APPENDIX C: PROJECTS TO ADDRESS KNOWN WATER QUALITY IMPAIRMENTS IN THE TENAKILL BROOK WATERSHED

Project Name:

Streamside Living Education Program

Location:	Subwatershed Priority:
The entire Tenakill Brook Watershed.	Second Priority

BMP Type and Description: Non-Structural (Education)

Educational program directed at residents living on or near Tenakill Brook or its tributaries, focused on the responsibilities that are included in being an environmentally sensitive streamside property owner.

Issues and Concerns:

A large majority of the Tenakill Brook and its tributaries travel through the properties of homeowners. Many of these residents may not fully understand or adhere to their responsibilities of being a streamside property owner. These properties may not have any significant riparian buffers next to the stream, allowing pollutants to enter the stream and for erosion to occur. Nonpoint source pollution from these residential properties may be a substantial contribution to the high concentrations of bacteria and nutrients seen in the watershed.

Existing Conditions:

During stream surveys in the Tenakill Brook Watershed, several residential properties along the streams were noted as having little to no riparian buffer. Riparian buffers are needed to absorb nutrients and pollutants, stabilize soil and stream banks, resist erosion, trap sediment, and slow rainwater runoff. There were also some properties close to the stream that exhibited the use of pesticides and fertilizers. The combination of the uses of these materials in excessive amounts and a lack of substantial riparian buffers can result in a majority of the pesticide and fertilizers ending up in streams.

Proposed Solutions:

The municipalities should each conduct a Streamside Living Education Program for residents. The education should include teaching residents to do the following: limit the use of pesticides and herbicides; establish a no-mow zone along stream banks; protect storm drains from debris; plant native trees, shrubs, perennials and grasses; identify and remove invasive plants; leave woody debris and rocks; avoid applying fertilizer near streams; never dumping chemicals down storm drains; and avoid storing waste or loose soil near a stream. The education program should also include appropriate state and local regulations. The Water Resources Program also recommends that municipalities inspect the properties of streamside owners periodically to ensure adherence to the recommended actions included in the Streamside Living Education Program.

Anticipated Benefits:

The nonpoint source pollution from streamside properties may have a significant impact on the high concentrations of bacteria found in the watershed. If this pollution is eliminated, then there may be a large decrease in bacteria concentrations. It would also teach residents to be aware of their impact on the watershed, and avoid other harmful activities that would help to reduce erosion, excessive nutrient pollution, and promote native vegetation and generally improve the health of the Tenakill Brook Watershed.

Major Implementation Issues:

Each municipality would have to find the most effective means to educate residents, either through conducting workshops, sending informative brochures, or other ways that have worked for the municipality in the past. Setting up a workshop and encouraging residents to attend may be both labor and time-intensive. Also, sending brochures may not be a guaranteed way to initiate a change in behaviors of residents. Conducting inspections of each streamside property can be intensive for a municipality. The amount of labor and associated costs required could make municipalities hesitate to do these projects in support of a Streamside Living Education Program.

Possible Funding Sources:
NJDEP Nonpoint Source Pollution 319(h) Grants (http://www.state.nj.us/dep/watershedmgt/319grant.htm)
USEPA Environmental Education Regional Grants (http://www.epa.gov/enviroed/grants.html)

Partners/Stakeholders:
All municipalities within the Tenakill Brook Watershed (Alpine Borough, Closter Borough, Haworth Borough, Demarest Borough, Dumont Borough, Cresskill Borough, Tenafly Borough, and Englewood City).

Task	Task Description	Cost
1	Create and produce brochures	$5,000
2	Streamside Living Educational Program Coordinator	$15,000
3	Conduct workshop(s) on streamside living topics	
4	Possible demonstration projects on residential properties	$7,000
5	Survey of program effectiveness	$6,000
6	Follow up inspection of properties	$5,000
Total Project Cost		$38,000

Supplemental Maps, Graphs and/or Photos:
Figure 1: Aerial photograph of a portion of the Cresskill Brook running through several residential properties.

