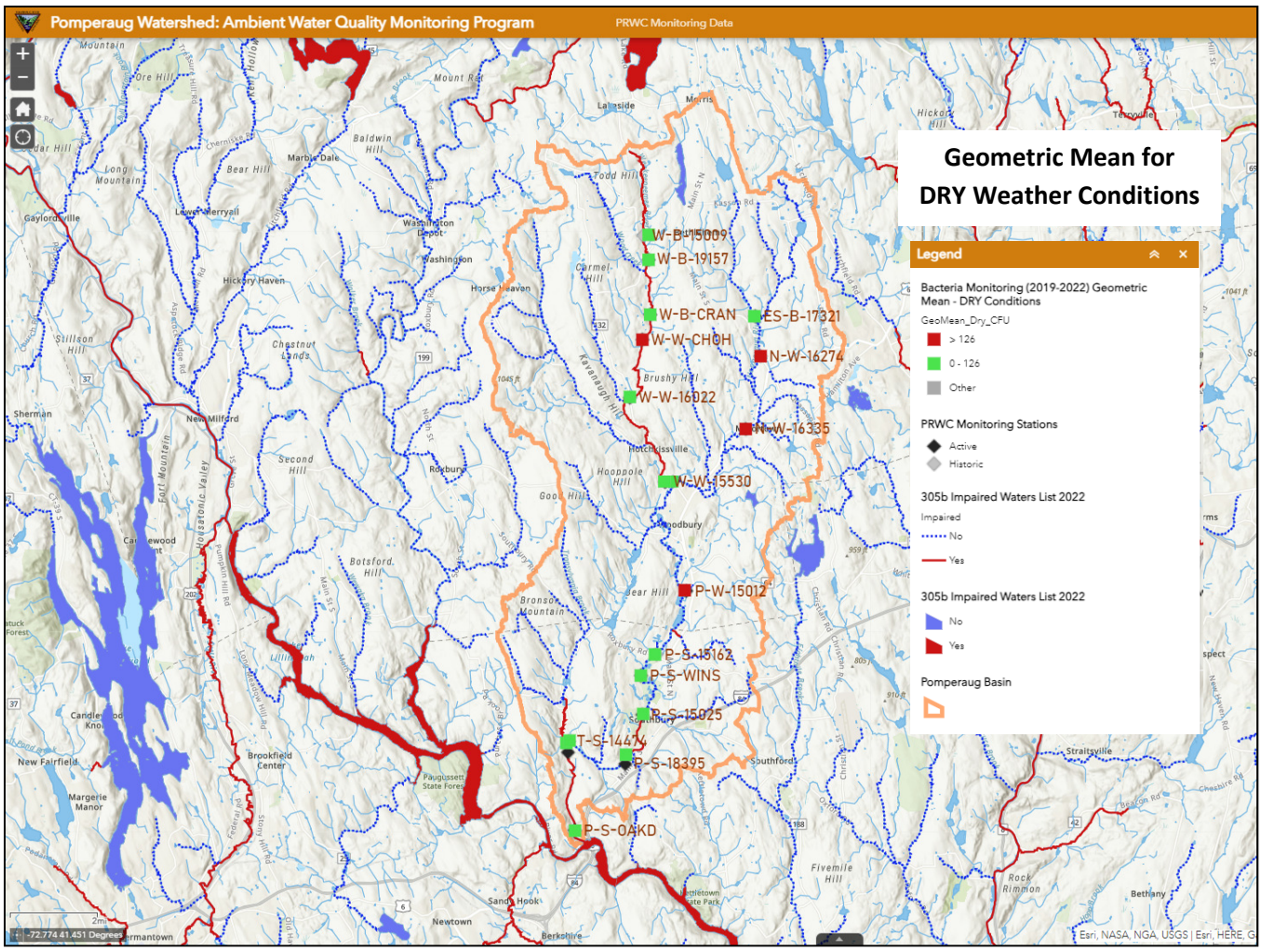

Figure 2-6. Summary data by sample site for ambient water quality monitoring conducted 2019-2022 detailing the geometric mean for DRY weather conditions. Sites shown in **green** meet the water quality limit for bacteria for safe recreational use in Connecticut with a result less than 126 CFU/100mL. Sites shown in **red** are locations where the geometric mean exceeded the water quality limit for bacteria for safe recreational use.

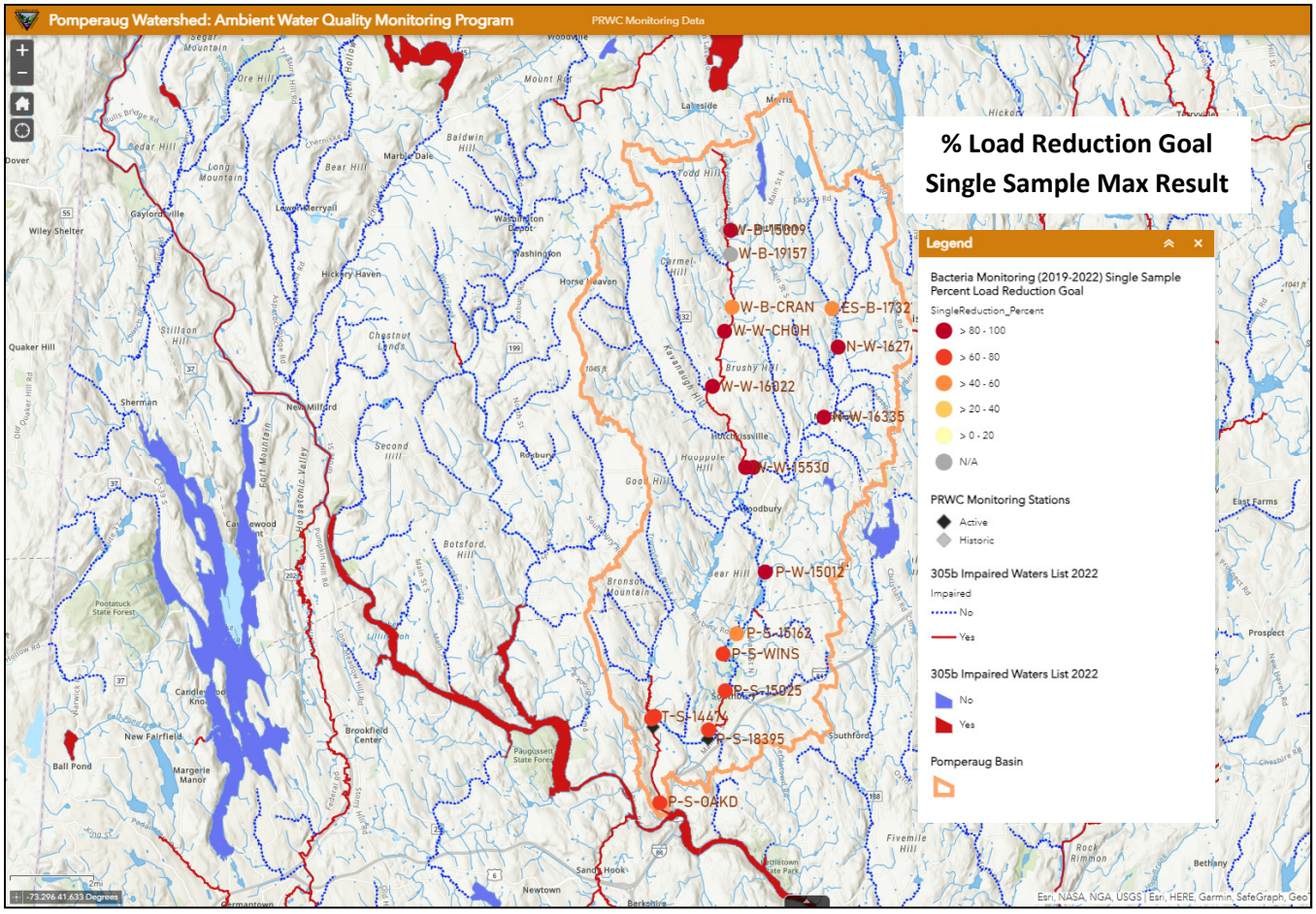

Figure 2-7. Summary data by sample site for ambient water quality monitoring conducted 2019-2022 detailing percent of bacteria load reduction needed to meet the single event criterion (< 410 CFU/100mL) to support safe recreational use in Connecticut. Sites displayed in gray already meet this water quality criterion.

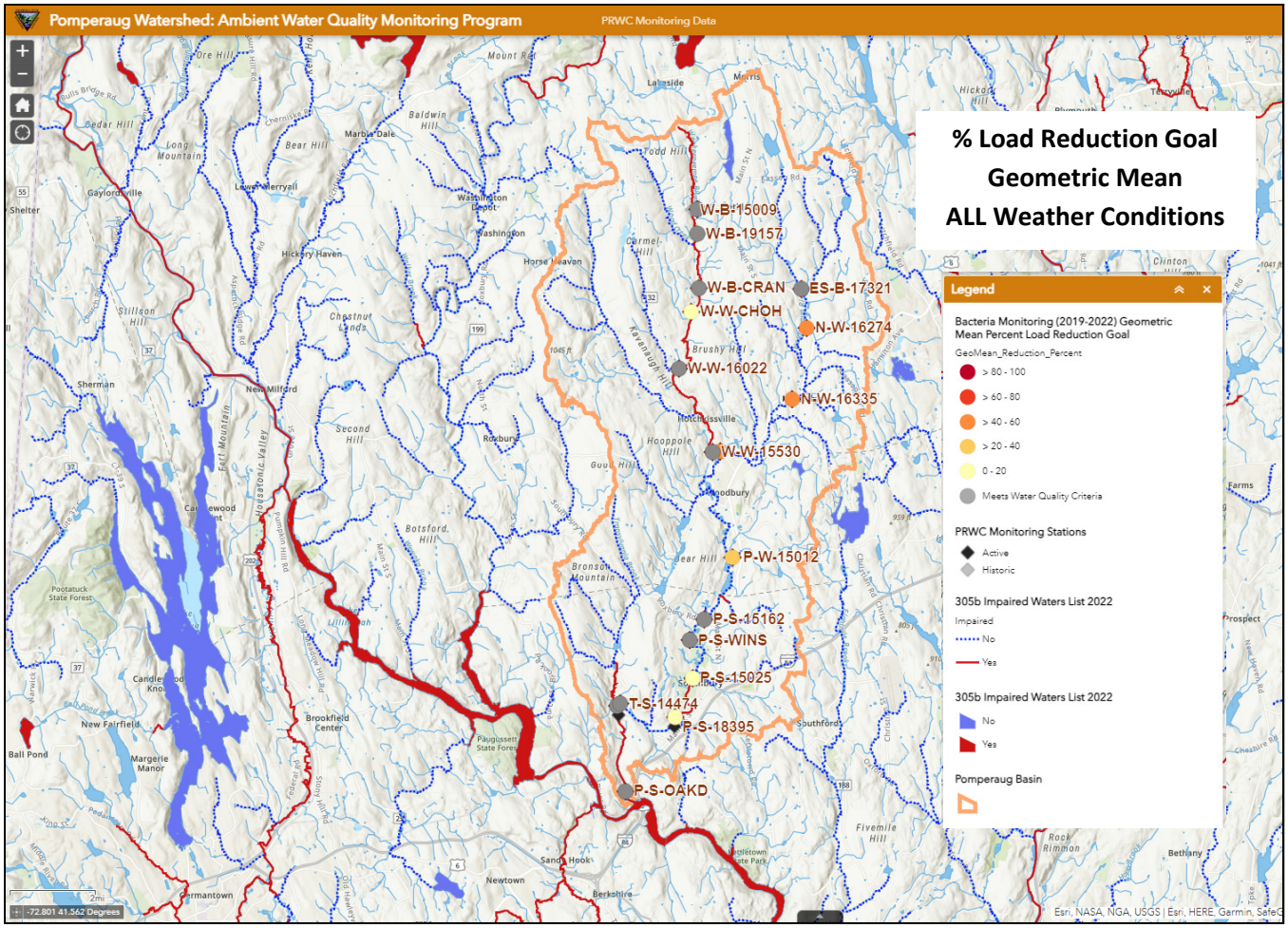

Figure 2-8. Summary data by sample site for ambient water quality monitoring conducted 2019-2022 detailing percent of bacteria load reduction in needed to meet the geometric mean criterion (< 126 CFU/100mL) to support safe recreational use in Connecticut. Sites displayed in gray already meet this water quality criterion.

STREAMWALK ASSESSMENT SURVEY WEEKEEPEEMEE RIVER (2021)

PRWC completed a Streamwalk Assessment Survey of the Weekeepeemee River in 2021. The entire 9.61 mile length of this river is listed as impaired for recreational uses based on bacteria counts observed in 2010 (CT DEEP, 2012). A total of 63 observations relating to riparian buffer, trash and debris, stream channelization, bank erosion, road crossings, potential bacteria sources, and opportunities to mitigate polluted runoff were recorded during the survey (**Appendix 2**). The distribution of the observations made during the survey is presented in **Figure 2-9**. The following summarizes the frequency for each broad category of the observations recorded:

- 19 Impaired Buffer Areas
- 8 Road Crossings
- 6 Trash and Debris Accumulations
- 5 Stormwater Outfalls
- 5 Channelized Sections
- 5 Sites with Livestock Present (at least two more visible from aerial images)
- 4 Bank Erosion Areas
- 3 Small, Temporary Stone Dams (appear to be hand-constructed)
- 3 Water Diversions (Irrigation)
- 3 Miscellaneous Observations
- 1 Beaver Dam
- 1 Ford-style stream crossing (at least two more visible from aerial images)
- Lots of evidence of wildlife – deer, raccoons, beaver, coyote, squirrels, mice, birds, fish

In several instances, more than one observation type was observed at a given site. For example, locations with an impacted buffer may have also had livestock present or many have also been channelized or exhibited bank erosion.

Major findings of the field assessments are further summarized below while individual site observations are detailed in **Appendix 2** along with site specific best management practice recommendations.

- **Lack of Stream Buffer** – Stream buffer encroachments were prevalent along the Weekeepeemee River and are most often associated with residential and agricultural properties. Residential lawns and some agricultural practices extend down to the banks of the stream in many areas (**Figure 2-10**). The degree of stream buffer encroachment can have a significant impact on the overall stream and habitat conditions. In general, larger natural buffers are associated with better stream health, including channel substrate, flow regime, water quality, and shading as well as better upland and wetland habitat that provide larger areas available to native flora and fauna.

- **Trash and debris accumulation** – Evidence of littering and illegal dumping was observed in at least three locations along state and town roads. While this does not contribute to the bacteria impairment that makes for unsafe recreation, it does present other hazards like broken glass and rusty metal that make recreation undesirable (**Figure 2-11**). Trash and debris found at other sites consisted of items that appeared to be deposited by high streamflows in slower moving areas. Increased “No dumping” or “No littering” signs may be needed along certain road areas to help prevent further accumulation. These areas should also be included in municipal “adopt a road” programs where volunteers conduct regular litter clean-up efforts. More frequent in-stream trash clean-up efforts may also be warranted.

- **Stormwater outfalls** – Storm drains and catch basins are quite prevalent throughout the Pomperaug Watershed and are an important safety component of transportation system infrastructure. Precipitation which falls directly on roadways of which flows off adjacent surfaces onto roadways is collected in these structures which are tied to a series of pipes that eventually discharge stormwater onto the ground (i.e. in the woods or onto a grassy area) or into a river or stream near the roadway (**Figure 2-12**) The pipe that discharges the stormwater is called the outfall. The discharge consists of untreated stormwater that has flowed off of the road and/or over the landscape where it may pick up pollutants including bacteria; nutrients; chemicals and other pollutants from landscaping; agriculture; automotive fluids, oils, and greases; and other human and wildlife activities. Depending on the volume and velocity of a stormwater discharge onto land and slope of the land, an outfall may cause erosion and a gully may form which could add to sediment loading if the gully extends downhill to a stream. Along the Weekeepeemee River, the Town of Woodbury is responsible for testing outfalls that discharge to the impaired stretch river under the provisions of their MS4 permit requirements. Bethlehem does not have population density large enough for their community to be subject to the MS4 permit program. Regardless, municipalities can employ best practices for educating residents about stormwater runoff, for mapping and testing outfalls, for cleaning out catch basins on a regular basis to ensure they function as designed, and for detecting and eliminating illicit discharges that may be connected to the stormwater conveyance system. The implementation of best management practices should be prioritized for areas where the bacteria counts in stormwater outfalls exceed thresholds for safe recreation (see Stormwater Outfall Monitoring Data section).

- **Agricultural Land Use** – Hobby farms, equestrian centers, and more intensive livestock farming practices were frequently observed in the Weekeepeemee watershed. While some farms maintain animal exclusion fencing to separate livestock from streams, other locations have grazing or feeding areas with apparent channelization or full access to streams and discharges to streams. Exclusion fencing, alternative approaches to manure management, such as moving manure piles further away from streams, and other agricultural BMPs can yield water quality improvements (**Figure 2-13**). Crop production is also common in the Weekeepeemee watershed; manure-based fertilizers may be used in these areas along with other soil amendments and pest controls. Additional best practices may be suitable in for nutrient and pest management and prevention of soil erosion in these areas including the establishment and maintenance of riparian buffers.

- **Channelization** – Historic realignment of stream channels was not uncommon throughout the Pomperaug Watershed (**Figure 2-14**). Many areas were straightened and/or had berms built up along the streambank prior to the adoption of wetlands and watercourses regulations in order to develop transportation routes, commercial areas, neighborhoods, to make agricultural areas easier to cultivate, and to provide faster drainage of water from roads, fields, driveways, and parking lots to help prevent flooding. These practices often result in the river becoming cut off from its floodplain, stream velocity increasing, and river banks/beds eroding which can significantly alter in-stream habitat for aquatic life and exacerbate downstream flooding. Such channelization was observed in several areas along the length of the Weekeepeemee River, many of which coincided with observations of streambank erosion. Restoring channelized section to more natural, meandering paths face many challenges including physical infrastructure and obtaining agreements among multiple property owners. While challenging and costly to restore some of these areas, there are opportunities that could support a healthier fishery and enhance recreational opportunities (example: Site Code R01-CM-01). These efforts are low priority restoration actions through the lens of addressing bacteria related impairments.

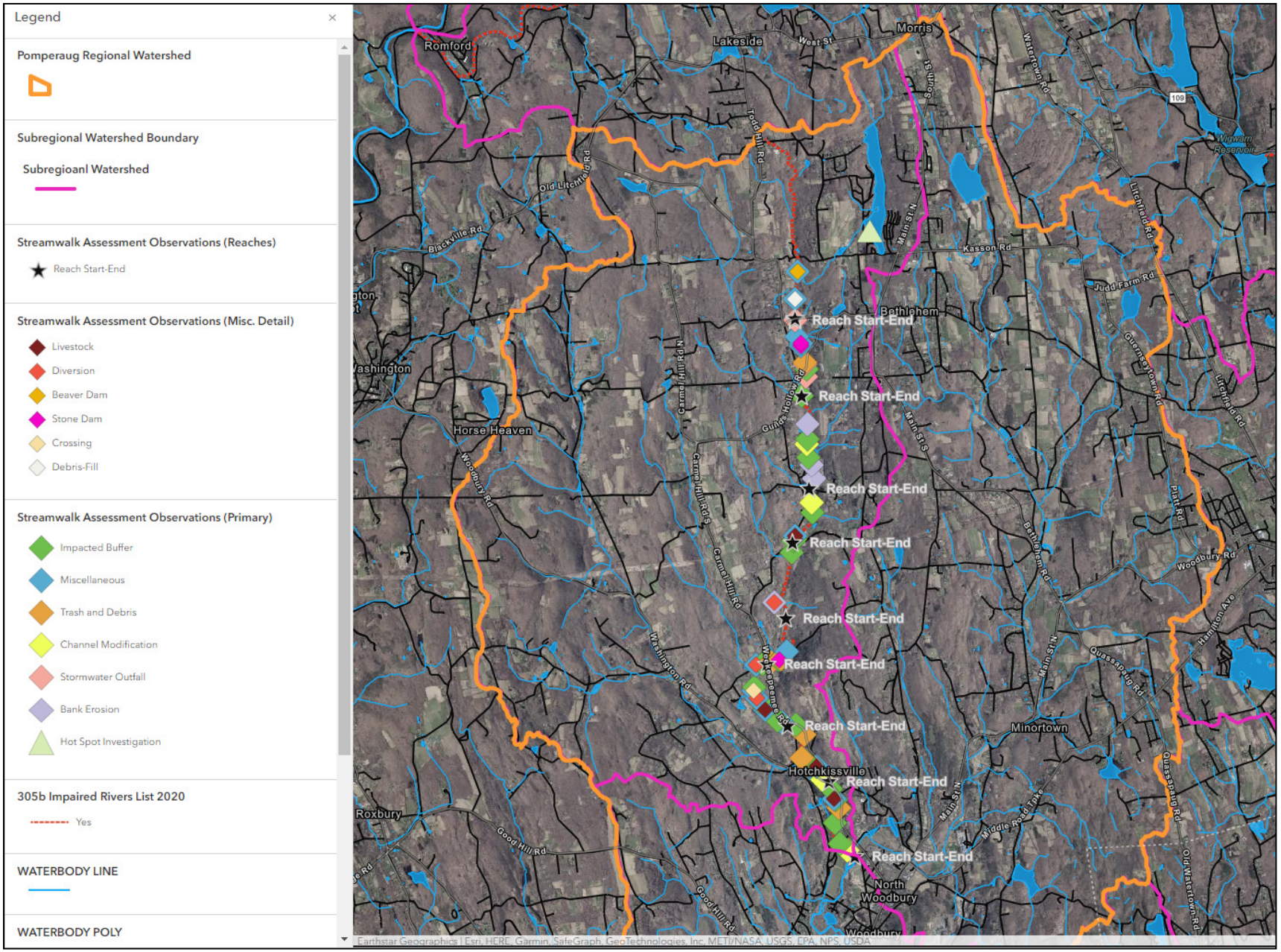

Figure 2-9. Weekeepeemee River Streamwalk Survey Observations – July and August 2021.

