Project 08-18 Task 1h

Mashamoquet Brook Abbreviated Watershed Based Plan

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Figure 1 Park Entrance

Mashamoquet Brook (CT 3710-00) is located in the town of Pomfret, CT. Years of water quality monitoring at Mashamoquet Brook State Park indicate that the brook does not meet required standards for recreational contact due to exceedances of *Escherichia coli* bacteria (*E. coli*). The Mashamoquet Brook State Park swimming area, which is fed by a diversion from Mashamoquet Brook, experiences periodic closures due to water samples exceeding *E. coli* standards for recreational contact. Water samples from the brook upstream of the pond diversion also exceed standards for recreational contact.

During the summer of 2010, ECCD staff and trained volunteers collected water samples from over 20 locations in the watershed in order to track down the sources of *E. coli* contamination found at the park. The known impaired area is located between the Taft Pond outlet dam (upstream of Taft Pond Road crossing) and the confluence with Wolf Den Brook (just upstream of Rt. 101 crossing). The results indicated that the most probable sources of bacteria were agricultural runoff and septic tank leachate, especially from the Abington Brook watershed, a small watershed that drains into Mashamoquet Brook across from the park entrance and also from land along Mashamoquet Brook below Taft Pond Road. This plan outlines agricultural Best Management Practices to address the agricultural sources of contamination and a strategy to address failing septic systems and/or illicit discharges from residential areas.

For more information on this project, you may visit the ECCD website at www.ConserveCT.org/Eastern and click on the Current Projects tab, or call the ECCD main office at 860-887-4163, extension 400.

2 Introduction

2.1 Document Overview

Mashamoquet Brook State Park is a 900 acre park located in Pomfret, Connecticut. It is managed by the Connecticut Department of Energy and Environmental Protection[1] (CT DEEP). The day use area of the park includes a public swimming area that is gravity fed by a diversion from Mashamoquet Brook. The pond has been referred to as By Pass Pond in *Off the Beaten Path*, a travel guide published by Readers Digest in 1987. It is also referred to as Braytons Pond in the Connecticut Environmental Online

Figure 2 By Pass Pond

[1] On July 1, 2011 the Connecticut Department of the Environmental Protection was merged with elements of the Connecticut Department of Public Utility Control. The agency is now known as the Department of Energy and Environmental Protection and is referred to as CT DEEP in this document.

(CT EcoMap) mapping program. Water enters a diversion behind a cement dam located upstream of the swimming area and is piped underground to the engineered pond. The swimming pond is shallow (less than 8 feet deep), has two lobes and a sandy bottom. Water is only diverted to the pond during the swimming season. The pond bottom is cleaned annually when it is empty to remove any accumulated organic material prior to refilling the pond for the swimming season.

Figure 3 Beach Closure Sign at Park Entrance

Mashamoquet Brook has experienced chronic water quality issues related to elevated levels of *E. coli* bacteria for decades. According to John Folsom, former long time Park Manager for Mashamoquet Brook State Park, the Mashamoquet swimming pond was closed for about seven weeks straight due to high coliform bacteria counts in 1976. It was highly suspected that the coliform bacteria entered the brook in contaminated stormwater runoff flowing over recently plowed fields that had been fertilized with cow manure. The Connecticut DEEP commissioned The Research Corporation of New England (TRC) in August 1978 to conduct a *Water Quality Evaluation Mashamoquet Brook Watershed, Pomfret, CT* (TRC Project Number 82986). The five primary tasks of the study were:

- Watershed mapping to identify possible non-point sources of fecal pollution.
- Collect flow measurement data from Mashamoquet Brook and its tributaries during low flow, storm and runoff periods. Flow measurements and bacteriological stream sampling were conducted concurrently.
- Bacteriological sample collections were made during an initial sampling period, dry weather sampling and during two storm events. Samples were to be analyzed for fecal coliform and fecal streptococci values.
- Utilize the water quality data to identify the drainage basins contributing significant fecal pollution.
- Recommend corrective actions including the capital expenses associated with each management technique to improve water quality in Mashamoquet Brook.

Figure 4 Mashamoquet Brook diversion to By Pass Pond

The initial report issued by TRC in January 1979 indicated there is a direct correlation of increased fecal bacteria with increased stormwater runoff and that the primary sources were being introduced from Abington Brook, an unnamed stream that flows into Mashamoquet Brook near the park entrance, and along the reaches of Mashamoquet Brook below Taft Pond Road. The fecal coliform/fecal strep ratio was used as an indicator whether the bacteria was human or other animal waste in origin. In an initial report, they indicated no human pollution was found during the single storm event they monitored, and livestock related fecal contamination was implicated. After additional storm related monitoring, a follow up report was

issued in November 1979 where human waste and other animal waste were both contributing to the water quality issues in Mashamoquet Brook.

An outcome of the report was to implement a policy for Park staff to block the diversion to the engineered pond at the onset of heavy rain events and to leave the diversion closed until flow rates return to normal. At the time the policy was initiated, a staff gauge and a rain gauge were installed on the park grounds and park staff was responsible for recording data on stream flow during and after storm events. The original staff gauge and rain gauge are no longer in place. Park staff has the ability to block the diversion inlet with a board and continue to do so if heavy rain is forecast. This effort may explain why at times the bacteria samples from the brook exceed the acceptable bacterial threshold while samples from the pond do not, but it is not a perfect science. Despite the efforts to reduce the introduction of fecal contaminated water to By Pass Pond, the pond continues to experience occasional exceedances of bacterial standards and beach closures.

2.2 Watershed Management Plan Purpose and Process Used

The purpose of this Mashamoquet Brook Watershed Management Plan (Plan) is to identify sources of bacterial contamination and recommend implementation strategies to address the sources of contamination that will lead to a delisting of Mashamoquet Brook segment 2 from the list of impaired waters in Connecticut. As a result of water quality monitoring conducted during the investigation of this watershed, additional water quality issues were revealed. General recommendations to address those concerns are also included in this document.

In order to develop this Plan, the Eastern Connecticut Conservation District (ECCD) reviewed all available water quality data collected in the watershed by a variety of organizations. This data includes bacteria sampling conducted at Mashamoquet Brook State Park as part of the CT DEEP summer bathing beach program, both from the pond and the brook at the diversion; StreamWalk data collected by volunteers participating in the Connecticut Audubon Society Citizen Science Program at their Center in Pomfret and biological monitoring data using indicator macroinvertebrates and cold water fish. The ECCD also conducted a bacterial monitoring program during the summer of 2010 in an attempt to bracket the sources of bacteria in the watershed. The TRC report was also reviewed.

2.2.1 Watershed Management Team

Watershed planning is a collaborative and participatory process. The ECCD developed a Watershed Management Team which, at various times of this project, assisted with the investigation of potential sources of nonpoint source pollution impacting this watershed. ECCD staff met individually with organizations such as the Pomfret Horse and Trails Council and the Pomfret Conservation Commission. Group meetings and presentations were scheduled throughout the watershed investigation to present data, share local knowledge and develop strategies. The Northeast District Department of Health shared important septic tank repair permit information and participated in choosing the location of water quality monitoring locations. The team also participated in the development of Plan's implementation recommendations. The team involved representatives from the following organizations:

Table 1 Mashamoquet Brook Watershed Management Team

Team Member	Role
CT DEEP Park Manager, John Folsom (retired in March 2011)	Provided historic information on water quality issues and previous actions
CT DEEP	Provided seasonal water quality data and input to 2010 water quality monitoring plan
CT DPH	Analyzed collected water samples for bacterial concentration
NDDH	Watershed Management Team Member; Water sample and data liaison; provided septic tank repair permit information
Pomfret First Selectman, Jim Rivers	Watershed Management Team Member
Pomfret Conservation Commission	Represented on Watershed Management Team
Pomfret Inland Wetlands Commission	Represented on Watershed Management Team
Pomfret Horse and Trails Association	Participated in discussions on manure management issues
CT Audubon Society Citizen Science Program Coordinator, Paula Coughlin	Watershed Management Team Member; Provided Stream Walk data for Mashamoquet Brook
CT Audubon Society/Wyndham Land Trust Land Manager, Andy Rzeznikiewicz	Watershed Management Team Member
Dairy farmer, Linda Rich	Provided manure management information
The Last Green Valley Water Quality Monitoring Program volunteers	Assisted in the collection of water quality sampling in 2010
The Pomfret Times	Local media outlet important for education and outreach
Jane Brawerman, Connecticut River Coastal Conservation District	Provided model bacteria monitoring QAPP and water quality monitoring advice.

2.2.2 Public Participation

The public was invited to participate in this project through multiple press releases announcing various activities associated with this project.

Table 2 Public Participation Opportunities

Volunteer Group	Activity
Hannah McMerriman and Celia Guillard	Assisted with NPS outreach at Positively Pomfret Day
Pomfret land owners	2010 Pomfret Farm Animal Census
The Last Green Valley Water Quality Monitoring Program Volunteers	Assisted with collection of water samples for bacterial analysis
Connecticut Audubon Society Wednesday Noontime Walkers	Assisted with field investigations of land drainage in and near Mashamoquet Brook State Park, Airline Trail State Park and Audubon land
Valerie Ietto	Assisted with a windshield survey of Pomfret farm animal locations
Connecticut Audubon Society Citizen Science Program Volunteers	Rapid Bioassessment of Mashamoquet and Wappoquia Brook

The Pomfret Times is a local town newsletter mailed to every home in Pomfret. The local population was kept informed through all phases of this project and invited ask questions or participate in the water quality investigation. In addition to the town newsletter, several regional newspapers reported on the project.

Volunteers were trained to conduct non-point pollution outreach and attended local fairs with a plastic watershed model to demonstrate NPS sources.

3 Watershed Description

3.1 Physical and Natural Features

Mashamoquet Brook is located in Pomfret, Connecticut. Pomfret is a rural town located in the northeastern part of Connecticut. The area of Pomfret is 40.6 square miles. The University of Connecticut College of Agriculture and Natural Resources, Center for Landuse Education and Research (CLEAR), as part of their Connecticut's Changing Landscape project, used 2006 aerial data to estimate that Pomfret is comprised of nearly 68% wooded areas and 17% agricultural land. The total developed portions of the town were calculated to be just over 7% in 2006. Large, contiguous blocks of forest, both in private ownership as well as part of the DEEP Natchaug State Forest and other protected open space, including Mashamoquet Brook State Park, are the dominant landscape feature of the town. See ***Map 1*** *2006 Mashamoquet Brook Land Cover* in the Map Appendix, located at the end of this document.

3.1.1 Watershed Boundaries

Mashamoquet Brook is located in the town of Pomfret, Connecticut. Portions of the brook's watershed extend into Eastford, Woodstock and Brooklyn, Connecticut. See Map 2 *Mashamoquet Brook Watershed Area* in the Map Appendix

3.1.2 Hydrology

Mashamoquet Brook is a 33.925 square mile sub-regional watershed within the Quinebaug regional watershed; part of the greater Thames River watershed basin. The 5.757 square mile Wappoquia Brook watershed is also designated a sub-regional watershed within the Quinebaug River watershed area. The Wappoquia Brook is a significant tributary of Mashamoquet Brook and therefore was included in this investigation although it flows into Mashamoquet Brook downstream of the diversion inlet at Mashamoquet Brook State Park.

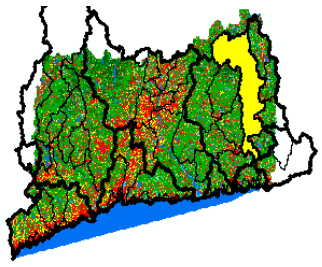


Figure 7 Quinebaug River Watershed

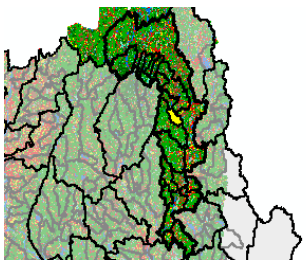


Figure 5 Wappoquia Brook Watershed

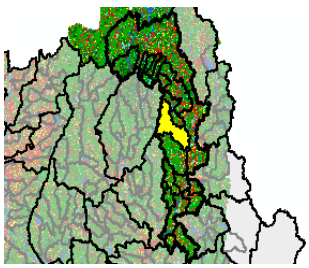


Figure 6 Mashamoquet Brook Watershed

3.1.3 Climate/Precipitation

Pomfret, Connecticut has a generally temperate climate, with mild winters and warm summers. The January mean temperature is 27°F (–3°C) and the July mean is 70°F (21°C). Data from

www.weather.com shows the average total precipitation in Pomfret is 51.25 inches/year. Precipitation tends to become evenly distributed throughout the year, although variations in precipitation from month to month are sometimes extreme. In the winter months, the precipitation often falls as snow.

Weather patterns during the ECCD watershed investigation were not average:

- March 2010 exceeded normal expected precipitation. Two days of heavy rain at the end of March sent many of the local brooks out of their banks.
- According to the National Weather Service, the summer of 2010 was among the hottest in recorded history. The temperature exceeded 32° C (90° F) in Hartford, Connecticut 34 times.
- Water levels were below normal by late summer due to an extended period of hot, dry weather.
- This unusual summer weather was followed by near record seasonal snowfall accumulations over the winter of 2010/11.