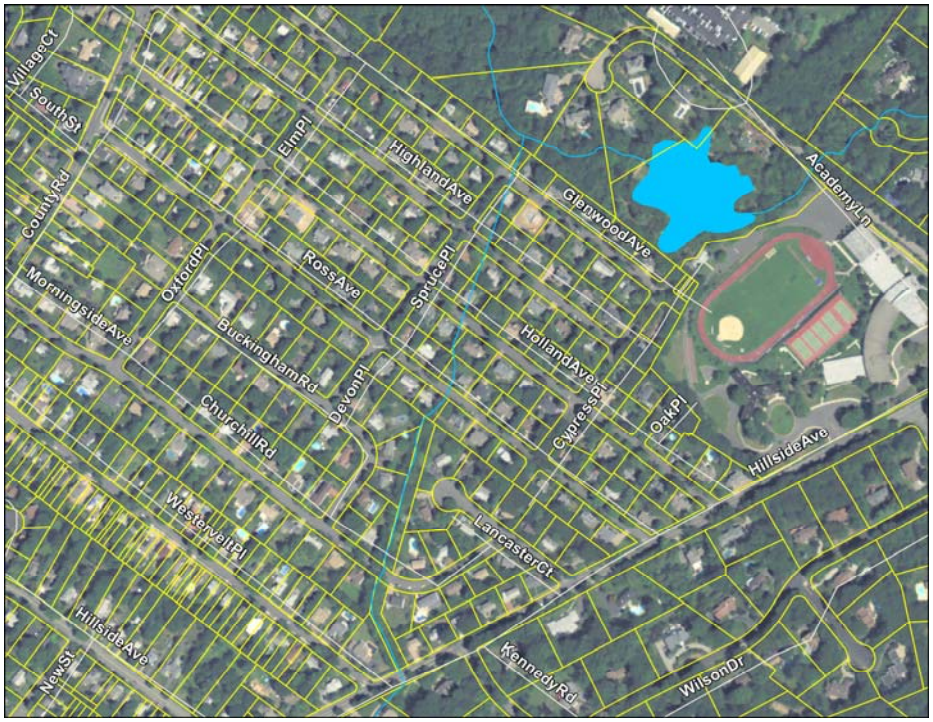

Figure 1: Aerial photograph of a portion of the Cresskill Brook running through several residential properties.

Project Name:

Tenafly High School Athletic Fields Basin Retrofit Project

Location:	Subwatershed Priority:
At the end of 3rd Street and behind Tenafly High School in Cresskill, NJ and Tenafly, NJ.	First Priority

BMP Type and Description: Structural (Retrofit)
Retrofit an existing detention basin and drainage swale at the Tenafly High School.

Issues and Concerns:
A total maximum daily load (TMDL) was established for the Tenakill Brook to remove 96% of the fecal coliform currently found in surface waters. Possible sources of fecal coliform in this watershed are wildlife, house pets, and humans from faulty sanitary sewer lines. Many open green spaces are populated with wildlife, especially Canada geese (*Branta canadensis*), throughout the Tenakill Brook Watershed. The green spaces throughout the watershed become potential sources of bacteria due to the animal waste left behind each day by local wildlife. Green spaces that are not equipped with a proper BMP to treat the stormwater runoff generated from sites with excess wildlife waste should be considered sources of bacteria. The athletic fields at Tenafly High School consist of turfgrass only, with no areas designed to handle stormwater runoff from the fields. Retrofitting the drainage system will help reduce stormwater pollutants.

Existing Conditions:
The drainage swale and detention basin are located behind Tenafly High School near the athletic fields. Athletic fields and parks attract large populations of Canada geese. The drainage swale discharges into a detention basin and both of these structures manage the stormwater runoff from all the athletic fields. The drainage area for this stormwater management system is approximately 16.25 acres of fields. The vegetation in the drainage swale and detention basin currently consists solely of turfgrass. The existing stormwater management system is not sufficient to treat runoff from the athletic fields. Studies have shown that detention basins alone do not remove pollutants from stormwater runoff very well and only reduce the quantity of stormwater. Considering the system's potential for poor removal of pollutants and the drainage area includes known areas with Canada goose waste, this site is a source of bacteria in the Tenakill Brook Watershed that needs to be mitigated.

Proposed Solutions:
The Water Resources Program proposes a two part solution for the Tenafly High School athletic fields.

The first part is re-vegetating the detention basin and swale. Clusters of turfgrass will be replaced with native warm season grasses, herbaceous plants, sedges, ferns and a minimum amount of woody vegetation. Over time, this new vegetation will expand past the boundaries of the initially-planted clusters to cover the entire basin and swale. The new vegetation will increase the infiltration capacity of the detention basin. The basin will not need to be mowed on a weekly basis, as it is now. The vegetation should be allowed to grow tall to increase its ability to filter nutrients and sediment out of stormwater runoff. The tall vegetation will have a deeper and more complex root structure allowing the basin to infiltrate greater amounts of water during each storm event.