Figure 2-10. Examples of residential and agricultural sites where there are opportunities for riparian buffer restoration. A healthy riparian buffer should consist of vegetation that includes trees, shrubs, and perennial ground cover to provide stream shade, soil stability, stormwater infiltration, and habitat and food for a variety of organisms including dragonflies, frogs, turtles, birds, and mammals.

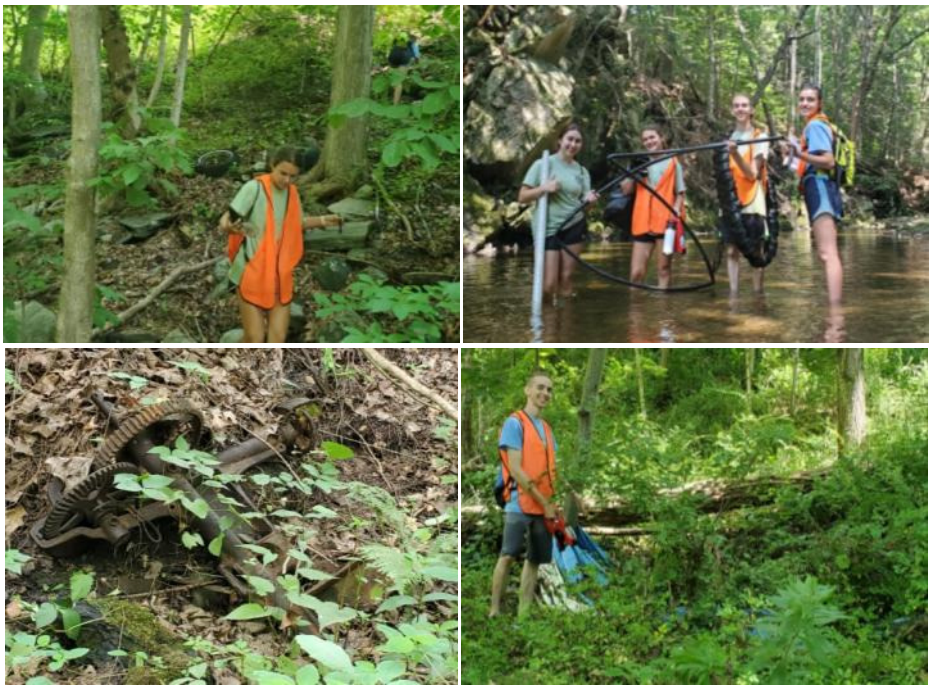

Figure 2-11. Examples of trash and debris observed in and along the Weekeepeemee River. Smaller items were collected during the survey and properly disposed of by the field team.

Figure 2-12. Examples of stormwater outfalls that discharge water in catch basins located on roadways and other impervious surfaces; their associated network of drainage pipes discharge stormwater away from the roadway and onto the ground or into a nearby river /stream.

Figure 2-13. Examples of hobby farms and commercial agricultural operations in the Weekeepeemee Watershed. Goats, alpaca, cattle, and chickens are common types of livestock present. Crop production is also common in this watershed. Best management practices for these properties include increased livestock fencing setback distances, manure management and storage practices, and riparian buffer restoration and maintenance.

Figure 2-14. Examples of channel modification where portions of the Weekeepeemee River had been straightened at some point in its history; typically in areas adjacent to agricultural fields and transportation routes.

Overall, five agricultural sites in the Weekeepeemee Watershed were identified as high priority opportunities for implementation of best management practices in this subregional watershed based mostly on the scale of site size and potential load reductions that may be achieved. Nonetheless, opportunities for improving riparian buffer conditions were one of the most frequently observed BMP opportunities in this subregional watershed, which are also high priority for implementation based on their collective load reduction potential (**Appendix 2**). The latter observation suggests that broad scale community education about what constitutes a healthy riparian buffer and how to establish or maintain one should be a high priority action item for improving water quality. The Watershed Based Plan had previously recommended community education and outreach as an essential component in mitigating non-point sources of pollution. The more recent field assessment data underscore riparian buffers as a priority focus for future outreach efforts.

In general, agricultural best practices include implementing and maintaining riparian buffers as one design element for mitigating bacteria pollution. Other elements include installing and maintaining livestock fencing, adopting rotational grazing practices, and storing manure in flat areas away from wetlands and water courses. Among the agricultural operations located along the Weekeepeemee River where there are opportunities to implement best management practices, two areas already had BMP recommendations and conceptual designs previously included in the Watershed Based Plan. Conceptual designs for one of the operations are still on point and will continue to be a high priority site for BMP implementation. The other site that had been included in the WBP actually consists of at least two and perhaps three separate operations, which means the BMP recommendations should be broken out as individual sites and updated based on new observations and reflect that some BMPs have already been implemented. The new area for which BMPs are being recommended may consist of two separate agricultural operations based on separate ownership of the parcels; however, it could be one operator leasing both properties. For now, the BMP recommendations will be presented on the assumption that there are two separate operations adjacent to each other. Conceptual plans for each of these agricultural land use areas are included in **Section 3** of this document.

Sites considered high priority opportunities for BMP implementation within the Weekeepeemee subregional watershed may be assigned a lower priority when ranking actions needed across the Pomperaug Regional Basin. For example, the ambient water quality monitoring data presented above suggest that higher priority should be given to implementation of BMPs in the Nonnewaug Watershed ; greater pollutant load reductions are needed to meet water quality criteria for safe recreation at stations along this river than for those along the Weekeepeemee. The Watershed Based Plan presented BMP recommendations for a few sites in the Nonnewaug Watershed which were based on neighborhood assessment surveys completed when the plan was developed. The priority for implementation of these recommendations should be elevated among the actions needed across the entire Pomperaug Regional Basin to reduce

bacteria pollution. A more extensive streamwalk assessment survey of the Nonnewaug and its two primary tributaries (Lewis-Atwood Brook and East Spring Brook) may be necessary to further refine the implementation strategy for this subregional watershed. Overall priority rankings are presented in **Section 3** after Municipal Stormwater Outfall data are factored into the equation for identifying potential sources of pollution and determining where the greatest return on investment can be achieved in mitigating bacteria pollution.

MUNICIPAL STORMWATER OUTFALL DATA (2019)

Within the Pomperaug Watershed, the towns of Woodbury and Southbury meet the criteria for needing a permit from CT DEEP to discharge stormwater collected through small municipal separate storm sewer systems (MS4 Permit or "stormwater permit"). The MS4 Permit which was issued by CT DEEP in 2016 and reissued without modification of requirements in 2021 has a number of requirements for each town including inventorying and mapping its catch basins and where the associated outfalls (stormwater discharges) are located. The permit also requires sampling stormwater water that discharges from the outfall pipes and taking steps to detect and eliminate illicit discharges that may be connected to the storm sewer system. Both the Town of Woodbury and the Town Southbury hired Fuss & O'Neill, Inc. to help them fulfill mapping and monitoring components of their MS4 Permit. PRWC obtained stormwater outfall monitoring data from 2019 for each town by contacting the municipal staff overseeing permit compliance.[1] The data include sample results from dry weather screening and wet weather monitoring.

Figure 2-15: Examples of stormwater outfalls that discharge to impaired segments of the Pomperaug River in Southbury, CT. (*Photos by Fuss & O'Neill, Inc.*)

[1] After extensively reviewing stormwater outfall data for this report, PRWC located additional stormwater outfall sampling data for 2021 and 2022 from the Town of Woodbury and the Town of Southbury as they were included in their respective **2022 MS4 Stormwater Management Annual Reports** to CT DEEP. Each town's report details both wet and dry weather screening and information pertaining to illicit discharge detection and elimination efforts by the munipality along with the overall progress they have made towards fulfilling the requirements of their MS4 permit.

As towns completed their storm sewer system inventories, outfalls that had flow present during dry weather were documented and the water being discharged was sampled. If present, olfactory and/or visual evidence of an illicit discharge (such as sewage smell, algae growth, or soap bubbles) were recorded. An outfall with dry weather flow present can be an indication that a pipe delivering untreated waste water (sewage or gray water) has been illegally connected to the stormwater system. Stormwater outfalls with dry weather flow present are detailed in **Figure 2-16** and **Table 2-3** for Woodbury and **Figure 2-19** and **Table 2-5** for Southbury. Results from dry weather sampling conducted by Fuss & O'Neill in 2019 reveal high indicator bacteria levels from a handful of stormwater outfalls in Woodbury (**Figure 2-17** and **Table 2-3**) and Southbury (**Figure 2-20** and **Table 2-5)**. These outfalls should be further evaluated and corrective actions should be taken to eliminate dry weather flow and any illicit discharges that are confirmed.

Outfall sampling in wet weather helps illustrate where potential sources of pollution may be concentrated in the landscape and prioritize areas where implementation of best management practices for mitigating stormwater runoff are suitable. In Southbury and Woodbury, wet weather sampling was required for outfalls in certain priority areas defined by the MS4 permit which included the "urbanized areas" of each town as well as outfalls that discharge to an impaired water body (i.e. Weekeepeemee River, Pomperaug River, and Transylvania Brook). For outfalls that discharge to an impaired water body, sampling included the pollutant associated with the impairment. Wet weather sampling illustrated that some outfalls had higher indictor bacteria present. In Woodbury, the outfalls near the historic Hotchkissville village (WR-09 and WR-10) had bacteria levels that suggest a concentration of bacteria sources associated with the upland area along Route 47 between Quassuk Road and the Route 132 (**Figure 2-18** and **Table 2-4**). In Southbury, outfalls along Meadowbrook Road and off of East Flat Hill Road that drain to Transylvania Brook (OF179, OF194, and OF240) had higher levels of bacteria present, again suggesting a concentration of bacteria sources being delivered from the upland areas to the stream. Outfalls draining the Heritage Village side of Poverty Road (OF185 and OF186) and between River Trail and Flood Bridge Road (OF261 and OF245) in Southbury also had elevated levels of bacteria in wet weather (**Figure 2-21** and **Table 2-6**). Accordingly, if an illicit discharge is not confirmed, these areas should be considered a higher priority focus for implementation of best management practices and achieving the best return on investment in terms of pollutant load reductions.

Per the requirements of the MS4 Permit, the Town of Woodbury has identified the areas in town that have directly connected impervious areas (DCIA) , which means runoff from these surfaces is collected through the storm sewer system and directly discharged to a river or stream. Each town with an MS4 Permit is supposed to install retrofits in a portion of these areas to allow water to infiltrate into the ground instead of directly discharge to a nearby river or stream. Woodbury has developed a plan that provides conceptual details for sites where directly connected impervious areas can be disconnected from the storm sewer system by installing retrofits. The Town's DCIA plan is included in **Appendix 3**. This plan compliments best management practices identified in the Pomepraug Watershed Based Plan as well as in the *Technical Memo: Streamwalk Assessment Survey for Weekeepeemee River*. These conceptual projects were considered in the reprioritization of best management practices to support bacteria pollution load reduction goals and those elevated as high priority are presented in Secton 3. At the time of this Updated Existing Conditions Report was prepared, Southbury's DCIA Plan was unavailable.

Table 2-3. Priority Outfall Screening, Dry Weather, Town of Woodbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Woodbury in 2019 where there was observed flow without a precedent rain event.

				HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00	HESSEKEY BROOK(2) 6805-00
Outfall ID				**HE-02**	**HE-14**	**HE-19**	**HE-23**	**HE-24**	**HE-26**	**HE-27**	**HR-37**
Sample Number				**1397190117-02**	**1493190117-07**	**1493190117-06**	**1493190117-05**	**1493190117-04**	**1493190117-03**	**1493190117-02**	**1493190117-01**
Parameter [1]	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**								
Fecal Coliforms			CFU/100mL	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	14100	<Null>
Total Coliforms	> 500 [5]	10	CFU/100mL	52	576	110	211	259	**13000**	**13000**	**1260**
E Coli	> 410 [5]	10	CFU/100mL	<10	<10	<10	120	<10	**1840**	**1100**	**450**
Surfactants (mg/L)	≥ 0.25 [2]	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	0.07	<0.05	<0.05
Field Screening											
Sample Deg C			C	8.98	1.64	1.74	2.07	4.09	5.68	1.98	2.57
Sample Conductivity			uS/cm	308.36	23	64	19	194	599	1117	587
Sample Salinity			g/L	0.15	0.02	0.05	0.02	0.15	0.45	0.92	0.46
Sample pH [3]			SU	7.38	5.76	7.98	8.42	8.36	7.85	8	8.16
Sample Chlorine	≥ 0 [2][4]	0.02	mg/L	**0.1**	**0.02**	**0.01**	**0.07**	**0.05**	**0.06**	**0.2**	**0.88**
Ammonia (mg/L)	≥ 0.5 [2]	0.05	mg/L	<0.05	<0.05	<0.05	0.07	0.07	<0.05	<0.05	<0.05
Other IDDE Indicators											
Visual Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None

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Table 2-3 (cont'd). Priority Outfall Screening, Dry Weather, Town of Woodbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Woodbury in 2019 where there was observed flow without a precedent rain event.

				TRIBUTARY TO HESSEKEY BROOK 6805-04	TRIBUTARY TO HESSEKEY BROOK 6805-04	GOOD HILL BROOK 6805-02	TRIBUTARY TO POMPERAGU RIVER 6800-01	TRIBUTARY TO POMPERAGU RIVER 6800-01	TRIBUTARY TO POMPERAGU RIVER 6800-01	TRIBUTARY TO POMPERAGU RIVER 6800-01	TRIBUTARY TO POMPERAGU RIVER 6800-01	TRIBUTARY TO POMPERAGU RIVER 6800-01
Outfall ID				**TH-04**	**TH-06**	**GH-11**	**TP-10**	**TP-11**	**TP-12**	**TP-13**	**TP-18**	**TP-24**
Sample Number				**1397190117-03**	**1397190117-04**	**1397190117-05**	**1362190117-06**	**1362190117-03**	**1362190117-07**	**1362190117-05**	**1397190117-07**	**1362190117-04**
Parameter [1]	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**									
Fecal Coliforms			CFU/100mL	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Total Coliforms	> 500 [5]	10	CFU/100mL	**1860**	**700**	**6490**	<10	86	399	63	41	**512**
E Coli	> 410 [5]	10	CFU/100mL	<10	20	52	<10	<10	41	<10	41	302
Surfactants (mg/L)	≥ 0.25 [2]	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Field Screening												
Sample Deg C			C	6.6	4.43	4.67	9.1	3.6	0.6	1.5	9.9	2.3
Sample Conductivity			uS/cm	214.29	75.88	155.29	463.4	293.9	194	553	624.94	133
Sample Salinity			g/L	0.1	0.03	0.07	0.24	0.14	0.09	0.26	0.3	0.06
Sample pH [3]			SU	7.27	7.37	6.95	7.21	7.2	7.4	7.04	7.41	7.3
Sample Chlorine	≥ 0 [2][4]	0.02	mg/L	0	**0.1**	0	**0.1**	**0.1**	**0.1**	**0.1**	0	**0.1**
Ammonia (mg/L)	≥ 0.5 [2]	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Other IDDE Indicators												
Visual Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None	None
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None	None

Continued next page (footnotes follow)

Table 2-3 (cont'd). Priority Outfall Screening, Dry Weather, Town of Woodbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Woodbury in 2019 where there was observed flow without a precedent rain event.

				POMPERAUG RIVER 6800-00	POMPERAUG RIVER 6800-00	WOODBURY RESERVOIR 6800-02	WOODBURY RESERVOIR 6800-02	SPRAIN BROOK 6803-00	SPRAIN BROOK 6803-00	WEEKEEPEEMEE RIVER 6804-00	WEEKEEPEEMEE RIVER 6804-00
Outfall ID				**PR-12**	**PR-18**	**WB-01**	**WB-03**	**SB-17**	**SB-16**	**WR-02**	**WR-03**
Sample Number				**1397190117-01**	**1397190117-06**	**1362190117-01**	**1362190117-02**	**1397190129-01**	**1397190129-02**	**1397190129-04**	**1397190129-03**
Parameter [1]	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**								
Fecal Coliforms			CFU/100mL	900	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>	<Null>
Total Coliforms	> 500 [5]	10	CFU/100mL	**910**	305	**602**	**1080**	134	121	199	420
E Coli	> 410 [5]	10	CFU/100mL	10	10	<10	10	0	0	0	10
Surfactants (mg/L)	≥ 0.25 [2]	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	0	0	0	0
Field Screening											
Sample Deg C			C	8.79	8.9	3.6	3.2	17.1	18.1	16.9	15.8
Sample Conductivity			uS/cm	274.34	135.89	189	236.4	121.71	543.14	334.67	100.23
Sample Salinity			g/L	0.13	0.06	0.05	0.11	0.05	0.21	0.18	0.05
Sample pH [3]			SU	7.66	7.29	8.1	7.59	6.48	6.59	6.16	6.08
Sample Chlorine	≥ 0 [2][4]	0.02	mg/L	0	0	**0.1**	**0.1**	0	0	0	0
Ammonia (mg/L)	≥ 0.5 [2]	0.05	mg/L	<0.05	<0.05	<0.05	<0.05	0.26	0.06	0.11	0.12
Other IDDE Indicators											
Visual Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None

Bold result indicates finding above potential sewage input indicator level
BDL indicates value not detected above laboratory/equipment reporting limit
NS indicates analyte not sampled/not requried by permit

Footnotes:
(1) Parameter List from MS4 General Permit - Appendix B - Section 5(c)
(2) Threshold Indicators of a potential sanitary discharge to stormwater (Ref.: MS4 General Permit - Appendix B - Section 7(d))
If ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and E. Coli > 410 MPN/100mls
If all three conditions are exceeded, the catchment area would be considered a 'High-priority catchment", with further investigation required.
(3) Parameter measures taken, but not required by MS4 General Permit
(4) Detectable levels of chlorine
(5) From MS4 General Permit - Appendix D - table of 'Water Quality Targets for Waters for Which Bacteria is a Storm water Pollutant of Concern
(6) Where quality of evidence measured parameter or field indicators (visual or olfactory) results indicate a potential pollutant source impairing waters of the State

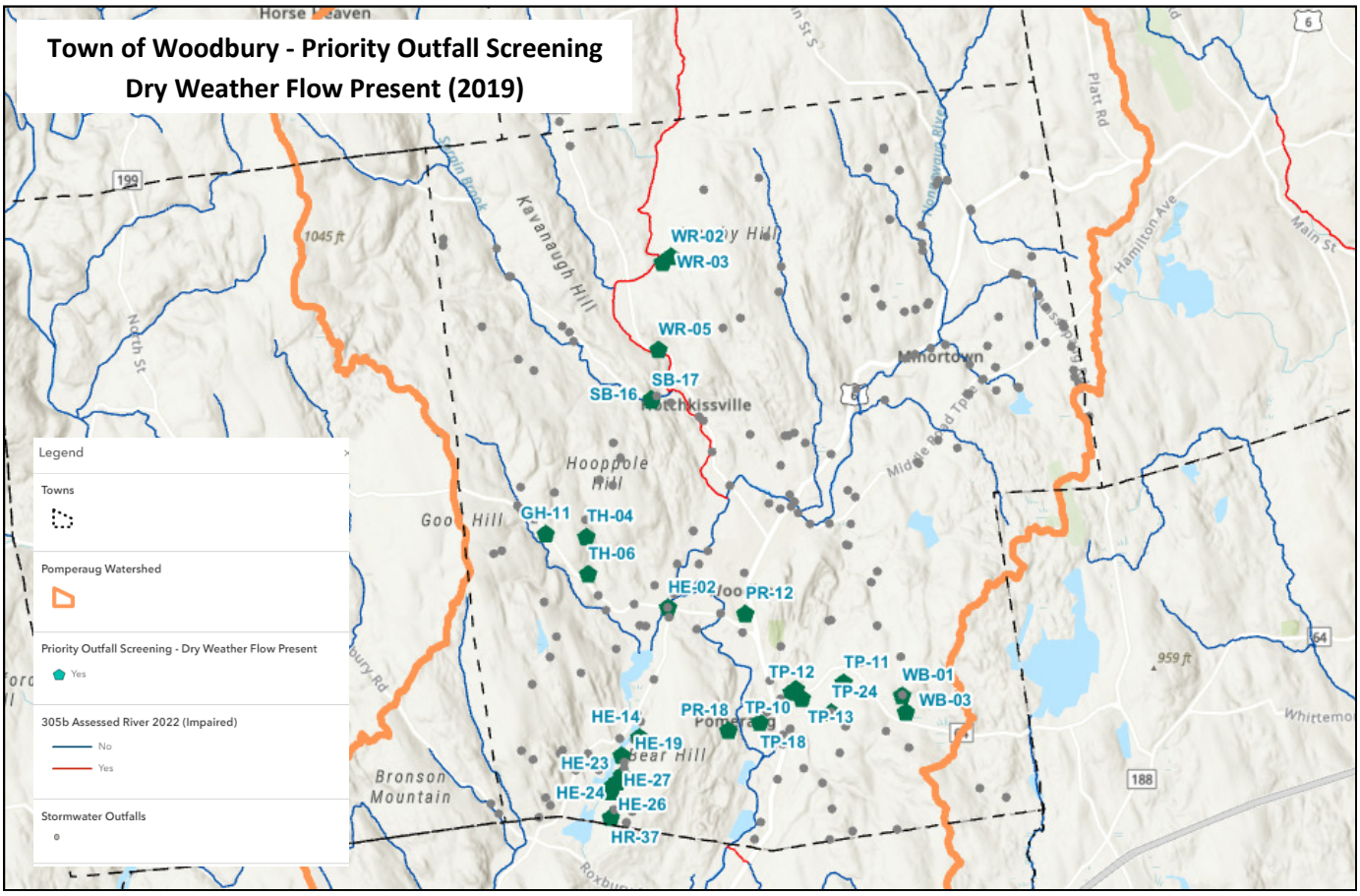

Figure 2-16. Priority Outfall Screening, Dry Weather, Town of Woodbury. Map shows stormwater outfalls with flow present in dry weather. Among the priority outfalls that discharge to the Weekeepeemee River, outfalls WR-02 and WR-03 had dry weather flow present. There were also outfalls that discharge to Sprain Brook near its confluence with Weekeepeemee River that had dry weather flow present (SB-16 and SB-17). None of the outfalls screened in dry weather presented olfactory or visual evidence of an illicit discharge.