3.1.4 Surface Water Resources

Mashamoquet Brook begins where Nightingale Brook and Lyon Brook converge at Taft Pond. Several low order tributary streams flow into Mashamoquet Brook, including Abington Brook, Sap Tree Run, Wappoquia Brook, White Brook, Wolf Den Brook and several unnamed perennial streams. All streams in this watershed have been designated Class A; Potential Drinking Water Resources by the CT DEEP.

3.1.5 Groundwater Resources

All homes and business in the Mashamoquet Brook watershed get their drinking water from groundwater wells. An underutilized stratified drift aquifer is located along the Quinebaug River in the area of Pomfret Landing. The Connecticut Water Company expressed interest to the Town of Pomfret regarding this area as a future location for an expansion of their current well fields in the region.

3.1.6 Flood Plains

Pomfret may occasionally experience localized stream flooding in low lying areas adjacent to stream channels, as was experienced in March 2010.The Federal Emergency Management Agency indicates there are no special flood management areas in Pomfret, Connecticut.

Figure 8 March 30, 2010 Flood

3.1.7 Navigation Channels, Ports and Harbors

Mashamoquet Brook is not used as a navigation channel. The Quinebaug River once served as a navigation channel. Goods were loaded onto boats at Pomfret Landing near the convergence with Mashamoquet Brook; however hydroelectric dams above and below the Mashamoquet Brook confluence with the Quinebaug River limit the Quinebaug River to recreational boating only.

3.1.8 Dams

Mashamoquet Brook begins at an earthen dam that impounds Taft Pond. This dam is the site of a former sawmill that was converted to steelworks. The site is not in operation at this time.

A notched cement dam is located in Mashamoquet Brook State Park where the water is diverted to the swimming pond. This dam has two pipes through it that are open to water flow in the non-bathing season. During the summer bathing season, the pipes are blocked by boards to impound water behind the dam and allow water to flow through the piped diversion to By Pass Pond.

Figure 9 Water Diversion Dam at MBSP

A secondary stream channel bypasses the water diversion dam. During the summer of 2010, a loose earthen dam was created across the beginning of the secondary stream channel. This loose earthen dam was not evident on April 25, 2011.

Nightingale Brook is impounded north of Route 244 at Nightingale Pond. Lyon Brook is impounded at the Windham Tolland 4 H Camp to serve as a swimming area. Several more small impounded areas exist upstream of this location.

3.1.9 Topography/Elevation

The elevation in Pomfret, Connecticut ranges from a low of 200 feet to a high of 863 feet above sea level. *Map 3 Mashamoquet Brook Topographic Map* is located in the Map Appendix.

3.1.10 Geology and Soils

Glacial tills dominate the makeup of the surficial materials in Pomfret, with numerous drumlins present throughout the landscape. A significant stratified drift deposit is located at the convergence of Mashamoquet Brook and the Quinebaug River near Pomfret Landing.

3.1.11 Vegetation

The predominant and natural vegetative cover in this watershed is forest. The primary forest type is mixed deciduous forest.

Portions of the Connecticut Audubon Society Bafflin Sanctuary area managed as grassland bird habitat. A small patch of pitch pine is also located on the sanctuary.

A natural gas pipeline transects the town of Pomfret. Early successional habitat exists along this route.

3.1.12 Exotic/Invasive Species

Japanese Barberry, *Berberis thunbergii*, a plant listed as invasive on the Connecticut Invasive Plant Species List, is present in the understory of the wooded slopes uphill from Mashamoquet Brook in Mashamoquet Brook State Park.

Figure 10 Japanese barberry

Phragmites australis is also evident in scattered marsh areas around town. Many other types of invasive plant species are present in town but not a focus of this watershed based plan.

3.1.13 Wildlife

With significant blocks of unbroken forested areas in Pomfret, the Mashamoquet Brook watershed contains important native wildlife habitat. In addition to the Natchaug State Forest and Mashamoquet Brook State Park, there are several preserved open space parcels managed for wildlife by the Connecticut Audubon Society, Wyndham Land Trust and The Nature Conservancy. These undeveloped areas are home to deer, coyote, bobcats, fisher, beaver, porcupines and many birds and small mammal species.

The Connecticut Audubon Society manages a portion of their sanctuary in the Wappoquia Brook watershed as a grassland bird nesting area. In addition, the many farm fields in town are attractive feeding areas to flocks of migrating Canada geese in the spring and fall.

3.1.14 Protected Species and Sensitive Areas

Map 4 in the Map Appendix depicts *Mashamoquet Brook Natural Diversity Data Base Areas*. Natural Diversity Data Base (NDDB) Areas represent known locations, both historic and extant, of state listed species and significant natural communities. State listed species are those listed as Endangered, Threatened or Special Concern under the Connecticut Endangered Species Act.

This data may be used by biologists to target further research on associated plant and animal species.

3.1.15 Sensitive Areas

Map 4 also contains information on areas of Pomfret considered to be Connecticut Critical Habitats. The Connecticut Critical Habitat data layer can serve to highlight ecologically significant areas and to target areas of species diversity for land conservation and protection. Within the project area, two types of rare and sensitive wildlife habitat have been indentified; Atlantic White Cedar Swamp and Floodplain Forest.

3.1.16 Cultural Resources

Pomfret is one of the 35 towns in northeastern Connecticut and South Central Massachusetts that are part of the Quinebaug-Shetucket Rivers Valleys National Heritage Corridor (QSHC). The more popular name for QSHC is The Last Green Valley. Due to the limited development in the upper Thames River watershed, the region stands out from space at night as the only dark area along the east coast of the United States between the Boston and Washington DC.

The former New York and New England Railroad once crossed the town diagonally. The abandoned rail bed, now known as the Airline Trail State Park, is utilized as a walking trail. Large stone arch bridges were built to carry the rail line over the hilly topography. The land drainage patterns have been altered as a result of the construction of this rail line.

The Town of Pomfret does not have a central industrial park or a traditional town center. Various small businesses and manufacturing firms are scattered thorough the town. The Brayton Grist Mill and the Marcy Blacksmith Museum, located on Mashamoquet Road (Route 44), near the entrance to Mashamoquet Brook State Park. Both date from the late 19th century, when Pomfret was a relatively significant industrial center in northeastern Connecticut.

Pomfret has one public school serving children from pre-kindergarten through 8th grade. In addition, there are two private boarding schools in Pomfret.

3.2 Land Use and Land Cover

The majority of the Mashamoquet Brook watershed is in Pomfret, Connecticut. Pomfret is a rural town, comprised of nearly 68% wooded area and 17% agricultural land. In 2006, the total developed portions of the town were calculated to be just over 7% (CLEAR).

3.2.1 Open Space

Nearly 25% of the town of Pomfret is preserved as open space. There is no breakdown on the percent of open space by watershed. The Town of Pomfret holds conservation easements on several properties. Some properties have agricultural easements. Some, like the Townsend property in northwest Pomfret, are forested.

The Wyndham Land Trust owns and manages over 800 acres of land in Pomfret. Most of the land is managed as wildlife habitat.

The 380 acre Dennis Farm Preserve owned by The Nature Conservancy is a former farm repopulated with hardwood trees. The fields are mowed periodically to maintain them for open fields for bluebirds, tree swallows, and other species.

The New England Forestry Foundation owns a 167 acre preserve in Pomfret. The forest consists of a variety of oaks with pine, hemlock and other hardwoods mixed throughout. Passive recreation is allowed. According to the wishes of the donors, no hunting or trapping (except fox hunting on horseback) is allowed on the property.

The Connecticut Audubon Society (CAS) owns a 700 acre wildlife sanctuary (Bafflin Sanctuary) in Pomfret Center. The Bafflin Sanctuary once made up four separate dairy farms that were bought up after they ceased operating and the land was donated to CAS. Some of the land on this preserve is leased for agricultural purposes.

The State of Connecticut Department of Agriculture holds conservation restrictions on twelve farmland parcels in Pomfret through the Purchase of Development Rights (PDR) Program. The total acres of Pomfret farmland preserved under this program equal 1,178 acres. Several of these farms cross municipal boundaries into adjoining towns.

Mashamoquet Brook State Park is a 900 acre park near the geographic center of the town. The State of Connecticut also manages several scattered parcels of forest land that are part of the Natchaug State Forest.

The Town of Pomfret has been involved with many partners in an aggressive campaign to increase the amount of land protected from development in town. In 2008, the Town of Pomfret approved a $4 million open space funding bond which they have been able to match with other funding sources to purchase land or the development rights of multiple properties.

3.2.2 Wetlands

According to the Pomfret Plan of Conservation and Development, last updated in 2002, approximately 22% of the town of Pomfret is classified as wetlands. In Connecticut, wetlands are determined by soil type. Map 5 *Mashamoquet Brook Wetland Soils* shows wetland areas greater than 3 acres. This map is located in the map appendix.

3.2.3 Forested Areas

University of Connecticut College of Agriculture and Natural Resources, Center for Landuse Education and Research (CLEAR), as part of their Connecticut's Changing Landscape project, used 2006 aerial data and determined that the town of Pomfret was 68% forested.

CLEAR also calculated land cover on a watershed scale. The Mashamoquet Brook watershed is 72.8% forested. Further research indicates that 25% of this forested land is comprised of uninterrupted blocks of forest greater than 500 acres in size. The Wappoquia Brook watershed is calculated to be 51.3% forested. Unlike the Mashamoquet Brook watershed, the forested areas in the Wappoquia Brook watershed are more fragmented. None exceed 250 acres in size. (Source: Connecticut's Changing Landscape, CLEAR website)

3.2.4 Agricultural Lands

Areas with Prime and Statewide important farm soils are shown on Map 6 *Mashamoquet Brook Farmland Soils* in the map Appendix. Town wide, approximately 17% of the land is made up of agricultural fields. Broken down by watershed, 12.9% of the Mashamoquet Brook watershed is in agricultural use, while 27.4% of the Wappoquia Brook watershed is in agricultural use.

CLEAR analysis of changing land use patterns demonstrates a loss of 189 acres of agriculture fields over agricultural soils town wide, with an increase of 138 acres of development on farm soils between 1985 and 2006. This information was not directly available on watershed scale.

3.2.5 Mining

Small sand and gravel mining operations are scattered throughout the project area.

3.2.6 Fisheries

Mashamoquet Brook is stocked annually with trout for recreational anglers. Native brook trout were reported in the most recent fish surveys in town (2004).

3.2.7 Recreation

The 900 acre Mashamoquet Brook State Park is located roughly in the center of Pomfret. The park consists of a day use area with a small engineered swimming area (By Pass Pond), picnic grounds and trails for hiking, horseback riding and mountain biking. By Pass Pond is the only public swimming area in the town. The park also has two campground areas.

The Airline Trail State Park, Connecticut Audubon Society's Bafflin Sanctuary, The Nature Conservancy's Dennis Farm Preserve, multiple Wyndham Land Trust preserves, and the Natchaug State Forest offer residents and visitors opportunities for passive recreation and nature study. Connecticut Audubon Society Center at Pomfret offers many organized hikes.

The Town of Pomfret owns and manages a recreation park with various types of playing fields. They also annually host a corn maze on a portion of this property. This park is located off of Hampton Road (Route 97) in the Abington Brook watershed.

The Pomfret Horse and Trails Association is a group organized to work with landowners to develop a horseback riding trail network in town. Their mission statement can be found on their website http://www.pomfrethorseandtrail.com.

The Town of Pomfret manages a car top boat launch at the Quinebaug River at the Route 101 crossing. This is in the area known as Pomfret Landing.

Active recreation opportunities include Vineyard Valley Golf Course, a 9 hole course located on a former vineyard. The Pomfret Speedway is a 1/8 mile Go Kart track. The oval asphalt track is 1/8 mile long. The Pomfret Rod and Gun club is a skeet and trap shooting facility.

3.2.8 Developed Areas

Pomfret was once made up of several small villages, neighborhoods, or sections:

- Abington Village
- Elliott's Village
- Pomfret
- Pomfret Center
- Pomfret Landing

Abington Village is located near the intersection of Hampton Road (Route 97) and Mashamoquet Road (Route 44). The village is comprised of older homes, the village church, a post office, library and a general store. The Pomfret Town Hall and Town Garage are located near there.

Pomfret Street Historic District is located roughly along Pomfret Street (Route 169), from Bradley Road to Woodstock Road in Pomfret. The district was added to the National Register of Historic Places in 1998. The district includes two private boarding schools. Rectory School, a coeducational junior boarding school for grades 5–9 and day school for grades K–9 (225 students), is located adjacent to Pomfret School, an independent coeducational college preparatory boarding and day school for 350 students in grades 9 through 12 and postgraduates. In addition, the area includes stately old summer homes and mansions.

Pomfret Center is the area of town where the Pomfret Community School is located. The old Town House, built in 1841, was once a meeting house for the community. The Connecticut Audubon Society Bafflin Sanctuary is also located in this part of town.