The second part of the solution is to create a small berm or series of berms that surround the outlet of the basin. The berm(s) would only be about 1 foot high and composed of a permeable material, such as coconut fiber logs or ¾ inch clean stone secured with fabric. The purpose of the berm(s) is to increase the amount of time stormwater is retained in the basin. The berm(s) would constrict the flow of runoff for small but frequent storms while not interfering with the basin's ability to prevent flooding for larger storms because larger flows of runoff would flow over the berm(s).

Anticipated Benefits:

The detention basin is expected to infiltrate a greater amount of water during each storm event and remove more nutrients and sediment from stormwater runoff. The new native vegetation will be allowed to grow tall which will enable it to have a strong filter effect on the stormwater runoff, removing sediment and nutrients. The larger vegetation will have a larger underground root structure to make the soil at the bottom of the basin more porous and increase infiltration to groundwater. The increased infiltration of the basin will allow less water to leave the basin after each storm which would prevent sediment and nutrients from entering local waterways. After the retrofits are complete the basin would be very similar to a bioretention basin and is expected to have the same pollutant removal rates. Bioretention basins typically remove 90% of total suspended solids (TSS), 30% of total nitrogen, and 60% total phosphorus. The removal rates for bioretention basins and wetlands are at or above 90% for bacteria (i.e., fecal coliform).

Major Implementation Issues:

There are two impediments to the implementation of this project. The first is permitting. This project requires a permit from the local soil conservation district. The soil conservation district would have to sign off on any alterations to the basin. The soil conservation district could be a partner on this project, but they would need to be shown some evidence that the berm(s) planned for this project would not adversely affect how the basin prevents flooding downstream or reduce the storage capacity of the basin.

The second impediment is aesthetics. The basin and drainage swale are next to frequently-used athletic fields. Parents, students, and school officials may not approve of the new designs for the detention basin and drainage swale. The Water Resources Program will work with school officials, students, and parents to make sure the designs will effectively treat stormwater runoff and improve water quality while incorporating aesthetically pleasing designs.

Possible Funding Sources:

NJDEP Nonpoint Source Pollution 319(h) Grants (http://www.state.nj.us/dep/watershedmgt/319grant.htm)
Watershed Institute Grant Program (http://www.thewatershedinstitute.org/resources/twig/)
NJ Watershed Protection and Flood Prevention Program (http://www.nrcs.usda.gov/programs/watershed/)
USEPA Clean Water State Revolving Fund (http://www.epa.gov/owm/cwfinance/cwsrf/index.htm)
NJ Environmental Infrastructure Trust (http://www.njeit.org/)

Partners/Stakeholders:

The municipality of Cresskill, NJ.

Task	Task Description			Cost
1	Prepare concept plan and present to Borough officials			$6,000
2	Complete topographic survey and soils test			$4,000
3	Prepare final design			$4,000
4	Prepare maintenance plan			$2,000
5	Prepare construction documents and solicit quotes from contractors			$4,000
6	BMP Installation			
	Activities for BMP Installation	Unit Costs	Quantity	
	Install berms in detention basin	$10,000	1	$10,000
	Install vegetated swale and basin	$10,000	1	$10,000
	Soil erosion and goose prevention measures	$3,000	1	$3,000
	'Geese Police'	$5,000	1	$5,000
	Contingency (20%)			$5,600
	Total BMP Installation Costs			$33,600
Total Project Cost				$53,600
Annual Operation and Maintenance Cost				$500

Supplemental Maps, Graphs and/or Photos:
Figure 1: Location of Tenafly High School athletic fields.
Figure 2: Photograph of swale to be vegetated.
Figure 3: Photograph of swale inlet to undergo a retrofit.