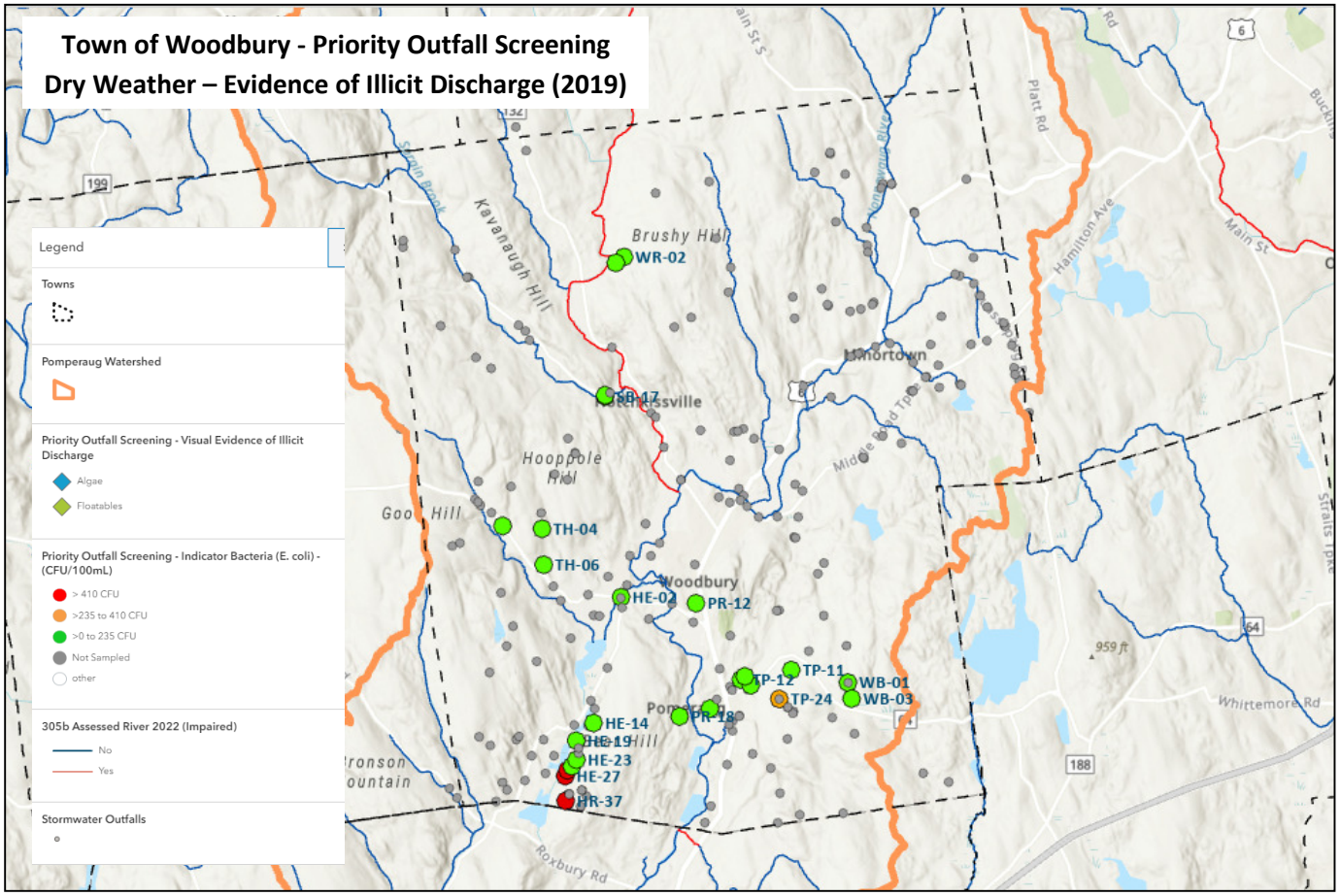

Figure 2-17. Priority Outfall Screening, Dry Weather, Town of Woodbury. Outfalls with flow present in dry weather and additional visual evidence of an illicit discharge or dry weather sampling data with elevated indicator bacteria counts. None of the outfalls screened in dry weather presented olfactory or visual evidence of an illicit discharge. Four outfalls were of concern based on this screening detail. Three of these are associated with the Wood Lake neighborhood that drains to Hesseky Brook (HE-26, HE-27, HR-37); and one is located off of Route 64 and drain to an unnamed tributary to the Pomperaug River (TP-24).

Table 2-4. Priority Outfall Screening, Wet Weather, Town of Woodbury. Wet weather screening results for water samples collected in 2019 from municipal stormwater outfalls that discharge to the impaired segment of Weekeepeemee River in Woodbury.

Outfall ID				WR-10	WR-06	WR-05	WR-02	WR-11	WR-09	WR-03
Sample Number				**1397190426-06**	**1397190426-07**	**1397190426-03**	**1397190426-01**	**1397190426-04**	**1397190426-05**	**1397190426-02**
Parameter [1]	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**							
Fecal Coliforms			CFU/100mL	387.3	5.2	63.1	37.3	146.7	272.3	17.3
Total Coliforms	> 500 [4]	10	CFU/100mL	**2419.6**	**1553.1**	**2419.6**	**2419.6**	**2419.6**	**2419.6**	**2419.6**
E. Coli	> 410 [4]	10	CFU/100mL	**517.2**	0	90.6	79.8	241.5	**648.8**	33.2
Field Screening										
Sample Deg C			C	10.4	9.8	12.3	9.4	11.1	10.5	9.6
Sample pH [3]			SU	7.37	7.12	7.64	8.87	7.32	7.7	7.11
Other IDDE Indicators										
Visual Evidence of Illicit Discahrge [2]				None	None	None	None	None	None	None
Olfactory Evidence of Illicit Discahrge [2]				None	None	None	None	None	None	None

Bold result indicates finding above potential sewage input indicator level
BDL indicates value not detected above laboratory/equipment reporting limit
NS indicates analyte not sampled/not an impairment constitunet

Footnotes:
(1) Parameter List from MS4 General Permit - Appendix B - Section 5(c)
(2) Where quality of evidence measured parameter or field indicators (visual or olfactory) results indicate a potential pollutant source impairing waters of the State
(3) Parameter measures taken, but not required by MS4 General Permit
(4) From MS4 General Permit - Appendix D - table of 'Water Quality Targets for Waters for Which Bacteria is a Storm water Pollutant of Concern

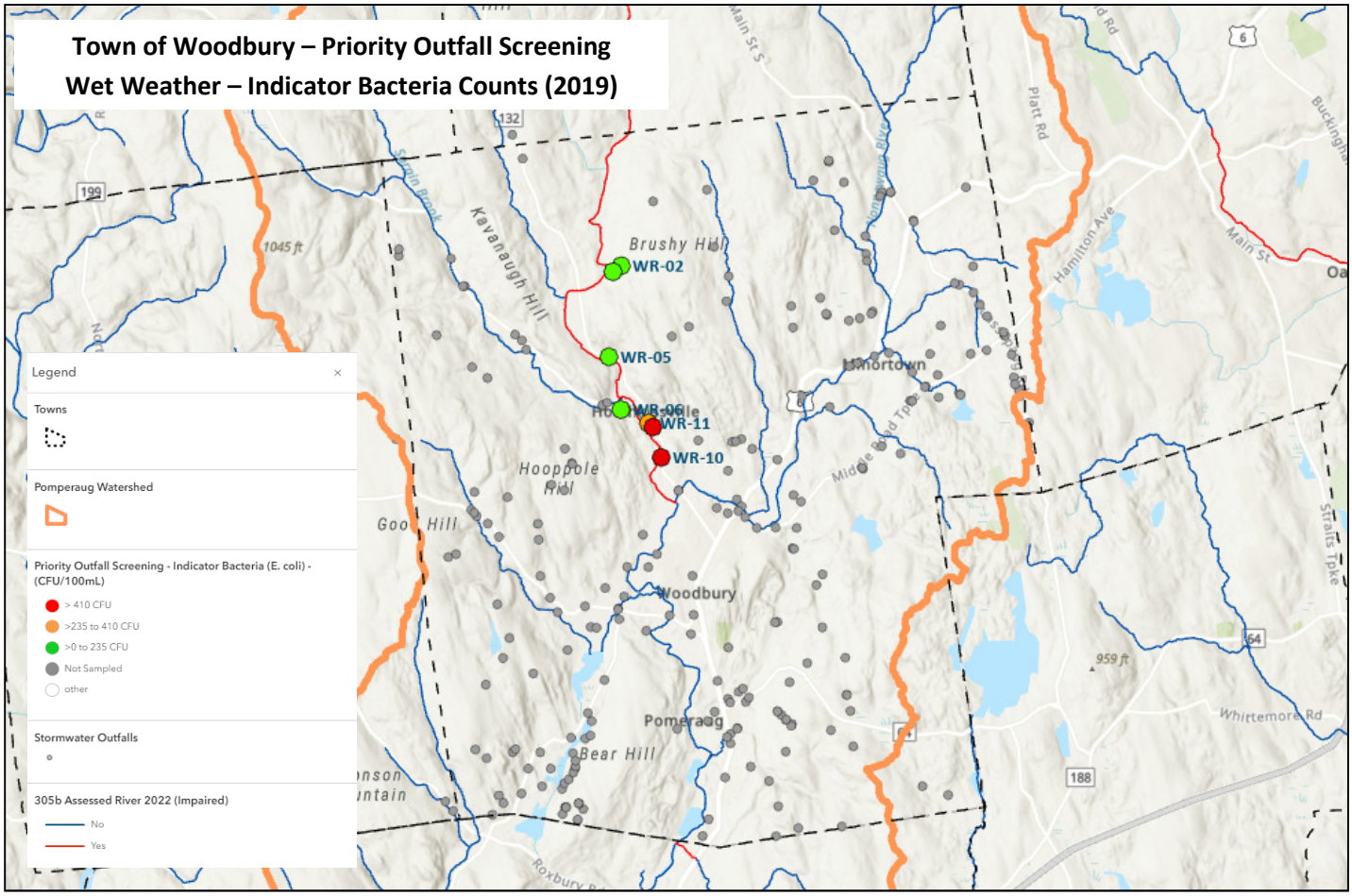

Figure 2-18. Priority Outfall Screening, Wet Weather, Town of Woodbury. Indicator bacteria (*E. coli*) counts from priority outfalls screened during wet weather. Outfalls with *E. coli* counts greater than 410 CFU/100mL are displayed in **red** which exceeds the water quality threshold for safe recreation. If not already associated with a possible illicit discharge, high bacteria counts from these outfalls during wet weather suggest that bacteria originate from non-point sources of pollution. This further suggests that best management practices to mitigate sources of bacteria pollution may be higher priority in the upland areas that drain to specific outfalls that discharge to Weekeepeemee River (WR-10 and WR-11) Note there was on additional outfalls in close proximity to these that had bacteria counts greater than 235 CFU/100mL (displayed in **orange)**, which is the threshold for safe recreation at public swimming areas.

Table 2-5. Priority Outfall Screening, Dry Weather, Town of Southbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Southbury in 2019 where there was observed flow without a precedent rain event.

				Flood Bridge - Pompearug	Old Field Rd - Bullet Hill BK	Eagle View - Unnamed Trib to Pomperaug	Eagle View - Unnamed Trib to Pomperaug	Georges Hill Rd - Unnamed Trib to Pomperaug	Oak Hill Rd - unnamed trib to South Branch Bullet Hill Bk	Jeremy Swamp Rd - unanemed trib to South Branch Bullet Hill Bk
Outfall Name				**OF284**	**OF178**	**OF316**	**OF324**	**OF326**	**OF278**	**OF273**
Sample Number				1362200505-01	1362200505-02	1362200505-03	1362200505-04	1362200505-05	1584200623-01	1584200623-02
Parameter	Threshold Indicators	Reporting Level (BDL - Below Detction Limit indicated)	Units							
Total Nitrogen			mg/L	NS	NS	NS	NS	NS	NS	NS
Nitrate			mg/L	NS	NS	NS	NS	NS	NS	NS
Nitrite			mg/L	NS	NS	NS	NS	NS	NS	NS
E-Coli	> 410 [5]	10	col/100ml	<10	<10	<10	<10	<10	<10	<100
Total Coliform	> 500 [5]	10	col/100ml	52	**754**	**627**	269	108	**11200**	**112000**
Fecal Coliform			col/100ml	NS	NS	NS	NS	NS	<10	2280
Total Phosphorous			mg/L	NS	NS	NS	NS	NS	NS	NS
TKN			mg/L	NS	NS	NS	NS	NS	NS	NS
Surfactants	≥ 0.25 [2]	0.05	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	0.1	0.14
Field Screening										
pH -3			SU	7.44	7.5	7.6	8.41	7.82	8.8	7.7
Spec Conductivity			uS/cm	1011	628	364	369	353	932	1041
Chlorine	≥ 0 [2][4]	0.02	mg/L	**0.05**	0	**0.03**	**0.04**	**0.04**	BDL	BDL
Ammonia as N	≥ 0.5 [2]	0.05	mg/L	BDL	BDL	BDL	0.25	BDL	0.09	0.52
Other IDDE Indicators										
Visual Evidence of Illicit Discharge [6]				Floatables	None	None	None	None	None	None
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None
Level of Concern (Priority Ranking) [7]				**Negligible**	**Low**	**Mid**	**Negligible**	**Negligible**	**Low**	**High**

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Table 2-5 (continued). Priority Outfall Screening, Dry Weather, Town of Southbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Southbury in 2019 where there was observed flow without a precedent rain event.

				Lakeside Rd - unnamed stream	Bullet Hill Rd - Kettledrum BK	Ichabod - Housatonic R	Ichabod - Housatonic R	Ichabod - Housatonic R	Ichabod - Housatonic R	Ichabod - Housatonic R
Outfall Name				**OF358**	**OF317**	**OF411**	**OF423**	**OF420**	**OF407**	**OF399**
Sample Number				1362200505-06	1362200505-07	1362200506-01	1362200506-02	1362200506-03	1362200506-04	1362200506-05
Parameter	Threshold Indicators	Reporting Level (BDL - Below Detction Limit indicated)	Units							
Total Nitrogen			mg/L	NS	NS	NS	2.61	NS	NS	NS
Nitrate			mg/L	NS	NS	NS	2.45	NS	NS	NS
Nitrite			mg/L	NS	NS	NS	<0.010	NS	NS	NS
E-Coli	> 410 [5]	10	col/100ml	<10	20	<10	<10	<10	<10	<10
Total Coliform	> 500 [5]	10	col/100ml	**1400**	**3080**	**3650**	262	75	**2910**	63
Fecal Coliform			col/100ml	NS	NS	<10	<10	<10	<10	<10
Total Phosphorous			mg/L	NS	NS	NS	0.014	NS	NS	NS
TKN			mg/L	NS	NS	NS	0.16	NS	NS	NS
Surfactants	≥ 0.25 [2]	0.05	mg/L	<0.05	<0.05	<0.05	0.07	<0.05	0.05	0.05
Field Screening										
pH -3			SU	9.22	7.72	8.77	8.07	7.88	7.84	8.03
Spec Conductivity			uS/cm	79	237	197	146	112	191	92.3
Chlorine	≥ 0 [2][4]	0.02	mg/L	**0.13**	**0.09**	**0.08**	**0.09**	**0.08**	0.01	**0.08**
Ammonia as N	≥ 0.5 [2]	0.05	mg/L	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Other IDDE Indicators										
Visual Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None
Level of Concern (Priority Ranking) [7]				**Mid**	**Mid**	**Mid**	**Negligible**	**Negligible**	**Low**	**Negligible**

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Table 2-5 (continued). Priority Outfall Screening, Dry Weather, Town of Southbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Southbury in 2019 where there was observed flow without a precedent rain event.

				Ichabod - Housatonic R	Ichabod - Housatonic R	Lee Bk	Lee Bk	Lee Bk	Lee Bk	Lee Bk	Lee Bk
Outfall Name				**OF412**	**OF381**	**OF440**	**OF460**	**OF462**	**OF466**	**OF459**	**OF458**
Sample Number				1362200506-06	1362200506-07	1362200506-08	1362200514-01	1362200514-02	1362200514-03	1362200514-04	1362200514-05
Parameter	Threshold Indicators	Reporting Level (BDL - Below Detction Limit indicated)	Units								
Total Nitrogen			mg/L	NS	NS	NS	NS	0.95	1.19	NS	NS
Nitrate			mg/L	NS	NS	NS	NS	0.75	0.96	NS	NS
Nitrite			mg/L	NS	NS	NS	NS	<0.010	<0.010	NS	NS
E-Coli	> 410 [5]	10	col/100ml	<10	<10	<10	20	<10	<10	<10	<10
Total Coliform	> 500 [5]	10	col/100ml	355	20	**2060**	**1480**	**1670**	**1050**	**1840**	**7270**
Fecal Coliform			col/100ml	<10	<10	<10	NS	10	<10	NS	NS
Total Phosphorous			mg/L	NS	NS	NS	NS	0.02	0.045	NS	NS
TKN			mg/L	NS	NS	NS	NS	0.2	0.23	NS	NS
Surfactants	≥ 0.25 [2]	0.05	mg/L	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06
Field Screening											
pH -3			SU	7.71	8.05	8.02	8.43	8.49	8.56	8.55	8.44
Spec Conductivity			uS/cm	1086	122	133.5	214	290	203	132	158
Chlorine	≥ 0 [2][4]	0.02	mg/L	**0.09**	**0.06**	**0.09**	**0.09**	0.02	0.02	**0.09**	**0.11**
Ammonia as N	≥ 0.5 [2]	0.05	mg/L	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Other IDDE Indicators											
Visual Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	Algae
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None	None	None
Level of Concern (Priority Ranking) [7]				**Negligible**	**Negligible**	**Mid**	**Mid**	**Low**	**Low**	**Mid**	**Mid**

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Table 2-5 (continued). Priority Outfall Screening, Dry Weather, Town of Southbury. Dry weather screening results for samples collected from municipal stormwater outfalls in Southbury in 2019 where there was observed flow without a precedent rain event.

				Lee Bk	Lee Bk	Lee Bk	High Meadow Rd - Lee Bk	River Rd - Housatonic	River Rd - Housatonic
Outfall Name				**OF454**	**OF406**	**OF402**	**OF437**	**OF418**	**OF354**
Sample Number				1362200514-06	1362200514-07	1362200514-08	1362200514-09	1362200514-10	1362200514-11
Parameter	Threshold Indicators	Reporting Level (BDL - Below Detction Limit indicated)	Units						
Total Nitrogen			mg/L	NS	NS	NS	NS	0.15	0.73
Nitrate			mg/L	NS	NS	NS	NS	<0.02	0.62
Nitrite			mg/L	NS	NS	NS	NS	<0.010	<0.010
E-Coli	> 410 [5]	10	col/100ml	1010	<10	10	<10	<10	<10
Total Coliform	> 500 [5]	10	col/100ml	**3450**	**1310**	**2190**	**1080**	238	**627**
Fecal Coliform			col/100ml	NS	NS	NS	NS	NS	NS
Total Phosphorous			mg/L	NS	NS	NS	NS	<0.010	<0.010
TKN			mg/L	NS	NS	NS	NS	0.15	0.11
Surfactants	≥ 0.25 [2]	0.05	mg/L	0.09	<0.05	<0.05	<0.05	<0.05	<0.05
Field Screening									
pH -3			SU	8.47	7.9	7.76	7.63	8.17	7.83
Spec Conductivity			uS/cm	93	165	104	319	68	113
Chlorine	≥ 0 [2][4]	0.02	mg/L	**0.11**	**0.06**	**0.05**	**0.06**	**0.11**	**0.08**
Ammonia as N	≥ 0.5 [2]	0.05	mg/L	BDL	BDL	BDL	BDL	BDL	BDL
Other IDDE Indicators									
Visual Evidence of Illicit Discharge [6]				None	Algae	None	None	None	None
Olfactory Evidence of Illicit Discharge [6]				None	None	None	None	None	None
Level of Concern (Priority Ranking) [7]				**Mid**	**Mid**	**Mid**	**Mid**	**Negligible**	**Mid**

Bold result indicates finding above potential sewage input indicator level
BDL indicates value not detected above laboratory/equipment reporting limit
NS indicates analyte not sampled/not requried by permit

Footnotes:
(1) Parameter List from MS4 General Permit - Appendix B - Section 5(c)
(2) Threshold Indicators of a potential sanitary discharge to stormwater (Ref.: MS4 General Permit - Appendix B - Section 7(d))
If ammonia ≥ 0.5 mg/L, surfactants ≥ 0.25 mg/L, and E. Coli > 410 MPN/100mls
If all three conditions are exceeded, the catchment area would be considered a 'High-priority catchment", with further investigation required.
(3) Parameter measures taken, but not required by MS4 General Permit
(4) Detectable levels of chlorine
(5) From MS4 General Permit - Appendix D - table of 'Water Quality Targets for Waters for Which Bacteria is a Storm water Pollutant of Concern
(6) Where quality of evidence measured parameter or field indicators (visual or olfactory) results indicate a potential pollutant source impairing waters of the State
(7) Samples of Concern rated as 'high' level exceeded thresholds for ammonia, surfactants and e-coli; as 'mid' level with multiple parameters above thresholds; as 'low' level with high total coliforms; and otherwise 'Negligable'.