Elliot's Village and Pomfret Landing are no longer population centers.

3.2.9 Transportation

The predominant form of transportation in Pomfret is the private automobile. There are no interstate highways in Pomfret. The major State roads are two lane roadways including Route 44, Route 97, Route 169 (A National Scenic Byway), Route 101 and Route 244.

The Airline Trail State Park crosses the town diagonally and provides an alternate transportation route for hikers and trail bikes. Efforts to improve the Airline Trail State Park as an improved bike path will depend on the availability of funding.

3.2.10 Political Boundaries

The majority of the Mashamoquet Brook watershed is located in Pomfret, Connecticut. Portions of the brook's watershed extend into Eastford, Woodstock and Brooklyn, Connecticut. Pomfret is in Windham County and is part of Connecticut's 2nd Congressional District.

3.2.10.1 Federal Lands

There are no federal lands within this project area.

3.2.10.2 State Lands

Several non-contiguous parcels that are part of Natchaug State Forest are located in Pomfret. In addition, Mashamoquet Brook State Park is 900 acres, and the Airline Trail State Park crosses the town diagonally.

The State of Connecticut Department of Transportation owns a facility on the north side of Route 101 where they have a highway maintenance garage. They also own property on Searles Road in the White Brook watershed.

3.2.10.3 Tribal Lands

There are no tribal lands within this project area.

3.2.10.4 Local Lands

The Town of Pomfret owns several parcels of developed land:

The Town Hall, Town Highway Garage and Pomfret Recreation Park are all located in the Abington Village area.

Pomfret Community School is located along Mashamoquet Brook in Pomfret Center.

3.2.11 Relevant Authorities

Most of the land in Pomfret is privately owned and management of that land is under the authority of the landowner. Pomfret initiated zoning regulations for the first time in 2003.

Significant tracts of publicly owned land are listed in Table 3 below.

Table 3 Relevant Authorities for Significant Public Land Areas in Pomfret, Connecticut

Land Description	Relevant Authority
Natchaug State Forest	DEEP Environmental Conservation
Mashamoquet Brook State Park	DEEP Environmental Conservation
Airline Trail State Park	DEEP Environmental Conservation
Connecticut DOT Garage	Connecticut Department of Transportation
Pomfret Town Hall 5 Haven Road	Town of Pomfret
Pomfret Highway Garage (12.6 acres) 624 Mashamoquet Road	Town of Pomfret
Pomfret Recreation Field (103 acres) 576 Hampton Road	Town of Pomfret
Pomfret Community School (9.4 acres) 20 Pomfret Street	Town of Pomfret
Vacant land (43 acres) 343 Wrights Crossing Road	Town of Pomfret
Vacant land (178 acres) 434 Killing Road	Town of Pomfret
Vacant land (78 acres) 362 Orchard Hill Road	Town of Pomfret

3.2.12 Future Land Use Considerations

The Town of Pomfret is divided into the following Zoning Districts:

- Rural Residential District (RR)
- Pomfret Street Residential District (PSR)
- Village District (V)

- Village District II (V-II)
- Business Village District (BV)
- Commercial Village District (CV)
- Commercial Business District (CB)

Map 7 *Pomfret, Connecticut Zoning Map*, prepared by Planner James Rabbit and Betty Morin for the Pomfret Planning and Zoning Commission is located in the Map Appendix. This map demonstrates the locations of the various Pomfret, Connecticut Zoning Districts based on parcel outlines.

The Town of Pomfret, working with multiple partners, is undertaking an aggressive campaign to protect large tracts of undeveloped land from future development. The town approved the purchase of an additional 700+ acres of land, either through a direct purchase or by purchasing the development rights in early 2010 and recently closed on the purchase of a conservation easement on a portion of the Townsend property in northwest Pomfret. Pomfret and its conservation partners work cooperatively and effectively to preserve contiguous blocks of open space rather than create islands of preserved land scattered thorough town. The Pomfret Plan of Conservation and Development (PoCD) supports purchasing land not suitable for development. In addition, the PoCD also advises limited development over a stratified drift aquifer along the Quinebaug River to maintain the recharge potential of the land above it.

3.3 Demographic Characteristics

3.3.1 Population

The 2000 Census documented the population of Pomfret, Connecticut to be 3,398 people. In 2010, the population increased 11.8% to 4,247 people.

3.3.2 Economics

The Connecticut Economic Resource Center, Inc (CERC) in their 2011 Town Profile of Pomfret Connecticut lists the top employers in Pomfret as Fiberoptic Technologies, Loos and Company, Inc, Pomfret Preparatory School and The Pomfret Board of Education as the top employers in 2006. Steak-UMM Company, LLC was also on the list of top employers in 2006 but has since closed their Pomfret facility. The makeup of the Pomfret Business profile in 2005 is indicated in Figure 11.

Economics

Business Profile (2005) *% of Total*

Sector	*Establishments*	*Employment*
Agriculture	7.4%	2.1%
Const. and Mining	12.3%	6.8%
Manufacturing	8.4%	42.0%
Trans. and Utilities	3.9%	1.6%
Trade	18.7%	12.8%
Finance, Ins. and Real Estate	8.4%	3.7%
Services	38.9%	29.0%
Government	2.0%	2.0%

Figure 11 Pomfret Economic Profile 2005

3.3.3 Languages

The predominant language spoken in Pomfret is English.

4 Watershed Conditions

4.1 Water Quality Standards

The State of Connecticut Department of Energy and Environmental Protection is responsible for establishing water quality standards for all of Connecticut. The Connecticut Water Quality Standards and Classifications were recently updated and adopted on February 25, 2011.

4.1.1 Designated and Desired Uses

The water quality classification of Mashamoquet Brook and all of its tributaries is Class A, and is described as a potential surface water supply watershed area. Fishable and swimmable criteria also apply.

4.1.2 Numeric and Narrative Criteria

The Connecticut Water Quality Standards and Classifications establishe the following criteria for *E. coli* bacteria in the State's surface waters to protect persons wishing to use the waters for recreational purposes such as swimming, canoeing, kayaking, wading, fishing, boating, water skiing, aesthetic enjoyment, and similar uses:

- Not to exceed 235 colonies/100ml (for official bathing areas) or 576/100ml (all other water contact recreation) for single samples;
- Not to exceed a geometric mean of 126 colonies/100ml for any group of samples.

The CT DEEP staff conducts macroinvertebrate sampling as part of their routine ambient monitoring program. The results are expressed as a multi metric index, or MMI. This index was built specific to Connecticut macroinvertebrate data. It replaces the EPA RBP 3 assessment. MMI is based on a scale of 0-100, with a score of 50 determining the impairment line. There is a +/ -5 point around the line due to natural variability. Sites with a score of greater than 55 clearly meet the goal for aquatic life support and those with less than 45 clearly do not. A score in the 45-55 range requires additional scrutiny of the species present, the habitat at the site, the flow the day of collection, and many other potential issues that could have influenced the data. Mashamoquet Brook and Wappoquia Brook meet the goals for aquatic life support as interpreted through this method.

The Rapid Bioassessment for Volunteers (RBV) method of water quality monitoring is a very useful tool for evaluating the aquatic life support function of a wadable stream. This method employs indicator species as a measure of water quality. The method utilizes a variety of commonly found species. Certain types of aquatic macroinvertebrates, such as specific types of mayfly and stonefly larvae, are very pollution sensitive. Their absence from a waterbody may demonstrate serious water quality issues including thermal pollution, high turbidity, pH issues and low dissolved oxygen among other problems. Conversely, a good diversity of pollution sensitive organisms in the samples indicates the water quality is sufficient for fish and other aquatic life. Other than during a brief breeding season, these aquatic macroinvertebrates are in the water 24 hours a day, 7 days a week and subjected to long term exposure of ambient conditions. The common species utilized by this method are large enough to catch in a kick net, can be seen unaided by the human eye and have characteristics easy enough to tell apart by a minimally trained novice. Qualified CT DEEP staff positively identifies the insects provided in each preserved voucher sample. The voucher sample is the actual data. The "most wanted" category consists of macroinvertebrates found exclusively in streams characterized by excellent water quality. The "moderately wanted" category consists of those that can be found in streams with at minimum good water quality. These species are commonly found in stream riffles where the bottom substrate is predominantly cobbles and gravel. The "least wanted" category consists of those that can be found in all levels of water from excellent to very poor. These 3 qualitative categories are intended to characterize water quality and are not intended to imply that a specific group is harmful or result in nuisance conditions.

Data collected as part of the Connecticut Audubon Society Citizen Science Program demonstrates a healthy diversity of "most wanted" macroinvertebrates in the Mashamoquet Brook and Wappoquia Brook watersheds. More information on the watershed condition can be found in a separate report *08-18 Task 1C Assess the Watershed of Mashamoquet Brook Physical/Visual Surveys and Rapid Bioassessments* available on the Eastern Connecticut Conservation District website www.ConserveCT.org/Eastern.

4.1.3 Anti-degradation Policies

The swimming area at By Pass Pond in Mashamoquet Brook State Park is gravity fed by a diversion off of Mashamoquet Brook. If heavy rain is forecasted, it is the policy of the park management to place a board across the diversion to block the flow of water from the brook. This management practice was developed after the previously mentioned study conducted by TRC in the late 1970s demonstrated a direct link between stormwater runoff and high bacteria counts in the brook and swimming pond. When the stream flow resumes a normal flow, the board is removed and the flow to the pond is restored. With this practice followed, the data demonstrates that there have been fewer instances of bacteria exceedances in the swimming pond than in the brook, but it is not a perfect science. While there have been occasional single sample exceedances of *E. coli* concentrations in water samples collected from the pond, the geomean of the pond data has not exceeded the threshold of 126 cfu/100 ml while the geomean of the brook samples has done so for 8 of the past 9 years.

The Town of Pomfret Plan of Conservation and Development, prepared by the Planning Commission and last updated in 2002, recommends town land use officials use a collection of Natural Resource Inventory (NRI) maps based on Geographic Information System data as part of their decision making process. The NRI maps were prepared by the Pomfret Conservation Commission as guidance for determining the location of future development in Pomfret and in evaluating specific building projects. The Planning Commission endorsed the following objectives and policies:

- Preserve environmentally sensitive natural resources by regulating encroachment by development on these resources permitted by statute.
- Continue to eliminate lands having no potential for subsurface disposal systems, including wetlands, excessive slopes, and shallow depth to bedrock, as defined in the Connecticut State Health Code. Provision should be made to allow for use of these lands for recreation, open space, and environmental protection by using these areas as buffers, habitat corridors, wetland enhancement and/or mitigation, and other similar uses that are in the interest of the community.
- Permanently set aside lands having no development potential either through acquisition by the Town or a land trust, or through the use of conservation restrictions within the meaning of Section 47-42A of the Connecticut General Statutes.
- Avoid any development on ridge lines unless such development would reduce impact on wetlands and water quality or balance the effect of development by mitigation.
- Preserve the quality of surface water supplies in both Pomfret and surrounding communities by limiting development in the critical water supply watersheds.
- Support the development of an awareness program for existing and potential sources of pollution in water supply watersheds and take corrective action where necessary.

- Provide educational and other assistance to homeowners regarding installation and care of septic systems, wells, underground petroleum storage tanks, and other conservation issues.
- Establish and enforce runoff and sediment and erosion control measures and standards for all new construction. Construction includes any excavation such as driveways, ponds, etc., where, because of the local slope and site topography, such measures are warranted and should not be limited to the construction of structures only. The commission, agency, and/or department with jurisdiction for permitting and enforcing should be granted power to enforce sedimentation and erosion control procedures and should be held responsible for enforcing the control measures that are under their jurisdiction.

The Town of Pomfret adopted Zoning Regulations in February 2003. The Zoning Regulations require that proposed development project contain certain information on the site plan used for review by the Planning and Zoning Commission. This information includes but is not limited to:

- Identification of surface and groundwater resources on and around the site, including any public or private domestic users of such waters; the depth to groundwater and description of adjacent soils, and an evaluation of the impact of the proposal on existing and potential surface and ground drinking water supplies. The Commission may require additional information necessary to ensure protection of water resources, and may require that the report be prepared by a hydrogeologist or other qualified professional.
- Identification of any chemicals or potential contaminants to be used, stored or produced on site or discharged on or off the site, and a detailed description of methods and procedures by which any chemicals or potential contaminants on site will be stored, used, applied, discharged, and disposed .

Mashamoquet Brook has been designated Class A by the CT DEEP. The Connecticut Water Quality Standards were updated in January 2011. The Connecticut Water Quality Standards for Class A surface water impose some limits to the types of wastewater discharges allowable. Prior to January 2011, Connecticut regulations did not permit treated domestic wastewater to be discharged into a Class A watershed. The updated regulations permit certain treated domestic wastewater discharges if the discharge is deemed necessary to abate a groundwater or surface water pollution issue, and the treatment system is for areas developed prior to February 28, 2011.