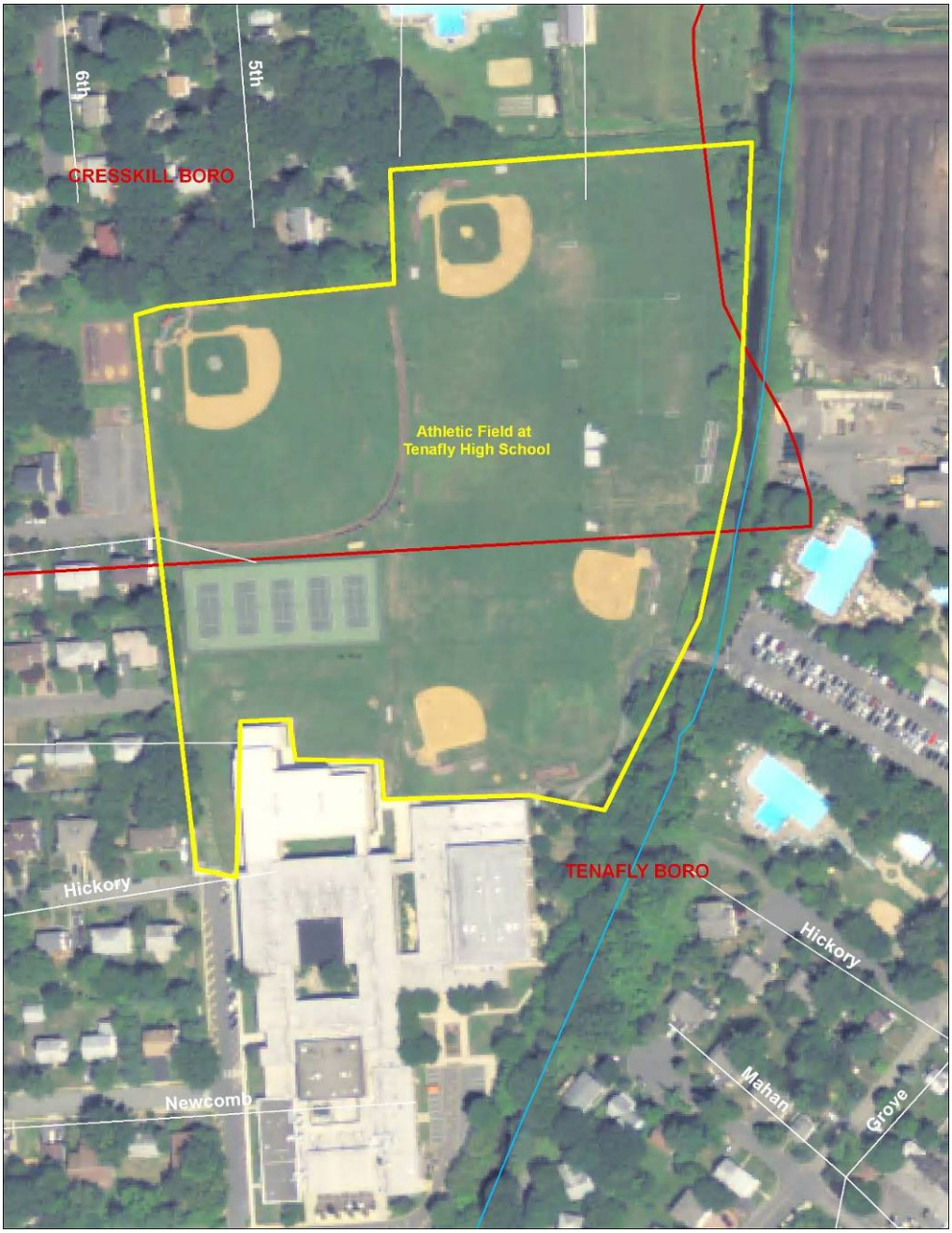

Figure 1: Location of Tenafly High School athletic fields.

Figure 2: Photograph of swale to be vegetated.

Figure 3: Photograph of swale inlet to undergo a retrofit.

Project Name:

Demarest Pond Buffer Installation

Location:	Subwatershed Priority:
Demarest Pond at Hardenburgh Avenue and County Road in Demarest, NJ.	First Priority

BMP Type and Description: Structural (Buffer) and Non-Structural (Geese Police)
Installing a vegetative buffer along the shoreline of Demarest Pond and using a Canada goose deterrent service to remove geese from the park.