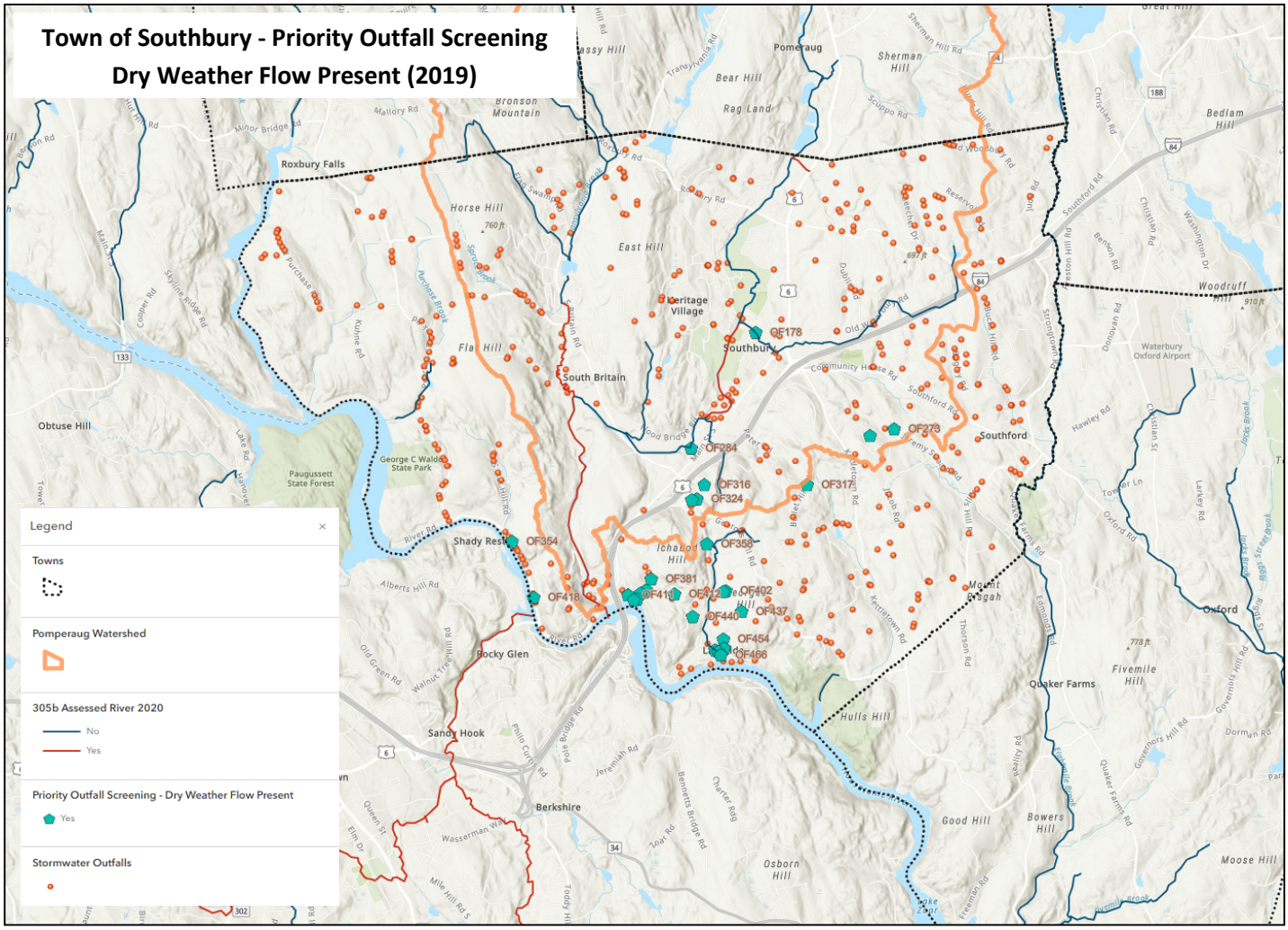

Figure 2-19. Town of Southbury Priority Outfall Screening. Outfalls with flow present in dry weather. Priority outfalls associated with impairments of the Pomperaug River are as follows: OF178, OF284, OF273, OF278, OF316, OF324, OF326, OF178. All other outfalls with dry weather flow are in watershed areas that flow directly to Lake Zoar / Housatonic River.

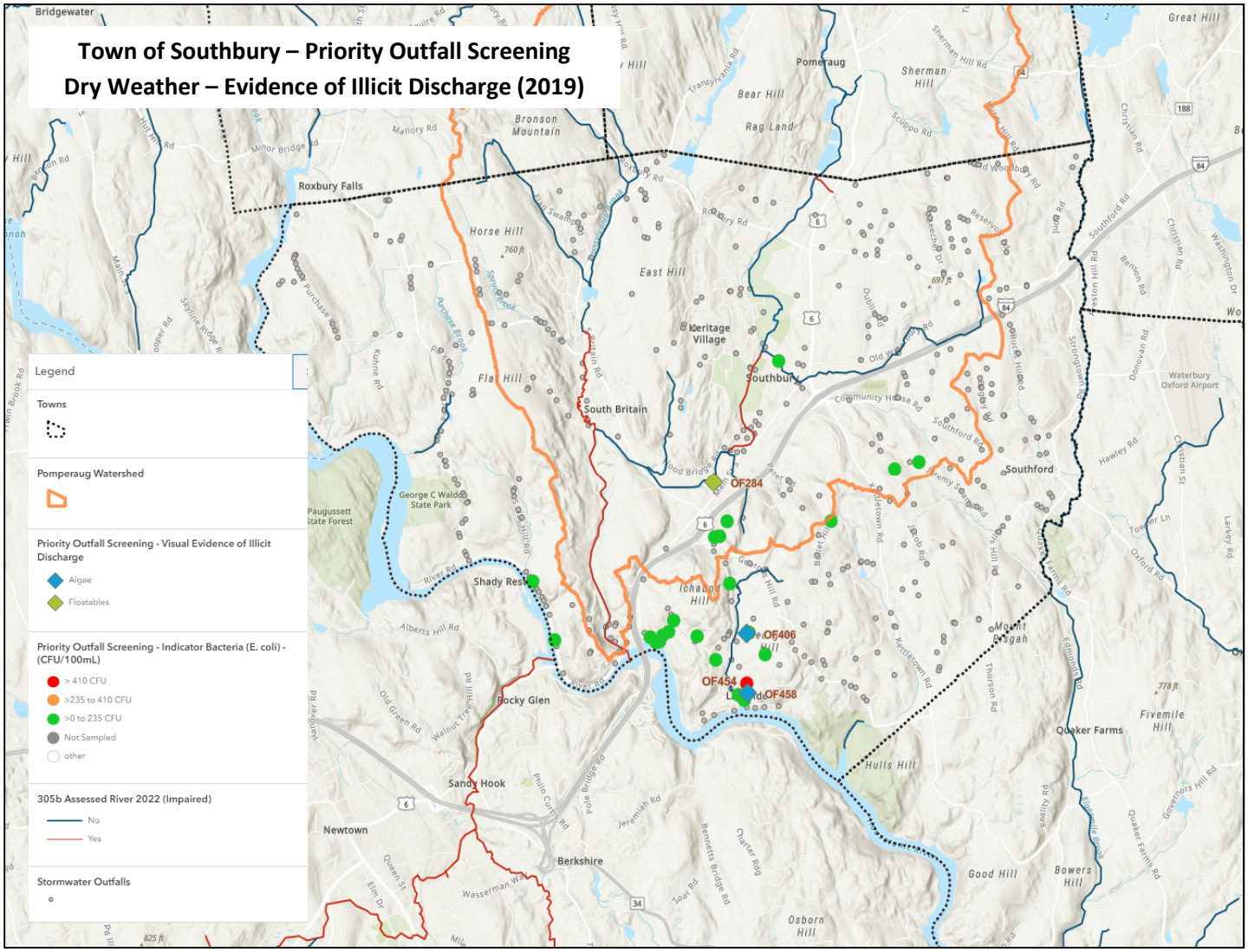

Figure 2-20. Priority Outfall Screening, Dry Weather, Town of Southbury. Outfalls with flow present in dry weather and additional visual evidence of an illicit discharge or dry weather sampling data with elevated indicator bacteria counts. None of the outfalls screened in dry weather presented olfactory evidence of an illicit discharge. Four outfalls were of concern – OF284, OF406, OF458, and OF454 – based on this screening detail. Only one of these - OF284 - falls within the Pomperaug Watershed. The others are associated with Lee Brook which is a direct tributary to Lake Zoar.

Table 2-6. Priority Outfall Screening, Wet Weather, Town of Southbury. Wet weather screening results for stormwater outfall samples collected in priority areas of Southbury in 2019.

				Meadowbrook Rd - Transylvania Bk	East Flat Hill Rd - Transylvania Bk	Meadowbrook Rd - Transylvania Bk	Manor Rd - Pomperaug River	Berkshire Rd - Pomperaug River	Poverty Road - Pomperaug River	Poverty Road - Pomperaug River
Outfall Name				**OF194**	**OF240**	**OF179**	**OF392**	**OF433**	**OF185**	**OF186**
Sample Number				MM191003-194	MM191003-240	01493130420-25	01493130420-11	01493130420-09	01493130420-26	MM191003-186
Parameter (1)	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**							
Total Nitrogen			mg/L	NS	NS	NS	NS	NS	NS	NS
Nitrate			mg/L	NS	NS	NS	NS	NS	NS	NS
Nitrite			mg/L	NS	NS	NS	NS	NS	NS	NS
E-Coli	>410 [4]	10	col/100ml	**10500**	**24200**	**457**	63	272	**3080**	**960**
Total Coliform	>500 [4]	10	col/100ml	**24200**	**24200**	**24200**	**17300**	**24200**	**24200**	**24200**
Total Phosphorous			mg/L	NS	NS	NS	NS	NS	NS	NS
TKN			mg/L	NS	NS	NS	NS	NS	NS	NS
Field Screening										
Temp C			°C	13.8	14.4	11.2	13.5	13.2	12.8	17.7
pH [3]			SU	7.22	6.97	6.41	6.59	6.68	6.92	7.29
Spec Conductivity			uS/cm	49.5	108.8	70.4	24.9	48.9	79.1	570
Other IDDE Indicators										
Visual Evidence of Illicit Discharge [2]				None	None	None	None	None	None	None
Olfactory Evidence of Illicit Dischage [2]				None	None	None	None	None	None	None

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Table 2-6 (continued). Priority Outfall Screening, Wet Weather, Town of Southbury. Wet weather screening results for stormwater outfall samples collected in priority areas of Southbury in 2019.

				Poverty Road - Pomperaug River	River Trail - Pompearug River	Flood Bridge Rd - Pomperaug River	Purchase Brook Rd - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar
Outfall Name				**OF187**	**OF245**	**OF261**	**OF336**	**OF444**	**OF450**	**OF428**
Sample Number				MM191003-187	MM191003-245	MM191003-261	MM191003-336	01493130420-10	01493130420-12	01493130420-13
Parameter (1)	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**							
Total Nitrogen			mg/L	NS	NS	NS	0.78	0.96	6.8	0.36
Nitrate			mg/L	NS	NS	NS	0.14	BDL	0.05	0.04
Nitrite			mg/L	NS	NS	NS	BDL	BDL	0.05	0.04
E-Coli	>410 [4]	10	col/100ml	BDL	359	**2480**	**683**	NS	NS	NS
Total Coliform	>500 [4]	10	col/100ml	BDL	**24200**	**24200**	**24200**	NS	NS	NS
Total Phosphorous			mg/L	NS	NS	NS	0.18	0.173	1.78	0.048
TKN			mg/L	NS	NS	NS	0.64	0.96	6.75	0.32
Field Screening										
Temp C			°C	15.8	15.6	15.5	14.8	14.1	13.5	11.7
pH [3]			SU	7.06	6.72	7.54	7.32	6.74	6.27	6.58
Spec Conductivity			uS/cm	440.1	91.4	148.8	25.6	19.3	51.5	54.4
Other IDDE Indicators										
Visual Evidence of Illicit Discharge [2]				None	None	None	None	None	None	None
Olfactory Evidence of Illicit Dischage [2]				None	None	None	None	None	None	None

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Table 2-6 (continued). Priority Outfall Screening, Wet Weather, Town of Southbury. Wet weather screening results for stormwater outfall samples collected in priority areas of Southbury in 2019.

				River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar
Outfall Name				**OF426**	**OF418**	**OF413**	**OF410**	**OF374**	**OF371**	**OF367**
Sample Number				01493130420-14	01493130420-15	01493130420-16	01493130420-17	01493130420-18	01493130420-19	01493130420-20
Parameter (1)	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**							
Total Nitrogen			mg/L	0.43	0.64	0.76	0.91	1.16	0.57	0.6
Nitrate			mg/L	BDL	BDL	BDL	0.03	0.82	0.12	0.09
Nitrite			mg/L	BDL	BDL	BDL	0.03	0.82	0.12	0.09
E-Coli	>410 [4]	10	col/100ml	NS	NS	NS	NS	NS	NS	NS
Total Coliform	>500 [4]	10	col/100ml	NS	NS	NS	NS	NS	NS	NS
Total Phosphorous			mg/L	0.04	0.06	0.13	0.085	0.039	0.088	0.142
TKN			mg/L	0.43	0.64	0.76	0.88	0.34	0.45	0.51
Field Screening										
Temp C			°C	9.4	9.6	9.8	10.2	8.3	11.9	12.6
pH [3]			SU	6.1	6.09	6.47	6.44	6.29	6.39	6.78
Spec Conductivity			uS/cm	65.4	55.8	60.9	59.3	118.5	70.8	56.3
Other IDDE Indicators										
Visual Evidence of Illicit Discharge [2]				None	None	None	None	None	None	None
Olfactory Evidence of Illicit Dischage [2]				None	None	None	None	None	None	None

Continued next page (footnotes follow)

Table 2-6 (continued). Priority Outfall Screening, Wet Weather, Town of Southbury. Wet weather screening results for stormwater outfall samples collected in priority areas of Southbury in 2019.

				River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	River Road - Lake Zoar	Pine Rock Rd - Lake Zoar
Outfall Name				**OF366**	**OF364**	**OF360**	**OF348**	**OF351**	**OF353**	**OF354**	**OF471**
Sample Number				01493130420-21	01493130420-22	01493130420-23	01493130420-24	MM191003-351	MM191003-353	MM191003-254	01493130420-01
Parameter (1)	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**								
Total Nitrogen			mg/L	0.37	0.55	1.19	0.68	0.71	2.41	1.71	0.88
Nitrate			mg/L	0.04	0.07	0.63	0.16	0.21	1.88	0.15	0.09
Nitrite			mg/L	0.04	0.07	0.63	0.16	BDL	BDL	0.019	0.09
E-Coli	> 410 [4]	10	col/100ml	NS	NS	NS	NS	292	**910**	**1660**	10
Total Coliform	> 500 [4]	10	col/100ml	NS	NS	NS	NS	**24200**	**24200**	**24200**	**14100**
Total Phosphorous			mg/L	0.063	0.097	0.068	0.073	0.105	0.052	0.528	0.153
TKN			mg/L	0.33	0.48	0.56	0.52	0.5	0.55	1.54	0.79
Field Screening											
Temp C			°C	10.2	12.2	10.9	10.1	13.7	14.4	14.4	12.2
pH [3]			SU	6.38	6.27	6.26	6.2	7.35	7.4	7.5	7.69
Spec Conductivity			uS/cm	61.2	46.9	56.1	53.4	96.5	92.6	106.6	88.7
Other IDDE Indicators											
Visual Evidence of Illicit Discharge [2]				None	None	None	None	None	None	None	None
Olfactory Evidence of Illicit Dischage [2]				None	None	None	None	None	None	None	None

Continued next page (footnotes follow)

Table 2-6 (continued). Priority Outfall Screening, Wet Weather, Town of Southbury. Wet weather screening results for stormwater outfall samples collected in priority areas of Southbury in 2019.

				Pine Rock Rd - Lake Zoar	Lee Farm Rd - Lake Zoar	Lee Farm Rd - Lake Zoar	Lee Farm Rd - Lake Zoar	Pine Rock Rd - Lake Zoar	Lakemere Dr - Lake Zoar	Lower Fish Rock Rd - Lake Zoar
Outfall Name				**OF469**	**OF466**	**OF465**	**OF462**	**OF464**	**OF472**	**OF423**
Sample Number				01493130420-02	01493130420-03	01493130420-04	01493130420-05	01493130420-06	01493130420-07	01493130420-08
Parameter (1)	**Threshold Indicators**	**Reporting Level (BDL - Below Detection Limit indicated)**	**Units**							
Total Nitrogen			mg/L	1.04	1.17	1.47	1.81	0.56	0.93	2.61
Nitrate			mg/L	0.05	0.19	0.22	0.04	0.04	0.06	0.69
Nitrite			mg/L	0.05	0.19	0.22	0.04	0.04	0.06	0.69
E-Coli	>410 [4]	10	col/100ml	148	**1610**	31	10	120	155	NS
Total Coliform	>500 [4]	10	col/100ml	**24200**	**24200**	**24200**	**24200**	**4880**	**17300**	NS
Total Phosphorous			mg/L	0.239	0.227	0.267	0.316	0.054	0.16	0.438
TKN			mg/L	0.99	0.98	1.25	1.77	0.52	0.87	1.92
Field Screening										
Temp C			°C	12.7	10.6	12	12.8	12.8	12.7	13.1
pH [3]			SU	6.99	6.18	6.44	6.92	6.63	6.56	6.33
Spec Conductivity			uS/cm	25.4	102.1	37.6	27.9	24.2	26.7	61.5
Other IDDE Indicators										
Visual Evidence of Illicit Discharge [2]				None	None	None	None	None	None	None
Olfactory Evidence of Illicit Dischage [2]				None	None	None	None	None	None	None

Bold result indicates finding above potential sewage input indicator level
BDL indicates value not detected above laboratory/equipment reporting limit
NS indicates analyte not sampled/not an impairment constitunet

Footnotes:
(1) Parameter List from MS4 General Permit - Appendix B - Section 5(c)
(2) Where quality of evidence measured parameter or field indicators (visual or olfactory) results indicate a potential pollutant source impairing waters of the State
(3) Parameter measures taken, but not required by MS4 General Permit
(4) From MS4 General Permit - Appendix D - table of 'Water Quality Targets for Waters for Which Bacteria is a Storm water Pollutant of Concern

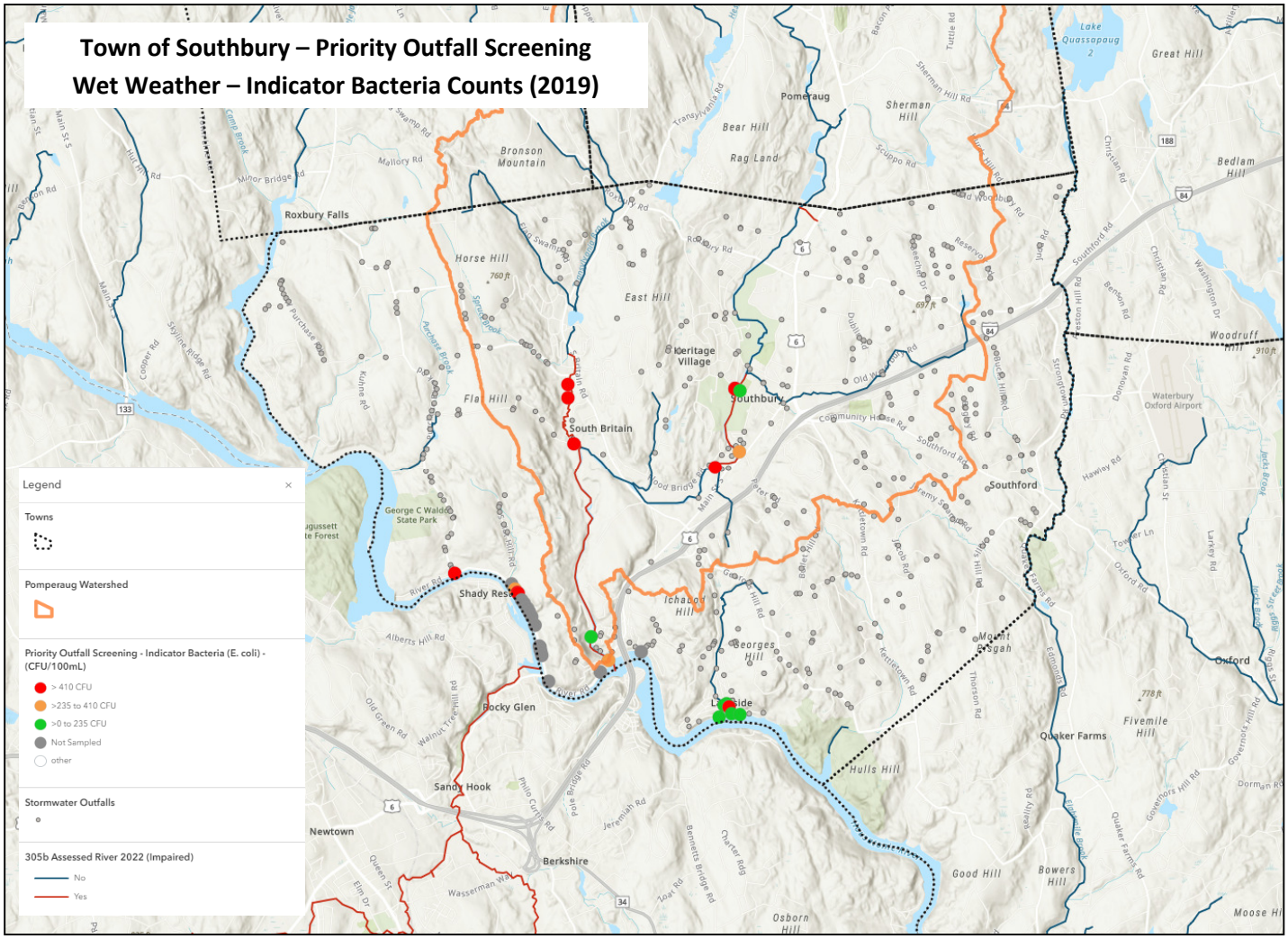


Figure 2-21. Priority Outfall Screening, Wet Weather, Town of Southbury. Indicator bacteria (*E. coli*) counts from priority outfalls screened during wet weather. Outfalls with *E. coli* counts greater than 410 CFU/100mL are displayed in **red** which exceeds the water quality threshold for safe recreation. If not already associated with a possible illicit discharge, high bacteria counts from these outfalls during wet weather suggest that bacteria originate from non-point sources of pollution. This further suggests that best management practices to mitigate sources of bacteria pollution may be higher priority in the watershed areas that drain to three specific outfalls that discharge to Transylvania Brook (OF 179, OF194 and OF240) and three that discharge to Pomperaug River (OF 185, 186, and OF261). Note there are two additional outfalls in close proximity that were screen and showed bacteria counts greater than 235 CFU/100mL (displayed in **orange)**, which is the threshold for safe recreation at public swimming areas.