4.2 Available Monitoring/Resource Data

4.2.1 Water Quality Data

Two previous reports associated with the creation of this Plan have previously been submitted to the CT DEEP outlining available water quality data:

Project 08-18 *Task 1 C Assess the Watershed of Mashamoquet Brook Using Physical/Visual Surveys and Rapid Bioassessment*. Key points of this report include:

- Summary of Rapid Bioassessment for Volunteers program data from 2001 – 09;
- Summary of a Mashamoquet Brook Stream Walk (visual assessment) completed between 2004 – 06 by Connecticut Audubon Society Citizen Science Volunteers;
- Summary of CT DEEP Bacterial data at Mashamoquet Brook State Park 2002 – 09;
- Summary of CT DEEP ambient monitoring program macroinvertebrate data 1999 – 2004.

Project 08-18 *Task 1 B Mashamoquet Brook, Pomfret, CT Determine Pollutant and Determine Possible Sources*. This report provided a summary of the water quality data collected in 2010 both by the CT DEEP beach monitoring program at Mashamoquet Brook State Park as well as an interpretation of data collected by ECCD staff in cooperation with The Last Green Valley Water Quality Monitoring Program during the summer of 2010. The data was collected under an approved QAPP (RFA 10147).

Copies of both of these reports are available for download on the Eastern Connecticut Conservation District website at www.ConserveCT.org/eastern.

4.2.1.2 Impaired Uses and/or Water Quality Threats

Mashamoquet Brook has been evaluated for *E. coli* concentration and for aquatic habitat support. The brook does not meet the standards for recreational contact due to elevated concentrations of *E. coli* bacteria. The impaired segment (CT3710-00_02) runs from the Taft Pond outlet dam (upstream of Taft Pond Road crossing), downstream to the confluence with Wolf Den Brook (just upstream of Rt. 101 crossing). The only data used by the CT DEEP to support this impairment listing was collected at the diversion to By Pass Pond and in two locations within By Pass Pond at Mashamoquet Brook State Park.

Additional monitoring conducted during the summer of 2010 found additional water quality issues related to exceedances of the Connecticut Water Quality Standards for *E. coli* downstream of this segment in Mashamoquet Brook CT3710-00_01 from the Quinebaug River to Wolf Den Brook. Monitoring data upstream of Mashamoquet Brook State Park indicates that the Abington Brook (CT 3710-11), an unnamed brook (CT 3710-12) that converges with Mashamoquet Brook State Park across Route 44 from the park main entrance, and potentially land drainage along Mashamoquet Brook downstream of Taft Pond Road are the sources of bacterial exceedances in Mashamoquet Brook at Mashamoquet Brook State Park. Bacterial counts higher than the acceptable level were measured in Abington Brook, the unnamed brook and at a Mashamoquet Brook monitoring station at Covell Road. Water samples collected at the Mashamoquet/Taft Pond Road/ Brook crossing met the standards for recreational contact.

4.2.2 Flow Data

There is currently no flow data available in the Mashamoquet Brook watershed. A flow gauge had been installed in Mashamoquet Brook at Mashamoquet Brook State Park as an outcome of the TRC water quality study. Park staff recorded daily flow rates and rainfall totals using an onsite rain gauge at the park manager's office, and compared the data to bacterial data to develop a correlation of flow rates to bacteria concentrations in Mashamoquet Brook. The staff gauge is no longer in place.

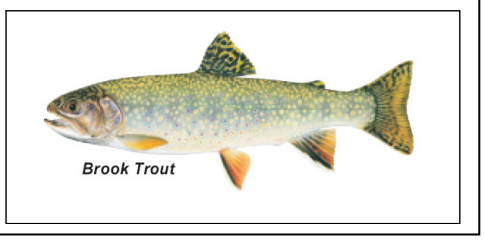
4.2.3 Biological Data

4.2.3.1 Benthic Macroinvertebrates

Mashamoquet Brook is meeting the goals for the State of Connecticut for aquatic life support, with a healthy diversity of macroinvertebrates. Please refer to Project 08-18 Task 1 C *Assess the Watershed of Mashamoquet Brook Using Physical/Visual Surveys and Rapid Bioassessment* Report.

4.2.3.2 Fish

Figure 12 Brook Trout



Brook trout, *Salvelinus fontinalis*, are the only native trout species in Connecticut. They can survive only in the coldest and cleanest water. In that respect, they are a symbol of the health of a watershed, but not as easy to catch as macroinvertebrates.

In general, brook trout populations are declining in Connecticut as the landscape becomes more developed.

The CT DEEP Inland Fisheries Division samples the streams in Connecticut to assess the variety of fish species present. Table 4 is a summary of streams in the Mashamoquet Brook watershed where native brook trout were located.

Table 4 CT DEEP Data for Confirmed Native Brook Trout Areas in Pomfret, CT

Stream Name	Segment Code	Year sampling took place
Wappaquia Brook	37090020R1	1994
White Brook	37191830R1	1994
Cemetery Brook	37100030R1	1994
Sap Tree Run	3710131	1994
Wappaquia Brook	37090020R1	2003
Mashamoquet Brook	371000030R1	2004
Mashamoquet Brook	371000030R5	2004
Mashamoquet Brook	371000030R8	2004

When Mashamoquet Brook was sampled for fish in 1994, no native brook trout were found in the samples. Wappaquia Brook, White Brook, Cemetery Brook and Sap Tree Run are all tributaries of Mashamoquet Brook and native brook trout were found in the fish survey samples in those streams in 1994. Native brook trout were found in the Mashamoquet Brook fish samples collected in 2004. The Mashamoquet Brook tributaries were not samples in 2004. Due to a lack of recent data, current fish populations are unknown.

4.2.3.3 Aquatic Nuisance Species

By Pass Pond is drained annually at the conclusion of the summer bathing season and is not refilled until late spring prior to the beginning of the summer bathing season. This practice does not encourage the establishment of any aquatic vegetation in By Pass Pond. In other waterbodies within the project area, aquatic nuisance species were not evaluated as part of this watershed based planning process.

4.2.3.4 Migratory Patterns

Not applicable to this project. Dams across the Quinebaug River downstream of the Mashamoquet Brook convergence are a barrier to diadromous fish migration at this time.

4.2.4 Stream Survey Data

Mashamoquet Brook is assessed by the CT DEEP ambient monitoring program staff for aquatic life support on a 5 year cycle. Over the last 3 cycles, the brook met the standards for aquatic life support based on macroinvertebrate studies. Additional data collected as part of the Rapid Bioassessment for Volunteers program coordinated by the Connecticut Audubon Society Center at Pomfret as part of their Citizen Science program supports this information.

For information on Stream Survey data for bacterial concentrations, please refer to *Project 08-18 Task 1 B Mashamoquet Brook, Pomfret, CT Determine Pollutant and Determine Possible Sources* Report.

5 Pollutant Source Assessment

5.1 Nonpoint Sources

Nonpoint Sources of water pollution originate from many diffuse locations rather a more easily identified piped discharge. As a Class A watershed, point source discharges to surface waters have not permitted in this watershed. Therefore, the sources of contamination are all from non-point sources or illicit discharges to the surface water.

5.1.1 Agriculture

In 1975, the Pomfret Conservation Commission published a report entitled "Mashamoquet Brook; Its Past – Into Its Future". The report is a very interesting 28 page historical account of life in Pomfret, Connecticut. At the time the booklet was published, the human population was estimated to be 2500. The same report estimated the dairy cow population to be 3400 head. In addition to dairy cows, the report estimated the horse population of Pomfret to be 34, and beef cows numbered around 30. They also reported 20 sheep and 25 hogs.

Regionally there has been a dramatic decline in the dairy industry. Pomfret currently has only two active dairy farms. Only one of those farms is upstream of the sampling location at Mashamoquet Brook State Park. Despite the decline in the dairy industry in Pomfret, Connecticut, dairy farms from outside of Pomfret continue to grow crops on agricultural land in Pomfret and truck manure in a liquefied form into town to fertilize the fields they lease. A significant amount of Pomfret farmland is currently leased to Fairvue Farms, LLC of Woodstock, Connecticut. So, even though there are fewer cows locally, there is not a proportional decrease in manure spreading. There are multiple opportunities to work with these agricultural producers to reduce their non-point source pollutant impacts on water quality, both at the animal housing areas and in their crop growing areas.

5.1.1.1 Livestock

Multiple small beef cattle farms are scattered throughout the watershed. An informal windshield survey indicated that Best Management Practices for keeping livestock out of riparian areas and the water were not being implemented.

While there are no firm number of horses in the area, horses were observed in many locations thorough out Pomfret and the Woodstock portion of the Mashamoquet Brook watershed. Horseback riding is a popular activity in Pomfret and zoning regulations allow for landowners to keep horses on their property if the property is 3 acres or larger. Woodstock does not have any minimum acreage requirements for horses or livestock.

Figure 14 Uncovered horse manure pile upslope of a waterbody.

Figure 13 Cows wading in a pond in Pomfret, CT

On average, a 1,000 pound horse can generate 8-10 tons of manure a year, accumulating at the rate of approximately 0.75 cubic feet per day. This equates to roughly 12-15 cubic yards of manure annually. Daily waste production per horse may consist of 30 lbs of feces plus 20 lbs of urine. Manure contains plant nutrients, soluble and insoluble organic compounds, and bacteria. An informal survey conducted at a meeting with the Pomfret Horse and Trails Association indicated that horse owners are interested in guidance on manure management practices. None reported covering their manure pile as a standard practice.
Agricultural livestock grazing in pastures deposit manure containing *E. coli* bacteria onto land surfaces. This material accumulates during periods of dry weather and is available for wash off and transport to surface waters during storm events. The number of animals in pasture and the time spent grazing are important factors in determining the loading contribution.

5.1.1.2 Cropland

Hay, feed corn and alfalfa are the dominant crops grown in Pomfret. Upstream of Mashamoquet Brook State Park in the Abington Brook watershed, a small dairy operator spreads manure solids on their crop land as a fertilizer. Additional crop land in the watershed is leased by out of town dairy operators, who truck manure in a liquefied form for soil enrichment. Processed agricultural manure from confined feeding operations applied to land surfaces can provide a significant source of E. coli bacteria loading.

Data available on the CLEAR website on Agricultural Fields and Soils, as part of their Connecticut's Changing Landscape project estimates a total of 3324 acres of land in agricultural use on agricultural soils in the town of Pomfret. An additional 1,100 acres of land is in agricultural use on non-agricultural soils.

Installation of tile drain systems was a common practice to facilitate drainage on farm fields. Many old systems were installed by the landowner and there may not be records remaining to show the location of old systems. These systems may help convey bacteria laden runoff into local streams and wetland systems.

Wildlife

Pomfret is located in DEEP Wildlife Zone 5. An aerial estimate completed in 2006/7 by CT DEEP Wildlife staff conservatively estimated the deer population at 28.7 deer/mi^2. There are no other estimates for wildlife populations in the area.

Canada goose populations vary seasonally. Large flocks evident in spring and fall are migratory and attracted to area farm fields to feed. The population decreases with spring migration. In summer, resident geese with goslings have been documented in scattered locations throughout the watershed, but data collected by DEEP seasonal staff indicates that no resident goose population is present at Mashamoquet Brook State Park. Pond management practices do not encourage Canada geese to nest in the area because the pond is drained during the time the geese are choosing their nesting locations.

5.1.3 Septic Systems

With the exception of the former Steak-UMMs facility located on Searles Road, all other Pomfret homes and businesses rely on subsurface wastewater disposal systems.

In a phone conversation with Terry Chambers of KWP Associates, the Pomfret School, located in the Pomfret Street Historic District, currently operates a mini-wastewater treatment facility prior to discharging their wastewater to a leaching field. The Rectory School, also located on Pomfret Hill, is currently operating a "glorified" septic system. Both schools, located in the Wappoquia Brook watershed, are in the process of renewing their groundwater discharge permits. New standards developed by the CT DEEP require lower amounts of nitrogen in groundwater discharges which the two schools will not be able to comply with using their current wastewater disposal methods. KWP has been contracted to design an extension of the existing forced main sewer line from Searles Road to Pomfret Hill. Loos and Company will also connect to this sewer line extension when it is installed. USDA Rural Development Funds have been awarded to assist with the cost of this project.

The Pomfret Plan of Conservation and Development updated in 2002 acknowledges there are challenges related to soil types for placement of subsurface wastewater disposal systems. In addition to the 22% of the land area in town that are wetlands, the Plan of Conservation and Development lists other soil types in Pomfret that are restrictive soils for septic tank absorption fields.

The soils with septic field suitability limitations represent approximately 64.5% of the town's land area. A map displaying *Mashamoquet Brook Soil Suitability for Onsite Subsurface Waste Disposa*l (Map 8) is located in the map appendix. The soil information was obtained from the Soil Survey Geographic (SSURGO) database for the State of Connecticut published by the USDA Natural Resources Conservation Service.