Issues and Concerns:
A total maximum daily load (TMDL) was established for the Tenakill Brook to remove 96% of the fecal coliform currently found in surface waters. Possible sources of fecal coliform in this watershed are wildlife, house pets, and humans from faulty sanitary sewer lines. Many open green spaces are populated with wildlife, especially Canada geese (*Branta canadensis*), throughout the Tenakill Brook Watershed. The green spaces throughout the watershed become potential sources of bacteria due to the animal waste left behind each day by local wildlife. Green spaces that are not equipped with a proper BMP to treat the stormwater runoff generated from sites with excess wildlife waste should be considered sources of bacteria. The Demarest Pond Park has a partial buffer, but the buffer needs to be completed around the pond to ensure reduction in stormwater pollutants.

Existing Conditions:
Demarest Pond Park is approximately 7.8 acres. About half of the pond is surrounded by a buffer. There is approximately 1,280 linear feet of unprotected shoreline. The park is mostly comprised of turf grass with the exception of some trees and a few shrubs. On each side of the pond, the landscape gently slopes towards the pond. The park provides a great feeding ground for Canada geese. Canada geese can always be found at the park, as well as goose waste throughout the park. This goose waste is one of the sources of bacteria found in the Tenakill Brook Watershed. Goose waste can stay on the ground for several weeks. Stormwater runoff gathers bacteria from the waste on the surface and carries it to the pond. The park also provides many access points for the geese to enter the water due to the lack of a vegetated buffer in spots surrounding Demarest Pond making the park even more attractive to the geese.

Proposed Solutions:
The purpose of the proposed project is to turn an appealing site for geese into an undesirable one. If the Canada geese do not find the site appealing they will not visit the site, therefore, the site stops being a source of bacteria to the watershed. The geese are drawn to parks for a few reasons: turf grass provides an ample food supply; geese prefer sites that provide easy access to a waterway; geese feel safe at locations with no obstructions blocking their view from potential predators. All of these conditions exist at Demarest Pond Park.

First, a geese deterrent service such as the 'Geese Police' should be hired to scare Canada geese from the site. A geese deterrent service brings dogs to locations at different times of the day and different days of the week. These random times prevent the geese from learning a pattern of when 'Geese Police' are at the site and when they are not. Over a period of time, the geese will learn not to visit the site anymore because of the geese deterrent system. This service can be expensive as a long term solution because the geese will always return to an appealing site to check for predators. Therefore, unless the features of the site change, the geese deterrent service will need to continue for the existence of the park.

A 15 meter (~50 feet) vegetative buffer should be installed along the entire shoreline of Demarest Pond. The vegetative buffer should be comprised of warm season grasses and herbaceous plants. The vegetation in the buffer should be allowed to grow very tall. Ideally, the buffer should only be mowed once a year during the

winter, and the buffer should be kept a minimum height of 6 inches at all times. The buffer will remove the site's access to water. The geese will not feel safe walking through the buffer to access the water. The buffer will dramatically reduce the amount of turf grass the geese will be able to eat at the site. Finally, the buffer will provide obstructions to the geese's view that will make them wary of predators.

Installing a 15 meter buffer will make this site unappealing for geese and remove it as a source of bacteria for the watershed. An additional advantage the buffer provides is treatment of stormwater runoff. If there are still bacteria in the stormwater runoff from Demarest Pond Park due to domesticated pets or wildlife, the vegetative buffer will filter the bacteria out of the stormwater runoff.

A year after the buffer has been installed, the geese deterrent service should be stopped. The geese should not return to the site, and this source of bacteria will be eliminated.

Anticipated Benefits:

During the development of the Tenakill Brook Watershed Restoration and Protection Plan, a project similar to the solution described above was installed. The Roosevelt Commons Park has a small pond that was frequented by many Canada geese. The outfall of the pond was a sampling location for the Tenakill Brook Watershed project and was visited two times a month. The number of geese around the pond was counted at each visit. The number of geese surrounding the pond was regularly above 30 animals. A geese deterrent service was hired and a buffer was installed (this park did not have a stream with unstable streambanks so there was no need for streambank stabilization). Post-construction sampling showed one year after the buffer was installed the amount of bacteria exiting the pond was reduced (by 91% for fecal coliform and 84% for *E. coli*) from two years prior. Similar results are expected from this project.

Major Implementation Issues:

The Demarest Pond Park is frequented by many residents throughout the year. Some of them may object to the change of vegetation. The pond is used as a local fishing spot, considerations would need to be made to protect the fishing opportunities the park provides to its residents. Engineers would need to work with residents and town officials to develop a plan that would make the site unappealing to geese while keeping all its appealing features to the town residents

Possible Funding Sources:

NJDEP Nonpoint Source Pollution 319(h) Grants (http://www.state.nj.us/dep/watershedmgt/319grant.htm)

Partners/Stakeholders:

The municipality of Demarest, NJ.