POLLUTANT LOAD ESTIMATES (2018)

The Pomperaug Watershed Based Plan included pollutant load estimates that are delivered from the upland landscape to rivers and streams in each of the subregional basin of the Pomperaug Watershed. To get these estimates, the Watershed Treatment Model – a pollutant load model created by the Center for Watershed Protection (CWP) – was applied to the each of the subregional watersheds (**Figure 1-1**). Potential sources of bacteria in the watershed include "non-point sources" such as diffuse stormwater runoff, failing or malfunctioning septic systems, agricultural activities including but not limited to numerous farms in the northern part of the watershed, and waste from wildlife and pets. "Point sources" of bacteria include discharges from Municipal Separate Storm Sewer Systems (MS4s), potential illicit discharges, and runoff from industrial and commercial facilities may also be contributing factors. Bacteria load estimates from these respective sources are based on the physical characteristics of the watershed including land use, land cover, impervious cover, open space, geology and soils, and hydrologic features as well as certain assumptions that were detailed in the Pomperaug Watershed Based Plan (Mas, *et al*, 2018). As these characteristics and attributes have not changed significantly since the pollutant load modeling was last applied (i.e. no new datasets are available), the estimates included in the WBP are still current and relevant.

The major anthropogenic sources of fecal indicator bacteria in the Pomperaug River watershed are summarized below.

- **Agricultural Practices.** Hobby farms, equestrian facilities, and livestock farming practices are common throughout the watershed, with the greatest concentration of farms and agricultural uses in the central and northern portions of the watershed. While some farms maintain animal exclusion fencing to separate livestock from streams, other farms have livestock grazing or feeding areas that allow direct access to streams. Many sites have little or no vegetated buffers, and manure storage locations are sometimes located in close proximity to waterbodies.
- **Developed Land Use.** Residential, commercial, industrial and other developed land uses in the watershed generate stormwater runoff containing fecal indicator bacteria. Common sources of fecal indicator bacteria in these developed areas include pet waste, waterfowl (such as Canada geese), potential illicit discharges to the storm drainage systems, failing or malfunctioning septic systems, and bacteria growing in sediments and organic materials that collect in the storm drainage system. Stormwater from developed areas includes both point discharges from municipal or privately-owned stormwater outfalls and diffuse nonpoint source runoff from lawns, roofs, driveways, and parking lots.
- **Wastewater Effluent.** Surface wastewater treatment facilities in the watershed discharge treated effluent to the Pomperaug River and its tributaries, including Heritage Village, IBM, and Woodlake Condominiums. Under normal operating conditions, these sources contribute relatively small amounts of fecal indicator bacteria to the receiving waterbodies.

The relative contribution of bacteria from different land uses and activities is well illustrated by a comparison of the modeled loads in the various subregional basins (Figure 2-19). In the more-developed Pomperaug River subregional basin, modeled bacteria loads are dominated by stormwater runoff from urban land use (43%) and potential illicit connections associated with residential and commercial land use (31%), with agricultural sources estimated to contribute approximately 10% of the estimated annual load. By contrast, in the more rural Weekeepeemee River subregional basin, agricultural land uses (rural land and livestock) contribute an estimated 45% of the annual bacteria load, with stormwater runoff contributing approximately 25% of the annual load.

This comparison highlights some of the opportunities and challenges in watersheds with mixed land use. The modeled bacteria loads in the Pomperaug River subregional basin illustrate the benefits of management measures that focus on

sources of fecal indicator bacteria associated with urban stormwater runoff, including source controls, structural stormwater BMPs, education and outreach, and illicit discharge detection and elimination (IDDE). Even though the estimates of illicit connections are modest (0.1% of the population and 5% of the businesses served by sewer), the elimination of these discrete sources of bacteria could substantially reduce bacteria loadings where sanitary-related illicit connections are present (i.e., in area served by sanitary sewers). Consequently, implementing an IDDE program in the more developed and/or sewered areas of the watershed can be effective at reducing bacteria loads.

In contrast, in the more rural subregional basins such as Weekeepeemee, livestock and agricultural practices were shown to be key drivers of bacteria loads, though pockets of residential and commercial development in these areas also contribute bacteria loads from urban runoff. Livestock in particular represent a considerable bacteria source in the Weekeepeemee River, Nonnewaug River, and Hesseky Brook subregional basins. Where practicable, load reduction in these basins should focus on agricultural BMPs such as exclusion fencing, vegetated buffers, alternative approaches to manure management, such as moving manure piles further away from streams, and other agricultural BMPs. Agricultural sources of bacteria typically require a combination of structural and non-structural best management practices (BMPs) to reduce loadings. Site specific management strategies should consider agricultural production and operational goals, physical constraints of the parcel(s), pollutant load reduction objectives, and financial requirements in the near and long-term. Ideally agricultural operations should develop a Comprehensive Nutrient Management Plan (CNMP), which factors in things like crop selection, soil types, the type and number of livestock present, and impervious cover and identifies strategies like how to reduce stormwater runoff, protect sensitive habitats (wetlands and water courses), prevent soil erosion (loss), minimize fertilizer applications, manage manure, and bolster climate resiliency. Soil scientists and conservation specialists from the USDA Natural Resource Conservation Service (NRCS) are available to help farms develop these comprehensive plans. NRCS offers several free and cost-shared technical services as well as grant, loan and cost share programs to support the implementation of best management practices identified in CNMPs.

Figure 2-22. Estimated annual pollutant load and relative pollutant load estimates by subregional watershed (*Mas et al*, 2018).

SUMMARY OF FINDINGS

Upon review and consideration for the data sets above – Streamwalk Survey of the Weekeepeemee; Ambient Water Quality Monitoring; Stormwater Outfall Monitoring; and Pollutant Load Estimates – the more targeted geographies, land use practices, and/or categories of BMPs emerged as high priority for the implementation of bacteria mitigation actions (**Table 2-7**).

Table 2-7. Sites and land use activities of high priority for implementation of bacteria mitigation actions by subregional watershed based on updated existing conditions.

Subregional Watershed	General Location and/or BMP Category	Basis for Prioritization				
		AWQM	Visual Assessment Survey	MS4 Data	Pollutant Load Model	303b Listed Impairment
Nonnewaug River	Agricultural Operations (Woodbury & Bethlehem)	X			X	
Weekeepeemee River Watershed	Agricultural Operations (Woodbury & Bethlehem)	X	X		X	X
	Hotchkissville Neighborhood	X		X	X	X
	Riparian Buffer installation and Maintenance	X	X		X	X
Transylvania Brook Watershed	Meadowbrook Road neighborhood runoff with consideration for land uses further uphill (agriculture)	X		X	X	X
	East Flat Hill neighborhood runoff (includes agricultural operations)	X	X	X	X	X
Pomperaug River Watershed	Heritage Village at Poverty Road neighborhood Runoff	X	X	X	X	X
	Cedarland and Flood Bridge Road neighborhood runoff	X	X	X	X	X
	Illicit discharge detection and elimination at Flood Bridge Road neighborhood		X	X	X	X
	Illicit discharge detection and elimination at Eagle View neighborhood			X	X	X
	Old Field Road at Heritage Road neighborhood runoff (Bullet Hill Brook)	X	X	X	X	X
	Old Hill Road and Jeremy Swamp Road neighborhood (Bullet Hill Brook)			X	X	X
Hessky Brook Watershed	Illicit discharge detection and elimination at Wood Lake neighborhood			X	X	
	Wood Lake neighborhood runoff			X	X	
	Agricultural Operations				X	

SECTION 3. Action Steps for Yielding Water Quality Improvements

Based on the response to focused agricultural outreach component of the Watershed Based Plan (WBP) Implementation Groundwork Project, agricultural operators within the Pomperaug Watershed community demonstrated that engagement with the Pomperaug River Watershed Coalition (PRWC) is not a priority at this time. That does not mean that agricultural operators are uninterested in learning more about the water resources vital to their production or that they are unwilling to implement actions that could further protect and improve water quality. It simply suggests that this hard-working cohort of stakeholders are juggling a variety of competing priorities and, just like everyone else, are doing the best they can with the resources they have available (time, energy, finances, land area, etc.).

As part of the WBP Groundwork Implementation Project, PRWC planned to conduct site visits with farmers to explore opportunities to implement agricultural best management practices (BMPs) suitable to their specific operations. With low participation in the outreach programs and a lack of response to such offerings, PRWC did not conduct any site visits with agricultural operators within the watershed. Therefore, PRWC has not prepared more detailed site-specific plans for local farm operations, refined the cost estimates for implementation of suitable best practices, calculated pollutant load reduction estimates for refined BMP plans, or developed partnership agreements and sought funding to move forward with implementation projects. Instead, this implementation strategy presents a refined set of non-structural and structural BMP recommendations based on observations made during the Streamwalk Assessment Survey and Ambient Water Quality Monitoring efforts. From this list of structural BMP opportunities, PRWC selected three high priority sites for implementation and assembled conceptual plans for them.

NON-STRUCTURAL BMP RECOMMENDATIONS

As landowner engagement is necessary to the implementation of the structural BMPs recommended, continued community education and outreach is the most critical element of non-structural action steps to further mitigate sources of pollution throughout the Pomperaug Watershed.

Based on the summary of finding, outreach and education efforts should focus on the topics of riparian buffers, septic system maintenance, disposal of animal waste, and practices help infiltrate of stormwater runoff. Outreach and education messages will need to be tailored to targeted groups of landowners – residential, commercial, municipal, and agricultural – as their infrastructure, land use practices, property sizes, and property management goals/needs vary. Overall, the education and outreach strategies detailed in the Watershed Based Plan are still relevant and should continue to be implemented.

The summary of findings presented in Section 2 reiterated that implementation of the following actions detailed in the Watershed Based Plan exhibit the greatest potential for reducing bacteria loads within the Pomperaug Watershed:

- Restoration and enhancement of riparian buffers across agricultural, municipal, commercial, and residential properties;
- Continued implementation of illicit discharge detection and elimination programs by municipalities;
- Regular inspection and pump-outs of residential, commercial, and community septic systems;
- Implementation of agricultural best management practices including riparian buffers, livestock fencing, rotational grazing, filter berms, sacrifice areas, manure storage, and biorentention / infiltration (**Figure X-X**).

Outreach and education messages will need to be tailored to targeted groups of landowners – residential, commercial, municipal, and agricultural – as their infrastructure, land use practices, property sizes, and property management goals/needs vary. Overall, the education and outreach strategies detailed in the Watershed Based Plan are still relevant and should continue to be implemented.

REPRIORITIZED STRUCTURAL BMP RECOMMENDATIONS

In the Summary of Findings (**Section 2**), PRWC presented a general list of sites and land use activities it identified as high priority for implementation of bacteria mitigation actions based on the updated existing conditions data. Using that list as a reference, the Structural BMP Prioritization Matrix included in the Pomperaug Watershed Based Plan was revisited and the BMP recommendations were adjusted up and down in their priority ranking. To this Revised Matrix (**Table 3-2**), PRWC added mid and high priority BMP opportunities identified in the Weekeepeemee River Streamwalk Survey as well as sites included in the Town of Woodbury Directly Connected Impervious Cover Reduction Plans as they offer the best return on investment for mitigating bacteria loads. The Revised Matrix also includes notes pertaining to the implementation of BMPs that were recommended in the WBP; some of the recommended BMPs have been implemented or partially implemented since the Plan was finalized in 2018.

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

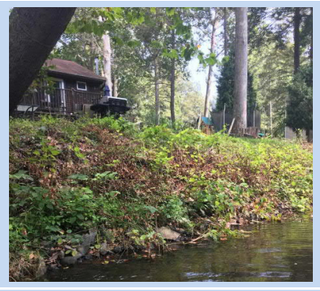
Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
POMPERAUG RIVER SUBWATERSHED										
Equestrian 1 *Mountain Valley Equestrian Center* (Pomperaug-01 and Transylvania Brook-01)	East Flat Hill Road, Southbury	Horse manure in paddocks Two drainage paths - one flows through Audubon old pasture, excellent buffer; another flows out drainage ditch to Transylvania Brook.	• Bioretention in drainage ditch adjacent to Audubon Property • Filter berm at bottom of paddock • Improved buffer around intermittent streams on equestrian property or reconfigured paddocks/runs/training areas • Move drainage away from the center of paddocks/pasture	• Outreach for manure management best practices • Connecticut Horse Environmental Awareness Program (HEAP) and Connecticut Horse Farm of Environmental Distinction Program	Medium (bioretention) High (filter berm/buffer)	Medium Medium	Medium Low	Yes (WBP)	**HIGH PRIORITY *based on MS4 data*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Page 125 Pomperaug Watershed Based Plan
Public School 1, Golf 1, Golf 2, Golf 3 (Pomperaug-03)	Old Field Road & Poverty Road, Southbury	Geese observed at both golf courses and in field adjacent to river at elementary school.	• Increase vegetated buffer around water hazards and adjacent to streams/river • Implement other waterfowl deterrent strategies		Medium (buffer) Low (other deterrent strategies)	Low Medium	Low High	Yes (WBP)	**HIGH PRIORITY *based on MS4 data*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Page 107 Pomperaug Watershed Based Plan
Residential Neighborhood 3 (Pomperaug-03)	Flood Bridge / River Hill neighborhood, Southbury	Failing or malfunctioning septic systems. Stormwater runoff.	• Sanitary/septic survey of Branch Road/Riverhill Road neighborhood • Infiltration in ROW or underground • Inspect Flood Bridge Road houses along riverbank for proper septic system sizing and function		Medium (IDDE/Septic investigation) High (infiltration BMP)	Medium High	N/A High	Yes (WBP)	**HIGH PRIORITY *based on MS4 data*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Page 105 Pomperaug Watershed Based Plan
Residential Neighborhood 4 (Pomperaug-03)	River Trail, Spring Road, Middle Road ("Cedarlands"), Southbury	Failing or malfunctioning septic systems. Raw sewage odor noted during stream walk near River Trail.	• Investigate septic odor • Encourage septic system inspections • Educate homeowners and homebuyers about proper use and maintenance of septic systems • IDDE investigation of drainage discharging at Cedarland Park		High	Low	Low	Yes (WBP)	**MED PRIORITY** One of many sites that underscores need for focused education and outreach to residential landowners on topics of septic care and riparian buffers	
Residential Neighborhood 1 *Berkshire Estates* (Pomperaug-01)	Western side of Pomperaug River outlet to the Housatonic, North of River Road	Stormwater runoff	• Infiltration below roadway, especially cul-de-sac at Pascoe Drive and Pomperaug Trail and at Pascoe Drive and Berkshire Road intersection • Increase buffer along river • More frequent catch basin cleaning		High	High	High	Yes (WBP)	**LOW PRIORITY** Great site to achieve DCIA goals in Southbury	See Page 98 Pomperaug Watershed Based Plan

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

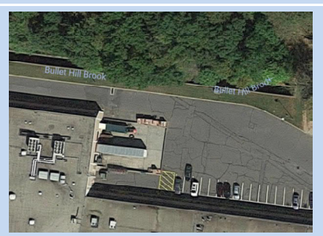
Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Residential Neighborhood 1 *Berkshire Estates* (Pomperaug-01)	Western side of Pomperaug River outlet to the Housatonic, North of River Road	Failing or malfunctioning septic systems	• Advanced subsurface sewage disposal systems (sand filter or similar) in riverside lots • Inspect septic systems for failure • Ledge/bedrock could be a constraint • Educate homeowners and homebuyers about proper use and maintenance of septic systems		High	High	High	Yes (WPB)	**MED PRIORITY**	
Residential Neighborhood 2 *Oakdale Manor* (Pomperaug-01)	Eastern side of Pomperaug River outlet to the Housatonic, North of River Road	Stormwater runoff	• Underground infiltration (limited space in ROW)	• Septic system inspection and outreach • Turf management • Grass clippings – outreach or establish collection for disposal	High	High	High	Yes (WBP)	**LOW PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Page 102 Pomperaug Watershed Based Plan
Mixed Residential / Commercial Complex 1 (Pomperaug-03)	Center of Heritage Village, Heritage Road, Southbury	Stormwater runoff	• Underground infiltration in ROW • Bioretention cells where feasible • Pervious pavement at older parking lots (e.g. Meeting House) needing maintenance	• Heritage Village should be included as a priority area in the Town of Southbury's MS4 Stormwater Management Program, including IDDE program implementation • Conduct a stormwater BMP retrofit inventory/feasibility study for Heritage Village, which would support Southbury's efforts to reduce and disconnect DCIA as required by the MS4 Permit	High	High	High	Yes (WBP)	**LOW TO MID PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan Great site to achieve DCIA goals in Southbury	See Page 112 & 113 Pomperaug Watershed Based Plan
Heritage Village Wastewater Treatment Facility (Pomperaug-03)	Heritage Road, Southbury	Wastewater treatment plant	• Conduct additional ambient water quality monitoring at new sampling locations to determine extent of impairment and possible source(s) of bacteria		N/A	Low	N/A	Yes (WBP)	**LOW PRIORITY**	
Commercial Complex 1 *Southbury Plaza* (tributary to Pomperaug-03)	East side of intersection of Route 6 and Main Street South, Southbury (South of Bullet Hill Brook)	Stormwater runoff, waste management, past septic issues	• Incorporate LID retrofits into site redevelopment • Underground infiltration, permeable pavement • Inspect septic systems for failure (due to size this falls under DPH or DEEP jurisdiction)	• Cover dumpsters with roof • Review stormwater control plan, if exists • Heavily channelized stream • Conduct survey for potential illicit discharges from businesses in plaza	High	High	High	Yes (WBP)	**LOW TO MID PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan Great site to achieve DCIA goals in Southbury	

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

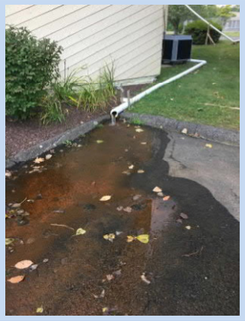
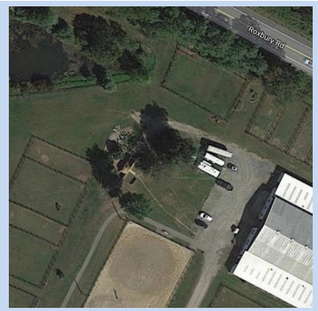
Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Business District 1 (Pomperaug-03)	Main Street South Corridor, Southbury (particularly concentrated at Municipal Complex west of the intersection with Peter Road	Stormwater runoff	• Develop and implement GI/LID "master plan" for Main Street South corridor • LID retrofits of municipal and commercial properties and within the municipal ROW between Route 6/Southbury Plaza and South Britain Road (Route 172) • Potential municipal sites include: ○ Southbury Police, Fire, and DPW ○ Southbury Town Hall ○ Southbury Park and Recreation ○ Rochambeau Middle School ○ Pomperaug Elementary School ○ Southbury Library ○ Municipal ROW • Numerous commercial redevelopment sites along the corridor		High	High	High	Yes (WBP)	**LOW TO MID PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan Great site to achieve DCIA goals in Southbury	
Health Care 2 (tributary to Pomperaug-03)	Intersection of Main Street South and Garage Road	Dry weather discharge (pavement stained)	• Follow up sampling of dry weather discharge and removal of any illicit connections found		Medium	Low	Low	Yes (WBP)	**LOW PRIORITY** Not a big concern based on MS4 data for outfalls in proximity to this site.	