Table 5 Soils with Septic Field Limitations

Soil Type	Restrictive Factor for Septic Suitability	# Acres
Charlton Hollis	slope	3,553
Hinckley	poor filter	1,062
Paxton	percs slowly	1,888
Sutton	wetness	127
Woodbridge	percs slowly, wetness	10,134
		16,764 Total Acres

The Northeast District Department of Health, the local health department authority, provided data on septic tank repair permits issued between 2006 and 2011. This information was plotted to a map. Refer to Map 9 *Septic Tank Repair Issued Permits 2006-11* in the map appendix. A cluster of repair permits was noted in the Abington Brook watershed.
In general, soils in significant areas of Pomfret are rated low or very low for suitability for subsurface wastewater disposal systems. Due to the low potential of the soils in Pomfret to properly facilitate on-site wastewater disposal systems, runoff from failing septic systems associated with residential housing located close to stream banks may be a source of bacterial contamination

There is a high potential for unreported septic tank issues due to many factors, including the high cost associated with conducting repairs or installation of new subsurface waste disposal systems. Because septic systems discharge underground, it is not always obvious when they fail. In general, septic systems fail in three ways:

- They back up into the house;
- Septic tank effluent pools above the drainfield;
- They pollute groundwater and eventually surface water.

It is the first type of failure that consistently gets homeowners to take action, sometimes the second, but usually homeowners are unaware of (or unconcerned about) the third type of failure and this type can go uncorrected for years or decades. Septic systems generally have an estimated life span of 30 years. Cesspools without leach fields, if they were installed legally, are generally well over 30 years old. (Source: email communication with Craig Mains, National Environmental Services Center, Morgantown, WV).

In 1998, the Connecticut Department of Public Health instituted a *Design Manual for Subsurface Sewage Disposal Systems for Households and Small Commercial Buildings*. Many homes in Pomfret predate this manual.

The life expectancy of a septic tank is influenced by many different factors, including but not limited to the frequency of routine maintenance, the ground water level where the septic tank and leaching field are located, and avoidance of introducing improper items to the system. More frequent pumping and installation of low flow plumbing fixtures will reduce the pressure on systems near failure.

CLEAR Changing Land Use data indicates estimates that 138 acres of agricultural land in Pomfret has been developed in recent decades. It may be possible that remnants of agricultural underground wastewater disposal system leaching fields, may convey septic leachate to area streams and wetland systems.

5.1.4 Silviculture

Hull Forest Products is located in Pomfret. This business is a well-respected for their forest management work in the area.

In 2010 a fine was issued to an unlicensed logger by the Connecticut State Attorney General for unpermitted logging activity on a 30 acre property located at 585 Mashamoquet Road in Pomfret. This parcel of land drains towards Abington Brook. Jennifer Hockl of the DEEP Forestry Division reported that no unusual water runoff that would contribute to the bacteria

loading of Abington Brook was observed during several site walks she participated on the property, including June 2010, August 2010 and December 2010.

5.1.5 Urban/Suburban Runoff

Developed areas of Pomfret represent less than 10% of the town, a number generally accepted as a threshold between impacted and non-impacted water quality. However the location of development in the watershed is an important factor. As part of the CLEAR's Connecticut's Changing Landscape project, an analysis was made to determine the amount of development in riparian zones of 100 foot and 300 foot widths. The data indicated that there were 1,880 acres of developed land in town in 2006. Of these 1,880 acres, 133 of the developed acres were located within the 100 foot stream buffer and 452 acres were located within the 300 foot stream buffer. The numbers also reflect that there has been less than a 1% increase in development in the riparian areas between 1985 and 2006.

Figure 15 Murdock Road Storm Drain Outlet

A common past management practice for stormwater runoff was to collect it in stormwater catch basins and direct it away from roadways to prevent street flooding. Newer stormwater management practices as outlined in the 2004 Connecticut Stormwater Quality Manual encourage better site planning and design to address both stormwater quantity and quality from developed areas, with a focus on spreading the stormwater out, slowing it down and soaking it in to the ground which both will decrease the quantity of runoff while at the same time, improving surface water quality.

An example of "collect it and get rid of it" stormwater design in Pomfret is a series of catch basins along Murdock Road that collect stormwater and discharge it at the top of a steep slope that drains towards Wappoquia Brook. Deep erosion gullies in the hillside below the discharge areas have developed as a result of this practice.

The Pomfret Town Hall driveway to the rear parking area is designed with a stormwater leakoff at the top of slope that drains towards Abington Brook. The site lacks any stormwater retention areas. An access trail that connects with the Airline Trail State Park originates there. The area has been seeded, but minor erosion rills were evident during an April 25, 2011 site visit.

Figure 16 Pomfret Town Hall Drainage

5.1.6 Streambank Erosion

Mashamoquet Brook and Wappoquia Brook converge on property owned and managed by the Connecticut Audubon Society. Portions of their Bafflin Sanctuary are managed as grassland bird nesting habitat with annual mowing to prevent forest succession. Mashamoquet Brook between Route 169 and the convergence with Wappoquia Brook meanders through a floodplain area on

the Bafflin Sanctuary. This area was submerged during the March 2010 flood event. Stream bank erosion was observed along this stretch of the brook.

A portion of the western bank along Wappoquia Brook between Day Road and the Day Brook convergence, also on the Bafflin Sanctuary, has collapsed. This may be related to upstream development that may be increasing water flow during storm events.

Figure 17 Lack of riparian vegetation along Mashamoquet Brook DS Wolf Den Drive.

Figure 18 2010 Aerial view of Wolf Den Drive corn fields showing bank erosion.

An additional significant area lacking riparian cover and a stream bank collapse was noted adjacent to a farm fields. Mashamoquet Brook between Wolf Den Drive and property owned by Loos and Company, Inc was reported to have limited riparian cover in a 2004 Stream Walk report. A review of the 2010 aerial images on the Connecticut EcoMap website demonstrated a significant area of bank erosion adjacent to this agricultural area.

5.1.7 Atmospheric Deposition

Atmospheric deposition is not a significant source of bacteria.

5.2 Point Sources

5.2.1 NPDES Permits

Fiberoptics Technologies, located at 28 Quasset Road has been issued a NPDES Permit related to a groundwater contamination remediation system discharge within the Wappoquia Brook watershed. This permit is not related to *E. coli* and the discharge does not impact the water quality at Mashamoquet Brook State Park.

The facility formerly used by Steak-UMM Company LLC, had been issued a NPDES permit, but the facility is no longer in operation. Chef Fresh Foods, a producer of airline dinners, was in operation at that site for a short time after the Steak-UMM operation closed, but Chef Fresh Foods ceased operations as of October 1, 2007. Their permit was revoked by CT DEEP on 10/15/2007. The waste system at this facility is connected to the Killingly Wastewater Treatment Plant, but due to the high amounts of fats, oils and grease (FOG) from the food processing operation, a pre-treatment FOG separator system was installed prior to discharging to the sewer line. Overflow from the lagoons is directed to the sewer. The owners of the property submitted a letter to CT DEEP stating their plans to mothball the waste water treatment system

by gradually lowering the water level in the on-site lagoons to a sufficiently low level to accommodate any influx of water without allowing overflow. Rita Langan of the CT DEEP reported that as of December 10, 2010, there were no new operators at the site.

5.2.1.1 Phase I and II Stormwater Permits

The towns of Pomfret, Eastford, Woodstock and Brooklyn are not included in the Phase I and II Stormwater Permit program.

5.2.1.2 CAFO Permits

There are no concentrated animal feeding operations in this watershed.

5.3 Hazardous Waste

5.3.1 CERCLA Sites

There are no reported CERCLA sites in this watershed.

5.3.2 Resource Conservation and Recovery Act (RCRA) Sites

Loos and Company

The Loos & Co., Inc. (Loos) property is located at 16B Mashamoquet Road (Route 101) in the town of Pomfret, Windham County, Connecticut. The 27-acre property is currently owned by Loos & Co., Inc, and consists of six buildings, a lawn, and three leachfields. One of the buildings is occupied by a commercial bank. The remainder of the property consists of a parking lot. The property is bordered to the south by a dirt road and wooded area; to the east by a stone wall; to the west by Wolf Den Brook and farmland; and to the north by Mashamoquet Road.

According to a SAND fact sheet last updated on 29 June 2001, the last known action at the Loos property was the SIP completed in 1996. As of March 19, 1996, the U.S. Environmental Protection Agency (EPA) decided that further site assessment activities under the provisions of CERCLA are necessary for the Loos property. According to available sources, the property is an active site under the CT DEEP. Loos has agreed to join the CT DEEP volunteer cleanup program.

Connecticut DOT Searles Road Disposal Facility #33

The Pomfret DOT Garage property is located along Pomfret Landing Road in Brooklyn, Windham County, Connecticut. The 4.5-acre property is occupied by a vacant lot used by the Connecticut Department of Transportation (CT DOT) for disposal of road sweepings and brush. The property is bordered to the north by a wooded area; to the south by a wooded area, Pomfret Road, and a residential property; to the east by a wooded area; and to the west by a wooded area, an unnamed stream, two small ponds, and a residential property. The property was used as a sand and gravel bank prior to acquisition by CT DOT in 1937. From 1937 to the present, CT DOT has disposed of scrap concrete, metal, tree stumps, road sweepings, and brush in a disposal area 500 feet (ft) long and 250 ft wide and 25 ft high oriented in a north-south direction on the property. In 1977, several CT DOT employees stated that an unknown quantity of yellow marking paint was released on the property when several drums were ruptured by a bulldozer during on-site activities to increase the size of the disposal area. Stormwater runoff from the property is estimated to flow towards an unnamed stream located approximately 25 ft west of the filled area. Additional surface water bodies located along the 15-mile downstream pathway include an unnamed pond, White Brook, Mashamoquet Brook, and Quinebaug River. Analytical results of

surface water and sediment samples collected by Hart Associates in 1986 did not indicate the presence of contaminants. Based on available data, no impacts to sensitive environments located along the downstream pathway are known or suspected.

5.3.3 Brownfields

No brownfields in this watershed were reported on the CT DEEP Brownfield Inventory as updated November 30, 2004.

5.3.4 Underground Storage Tanks

The presence or absence of underground storage tanks would not affect bacterial contamination of Mashamoquet Brook.

5.4 Other Potential Pollutant Sources

- Pet waste – Mashamoquet Brook State Park, with its network of hiking trails, is a popular location for dog walking in the day use area of the park. Dogs are prohibited from the beach and camp areas. There are currently no signs requesting park visitors to clean up their pet waste, or pet waste disposal bags available to encourage this behavior. During repeated visits to Mashamoquet Brook State Park during the summer of 2010, pet waste was regularly seen near the brook.
- There are a number of picnic table and grilling areas located along Mashamoquet Brook. As a management practice, dumpsters are located away from the brook to discourage trash accumulations that may attract wildlife to the area. Daily clean-up of the picnic area is recommended so as not to attract wildlife to the area to scavenge for food scraps.
- Japanese barberry (*Berberis thunbergii)* was found in the forest understory on the slope uphill of the water diversion to By Pass Pond. Japanese Barberry is listed as a Connecticut Invasive Plant. Japanese barberry infestations have been linked to higher non-native earthworm biomass and increased activity of some earthworm species has been linked to increased phosphorus leaching. Therefore, removal of Japanese barberry could provide a mechanism for reducing nitrogen and phosphorus loading and a decrease of soil erosion on the slope draining towards Mashamoquet Brook.
- A property locally known as the Abington Mall, located on Mashamoquet Road west of the Hampton Road intersection in the Abington area of Pomfret, is a 0.81 acre parcel that once housed 3 structures used for various purposes, including a restaurant. The Town of Pomfret purchased this property in 2010. The buildings were razed but the on-site waste disposal systems are still present on the property. A potential future use of this property includes the possibility of converting it into a commuter lot. Future plans to repurpose this property should include a plan to decommission the former on-site wastewater disposal system.
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6 Linkage of Pollutant Loads to Water Quality

6.1 Estimation of Pollutant Loads

The CT DEEP, as part of their routine annual bathing beach monitoring program, has been analyzing water samples collected at Mashamoquet Brook State Park for *E. coli* content since 2002. Prior to 2002, a different bacterial standard was utilized. These water samples are obtained from two locations in By Pass Pond and an additional sample is collected from Mashamoquet Brook at the water diversion inlet. The data indicates that the management

technique employed by park staff to block the diversion if heavy stormwater runoff is expected appears to reduce the number of bacterial exceedances in the pond compared to samples collected from the brook at the diversion. This data also indicates that Mashamoquet Brook at the diversion dam has been failing water quality standards for recreational contact both due to single sample exceedances and a failure to meet the geomean standard of the annual sample set. The pond samples occasionally fail the single exceedance threshold, but the geomean of the sample set has met Connecticut Water Quality Standards for bathing areas.

6.1.1 Existing Conditions and Pollutant Load Estimates

ECCD staff, with assistance of volunteers associated with The Last Green Valley Water Quality Monitoring Program, collected water samples throughout the Mashamoquet Brook and Wappoquia Brook watersheds between June 3 and September 15, 2010. This data collection was conducted following an approved Quality Assurance Project Plan. In addition to the ECCD monitoring project, the DEEP beach bathing program also collected water samples for bacterial analysis at Mashamoquet Brook State Park during the 2010 summer bathing season. The data summary, in the form of an excel spreadsheet, was submitted to the CT DEEP on January 25, 2011. This data can be applied to the pending statewide bacteria Total Maximum Daily Load (TMDL) plan.