Task	Task Description (each project)			Cost
1	Prepare concept plan and present to Borough officials			$3,000
2	Complete topographic survey and soils test			$3,000
3	Prepare final design			$4,000
4	Prepare maintenance plan			$2,000
5	Prepare construction documents and solicit quotes from contractors			$4,000
6	BMP installation			
	Activities for BMP Installation	Unit Costs	Quantity	
	Install vegetated buffer	$1/sq. ft.	63,900 sq. ft.*	$63,900
	Soil erosion and geese prevention measures	$3,000	1	$3,000
	'Geese Police'	$5,000	1	$5,000
	Contingency (20%)			$14,380
	Total BMP Installation Costs			$86,280
Total Project Cost				$102,280
Annual Operation and Maintenance Cost				$500

Supplemental Maps, Graphs and/or Photos:
Figure 1: Location of Demarest Pond Park.
Figure 2: Portion of Demarest Pond unprotected by buffers (facing downstream).
Figure 3: Unprotected shoreline along Demarest Pond.

Figure 1: Location of Demarest Pond Park.

Figure 2: Portion of Demarest Pond unprotected by buffers (facing downstream).

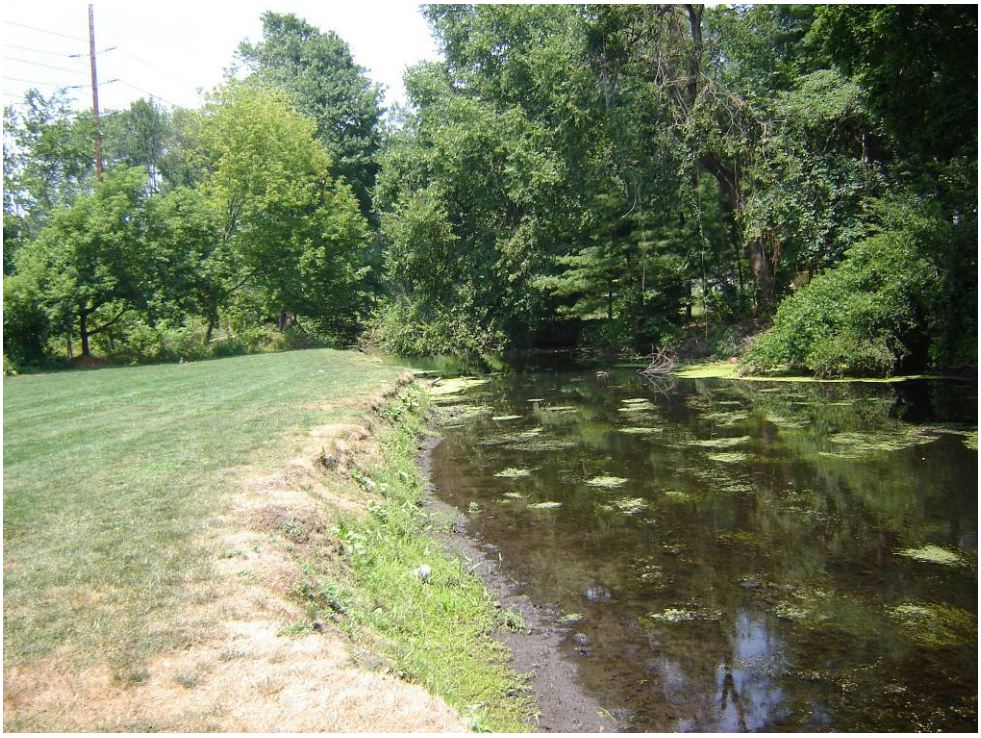

Figure 3: Unprotected shoreline along Demarest Pond.

Project Name:

Illicit Connection Disconnection Program and Sanitary Sewer Survey

Location:	Subwatershed Priority:
The entire Tenakill Brook Watershed.	First Priority

BMP Type and Description: Non-Structural (Survey) and Structural (Disconnection)
Detecting and eliminating all illicit connections and sanitary sewer discharges in the Tenakill Brook Watershed.