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Equestrian 2 *Stonecrest Farm*	Pomperaug River Crossing on Route 172, South Britain	Equestrian facility, manure piles, paddock	• Move manure piles to alternative site with filter berms or drainage away from Pomperaug • Filter berms or increased buffer to pond • Bank stabilization and buffer improvement along river edge • Evaluate need for farm pond • Move and regrade paddock/training areas to improve buffer	• Manure management in place • Most paddocks drain away from Pomperaug and toward a pond with algal mats that drains to Pomperaug • Farm to the north allows cows/cattle access to tributary. Add buffer and fencing around stream. • Outreach for manure management best practices • Connecticut Horse Environmental Awareness Program (HEAP) and Connecticut Horse Farm of Environmental Distinction Program	High	Medium	Low	Yes (WBP)	**MID PRIORITY – PARTIALLY COMPLETED** Manure piles moved away from river in 2018. Remainder of BMPs included in conceptual design included in Watershed Based Plan continue to be recommended as mid priority for implementation.	See Page 127 Pomperaug Watershed Based Plan
Equestrian 4 *Red Barn Stables*	Intersection of Route 67 and Crook Horn Drive	Manure in open dumpsters	• Cover dumpsters or ensure drainage away from river	• Outreach for manure management best practices	High	Low	Low	Yes (WBP)	**MID PRIORITY** Spoke with operator at local farmers market in 2021 and learned manure dumpsters are emptied weekly. Other BMPs strategies may be suitable to mitigate NPS pollutants. Draft site specific BMP conceptual plan.	
State Facility 1 *CT DOT Garage*	Garage Road, Southbury	Stormwater runoff, potential illicit discharges (buried stream)	• Good housekeeping/pollution prevention • Infiltration where possible					No	**LOW PRIORITY** Addressed through good-housekeeping and other requirements included CT DOT's Stormwater Discharge Permit administered by CT DEEP.	

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Town Park 2 *Three Rivers Park* Pompearug River, Nonnewaug River, Weekeepeemee River	Judson Avenue / Jack's Bridge Road, Woodbury	Pet and wildlife waste Manure Spreading on Ag Fields	• Pet waste management • Increase buffer width • Manure spreading best practices related to time of year and forecasted precipitation	• See Details for Same Park under Weekeepeemee Watershed / Nonnewaug Watershed • Significant stream channelization, bank erosion, channel incision and berm that has disconnected the river from its flood plain, flow constriction at bridges impacting downstream erosion • Review farm lease agreements – consider including minimum buffer width requirements and timing / application rates for manure spreading / maintaining winter cover crops				No	**MID TO HIGH PRIORITY** A complex matrix of best practices are recommended for this site including those illustrated in Conceptual Site Design included in Watershed Based Plan. Build upon existing site concept plan and develop comprehensive plan to address buffer, sedimentation, channelization and migration, erosion, and in-stream habitat from Three Rivers Park to Hollow Park, Woodbury	See Page 120 Pomperaug Watershed Based Plan
Dog Park 1 & Town Park *Southbury Dog Park & Bennett Park*	Route 67 along the north bank of the Pomperaug River, Southbury	Pet waste, bank erosion, wildlife	• Increase buffer width, bank stabilization projects already being discussed conceptually and no mow zones being established in near-term while long-term stabilization measures and habitat enhancements are explored.	• Pet waste management measures well established at Dog Park. • Bank stabilization projects in discussion; no mow zones being established in near-term while long-term stabilization measures and habitat enhancements are explored. • Continue to pursue funding opportunities to support buffer restoration and streambank stabilization and designated river access points.	Mid	Mid	Mid	Yes (WBP)	**MID PRIORITY** Conceptual site designs drafted and included in Pomperaug Watershed Based Plan for the dog park. Build upon existing site concept plan and develop comprehensive plan to address buffer, sedimentation, channelization and migration, streambank erosion, and in-stream habitat between Mansion House Road neighborhood to Route 67 including Bennett Park.	See Page 118 Pomperaug Watershed Based Plan

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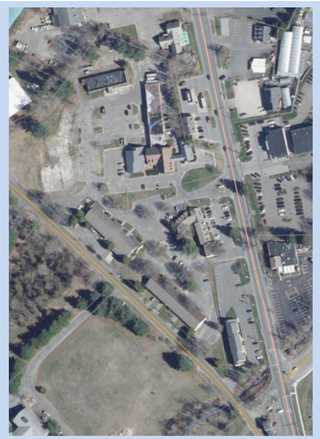
Equestrian 3 *Sabill's Stables*	Route 67 along South Branch of Bullet Hill Brook	Stream running through paddock	• Encourage sufficient buffer • Animal exclusion fencing	* Located in area near stormwater outfalls with elevated indicator bacteria * Encourage development of Comprehensive Nutrient Management Plan if one does not already exist				No	**MID PRIORITY** Need to conduct windshield survey and consider if ranking should shift and whether conceptual site designs should be drafted. Stormwater outfall screening data does not flag concerns in this area; continue to review new data as it becomes available.	 (2016 aerial)
Residential Complex 3 *Spruce Bank*	Route 6 across intersection from South Pomperaug Avenue, Middle Quarter, Woodbury	Past septic issues	• Inspect septic system for proper function					No	**LOW PRIORITY *in terms of Nonpoint Source Pollution*** Review documentation submitted to State and Local Health Department and/or Water Pollution Control Authority as part of their Permitted Wastewater Discharge requirements	N/A
Commercial Complex 2 *Middle Quarter Mall*	West side of Route 6; south of intersection with Route 64, Middle Quarter Woodbury	Historical groundwater contamination Septic failure issues	• Inspect septic system for proper function • Retrofit impervious cover to reduce DCIA; onsite stormwater infiltration and bioretention	Site redevelopment in progress	High	High	Med	No	**MID PRIORITY** Review documentation submitted to State and Local Health Department and/or Water Pollution Control Authority as part of their Permitted Wastewater Discharge requirements.	

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Health Care 1 *River Glen*	North of intersection of Route 172 and Main Street South, Southbury adjacent to Pomperaug River	Past septic issues	• Inspect septic system for proper function					No	**LOW PRIORITY *in terms of Nonpoint Source Pollution*** Review documentation submitted to State and Local Health Department and/or Water Pollution Control Authority as part of their Permitted Wastewater Discharge requirements	N/A
Eagle View Neighborhood	Eagle View Neighborhood off of Georges Hill Road, Southbury	Pet waste, wildlife, septic systems	• Conduct neighborhood assessment survey to evaluate potential sources of pollution and BMP opportunities	• Municipal stormwater outfalls in this neighborhood with high indicator bacteria levels.	High	Med	Low	No	**HIGH PRIORITY - *New Area of Concern added based on MS4 data*** Conduct neighborhood assessment survey to evaluate potential sources of pollution and BMP opportunities and draft conceptual site designs as needed	 (2019 aerial – NVCOG)
Woodbury School Complex 1 *Mitchell Elementary Woodbury*	Intersection of School Street and Washington Avenue		• Biotention and infiltration retrofits to capture runoff from impervious cover areas	• Ideal site to achieve DCIA goals in Woodbury					**MID PRIORTY – *New project site based on Woodbury DCIA Plan – partially completed with rain garden installation in 2021*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Woodbury DCIA Plan
Federal Facility 1 *U.S. Post Office, Woodbury*	Intersection of Judson Avenue, Washington Avenue, and Main Street South		• Biotention and infiltration retrofits to capture runoff from impervious cover areas	• Ideal site to achieve DCIA goals in Woodbury					**MID PRIORTY – *New project site based on Woodbury DCIA Plan*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Woodbury DCIA Plan
Woodbury *Municipal Complex*	Intersection of Judson Avenue, Washington Avenue, and Main Street South		• Biotention and infiltration retrofits to capture runoff from impervious cover areas	• Ideal site to achieve DCIA goals in Woodbury					**MID PRIORTY – *New project area based on Woodbury DCIA Plan*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Woodbury DCIA Plan

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WEEKEEPEEMEE RIVER SUBWATERSHED See *TECHNICAL MEMO: STREAMWALK ASSESSMENT SURVEY 2021* for full roster of potential pollution sources and BMP opportunities in this subregional watershed; high and medium priority BMP implementation sites added to this Revised BMP Prioritization Matrix.										
Row Crops R1-IB-01 *Meadow Farm*	Northwest of Jack's Bridge Road at Intersection with Route 47	No livestock present but possibly manure if spread on fields as fertilizer	• Add shade trees along the river bank; less than 25% shading of river channel along 600 feet of riverbank	• Landowner has been working to clear invasive species from the riparian buffer .	High	Med	Med	Yes (2021 Streamwalk Weekeepeemee)	**MEDIUM PRIORITY – *new area added based on Streamwalk Assessment***	 (2019 Aerial – NVCOG)
Residential R1-IB-02 (Weekeepeemee-01)	Washington Road near Quassuk Rd	None apparent	• Recommend planting a shrub layer or establishing a no mow zone. Approximately 200 feet x 15 feet along the river bank available for planting.	• Houses are set back from the river approximately 100 feet. Right bank is well vegetated.	Low	Med	Low	Yes (2021 Streamwalk Weekeepeemee)	**MEDIUM PRIORITY – *new area added based on Streamwalk Assessment*** One of many sites that illustrates need for community education on attributes and benefits of a healthy riparian buffer is a high priority while site specific implementation is ranked medium priority	

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Hotchkissville Residential Neighborhood State Road ROW (Weekeepeemee-01)	Easy St, Woodbury to Intersection of Route 47 and Route 132 Hotchkissville	Septic, pet waste; wildlife	• Septic inspections and maintenance • Homeowner education on recommended septic pump-out schedules • Pet waste pick up • DCIA and Biotention in State ROW	• Municipal stormwater outfalls with high bacteria levels in wet weather. • Channelization of river along 1000 feet immediately adjacent Route 47 upstream of the bridge; bank is heavily armored to protect the road; flow poorly aligned and constricted through the bridge prone to.	High	Med	Med	Yes (2021 Streamwalk Weekeepeemee)	**HIGH PRIORITY** - ***New area added based on MS4 data*** Revisit area for neighborhood survey from road view vs. river view to develop conceptual BMP plans. Addressing channelization is lower priority.	 (2019 aerial – NVCOG)
Livestock 1 (Weekeepeemee-01) *Cattle Farm Upstream of Chohees Trail Bridge*	Intersection of Chohees Trail & Weekeepeemee Road	Run-off from livestock pasture and feeding paddocks. Livestock access to intermittent stream. Row crops.	• Filter berms along pasture and Weekeepeemee • Increased vegetated buffer width • Infiltration BMP on north farm next to road • Remove stream access through buffer and/or fencing	• Fencing in good repair, encourage maintenance • Encourage effective manure application (e.g., not before rain storm) • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist.	High	Medium	Low	Yes (WBP & (2021 Streamwalk Weekeepeemee)	**HIGH PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan Update conceptual plan to reflect cropland is a separate operation from livestock production	See Page 123 Pomperaug Watershed Based Plan
Equestrian 5 (Weekeepeemee-01) *Another Farm*	Weekeepeemee Road Woodbury, just south of the Bethlehem town line	Livestock (horses, goats, alpaca) manure	• Filter berms along intermittent stream • Increase buffer width	• Fencing in good repair, encourage maintenance • Outreach for manure management best practices • Operation not immediately adjacent to impaired reach, but tributary to Weekeepeemee flows through the along / through the farm property. • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist.	High	Medium	Low	Yes (WBP)	**MID PRIORTY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist.	 (2016 aerial)

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Cropland 1 (Weekeepeemee-01)	Weekeepeemee Road South of Peter Road, Woodbury (first and second parcels south of Peter Road – two separate sites)	Row crops	• Increase buffer width and enhance tree, shrub, or herbaceous layer to reduce direct sun exposure.	• Timing relevant to application of manure / fertilizer on the fields	High	Medium	Low	Yes (WBP & 2021 Streamwalk Weekeepeemee)	**HIGH PRIORTY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan need to be refined to reflect that there are three separate agricultural operations south of Peter Road.	 (2016 aerial)
Cropland R3-IB-03 R3-MI-03 R3-MI-04 (Weekeepeemee-01) *The Farm*	Weekeepeemee Road South of Peter Road, Woodbury (first and second parcels south of Peter Road – two separate sites)	None apparent; possibly manure if spread as fertilizer on the crop fields.	• Could use an additional row of shrubs, trees, and/or perennials between the river and the crop field. Area available for planting spans approximately 300 feet by 25 feet. Opposite bank also has room for similar planting or letting it naturally regenerate.	• Aim to balance crop production area with river protections. • Formalize river crossing between fields to prevent channel bed erosion • Encourage development of Comprehensive Nutrient Management Plan	Med/High	High	Med	Yes (WBP & 2021 Streamwalk Weekeepeemee)	**HIGH PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan need to be refined to reflect that there are three separate agricultural operations south of Peter Road.	 (2019 aerial – NVCOG)
Livestock (Weekeepeemee-01) *Quickwater Farm*	Weekeepeemee Road South of Peter Road, Woodbury	Livestock (few head);	• Filter berms along Weekeepeemee • Increase buffer width and enhance tree, shrub, or herbaceous layer to reduce direct sun exposure.	• Encourage effective manure application (e.g., not before rain storm) • Outreach for manure management best practices	High	Medium	Low	Yes (WBP & 2021 Streamwalk Weekeepeemee)	**MID PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan need to be refined to reflect that there are three separate agricultural operations south of Peter Road. ***WBP recommendations partially implemented –*** livestock fencing installed and rotational pasturing practices installed / adopted.	See Page 121 Pomperaug Watershed Based Plan

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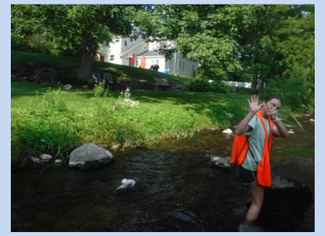
Cropland 2 (Weekeepeemee-01)	North of Peter Road, adjacent to Carmel Hill Brook	Row crops / vegetable	• Increase buffer width and enhance tree, shrub, or herbaceous layer to reduce direct sun exposure.	• Fields located on tributary to impaired section of the Weekeepeemee River. BMPs are considered higher priority for the parcels this operator has in production along the main stem of the Weekeepeemee. • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist.	High	Medium	Low	Yes (WBP)	**MID TO LOW PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist.	 (2019 aerial – NVCOG)
Residential **R3-IB-04** **(Weekeepeemee-01)**	Peter Road at Route 132	None apparent	• Increase buffer width; older house located very close to the river with minimal yard area which is dominated by lawn. Add tree, shrub, or herbaceous layer to reduce direct sun exposure.	• Recommend establishing at least 5 feet of a no-mow zone and/or strategically planting native perennials and shrubs along up to 100 feet of river bank. Small area could be kept clear (mowed) for view and or river access if desired.	Low	Medium	Medium	Yes (2021 Streamwalk Weekeepeemee)	**MID PRIORITY** – ***New site based on Streamwalk Assessment*** One of many sites that illustrates need for community education on attributes and benefits of a healthy riparian buffer is a high priority while site specific implementation is ranked medium priority.	
Cropland / Livestock **R4-MI-02** (Weekeepeemee-01) *Weekeepeemee River Farm*	Weekeepeemee Road south of Dowd Brook, north of Brushy Hill Road	Livestock - cattle, sheep, goats, chickens	• Manure management, livestock fencing, rotational grazing, stream crossings, irrigation, riparian buffer, timing for application of fertilizers / pesticides	• At least 2 stream crossings evident from aerial image where vehicles drive through stream • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist.	High	High	Med	No	**HIGH PRIORITY** – ***New area assed based on Streamwalk Assessment*** Develop conceptual BMP design plans for both parcels whether as one operation or two.	 (2019 aerial – NVCOG)

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Livestock 3 *Kuss Farms*	Guilds Hollow Road	Livestock grazing and feed lot	• Filter berm along Dowd Brook • Feeding appears to occur in a local depression, ensure that it does not drain under road	• Operation is located well away from the main stem of the Weekeepeemee River; farm runoff drains Dowd Brook • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist. • The operator has several acres placed in a conservation easement through Connecticut Farmland Trust.	High	Medium	Low	Yes (WBP)	**MID TO LOW PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Page 122 Pomperaug Watershed Based Plan
Cropland / Livestock 2 *Percy Thomson Meadows*	Thomson Road, Bethlehem	Livestock access to tributary	• Increased buffer and fencing or filter berms	• Evaluate manure storage • Outreach for manure management best practices • Operation is located well away from the main stem of the Weekeepeemee River; farm runoff drains to unnamed tributary.	High	Low	Low	Yes (WBP)	**LOW PRIORITY – *PARTIALLY COMPLETED*** Spoke with one of the operators in 2018 and learned livestock fencing had been installed to keep animals away from river and alternate water supply near barn was established with funding through NRCS EQIP grant program.	See Page 124 Pomperaug Watershed Based Plan
Livestock 2 *Abbey of Regina Laudis*	Robert Leather Road, Bethlehem	Convent with active farm operation. Past grant recipient for cattle management to get cows out of a wetland area. Variety of livestock present – sheep; goats; cattle; chickens	• Encourage effective manure management	• Evaluate manure storage • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site. • Not located immediately adjacent to Weekeepeemee River • Operation is located well away from the main stem of the Weekeepeemee River; farm runoff drains to unnamed tributary.				Yes (WBP)	**LOW PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	 (2016 aerial – NVCOG)

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Earthworks 2 (Weekeepeemee-01)	North of Crane Hollow Road, east of Weekeepeemee River	Earth excavation and school bus yard	• Encourage effective sediment and erosion controls, runoff infiltration • Stormwater outfall screening • Wastewater discharge permit compliance	• Natural, open stream channel on the left bank that is between 24 and 36 inches wide and is 4 inches deep with moderate flow. Unclear is if this is a tributary or a stormwater outfall; intense land use on the east site of the river suggests it is an outfall and there is no tributary shown on the map. Water is clear, not turbid, no benthic growth, no odor, no staining, and no floatables. Confirm source of flow. • Riparian buffer well established.	Low	Low	Low	Yes (WBP & 2021 Streamwalk Weekeepeemee)	**LOW PRIORITY** Review documentation submitted to State and Local Health Department and/or Water Pollution Control Authority as part of their Permitted Wastewater Discharge requirements.	 (2019 aerial – NVCOG)
Residential R6-IB-02 (Weekeepeemee-01)	Arrowhead Lane	None apparent Possible pet waste and wildlife	• Increase buffer width • Pool chemical storage and discharge best practices	• Recommend planting native trees, shrubs, perennials to create at least a 15 foot wide riparian buffer along the 125 feet of streambank.	Medium	Med	Low	Yes (2021 Streamwalk Weekeepeemee)	**MID PRIORITY – *New site based on Streamwalk Assessment*** One of many sites that illustrates need for community education on attributes and benefits of a healthy riparian buffer	 
Residential Neighborhood 6	Kasson Grove, Bethlehem	Lake side housing community -- old seasonal camps, many now year round residences	• Inspect septic system for proper function and sizing					No	**LOW PRIORITY** BMP Conceptual Design drafted and included in Pomperaug Watershed Based Plan	See Page __ Pomperaug Watershed Based Plan
Residential Neighborhood 5	Lake Drive	Lake side housing community -- old seasonal camps, many now year round residences	• Inspect septic system for proper function and sizing					Yes (WBP & 2021 Streamwalk Weekeepeemee)	**LOW PRIORITY** BMP Conceptual Design drafted and included in Pomperaug Watershed Based Plan	See Page __ Pomperaug Watershed Based Plan

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Dairy Farm 1	West of Todd Hill Road, north of intersection with Wood Creek Road, Bethlehem	Manure storage	• Encourage effective manure management	• Operation nestled between Wood Creek and Weekeepeemee River in upper watershed areas of each • Evaluate manure storage • Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	High	Medium	Low	Yes (2021 Streamwalk Weekeepeemee)	**LOW TO MID PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	 (2019 aerial – NVCOG)
Equestrian 6 (Weekeepeemee-01) *Windhorse International*	East of Todd Hill Road, south of Bergman Hill Road, Bethlehem	Manure storage	• Encourage effective manure management	• Evaluate manure storage • Outreach for manure management best practices • Ample vegetation along streambank / riparian buffer • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site. • Ambient water quality monitoring stations had relatively low bacteria counts in the upper watershed area	High	Medium	Low	No	**LOW TO PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	 (2019 aerial – NVCOG)

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

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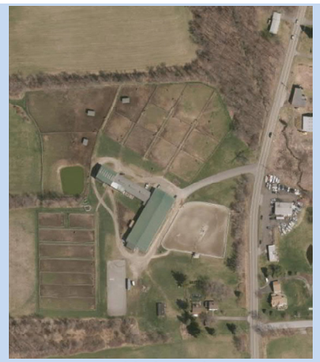
Equestrian 7 *Fox Crossing Equestrian*	Route 61, Morris north of fairgrounds	Manure storage	• Increase buffer to stream • Located in headwaters area of Long Meadow Pond which drains to Weekeepeemee River	• Manure management measures appear to be in place • Outreach for manure management best practices • Connecticut Horse Environmental Awareness Program (HEAP) and Connecticut Horse Farm of Environmental Distinction Program	High	Low	Low	Yes (WBP)	**LOW PRIORITY** Revisit site to conduct windshield survey and consider if ranking should shift and if conceptual site designs should be drafted.	 2016 aerial
NONNEWAUG RIVER SUBWATERSHED										
Equestrian 8 *Froizer Farm Equestrian Training Center*	Middle Road Turnpike, Woodbury	Horse access to tributary stream	• Filter berms and/or increased buffer in pasture • Reconfigure paddocks to avoid stream	• Some buffer exists in parts of pasture land • Outreach for manure management best practices • Connecticut Horse Environmental Awareness Program (HEAP) and Connecticut Horse Farm of Environmental Distinction Program	High	Medium	Low	Yes (WBP)	**HIGH PRIORITY** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan	See Page 129 Pomperaug Watershed Based Plan
Dairy Farm 2 *Logue Farm*	Artillery Road, Woodbury	Livestock access to tributary. Incomplete coverage of manure storage.	• Filter berms or fencing and increased buffer around stream to prevent livestock access • Reconfigure manure composting to divert runoff away from catch basins • Consider covered manure storage or manure composting	• Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site. • Also consider BMPs for properties leased by this operator for corn / feed production.	High	Medium	Low	Yes (WBP)	**HIGH PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site. Develop site specific conceptual BMP designs.	