The 2010 water quality monitoring results indicate that the sources of bacteria loading upstream of Mashamoquet Brook State Park originate in the Abington Brook watershed, the watershed associated with an unnamed brook that flows into Mashamoquet Brook across Route 44 from the main Mashamoquet Brook State Park entrance and land drainage along Mashamoquet Brook downstream of Taft Pond Road.

Addition brooks where the bacterial load exceeded the CT DEEP criteria for recreational contact in the 2010 study include:

- Mashamoquet Brook CT 3710-01 from the Quinebaug River to Wolf Den Brook
- White Brook approximately 200 feet upstream of the convergence with Mashamoquet Brook
- Wappoquia Brook
- Day Brook
- Sap Tree Run Brook

6.1.2 Future Conditions and Pollutant Load Estimates

The human population of Pomfret increased 12% from 2000 -2010 to a population of 4247 according to the recent US Census data. Between 1985 and 2006, the developed land areas of Pomfret increased by 25%. Amount of land in agriculture production decreased by 5.3 %.

Unless land management practices associated with agricultural production, including livestock areas, change and maintenance of and upgrades to existing on-site wastewater disposal systems are improved, the future water quality issues will remain unchanged. If an aggressive effort is made to improve water quality conditions, the water quality standards for recreational contact in Mashamoquet Brook can be achieved.

6.2 Identification of Critical Areas

Critical areas for reducing the *E. coli* concentrations in the waters upstream of Mashamoquet Brook State Park have not changed since the TRC report was prepared in 1979. These areas

include the Abington Brook watershed, the watershed of the unnamed brook that flows into Mashamoquet Brook across Route 44 from the park entrance and land along Mashamoquet Brook between the Taft Pond Road crossing and the park. Critical areas for additional streams where water quality issues were revealed as a result of the water quality monitoring during the summer of 2010 are not a major focus of this Watershed Based Plan. Further monitoring to bracket those contamination sources will be necessary. General recommendations for those areas of concern will be provided.

7 Watershed Goals and Objectives

7.1 Management Objectives

The management objectives of the Mashamoquet Brook Abbreviated Watershed Based Plan is for Mashamoquet Brook and its tributary streams to meet the State of Connecticut Water Quality Standards for recreational contact and to prevent future beach closures at Mashamoquet Brook State Park. This plan contains a core list of water quality improvement opportunities. The list includes reasonable opportunities for improving Mashamoquet Brook.

This plan and the identified opportunities are not mandatory actions that stakeholders must implement, but rather a set of recommended options for achieving the plan objectives. The costs for implementing all the recommended opportunities currently exceed the funding capacity of all watershed stakeholders. Implementation, particularly significant structural best management practices (BMPs), will have to rely on leveraging opportunities as they arise, both from outside funding sources and in response to changing circumstances within the watershed such as redevelopment or property ownership transitions.

The improvement opportunities were presented to the public through a series of newspaper articles and PowerPoint presentations at the Pomfret Town Hall. The public was provided contact information to provide feedback. The Mashamoquet Brook Watershed Management Team will continue to provide the public with opportunities to comment and work on specific projects as they are considered for implementation.

In addition, the management objectives will include anti-degradation policies for areas not demonstrating water quality concerns.

ECCD, along with the Mashamoquet Brook Watershed Management Team, identified the following management objectives that need to be addressed in order to improve the water quality in the Mashamoquet Brook watershed:

- Reduce the amount of contaminated runoff from agricultural areas.
- Restore riparian vegetation in areas where it has been removed.
- Reduce the number of septic system failures and/or illicit discharges.
- Promote BMPs for forest harvests.
- Address stormwater runoff through better design and retrofit of poorly designed areas.
- Address stream bank erosion.
- Address Mashamoquet Brook State Park Management Practices.
- Implement a Pet Waste Clean Up Policy
- Reduce wildlife in picnic grounds by continuing to perform routine cleanup of picnic areas
- Remove Japanese Barberry upslope of Mashamoquet Brook

- Review and update Pomfret Land Use Regulations for consistency with the 2004 Connecticut Stormwater Quality Manual and the 2002 Connecticut Erosion and Sediment Control Manual.

Reduce the amount of contaminated runoff from agricultural areas.

Agricultural activities can be a significant source of *E. coli* and other coliform bacteria loading to surface waters. The activities of greatest concern are typically those associated with livestock operations.

No-till is a year-round conservation farming system. In its pure form, no-till does not include any tillage operations either before or after planting. The practice reduces wind and water erosion, catches snow, conserves soil water, protects water quality, and provides wildlife habitat. No-till helps control soil erosion and improve water quality by maintaining maximum residue levels on the soil surface. These plant residues: 1) protect soil particles and applied nutrients and pesticides from detachment by wind and water; 2) increase infiltration; and 3) reduce the speed at which wind and water move over the soil surface.

If manure application is desired, sampling and chemical analysis of manure can be performed to determine nutrient content for establishing the proper manure application rate. Knowing the nutrient content of manure will help reduce the possibility of over application and minimize nutrient runoff or leaching potential. Nutrient content of manure varies widely with animal type, age, and size; feed; manure storage system; and climate. For these reasons, determination of manure nutrient values from sampling and laboratory analysis is preferable to using average values. A sample should be taken from each manure source or storage system. For daily hauling, take many small samples over a representative period. The sample should be taken as close to time of use as possible, allowing time for analysis, interpretation of results, and calibration of the manure spreader. Manure should be re-sampled if changes in management, handling, or feeding occur.

Soils should be sampled to a 2-foot depth from 1 to 6 months prior to applying the fertilizer and analyzed for nitrate-nitrogen and sampled to a 6-inch depth for phosphorus. The results are analyzed by a professional agronomist to make fertilizer recommendations. Soil testing evaluates the amount of nitrogen and phosphorus in the soil available for the forthcoming crop, and to develop fertilizer recommendations that will match crop needs and yield goals. All homeowners, businesses, and farmers should be encouraged to have their soil tested for nutrient content prior to adding soil amendments to ensure proper application rates.

Exclusionary fences (short fences or barriers) can be installed to direct livestock movement. The fences manipulate livestock patterns in a way that reduces soil erosion problems and keeps livestock away from surface waters. A fence can be used to block a gentle slope where continual trailing of animals is causing gullies. This will force the animals to utilize different areas. A drift fence parallel to a stream keeps animals out and prevents direct input of *E. coli* to the stream.

Agricultural livestock grazing in pastures, including but not limited to cows and horses, deposit manure containing *E. coli* and other bacteria onto land surfaces. This material accumulates during periods of dry weather and is available for transport to surface waters during storm events. The number of animals in pasture and the time spent grazing are important factors in determining the loading contribution. Maintenance of streamside buffers at least 35 feet wide will reduce the amounts of contaminants in stormwater runoff draining from those areas.

Agricultural livestock were observed having direct access to waterbodies which can provide a concentrated source of *E. coli* and other bacteria and nutrient loading directly to a stream. Exclusionary fencing, alternate watering resources and shade outside of the riparian buffer can reduce the amount of fecal contamination in a stream.

Manure stockpiles exposed to rain can contribute significant amounts of nutrients and bacteria to nearby water resources with the stormwater runoff from the area. Manure storage areas should be located away from wetlands and water resources as well as drainage areas directed towards those water resources. Manure solids should be stored in a covered area.

Processed agricultural manure from confined feeding operations is applied to land surfaces and can provide a significant source of *E. coli* and other bacteria as well as nutrient loading. The Eastern Connecticut Resource Conservation and Development Council (ECRC&D) conducted a study on various effective means to reduce non-point source pollution from agricultural runoff by processing manure into other value added products, including use as an energy source. ECRC&D prepared The Woodstock Anaerobic Digester Business Center Plan that explains this proposed project in detail.

http://easternrcd-ct.org/NutrientManagement/NMpdfs/Woodstock_ADBusinessPlan_Final.pdf
As a result of this study, Fairvue Farms of Woodstock, Connecticut has been seeking funding assistance to install an aerobic manure digester on their farm. Although the digester would be located outside of this watershed, its installation would positively impact water quality in this watershed.

Guidance for issues relating to manure application is available through the USDA Natural Resources Conservation District.

Much of the agricultural land in Pomfret is not farmer-owned. The need to adopt improved practices or make changes in farm organization should be included in a lease agreement. Generally, conservation and other improved practices require labor and expenses in addition to typical farming operations. This means reevaluating existing leasing practices in terms of contributions of labor and cash, and of the effects on both tenant and landlord incomes. The landlord and tenant can agree on conservation practices to be used on the farm and how each will share expenses Restore riparian vegetation in areas where it has been removed.

Riparian areas are located along the sides of streams. Management of riparian areas protects river banks with a buffer zone of vegetation, including grasses, shrubs, or trees. Management of this area is beneficial for streams near urban and suburban development areas, cropland, and pastureland. Riparian area buffer zones can trap bacteria, soluble nutrients, and soluble pesticides in runoff water if the runoff moves over the buffer area in a shallow, even flow. The buffer areas prevent sediment and other pollutants from reaching streams as well as provide shade to the water body. They reduce water erosion, slow runoff, trap soil particles, and provide food and nesting cover for wildlife. The effectiveness of riparian buffer zones is increased as the width of the zone is increased.

Reduce the number of septic system failures and/or illicit discharges.

Septic systems located in small lots adjacent to stream channels, such as those found in Abington Village and on the north side of Route 101 between Route 169 and the Killingly border, may need more frequent pump outs. They may also benefit from the use of new technologies that are designed for small lots or soils with limited infiltration capacities. An inventory of system types,

age, maintenance schedules and location in relation to the brook will assist with evaluating systems that may be in need of repair or replacement.

Homes with older plumbing fixtures may benefit by replacing those high volume fixtures with more modern fixtures that use less water. A rebate program to offset the cost of these updates will encourage more homeowners in critical areas of the watershed to update their plumbing fixtures.

Farmland converted to residential or commercial development may have abandoned tile drain systems in place. These systems may convey septic tank leachate or other contaminated runoff to nearby stream and wetland systems. A review of old aerial photographs or USDA Natural Resource Conservation Service records may provide clues to the location of these systems. It may be necessary to remove or interrupt the existing systems in order to restore water quality.

Pomfret Land Use Officials should use the NRCS Web Soil Survey as a planning tool for determining the potential soil suitability for onsite subsurface waste disposal systems for future development areas in town.

Promote BMPs for forest harvests.

In the spring of 2007, the CT DEEP published a booklet, *BMPs for Water Quality While Harvesting for Forest Products*, to assist certified forest practitioners, private landowners and municipal officials towards a better understanding of the best management practices BMPs associated with the harvest of forest products. BMPs for water quality are the minimum standards to be taken to ensure water quality.

Address stormwater runoff through better design and retrofit of poorly designed areas.

Water contaminants, including *E. coli* bacteria, can be carried to local waterbodies in stormwater runoff from developed areas. Local landuse regulations should be updated to reflect contemporary stormwater management practices as outlined in the 2004 Connecticut Stormwater Quality Manual. Seeking opportunities to retrofit stormwater outfall areas should be an ongoing process.

Address stream bank erosion.

Streambank erosion, especially in areas adjacent to agricultural fields, can be a source of sediment, nutrients and bacteria to the stream and can have a negative effect on aquatic habitat. Restoring the riparian vegetation would serve to stabilize the stream banks, and provide protection of cold water habitat from solar exposure.

Address Mashamoquet Brook State Park Management Practices.

Pets are prohibited in the camping areas of Mashamoquet Brook State Park, but are permitted in the day use areas of the park. ECCD staff observed pet waste deposits in the park. Park visitors can be encourage to clean up their pet's waste with signage and the availability of pet waste disposal bags near parking areas and at trail heads. Due to the use of composting toilets in the park for human waste, the pet waste disposal bags should be biodegradable in the event of improper disposal in the toilets instead of a proper waste receptacle.

A number of picnicking areas, with grilling facilities, are located around the main entrance to the park and in close proximity to the brook and swimming pond. Those areas should be properly maintained to eliminate any food waste from the site. Doing so will reduce the likelihood that

wildlife will come to the area, which, in turn, will lessen the chance that wildlife feces will be in close proximity to the waterbodies in this area. Maintenance of the areas can be achieved through educational means (e.g. signage in the picnicking area), reliance on park users, and seasonal DEEP staff. The longer-term more beneficial approach would be to educate the public and park users about the implications of leaving food waste, having visits from wildlife, and the associated water quality concerns (i.e. signage, literature).

Control Japanese Barberry, especially in riparian areas in Mashamoquet Brook State Park. Japanese Barberry is an invasive species that not only displaces the native shrub understory in wooded areas, but also is correlated to increased non-native earthworm activity, which in turn composts the leaf litter layer on the forest floor, exposing the soil and increasing the erosoion potential during rain events. Studies have shown an increased leaching of nutrients and higher rates of soil erosion in sloped areas under dense barberry patches. Removing the Japanese Barberry using weed wrenches and other means will not only protect water quality, but provide better habitat for native organisms.