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Residential Neighborhood 7 *"Eden Acres"*	Quassapaug Road at Soucy Road, Woodbury	Impacts to wetland areas Historic (chronic) septic failures	• Ensure wetland limits have been respected • Septic inspections • Evaluate potential for alternative or advanced treatment system for neighborhood	• Potential for connecting to neighboring sewer system in Watertown would be extremely cost prohibitive.	High	High	High	No	**MID PRIORITY** Review inland wetlands and health department records for this neighborhood. Encourage residents to have septic systems inspected and regularly pumped out.	 (2019 aerial – NVCOG)
Livestock 4 *Butkus Farm*	Hard Hill Road South, approximately 1/4 mile north of intersection with Nonnewaug Road, Bethlehem	Livestock paddock near farm pond Possible junkyard	• Encourage adequate buffer to water body • Ensure proper waste storage and disposal	• Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	High	Medium	Low	No	**MID PRIORITY** Need to conduct windshield survey and consider if ranking should shift. Conceptual site designs should be drafted.	 (2019 aerial – NVCOG)
Plant Nursery 1 *Young's Nursery*	North of Washington Road (Route 47 Bridge), Woodbury	Fertilizer and pesticide applications	• Encourage effective application (and storage) strategies and timing • Increase riparian buffer width and/or composition	• Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site. • Less potential for bacteria pollution	Medium			No	**MID TO LOW PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	 2016 aerial

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

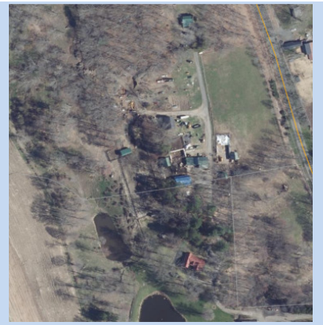
Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Livestock 7 *Pabst Farm*	West side of Flanders Road north of Brushy Hill Road, Woodbury	Cattle	• Not located on main stem of Nonnewaug River • Encourage effective manure management	• Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.				No	**MID PRIORITY** Need to conduct windshield survey and consider if ranking should shift. Conceptual site designs should be drafted.	 (2019 aerial – NVCOG)
Livestock 6 *Geraci Farm*	West side of Flanders Road South of Intersection with Brushy Hill Rd, Woodbury	Cattle, chickens, pigs, etc	• Encourage effective manure management	• Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	High	High	Medium	No	**MID TO LOW PRIORITY** Need to conduct windshield survey and consider if ranking should shift. Conceptual site designs should be drafted.	 (2019 aerial – NVCOG)
Livestock 5 *Young's Longrange Farm*	Route 6 near Guernseytown Road on the Woodbury / Watertown townline	Cattle, chickens, pigs, etc	• Encourage effective manure management • Several fields for hay and corn production	• Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	High	High	Medium	No	**HIGH PRIORITY** Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	 (2019 aerial – NVCOG)

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Cropland 3 *Region 14 School District / Town of Woodbury – Logue Farm*	East of Main Street North (Route 6), north of Scratchville Road along Nonnewaug River	Cornfield – application of manure as fertilizer	• Encourage effective application strategies and timing • Enhance width of riparian buffer • Maintain winter cover crops	• Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site. • Review farm lease agreements – consider including minimum buffer width requirements and timing / application rates for manure spreading / maintaining winter cover crops	High	Medium	Medium	No	**HIGH PRIORITY** Develop site specific conceptual BMPs designs. Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	 (2019 aerial – NVCOG)
EAST SPRING BROOK SUBWATERSHED										
Fish Hatchery 1	Nonnewaug Road, Bethlehem	Nutrients	• If still active, encourage effective waste management, possibly through multi-trophic aquaculture					No	**LOW PRIORITY**	N/A
Dairy Farm 3 *Devil's Backbone Farm*	Magnolia Hill Road and Hard Hill Road South, Bethlehem	Livestock access to tributary. Manure storage	• Filter berms or fencing and increased buffer around stream to prevent livestock access • Increase buffer width • Evaluate manure storage and spreading practices	• Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plans if not already in place				No	**MID PRIORITY** Need to conduct windshield survey and consider if ranking should shift. Draft conceptual BMP site designs.	 (2019 Aerial NVCOG)
TRANSYLVANIA BROOK SUBWATERSHED										

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
State Facility 2	Cassidy Road at Spruce Brook Road, Southbury	Land in agricultural easement with large plots in long-term leases with multiple local farming operations. Multiple operations include fruit orchard, livestock, and row crops	• Encourage effective manure management and timing for spread of fertilizer/manure on cropland areas	• Outreach for manure management best practices • If they do not already exist, encourage development of Comprehensive Nutrient Management Plans for each of the various agricultural operations	TBD			No	**LOW PRIORITY** Need to conduct windshield survey and consider if ranking should shift. Conceptual site designs should be drafted.	 (2019 aerial – NVCOG)
State Facility 2 *(Transylvania Brook-01)*	Route 172, Southbury north of South Britain Historic District	Waterfowl	• Establish / increase riparian buffer width to filter runoff from fields where geese graze	• Pond infested with water chestnut • Dam endured partial breach in 2023 Town working on redevelopment plans for Training School Property – encourage integration of stormwater retrofits for DCIA				No	**LOW PRIORITY – *PARTIALLY COMPLETED with native riparian buffer planting installed in 2022.*** Conceptual Site Designs Drafted and included in Pomperaug Watershed Based Plan. Other recommended BMPs align more with municipal DCIA goals.	See Page 116 Pomperaug Watershed Based Plan
Dairy Farm 4 *(Transylvania Brook-01)* *Platt Dairy Farm*	Spruce Brook Road, Southbury	Manure storage	• Encourage effective manure management • Headwaters of Spruce Brook flow through pasture and feeding areas; Spruce Brook is a primary tributary of the impaired section of Transylvania Brook	• Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.				No	**HIGH TO MID PRIORITY** Need to conduct windshield survey and consider if ranking should shift and if conceptual site designs should be drafted. Encourage Comprehensive Nutrient Management Plan if one does not already exist.	

Table 3-2. Revised Best Management Practice (BMP) Prioritization Matrix for *Potential* Areas of Concern. Updated based on Ambient Water Quality Monitoring Data, Streamwalk Survey Observations, Municipal Stormwater Outfall Monitoring Data, and Pollutant Load Estimates reviewed as part of the Pomperaug River Watershed Based Plan Implementation Groundwork project. Matrix template modified from the one prepared by Fuss & O'Neill, Inc and included in the Pomperaug WBP.

Site ID *Description* Streamwalk ID (Impaired Segment)	Location Description	Potential Bacteria Sources	Potential Best Management Practices (BMPs)	Other Recommendations and Notes	Relative BMP Pollutant (Bacteria) Removal	Relative Cost	Maintenance Requirements	Field Visit Conducted (timeframe)	BMP IMPLEMENTATION STRATEGY STATUS & PRIORITY RANKING UPDATE AS OF JULY 2023	PHOTO
Residential Meadow Brook Road	Meadowbrook Road off of Spruce Brook Road	Pet waste, wildlife, septic systems	• Conduct neighborhood assessment survey to evaluate potential sources of pollution and BMP opportunities	Municipal stormwater outfalls in this had high indicator bacteria levels.				No	**HIGH PRIORITY - *New Area of Concern based on MS4 data*** Conduct neighborhood assessment survey to evaluate potential sources of pollution and BMP opportunities and draft conceptual site designs as needed	 (2016 aerial – NVCOG)
HESSEKEY BROOK SUBWATERSHED										
Residential Complex 4 *Wood Lake Tax District*	Transylvania Road & Woodlake Road	Private sewage treatment plant Municipal Stormwater Runoff	• Ensure correct sizing and effective monitoring for failures • Illicit Discharge Detection and Elimination • Sewage treatment plant upgrades for nitrogen and phosphorus removal	• Municipal stormwater outfalls in this neighborhood with high indicator bacteria levels. • Increasing algae blooms in the lake/pond and presence of invasive aquatic plants (fanwort, water chestnut confirmed upstream in Transylvania Pond)	High	Low	Low	No	**HIGH PRIORITY – *Elevated concern based on MS4 data*** Conduct neighborhood assessment survey to evaluate potential sources of pollution and BMP opportunities and draft conceptual site designs as needed. Explore funding opportunities for upgrading wastewater treatment system. Review wastewater discharge data for permit compliance.	 (2019 aerial – NVCOG)
Dairy Farm 5 *Hannan Dairy Farm*	north of intersection of Grassy Hill Road and North Road, Woodbury	Manure storage / Cattle pastured on slope draining to pond with minimal buffer width	• Filter berms and/or fencing and increased buffer around stream to prevent livestock access	• Outreach for manure management best practices • Encourage development of Comprehensive Nutrient Management Plan if one does not already exist for this site.	High	Mid	Low	No	**MID to HIGH PRIORITY** Need to conduct windshield survey and consider if ranking should shift and if conceptual site designs should be drafted.	 (2019 aerial – NVCOG)

SITE SPECIFIC BMP IMPLEMENTATION STRATEGIES

Building on the BMP concepts introduced in the Pomperaug Watershed Based Plan, PRWC selected three agricultural areas along the Weekeepeemee River to further illustrate how a variety of best management practices could be implemented in this subwatershed to prevent potential sources of bacteria and nutrients from entering this impaired river. Based on the presence of livestock or potential application of manure on crop fields, these areas are considered high priority opportunities for implementing best practices. The first area (**Agriculture/Livestock R4-MI-02**) is one that was newly recognized during the Implementation Groundwork Project. The second area (**Livestock 1**) expands upon and refines BMP concepts previously included on page 121 of the WBP. The third area (**Cropland/Livestock 1**) is included as it was presented on page 123 of the WBP as the concepts are still relevant BMP opportunities.

By including these sites, PRWC is not trying to single out particular farmers on how they run their operations. PRWC recognizes the numerous challenges of farming and that bacteria (and nutrients) come from a wide variety of sources across the landscape. PRWC is simply presenting strategies that could be employed at these sites and other operations to reduce the amount of bacteria and nutrients that stormwater runoff could potentially deliver to a nearby stream. In presenting these strategies, it is important to recognize that some or all of them may already be in place or are in the process of being implemented. Ultimately, the measures depicted by the concept plans are intended to be implemented voluntarily by willing, cooperative partners working together to protect and improve water quality. Individual project proponents (e.g. municipalities, private property owners, developers) would be responsible for evaluating the ultimate feasibility of, as well as design and permitting for implementation of the site-specific concepts. Financial and technical assistance toward the implementation of these measures may be available from sources like the USDA Natural Resource Conservation Service (NRCS), CT DEEP, and similar agencies which are referenced in Appendix H of the Pomperaug Watershed Based Plan (Mas et al, 2018). Technicians from NRCS, in particular, can provide support in developing Comprehensive Nutrients Managements Plans (CNMP) as well as site specific design plans. Having a CNMP in place is typically an eligibility requirement to obtain project funding from NRCS. The CNMPs evaluate site conditions, production and operation goals and provide detailed recommendations to minimize soil loss, nutrient and bacteria runoff and stormwater runoff and to strengthen climate resiliency.

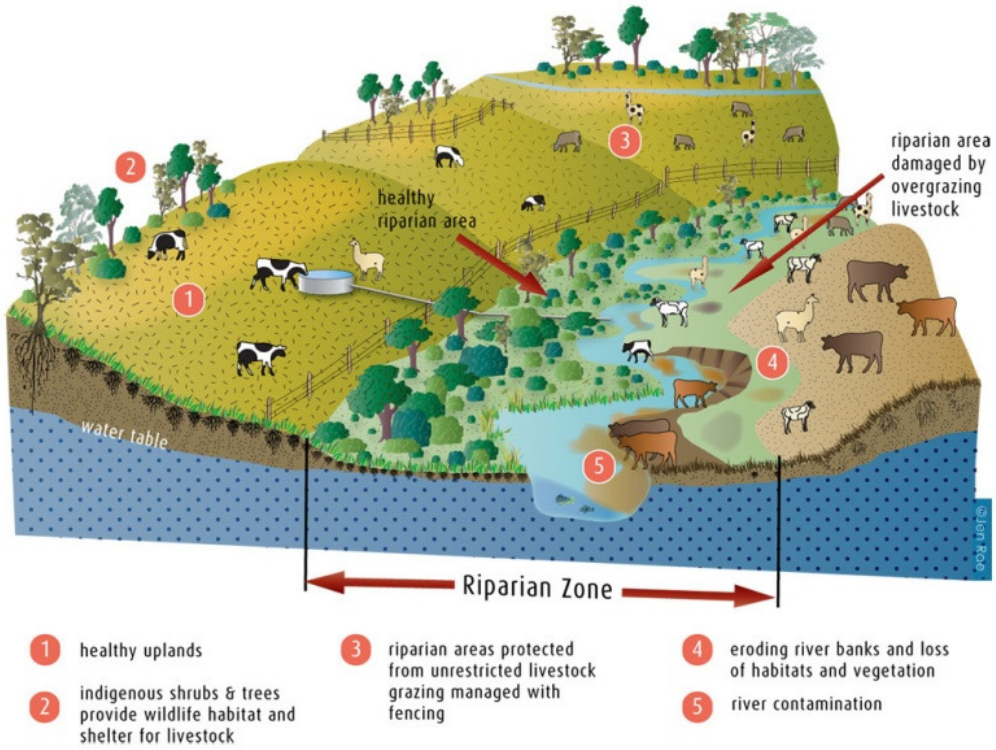


Figure 3-1. Examples of Agricultural Best Management Practices.
This schematic provides a comparison of agricultural management practices in a riparian zone highlighting potential impacts of livestock access to wetlands and water courses.

Image Source:
https://www.nyikasilika.org/riparain-zones-crucial-yet-an-overlooked-ecosystem

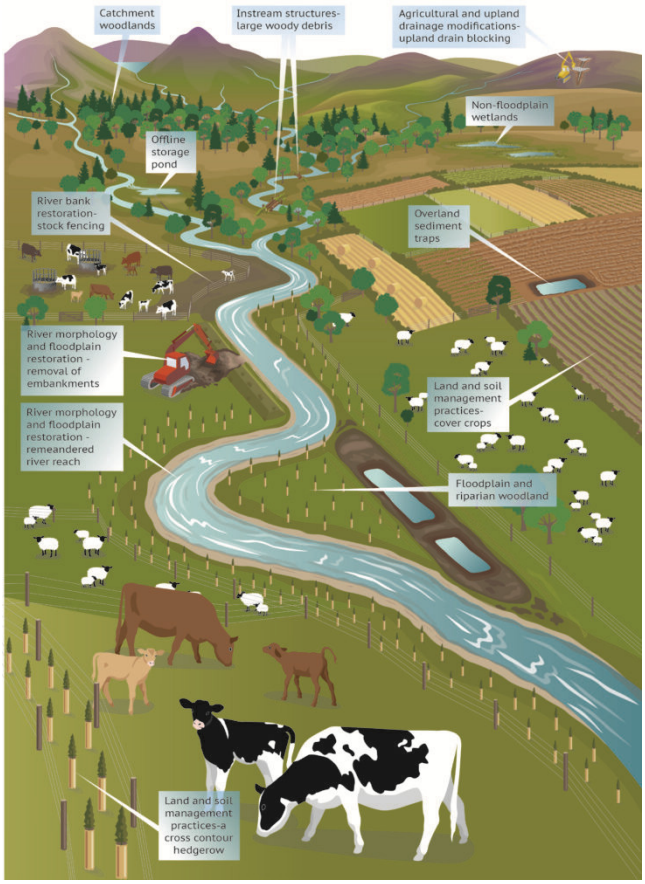


Figure 3-2. Examples of Agricultural Best Management Practices. These two schematics illustrate agricultural management practices in a riparian zone and highlight potential impacts of livestock access to wetlands and water courses. Agricultural BMPs include but are not limited to:

- Contour Farming
- Filter Strips
- Riparian Buffers
- Exclusionary Fencing
- Manure Management
- Vegetated Swales
- Filter Berms
- Bioretention
- Rainwater Harvesting
- Subsurface Infiltration
- Rotational Pasturing
- Cover Crops
- Stream Crossing Structures
- Off-stream Animal Watering

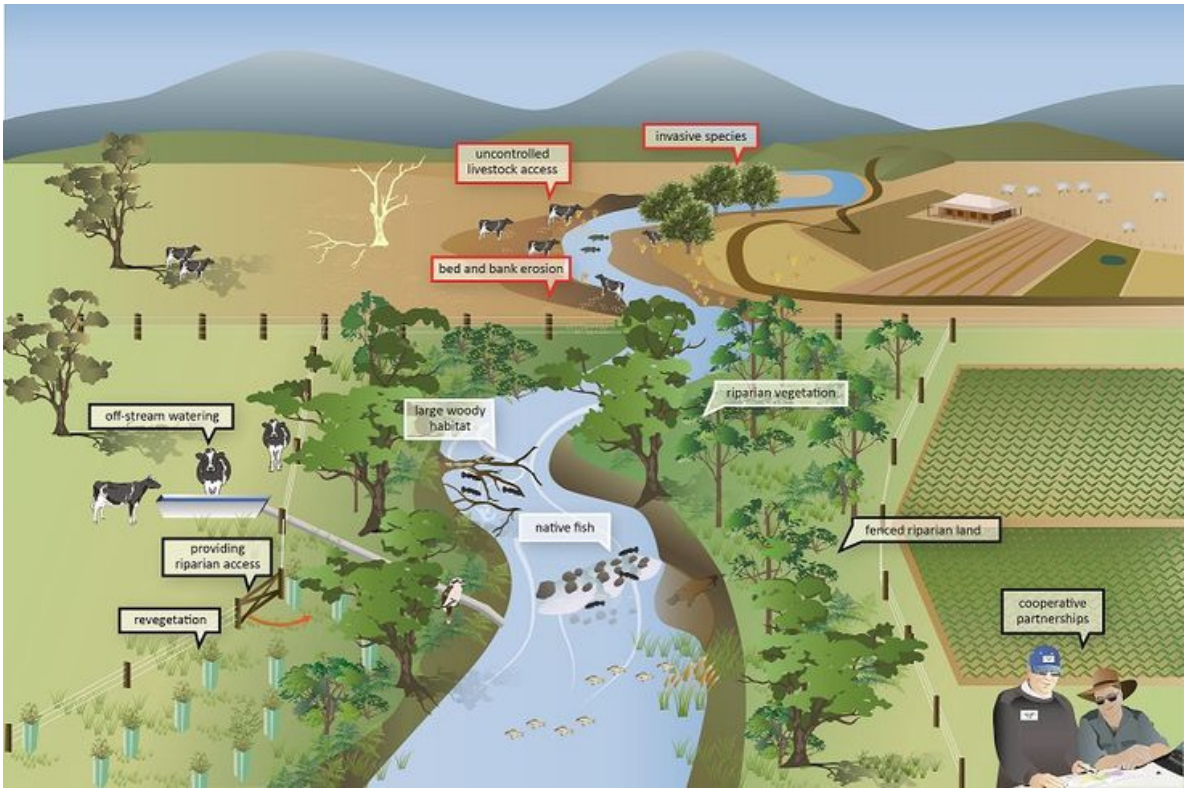


Image Sources:
(Top) https://www.catchments.ie/natural-water-retention-measures-implementing-the-flood-risk-management-plans; (Bottom) Unknown

Agricultural BMPs described and illustrated in Section 3.5 of the Pomperaug Watershed Based Plan included manure management, vegetated buffers and filter strips, and filter berms. This implementation strategy provides additional illustrations and notes highlighting exclusionary fencing, rotational pasturing, and sacrifice areas (heavy use areas) as supplemental measures that can help reduce bacteria loads from agricultural lands. Stream crossing structures are also introduced as a measure to prevent degradation of in-stream habitat; they are included based on observations of current practices in the watershed.

Exclusionary Fencing

In this practice, permanent or temporary fencing like woven wire, barbed wire, or electrified wire is installed to keep livestock and their manure away from surface water (Figure 3.3). The type of fencing to use varies depending on the type of livestock. When considering exclusionary fencing, an alternate animal watering source may need to be established. As illustrated below, livestock access can also be limited to formal stream crossing locations or water stations through the use of exclusionary fencing. Such fencing materials may also be used when establishing rotational pastures or defining heavy use areas.