Review and update Pomfret Land Use Regulations for consistency with the 2004 Connecticut Stormwater Quality Manual and the 2002 Connecticut Erosion and Sediment Control Manual.

Pomfret Land Use Regulations should be reviewed for consistency with the 2004 Connecticut Stormwater Manual or its successor for guidance on stormwater management regulations for new development. The most current Pomfret Subdivision Regulations, effective date April 11, 2001 state that "The discharge of all storm water from the subdivision shall be into suitable natural watercourses or into Town or State drains, ditches or other Town or State drainage facilities with adequate capacity to carry the additional water." Direct discharge of stormwater into watercourses doesn't allow for any pretreatment of the water and may convey contaminants, including thermal pollution, into local streams.

Low impact development strategies, where appropriate based on soil limitations, should be required in new development to encourage groundwater recharge in areas with suitable drainage. Chapter 4 of the 2004 Connecticut Stormwater Manual outlines numerous low impact development management practices that effectively reduce the impacts of development. The Connecticut Audubon Society Lois Orswell Grassland Bird Conservation Center, located at 218 Day Road in Pomfret, Connecticut is a good example of contemporary stormwater management concepts.

Pomfret Land Use Regulations should also be reviewed for consistency with the 2002 Connecticut Erosion and Sediment Control manual.

7.2 Load Reduction Targets

The load reduction targets of the Mashamoquet Brook Abbreviated Watershed Based Plan are to reduce the amount of *E. coli* bacteria in water samples in order to meet the Connecticut Water Quality Standards as updated in 2011:

- Not to exceed 235 colonies/100ml (for official bathing areas) or 576/100ml (all other water contact recreation) for single samples;
- Not to exceed a geometric mean of 126 colonies/100ml for any group of samples

Table 6 on the next page indicates the geometric mean of the data sets from bacterial data from select monitoring stations collected during the summer 2010 bathing season in the Mashamoquet

Brook and Wappoquia Brook watersheds. Load reduction targets were calculated using the formula ((Station Geomean-Target)/Target) * 100 = % load reduction.

Table 6 Load Reduction Targets

Monitoring station	CT Stream Code	Geomean 2010 data cfu/100ml	# samples	Target cfu/100ml	% Load Reduction
Mashamoquet Brook #1	CT 3710-01	316	10	126	151
Mashamoquet Brook #2	CT 3710-02	155	18	126	23
Mashamoquet Brook #3	CT 3710-02	190	8	126	51
Mashamoquet Brook #4	CT 3710-02	311	16	126	147
Mashamoquet Brook #5	CT 3710-02	38	19	126	--
Mashamoquet Brook #6	CT 3710-01	140	8	126	11
Mashamoquet Brook #7	CT 3710-01	128	9	126	2
White Brook #1	CT 3710-18	378	8	126	200
Wappoquia Brook #1	CT3709-01	142	8	126	13
Wappoquia Brook #2	CT3709-01	369	17	126	193
Wappoquia Brook #3	CT3709-01	84	10	126	--
Wappoquia Brook #4 (formerly referred to as Day Brook #2)	CT3709-01	138	8	126	10
Day Brook #1	CT3709-02	323	9	126	156
Abington Brook #1	CT3710-11	432	16	126	243
Abington Brook #2 (trib)	CT3710-11	575	9	126	356
Abington Brook #3	CT3710-11	304	8	126	141
Unnamed Brook #1	CT 3710-12	165	8	126	31
Sap Tree Run Brook	CT3710-13	308	8	126	144

Data was collected over a 16 week period between June 3 and September 15, 2010. Water samples were collected only during the first eight weeks at Mashamoquet Brook site #1, Wappoquia Brook site #1, White Brook, Sap Tree Run Brook and unnamed brook #1. During the second eight weeks of the sampling period, an attempt was made to bracket contamination sources. Mashamoquet Brook sites #6 and 7, Wappoquia Brook sites # 3 and 4, Abington Brook sites #2 and 3 and Day Brook site #1 were only sampled during the second eight weeks. All other monitoring stations involved a full sixteen week sample set.

It should be noted that the sampling data only includes one sample set where the total rainfall exceeded 1 inch in the 24 hour period prior to the sampling event. This event occurred during the first eight week monitoring period. By general consensus, rainfall >1.0 inches is used as a threshold for assessing rain events to determine when to close some beaches in the State of Connecticut. However, most literature considers "wet weather" where rainfall is >0.1 inches. With less 10% total impervious cover in this watershed, the exact amount of rainfall that would lead to increased surface runoff is undetermined.

8 Identification of Management Strategies

8.1.1 Existing Structural Controls

The CT DEEP Mashamoquet Brook State Park management has the ability to physically block the flow of Mashamoquet Brook water to By Pass Pond by manually inserting a board across the

bypass opening following a period of heavy rain. This practice reduces the amount of *E. coli* in By Pass Pond by blocking the flow of water when the load of *E. coli* concentration has been demonstrated to be highest.

A small farm located at 114 Covell Road at the convergence of Abington and Mashamoquet Brooks has worked with USDA Natural Resources Conservation Service officials to develop a manure management plan. At the time this plan was produced, the farm housed horses, cows and sheep. Earthen berms were installed along Mashamoquet Brook to prevent manure contaminated stormwater from flowing into the brook. Roof gutters were installed on barns that housed animals. Exclusionary fencing was put in place to keep animals out of the water courses with the exception of a stream crossing used by the animals to cross Abington Brook. This stream crossing is gated to restrict access. Rotational grazing is also practiced on this farm. These improvements, approved in 1996, were still functioning during a May 2011 site visit.

The existence of other structural controls to prevent *E. coli* contamination of Mashamoquet Brook is unknown.

8.1.2 Existing Nonstructural Controls

The Northeast District Department of Health (NDDH) routinely inspects onsite waste water disposal systems for proper function if they receive a request from a home owner or a complaint from a neighbor. It is the policy of NDDH to work with a homeowner to correct the problem. If there are signs of a breakout, they will have the homeowner immediately contact a septic pumper to have the tank pumped on a routine basis to maintain the overflow. The homeowner is required to submit pumping receipts to NDDH. Their office aims to work with the owners to correct the problem, but if they receive no cooperation, the following steps are implemented:

1. An administrative order is sent to the homeowner to have the system repaired.
2. If system is not repaired within time constraint, information is sent to the housing prosecutor.

NDDH has also produced a brochure entitled *A Guide to Septic System Maintenance* which is available at several public locations thorough the region, including the Pomfret Town Hall.

The Town of Pomfret Zoning Regulations requires minimum acreage for horse owners.

> "When horses are kept or to be kept on any lot or parcel of land, the lot or parcel must meet the greater of (1) the minimum lot size required for a principal use in the underlying zone; or (2) three (3) acres (130,680 square feet), including at least one (1) acre (43,560 square feet) of land usable for grazing, for one horse and at least one additional half-acre (21,780 square feet) of land usable for grazing for each additional horse."

8.2 Additional Strategies Needed to Achieve Goals

Each of the following management strategies have been broken down into structural and non-structural controls. The effectiveness for reducing pollution loads each strategy is rated low to high.

8.2.1 Structural Controls

Table 7 Recommended Structural BMPs to Reduce *E. coli*

BMP	Reduction estimate	Reference
Elimination of Septic System Failures/Illicit Discharges	High	Email communication with Seth Lerman of USDA NRCS
Reduction of sources that can be treated by riparian buffer	Medium	Virginia DEM Guidance Manual for TMDL Plans
Manure management – horses Cover manure with tarp or structure Install manure compost system Initiate manure composting cooperative	Medium	Kings Mark RC&D Council
Animal feeding operations – large dairy farm Aerobic Manure Digester	High	Eastern Connecticut Resource Conservation and Development Council
Animal feeding operations – small farms Install manure storage area with 4 – 6 month holding capacity Separate clean runoff from manure contaminated area Cover livestock holding areas Bermed livestock yard to prevent runoff	Medium	Virginia DEM Guidance Manual for TMDL Plans
Livestock grazing BMPs Exclusionary fencing to keep livestock out of riparian areas and streams Provide watering station away from stream Upland shade trees	Medium	Delaware Department of Environmental Resources and Control
Stormwater infiltration systems (rain gardens, etc)	High	Delaware Department of Environmental Resources and Control
UV light Treatment system to pre-treat water flowing into By Pass Pond	High	Keeton Industries website
Install pet waste disposal bag dispenser and signage at Mashamoquet Brook State Park	Low	Delaware Department of Environmental Resources and Control

Nonstructural Controls

Table 8 Recommended Nonstructural Controls to Reduce *E. coli*

Nonstructural BMP	Reduction estimate	Purpose
Water conservation/reduce pressure on wastewater systems	Low	Reduce waste volume in challenged systems
Manure management – cropland Calibrated manure spreading equipment Soil testing to determine nutrient needs Manure testing to determine nutrient content Encourage no-till farming methods	Medium	Reduce excess application of manure; reduce runoff from farm fields
Manure management t– large dairy farm Aerobic manure digester	High	Power generation with a side effect of bacteria elimination in nutrient byproduct.
Manure management – small farms Develop manure management plan with USDA NRCS assistance	Low/ Medium	Make small farms eligible for funding assistance for BMP installations

Nonstructural BMP (continued)	Reduction estimate	Purpose
Promote timber harvest BMPs	Low	Prevent water contamination through erosion from timber harvest areas
Pet waste Pickup	Low	Reduce local source of bacteria in the park
Wildlife exclusion practices at picnic area adjacent to Mashamoquet Brook Daily cleanup food scraps to discourage attraction of scavenging animals near brook	Low	Reduce local source of bacteria in the park
Create a septic system database including age, type and maintenance history	NA	To help locate failing systems and target outreach

9 Implementation Program Design

9.1 Management Strategies

It will take time, determined focus and funding to correct the water quality issues in the Mashamoquet Brook watershed. A list of structural management measures to reduce *E. coli* contamination of surface water is presented in Table 9 and a list of non-structural management measures is presented in Table 10. For each management measure, an interim milestone has been estimated into time intervals of Short-term (1 to 1.5 years), Mid-term (1 to 4 years) and Long-term (5 to 10 years or longer). Appropriate conservation partners and funding assistance possibilities have been provided for each measure. Cost estimates were broken into Low, Medium and High categories and indicators on how to measure progress have also been presented.

Table 9 Structural Management Measures to Reduce *E. coli* contamination of surface water

Management Measure	Interim Milestones	Technical Assistance/ Potential Funding Source	Cost	Progress Indicators
Aerobic manure digester	Long-term	CT DEEP/EPA, REAP, Native Energy	Very high	Completed installation
Exclusionary fencing	Mid-term	USDA EQIP	Medium	# feet of fencing installed along stream channels
Alternate water source for grazing animals	Mid-term	USDA EQIP	Low/ Medium	# of water systems installed
Plant shade trees for animal cooling areas	Long term	USDA EQIP	Low	# of trees planted in pasture areas
Install bio-filtration/rain garden at Pomfret Town Hall	Short-term	Rivers Alliance of Connecticut small grants program or other local funding source	Low	Area of land runoff infiltrated into soil
Implement horse manure BMPs	Short-term to Mid-term	EPA 319 funds	Low to Medium	# horse owners implementing BMPs for manure management
Riparian buffers	Mid-term	USDA WHIP, EQIP	Medium	# of sites and # linear feet riparian vegetation restored
Pet Waste Stations at MBSP	Short-term	Rivers Alliance of Connecticut small grants program or other local funding source	Low	Replacement rate of disposable pet waste bags
Install rain gauge and flow gauge at Mashamoquet	Short-term	CT DEEP	Low	Completed installation and data recording

Brook State Park				

Table 10 Non Structural Management Measures to Reduce *E. coli* Contamination of Surface Water

Management Measure	Priority	Responsible agency	Cost	Progress Indicators
Promote no-till farming	Short-term	USDA NRCS ECCD	Low	# acres converted from till to no-till
Promote Manure and soil testing	Short-term	USDA NRCS ECCD	Low	# workshops and outreach materials distributed
Promote Manure Management BMPs	Short-term	USDA NRCS UConn Extension ECCD, Pomfret Horse and Trails Association	Low	# workshops and outreach materials distributed
Review farmland lease agreements	Mid-term	Local Landowner Town of Pomfret	Low	# leases reviewed and updated as needed
Promote On-site wastewater treatment system inspection and maintenance	Short-term	NDDH Town of Pomfret	Low	# articles and outreach materials distributed
Perform septic system inventory	Mid-term	NDDH Town of Pomfret	Medium	Completion of septic system inventory in critical watershed areas
Seek funding assistance for septic system repairs/replacements for financially challenged	Long-term	NDDH Town of Pomfret	High	# of repair permits issued by NDDH
Promote retrofit to low flow plumbing fixtures in older homes	Mid-term	NDDH Town of Pomfret	Low/ medium	# of plumbing retrofits in homes built before 1998
Educate local landuse officials of forestry BMPs	Mid-term	DEEP Forestry Division UCONN Extension	Low	# workshops and outreach materials distributed
Review local land use regulations for compatibility with 2002 CT Soil and Erosion Manual and the 2004 CT Stormwater Quality Manual	Mid-term	UCONN Extension NECCOG	Low	Completion of the review and update of documents
Remove Japanese Barberry uphill of the water diversion at MBSP	Long-term	CT DEEP volunteers	Low	# acres where barberry control executed

9.2 - 9.5 Schedule of Activities, Interim Milestones, Cost Estimates and Indicators to Measure Progress

The goal to improve the water quality in the Mashamoquet Brook watershed by reducing bacterial contamination and degradation from other non-point source pollutants, including nutrients will be achieved through the following objectives and schedules:

Objective 1: Work with the agricultural community to enhance understanding of land stewardship and use of BMPs to protect water quality.	
Actions/Milestones	• Gather existing educational information for agricultural management, and develop new agricultural management educational materials as needed. • Create new materials (includes both general information as well as information specific to particular types of agriculture [horse farming, crop management, land lease agreements, etc…]) • Distribute written materials to agricultural operators that farm in the watershed • Provide materials explaining State (CT DOA, CT DEEP) and Federal (USDA) programs • Advertise the Horse Educations and Awareness Program (HEAP) and work to involve horse farm operations in HEAP • Conduct workshops dependent upon interest and need. • Obtain funding to produce and distribute materials and to conduct workshops.
BMPs	Educational materials and workshops
Responsible Parties:	ECCD, NRCS, CT DOA, CT DEEP, FSA, AFT, Farm Bureau
Anticipated Products:	Educational materials
Estimated Costs:	N/A
Evaluation:	# workshops, # educational products produced
Timeline:	1 - 10 years

Objective 2: Address pollution from failing septic systems and illicit discharges in priority areas	
Actions/Milestones	• Work with Town sanitarian (NDDH) to evaluate the residential septic systems in the priority areas as defined by the WBP • Perform water quality monitoring using DNA markers to quantify human waste contribution to water quality issues. • Provide educational materials regarding septic system maintenance and municipal ordinances • Prioritize areas for assessment • Assess the sites • Report findings • Select sites for repair or enforcement • Work with landowners to implement repairs • Select and hire contractors • Repair systems • Follow up water quality monitoring after implementation
BMPs	Repaired septic systems and eliminated illicit discharges
Responsible Parties:	Town of Pomfret, Northeast District Department of Health, Property owners
Anticipated Products:	Fixed septic systems, elimination of illicit discharges
Estimated Costs:	DNA marker study (includes QAPP) $6000 Outreach materials $2000

	Septic system assessment using GIS and field inspections $5000 Dye testing $125/test
Evaluation:	Photo-documentation, sanitarian confirmation. Follow up monitoring
Timeline:	1 - 3 years

Objective 3: Initiate Small Farm Manure Management BMP projects	
Actions/Milestones	• Inventory of small farms in priority areas • Provide educational materials regarding small farm BMPs/manure management to small farm operators • Assess the sites/determine needs • Select sites for BMP installations • Design appropriate BMP system • Seek funding assistance for implementation of BMP if needed • Select and hire contractors • Implement BMP measure
BMPs	Construction of place based BMP
Responsible Parties:	ECCD, Town of Pomfret CC, USDA NRCS, CT DEEP, small farm operators
Anticipated Products:	Covered manure storage areas, manure composting systems, exclusionary fencing
Estimated Costs:	Dependent on project
Evaluation:	Photo-documentation, water quality monitoring
Timeline:	2 – 5 years

Objective 4: Establish riparian buffers in priority areas	
Actions/Milestones	• Identify priority sites for establishment of buffers • Contact landowners to determine level of interest, cooperation, and obtain permission • Obtain funding for implementation of at least two (2) buffer sites • Design the riparian plantings (develop a painting plan) • Plant the buffers • Conduct water quality monitoring
BMPs	Established buffers
Responsible Parties:	ECCD, NRCS, CT DEEP, land owners, Town of Pomfret
Anticipated Products:	Planting/Buffer design plans, before-after photo documentation of sites
Estimated Costs:	$450/ac - $2,400/ac (dependent on materials selected)
Evaluation:	Photo documentation. Pre-post water quality monitoring of sites, documentation of number of sites and the linear feet buffered
Timeline:	3 - 6 years

Objective 5: Continue ongoing water quality monitoring program in the watershed to develop baseline conditions and measure changes pre and post BMP implementation.	
Actions/Milestones	• Identify specific locations for monitoring (8 - 10). Sites should include several locations within the Mashamoquet Brook mainstem, at least one location (e.g. confluence) for each of the tributaries to the mainstem and sites bracketing the implementation project areas. • Obtain funding for monitoring program • Develop monitoring parameters and program details • Train volunteers • Monitor sites • Report results
BMPs	Data that improves knowledge of originating locations of bacteria and other NPS pollutants.
Responsible Parties:	ECCD, CT CDPH, NDDH, TLGV, CAS Citizen Science Program, Local stakeholders, Town of Pomfret
Anticipated Products:	Monitoring data, report describing data, recommendations for focus areas
Estimated Costs:	$4000/year
Evaluation:	Review of data with appropriate agencies
Timeline:	1 year

Objective 6: Implement BMPs at Mashamoquet Brook State Park including monitoring stream flow/rainfall data, installation of pet waste signage and disposal bags and park maintenance	
Actions/Milestones	• Install and calibrate flow gauge in Mashamoquet Brook • Install rain gauge • Install pet waste management and signage at major trail heads in Mashamoquet Brook State Park • Remove Japanese Barberry uphill of the water diversion at MBSP
BMPs	pet waste management, pond management, invasive species control
Responsible Parties:	CT DEEP
Anticipated Products:	Stream flow/precipitation curve to guide bypass management Reduction of pet/animal waste near Mashamoquet Brook Elimination of invasive Japanese Barberry upslope/upstream of By Pass Pond diversion.
Estimated Costs:	pet waste station and bags (2) $1000 stream and rain gage $100 $150/weed puller
Evaluation:	Completed installations # acres of barberry removal
Timeline:	1 – 2 years

Objective 7: Promote Low Impact Development through land use regulation review/revision and installation of a demonstration project at the Pomfret Town Hall	
Actions/Milestones	• Review Pomfret Land Use regulations for compatibility with 2002 CT

	Erosion and Sediment Control Manual and 2004 CT Stormwater Manual • Work with town land use officials to update regulations as appropriate • Select a location at the Pomfret Town Hall for a LID demonstration project such as a rain garden. • Design project using appropriate planting materials • Seek funding to implement project • Install the garden • Develop and follow maintenance plan for rain garden
BMPs	Low Impact Development strategies and demonstration project
Responsible Parties:	Town of Pomfret, CT DEEP, ECCD, UConn Extension Service, Community and Natural Resource Planning Program (formerly Green Valley Institute), Northeastern Connecticut Council of Governments
Anticipated Products:	Updated land use regulations that reflect contemporary stormwater BMP practices Completed Rain Garden
Estimated Costs:	$10,000- 15,000
Evaluation:	Adoption of contemporary stormwater management practices (Low Impact Development) and photo documentation of implementation project
Timeline:	1 – 3 years

Objective 8: Conduct Track Down Surveys in Wappoquia Brook, White Brook and Sap Tree Run Brook to determine sources of *E. coli* Bacteria in those Watersheds	
Actions/Milestones	• Review existing data • Develop Monitoring Plan and Protocol • Recruit and Train Volunteer Water Quality Monitors • Collect Data • Evaluate Data • Develop a watershed based plan based on results
BMPs	Water Quality Monitoring including bacterial analysis and visual surveys.
Responsible Parties:	CT DEEP, ECCD, Connecticut Audubon Society, TLGV, NDDH
Anticipated Products:	Watershed Based Plan for each local watershed addressing the EPA nine required elements.
Estimated Costs:	$20,000 - $40,000 per survey
Evaluation:	Development of mini watershed based plans for each impaired stream
Timeline:	3 - 5 years

9.6 Information/Education Component

An extensive education and outreach component was conducted during the development of this Plan. A summary of these activities can be found in a separate report "*08-18 Task 1g Mashamoquet Brook, Pomfret, CT Education and Outreach Summary*." In order for this

abbreviated watershed based plan to succeed, continued outreach is necessary by Mashamoquet Brook Watershed Team Members focused on their individual roles in the Plan implementation.

Table 11 Future Outreach Role of Mashamoquet Brook Watershed Team Members

Watershed Team Member	Outreach Role
USDA NRCS	• Conduct outreach about available funding assistance for implementation of agricultural BMPs or habitat enhancement projects. • Present workshops on Agricultural BMPs as needed.
CT DEEP	• Conduct outreach regarding funding assistance available from EPA 319 sources for implementation work. • Conduct pet waste management outreach in Mashamoquet Brook State Park. • Conduct outreach on forest harvesting BMPs.
NDDH	• Continue outreach regarding septic tank maintenance • Continue enforcement of regulations.
ECCD	• Provide weblinks to this Plan and all reports associated with the development of this plan. • Serve as interim Watershed Team Coordinator as further team responsibilities are defined. • Work with other conservation partners to facilitate educational workshops as needed.
TLGV	• Educate local population about water quality issues through the continuance of a volunteer water quality monitoring program. • Coordinate volunteers to continue to collect water samples in the watershed as implementation projects progress.
Connecticut Audubon Society Center at Pomfret	• Continue education programs on water quality issues and water quality monitoring through the Citizen Science Program
UConn Cooperative Extension System	• Provide information/education on small farm manure management.
Town of Pomfret	• Continue to use the town newsletter as a means to disseminate information on NPS pollution, septic tank management and agricultural BMPS, and the current water quality conditions within the Mashamoquet Brook watershed.
Thames River Basin Partnership	• Use website and e-newsletter to focus partnership success stories related to implementation work in this watershed

Members of the Mashamoquet Brook Watershed Team including several representatives within the CT DEEP were given an opportunity to review the draft version of the Mashamoquet Brook Abbreviated Watershed Based Plan and encouraged to provide feedback and/or criticism to be considered in the final version of this plan. General positive feedback was received with limited detailed critique.

9.7 Monitoring Component

The CT DEEP, as part of their routine monitoring of the bathing water at Mashamoquet Brook State Park, will continue to collect water samples for *E. coli* concentration analysis.

Additional monitoring may also be coordinated through The Last Green Valley Volunteer Water Quality Monitoring Program and the Connecticut Audubon Society Center at Pomfret Citizen Science Program as funding and volunteer time allows.

With additional funding, a species specific Enterococcus identification program can be introduced in critical areas to test for the absence or presence of human, horse or cattle fecal bacteria DNA markers in water samples, followed by a quantification analysis of human related sources if the presence/absence test indicates it is necessary. This monitoring would serve to better determine the source of *E. coli* contamination in the watershed.

9.8 Evaluation Framework

In order to determine the overall success of the Mashamoquet Brook Abbreviated Watershed Based Plan, it is recommended that the Mashamoquet Brook Watershed Management Team meet on an annual basis at a minimum to report on progress of the implementation strategies outline in this Plan. During the first eighteen months, these meetings should be more frequent.

1. The Team should develop a work plan with an agreed upon process on how to determine next steps to take. One task should be to review the Mashamoquet Brook assessed water body segments included in the biennial Connecticut Integrated Water Quality Report to Congress.
2. The Team should develop and maintain a Mashamoquet Brook watershed progress "database" to document completed projects and other activities within the watershed. The database or registry will likely be the primary means for demonstrating progress towards water quality improvements.
3. The Team should conduct follow up water quality monitoring, including possible revisions to the QAPP as necessary, and evaluate any trends in water quality.
4. The Team should review and revise the Plan as necessary.
5. The Team should continue to solicit input from local, state and federal agencies as appropriate.

In the short term, the Town of Pomfret leadership and land use commission representatives, along with the Northeast District Department of Health, and CT DEEP Watershed/NPS Management program staff should meet to review the objectives are to review Plan findings relative to suspected septic system and possible illicit discharge issues in the Plan's prioritized areas, and to understand local policies and practices. Further, the meeting participants should review opinions from both the Town and the NDDH in terms of a practical and effective strategy to move necessary investigations and analysis further along to aid decision makers on recommended next steps.

A second short term objective is to convene a meeting with a Watershed Team Coordinator or interim coordinator (perhaps through the ECCD office), CT DEEP Watershed Management/NPS Management staff and CT DEEP State Parks and Recreation staff responsible for the operations and maintenance of Mashamoquet Brook State Park. The objective is to obtain the State Parks program response(s) to the relevant Plan findings and recommendations for Bypass Pond and the brook segment within the State Park boundaries.

Map Appendix

List of Maps

Map Number	Map Title
1	Pomfret, CT Land Cover 2006
2	Mashamoquet Brook Watershed Area
3	Pomfret Shaded Relief with 100' Contour Lines
4	Pomfret Natural Diversity Data Base Habitats
5	Pomfret, CT Wetland Soils
6	Pomfret, CT Farmland Soils
7	Pomfret, CT Zoning Map
8	Soil Suitability for Onsite Subsurface Waste Disposal
9	Septic Tank Repair Permits 2006 - 2011