Figure 3-3. Examples of temporary and permanent exclusionary fencing.

The image on the top left shows cattle that have access to surface water are standing in the water where direct deposition of manure and bank erosion may become problematic if prolonged access continues. The supporting images illustration how exclusionary fencing can be implemented to limit livestock access to wetlands and watercourses.

Image Sources:
(Top Left) USDA NRCS; (Top Right and Bottom Left) Unknown;
(Bottom Right) https://www.mifflinccd.com/riparian;

Rotational Grazing

In this practice, pasture lands are sub-divided into areas that livestock can be rotated between. The smaller pastures can be established using permanent or temporary livestock fencing. The goal is to not allowing animals to graze the pasture to nearly bare soils which can lead to erosion and compaction. Compacted soils are less effective at absorbing rain and tend to generate more stormwater runoff. In areas of concentrated livestock, compacted soils may cause manure (and bacteria) to be transported to nearby waterways. By rotating animals between pastures, vegetation is given a chance to re-grow naturally or by reseeding. When the area re-grows naturally, deeper root systems are established which help hold soil in place, absorb rainfall, and prevent the establishment of invasive species. Overall this practice helps increase forage quality, reduces pasture erosion, and supports even distribution of nutrients throughout a pasture. Pastures can also be configured to protect streams and wetlands while maintaining access to water sources and shelter for the livestock. NRCS can help write grazing management plans that address all livestock needs and possible pasturing options.

Figure 3-4. Examples of rotational pasturing practices.

Image sources:
(Top) https://transterraform.com/permaculture-strategies-intensive-rotational-grazing
(Bottom Right) PRWC Staff; (Bottom Left) USDA NRCS

Sacrifice / Heavy Use Areas

Certain areas of any property inevitably are subject to heavier use than others. For agricultural operations with livestock present, these are most commonly located around watering and feeding stations or winter housing. Materials like stone, gravel, sand or concrete can be used or placed in these heavy use areas to cover bare soil in order to prevent soil erosion. Sand, gravel, and stone will allow for some infiltration of stormwater runoff, but these areas should be kept clear of manure to prevent it from leaching into the groundwater. Additional structural BMPs often accompany sacrifice areas and may include directing roof runoff and downspouts away from the sacrifice areas or using bio-retention to capture and infiltrate runoff from adjacent barn roofs, diligent manure collection and storage practices, or installation of filter berms to treat stormwater runoff. Sacrifice areas should be established away from wetlands and watercourses and should be utilized when pastures are over-saturated. Although images below show examples with horses, they are also appropriate for operations with other types of livestock.

Figure 3-5. Examples of sacrifice and heavy use areas.

Image Sources:
(Left) https://www.pinterest.com/pin/313422455317005451;
(Middle and Right) https://www.annearundelscd.org/agriculture/best-management-practices/

Stream Crossing Structures

According to NRCS's Conservation Practice Overview (July 2022), "A stream crossing is a stabilized area or a structure constructed across a stream to provide a travel way for people, livestock, equipment, or vehicles. Stream crossings can be used to provide access to another field or area, improve water quality by reducing sediment and nutrient loading of the stream, or reduce streambank and streambed erosion. This practice applies where an intermittent or perennial watercourse exists and a ford, bridge, or culvert-type crossing is needed. A ford crossing is best suited for a wide, shallow watercourse with a firm streambed. Typical materials used for a ford crossing are concrete or rock. Ford crossings have the least detrimental effect on water quality when their use is infrequent. If the stream crossing will be used often, as in a dairy operation, a bridge or culvert crossing should be used. Culverts and bridges work best on sites where the stream channel is relatively narrow or where the banks are steep. Bridges that fully span the stream are preferred where excessive sediment flows or large woody debris is expected. Culvert crossings are usually more economical to install than bridges; however, culverts have some potential to impede passage of fish and other aquatic organisms." Examples of various temporary and permanent stream crossing structures are illustrated below. Note the variety of materials used and that crossings are often supported by exclusionary fencing.

Figure 3-6. Examples of stream crossing structures.

Image sources:
(Top Left, Top Middle, Bottom Left) USDA NRCS
(Top Right) https://www.wigan.gov.uk/Docs/PDF/Resident/Environmental-Problems/Culvert-Advice-Note.pdf
(Bottom Right) https://www.keystoneconcreteproducts.com/scslats.html

Agriculture / Livestock (R4-MI-02)

PRWC's Field Technicians did not walk the full length of the stream channel for Reach 4 of the Weekeepeemee River. The field team respectfully honored the agricultural operators request to bypass the section of river as it flows through the two agricultural parcels highlighted in **Figure 3-7**, but did follow along the river bank within the parcel to the southwest which is owned by Flanders Nature Center and Land Trust as it navigated from Brushy Hill Road to Weekeepeemee Road and onto Chohees Trail. The survey team also drove past the farm during a windshield survey of areas inaccessible from the river channel itself and referenced satellite images to observe land use activities along this (and other portions) of the watershed. From these observations, it is unclear if the two parcels are associated with one agricultural operation or two separate operations. Field observations for this area included bank erosion at the sharp bends in the river and presence of irrigation pumps and presence of a variety of livestock (goats, chickens, sheep, and cattle). The irrigation pumps themselves are not of concern, but their placement is somewhat precarious. They are located at the top of a steep, sandy bank on the outside bend of the river which does not appear to be overly stable (slope is nearly 1:1). It would be in the operator's best interest to move the irrigation pumps and related storage tanks a bit further up the streambank and extend the length of the hose used to withdraw water from the stream so as not to lose their equipment in the event of streambank failure. The streambank itself could be stabilized by a combination grading to achieve a 1:2 slope (1 foot rise to 2 foot run) and re-vegetating the slope with a mix of native plants that includes perennials, shrubs, and trees. Strategically placing boulders at the toe of the bank could add to the stability and potentially enhance in-stream habitat.

The aerial image suggests heavy animal traffic with possible overgrazing in the pasture areas southeast of the barn and that livestock may also have access directly to the river. The installation of livestock fencing and setting up an alternate water source (if not already available) may be appropriate BMPs to limit livestock access to the river. Livestock access can result in streambank erosion issues as well as the direct manure deposition into the watercourse. Rotational grazing practices could be implemented to give pastures a chance to grow deeper root systems and taller vegetation which helps prevent erosion and filter nutrients. There also appears to be a concentrated animal feeding area on the southwest corner of the barn. Here, recommendations include best practices associated with sacrifice areas for feeding (examples: manure management from formal paddock, drainage capture using bio-retention or subsurface infiltration, etc). Finally, from the aerial image it appears that vehicles regularly cross through / over the stream at particular locations. Here, more formal stream crossing structures may be appropriate to stabilize river bed and prevent erosion.

The USDA Natural Resource Conservation Service offers technical support in developing site specific plans and has a variety of funding opportunities that may help support implementation of a project like this. Technicians from NRCS can also provide support in developing Comprehensive Nutrients Managements Plans. Having such a plan in place is typically an eligibility requirement to obtain project funding from NRCS. The CNMPs evaluate site conditions, production and operation goals and provide detailed recommendations to minimize soil loss, nutrient and bacteria runoff and stormwater runoff and to strengthen climate resiliency.

Figure 3-7. BMP Concepts for Agriculture / Livestock (R4-MI-02)

The concepts presented in this figure illustrate potential measures that could be implemented at this and similar sites in the Pomperaug River watershed. Individual project proponents (e.g. municipalities, private property owners, developers) would be responsible for evaluating the ultimate feasibility of, as well as design and permitting for implementation of the site-specific concepts. The measures depicted by these concepts are intended to be implemented voluntarily by willing, cooperative partners working together to protect and improve water quality. Financial and technical assistance toward the implementation of these measures may be available from sources like the Natural Resource Conservation Service, CT DEEP, and similar agencies.

Livestock 1 (Weekeepeemee)

BMP concepts for the site coded as Livestock 1 were previously introduced in the Watershed Based Plan (**Figure 3-8**) and were lumped as recommendations for a single agricultural operation. This area of farmland is comprised of three different distinct parcels which are managed by at least two and possibly three distinct agricultural operators. The BMP concept previously presented has been expanded upon based on new data and understanding that they are three distinct parcels that make up this section of farmland (**Figure 3-9**). The most downstream operator has a small number of livestock present (cattle, goats, and chickens). Since the WBP was approved, this operator has implemented rotational pasturing practices and installed exclusionary fencing to keep animals away from wetlands and water courses.

The next upstream parcel features agricultural land use characterized by production of row crops including corn, pumpkins, cut flowers, and other vegetables. A truck / tractor-crossing point across the streambed (ford-style crossing) was observed during the Streamwalk Assessment survey. Here, more formal stream crossing structures may be appropriate to stabilize river bed and prevent erosion. An opportunity to enhance the riparian buffer was exists along this parcel. There is a continuous row of well established trees along the river which could be bolstered by the addition of shrubs, grasses, and perennial wildflowers to create a wider swath of vegetation along the river bank. A wider buffer would help absorb the impact of flood waters as they enter and exit the cropland. It would also help trap or filter any eroding soils and nutrients. Ideally, the buffer should extend at least 25 feet from the riverbank along the 800 to 1000 feet of river channel that flows along the western edge of the farmland. However, maintaining a buffer of that width takes more than a ½ acre of land out of agricultural production on fields already limited to approximately 18 acres along. It is uncertain if cover crops are planted over the winter months, what soil amendments may be used, or how crops are rotated to help manage soil nutrients. If one does not already exist for this operation, a Comprehensive Nutrient Management Plan could be a helpful tool to support long-term production goals.

The third parcel in this area features agricultural land use characterized by hay production. Here, an opportunity also exists to bolster the riparian buffer along approximately 900 feet of the stream bank in an effort to help absorb the impact of flood waters as they enter and exit the cropland, provide shade for stream inhabitants, prevent streambank erosion, trap soils that may erode from the farmland, and filter nutrients and bacteria potentially carried by stormwater runoff. Ideally, the buffer should extend at least 25 feet from the riverbank along approximately 900 feet of the river channel that flows along the north and western edge of the hayfield. It is uncertain what soil amendments may be used or how crops are rotated to help manage soil nutrients. If one does not already exist for this operation, a Comprehensive Nutrient Management Plan could be a helpful tool to support long-term production goals for this parcel.

As for all agricultural operations, the USDA Natural Resource Conservation Service offers technical support in developing site specific plans and has a variety of funding opportunities that may help support implementation of a project like this. Technicians from NRCS can also provide support in developing Comprehensive Nutrients Managements Plans. Having such a plan in place is typically an eligibility requirement to obtain project funding from NRCS. The CNMPs evaluate site conditions, production and operation goals and provide detailed recommendations to minimize soil loss, nutrient and bacteria runoff and stormwater runoff and to strengthen climate resiliency.

4.9 Livestock 1

Between Weekeepeemee Road (South of Peter Road) and the Weekeepeemee River in Woodbury is a clustering of farm operations with several head of livestock, 17 acres of row crops, and two pasture areas. An intermittent stream passes between a fenced grazing area and the row crops. Further west, water is channelized in the row crop field, passes through the other pasture, and joins the Weekeepeemee River.

- **Buffer Restoration.** At 0.75 acres, the fenced grazing area represents the most significant source of bacteria. Several head of cattle are separated from the intermittent stream by no more than 10 feet of vegetated buffer. While available space is limited in this area, doubling the buffer width to at least 20 feet is recommended. The shade from a tree in the existing buffer area might be reduced by increasing the buffer width, so a new shelter/shade structure may also be needed.

- **Buffer Restoration.** The larger pasture area nearer the river contains a drainage channel from the upgradient row crops. Where this channel passes through the pasture area, a vegetated buffer is proposed on both sides to filter pollutants and promote infiltration. Moving the fence line to prevent grazing animals from accessing the buffer vegetation is also proposed. Proposed BMP concepts for this site are shown in *Figure 4-15*.

Figure 4-15. BMP Concept: Livestock 1
The concepts presented in this figure illustrate potential measures that could be implemented at this and similar sites in the Pomperaug River watershed. Individual project proponents (e.g., municipalities, private property owners, developers) would be responsible for evaluating the ultimate feasibility of, as well as design and permitting for, the site-specific concepts. The measures depicted by these concepts are intended to be implemented voluntarily by willing, cooperative partners working together to protect and improve water quality. Financial and technical assistance towards the implementation of these measures may be available from sources like those listed in Appendix H.

Figure 3-8. BMP Concepts for Livestock 1 as presented in the Pomperaug Watershed Based Plan.

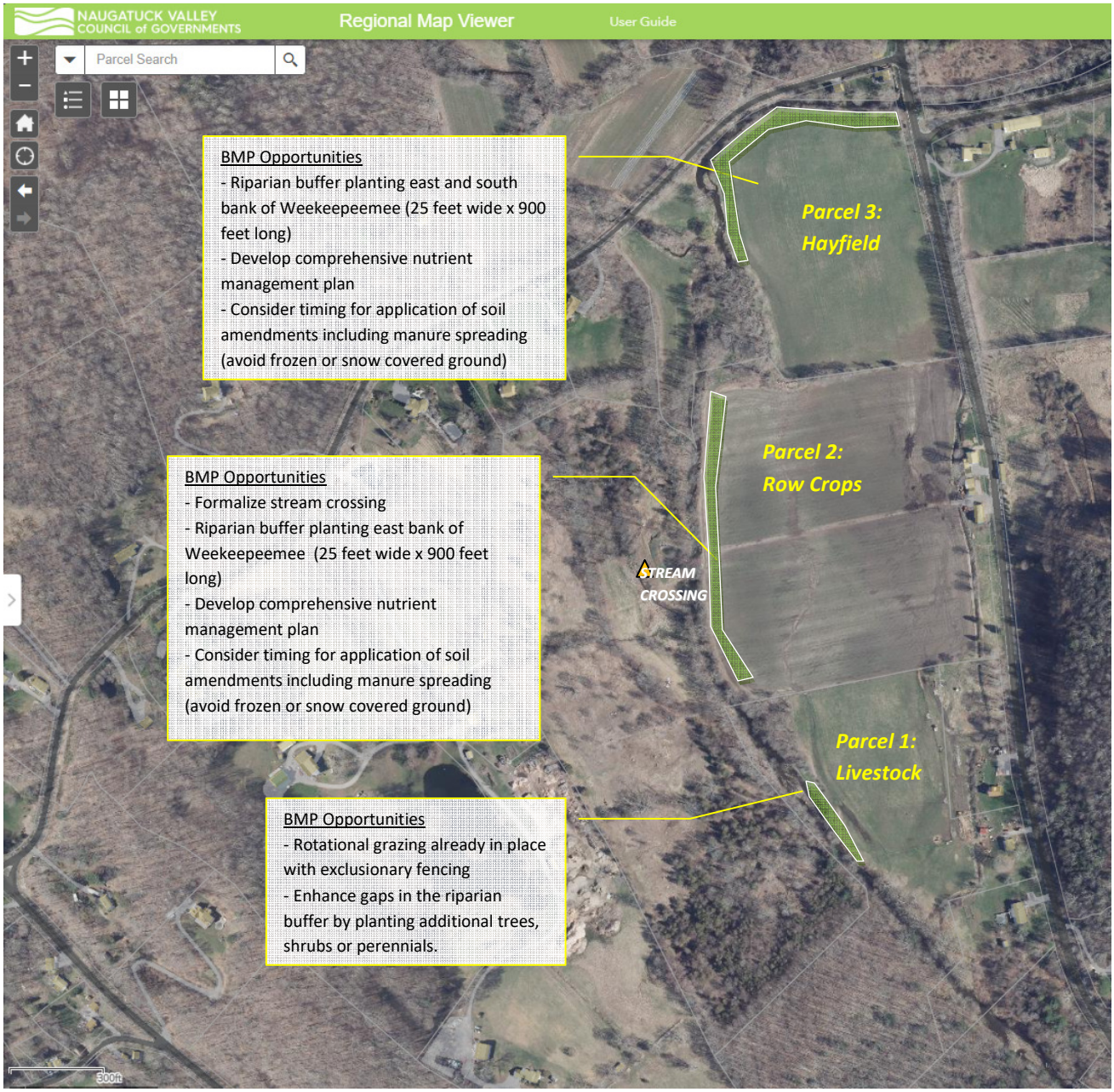


Figure 3-9. Supplemental BMP Concepts for Livestock 1.

This figure presents BMPs that compliment those previously included in the Pomperaug Watershed Based Plan as there are three separate parcels along the eastern side of the Weekeepeemee River south of Peter Road that are used for agricultural production by at least two, possibly three, separate operators. The concepts presented in this figure illustrate potential measures that could be implemented at this and similar sites in the Pomperaug River watershed. Individual project proponents (e.g. municipalities, private property owners, developers) would be responsible for evaluating the ultimate feasibility of, as well as design and permitting for implementation of the site-specific concepts. The measures depicted by these concepts are intended to be implemented voluntarily by willing, cooperative partners working together to protect and improve water quality. Financial and technical assistance toward the implementation of these measures may be available from sources like the Natural Resource Conservation Service, CT DEEP, and similar agencies.

Cropland / Livestock 1 (Weekeepeemee)

The BMP concepts presented in the Watershed Based Plan for this livestock operation continue to be high priority opportunities to protect and improve water quality. The narrative supporting concepts illustrated in **Figure 3-10** were presented in the WBP as follows:

> This site is a 50-100 head livestock farm operated in close proximity to the water along the Weekeepeemee River in Woodbury. Exclusion fencing along the river appeared in good repair during the field visit, though dense buffer vegetation was minimal along part of the streambank. Adjacent to the river is a 2-acre feeding and grazing area. A 1-acre area of row crops and 11 acres of other hay and grazing fields are located uphill from the pasture area. Several intermittent streams flow down the hill and feed the Weekeepeemee River.
>
> - **Buffer Restoration and Exclusion Fencing.** A vegetated buffer is proposed between the pasture and riverbank along the length of the existing fence line. The fence line would need to be reconfigured to provide enough space for the vegetated buffer. If the field surrounded by a fieldstone wall, located immediately north of the pasture area, is used for grazing, then additional exclusion fencing should be considered to restrict livestock access to the intermittent stream and to allow the buffer vegetation to regrow. An alternative water supply may also be needed if livestock rely on the stream for drinking water.

Since conducting the Streamwalk Assessment Survey in 2021, it appears the operator has replaced posts supporting the existing exclusionary fencing and that alternate manure storage locations have been established away from the barn nearest the road. Nonetheless, increasing the distance of the exclusionary fencing away from the river and restoring the riparian buffer between it and river would further enhance treatment of stormwater runoff by trapping sediment and absorbing nutrients and bacteria. A wider buffer would also help provide shade for in-stream organisms and prevent streambank erosion, particularly during heavy rain events. No additional BMP opportunities were identified through the Streamwalk Assessment Survey or Ambient Water Quality Monitoring program, but the site was ranked as high priority for BMP implementation in the Weekeepeemee sub-watershed.

Figure 3-10. BMP Concepts for Cropland / Livestock 1

This figure presents BMP concepts that were prepared by Fuss & O'Neill and were included in the Pomperaug Watershed Based Plan. The concepts presented in this figure illustrate potential measures that could be implemented at this and similar sites in the Pomperaug River watershed. Individual project proponents (e.g. municipalities, private property owners, developers) would be responsible for evaluating the ultimate feasibility of, as well as design and permitting for implementation of the site-specific concepts. The measures depicted by these concepts are intended to be implemented voluntarily by willing, cooperative partners working together to protect and improve water quality. Financial and technical assistance toward the implementation of these measures may be available from sources like the Natural Resource Conservation Service, CT DEEP, and similar agencies.

NEXT STEPS

Efforts to protect and improve water quality in the Pomperaug River Watershed are ongoing. In relation to mitigating non-point sources of pollution, particularly bacteria, the following items summarize the next immediate steps necessary in furthering implementation of the Watershed Based Plan and this addendum:

- Continue to develop and revise site specific conceptual BMP plans for sites reprioritized as high priority for implementation of bacteria and other nonpoint source pollution mitigation measures if they do not already exist or if they should be updated based on recent and future data.
- Continue outreach and education campaigns to cultivate community stewardship of their water resources.
- Continue to explore funding opportunities and build relationships with landowners to support implementation of high priority structural BMPs.

Data collection will continue to be a critical component to the protection and restoration efforts in terms of continuing to refine priority levels for implementation projects and measuring the efficacy of those already implemented. Accordingly, the collection of ambient water quality monitoring data and streamwalk assessment survey data should also be included in the next steps along with sharing updates on water quality conditions with the various stakeholder groups in the community.

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APPENDIX 1

Technical Memorandum – Ambient Water Quality Monitoring

SUBAPPENDIX A:

Quality Assurance Project Plan

SUBAPPENDIX B:

Tabulated Results by Sample Site

SUBAPPENDIX C:

Results & Summary Statistics Compared to CT Water Quality Standards

SUBAPPENDIX D:

Raw Data - Field Data Sheets, Chain of Custody Forms, Laboratory Reports

APPENDIX 2

Technical Memorandum – Visual Field Assessments

SUB-APPENDIX A:
Quality Assurance Project Plan

SUB-APPENDIX B:
Reach Maps

SUBAPPENDIX C:
Completed Field Data Sheets

APPENDIX 3

Municipal Stormwater Outfall Data

Town of Southbury (2019)

Town of Woodbury (2019)

Town of Woodbury DCIA Plan