Issues and Concerns:
A total maximum daily load (TMDL) was established for the Tenakill Brook to remove 96% of the fecal coliform currently found in surface waters. Possible sources of fecal coliform in this watershed are wildlife, house pets, and humans from faulty sanitary sewer lines. Many open green spaces are populated with wildlife, especially Canada geese (*Branta canadensis*), throughout the Tenakill Brook Watershed. There are no septic systems or a large homeless population in this watershed which are common sources of bacteria from human waste. The only plausible source of bacteria from human waste is the sanitary sewer system. The two known ways for the sanitary sewer to contaminate the Tenakill Brook is through a broken sanitary sewer line that leaches influent into the brook or an illicit connection. An illicit connection is when a sanitary sewer line is illegally connected to the stormwater sewer or directly to a stream.

Existing Conditions:
During a brief survey of one subwatershed in the Tenakill Brook Watershed, at least three possible illicit connections were found entering the Tenakill Brook. Three different pipes on different properties were found in the stream bank of the Tenakill Brook. These pipes could be connected to basement sump pumps, kitchen sinks, etc. The effluent from these pipes should be connected to a sanitary sewer system for treatment before it is discharged to surface water. The Water Resources Program reviewed sanitary sewer inspection video from Haworth Borough (a small portion of Haworth is in the Tenakill Brook Watershed). The inspection video showed broken and/or clogged pipes. The infrastructure of the municipalities in this watershed is around the same age. The Water Resources Program believes that if the sanitary sewer lines in Haworth Borough are damaged then the sanitary sewer lines of the other municipalities in the Tenakill Brook Watershed could be damaged and potentially leaching sewage into the surface water.

Proposed Solutions:
The municipalities should each have an illicit connection program to meet the requirements of their MS4 permits. This program should include a public education/outreach portion. The Water Resources Program recommends that municipalities continue their illicit connection programs and increase the amount of education/outreach and inspections of connections that they perform. The Water Resources Program recommends that each municipality investigate their sanitary sewer lines with the assistance of Bergen County Utilities Authority, who conducted the Haworth Borough video survey. These investigations should include whatever method is deemed necessary and/or appropriate to find leaks in sanitary sewer lines.

Anticipated Benefits:
The Water Resources Program has determined that the majority of bacterial contamination in the Tenakill Brook Watershed is from human sources and waterfowl. If human sources of bacteria due to illicit discharges or failing sanitary sewer infrastructure are eliminated, then a fraction of the bacteria found in the Tenakill Brook Watershed would be left to treat through other means.

Major Implementation Issues:
Illicit connections are installed by homeowners. The municipalities would have to work with each homeowner on a one on one basis to remove their illicit connection(s), increasing the amount of time needed to perform these disconnections. A sanitary sewer inspection can be costly and time consuming for a municipality. The amount of work and money required even with funding support from grants could make municipalities reluctant to perform these projects.

Possible Funding Sources:
NJDEP Nonpoint Source Pollution 319(h) Grants (http://www.state.nj.us/dep/watershedmgt/319grant.htm)
New Jersey Environmental Infrastructure Trust (http://www.njeit.org/)

Partners/Stakeholders:
All municipalities within the Tenakill Brook Watershed (Alpine Borough, Closter Borough, Haworth Borough, Demarest Borough, Dumont Borough, Cresskill Borough, Tenafly Borough, and Englewood City) as well as the Bergen County Utilities Authority.

Task	Task Description	Cost
1	Video inspection of sanitary sewer lines	TBD
Total Project Cost		TBD

Supplemental Maps, Graphs and/or Photos:
Figure 1: Sewer service areas in the Tenakill Brook Watershed overseen by the Bergen County Utilities Authority.

Figure 1: Sewer service areas in the Tenakill Brook Watershed overseen by the Bergen County Utilities Authority.

Project Name:

Memorial Park Shoreline Restoration Project

Location:	Subwatershed Priority:
Memorial Park at Harrington Avenue and Closter Dock Road in Closter, NJ.	Sixth Priority

BMP Type and Description: Structural (Buffer) and Non-Structural (Geese Police)
Hiring 'Geese Police' to deter Canada geese from Memorial Park, installing a vegetative buffer along the stream, and re-grading the streambanks to reduce pollutants from entering Tenakill Brook.

Issues and Concerns:
A total maximum daily load (TMDL) was established for the Tenakill Brook to remove 96% of the fecal coliform currently found in surface waters. Possible sources of fecal coliform in this watershed are wildlife, house pets, and humans from faulty sanitary sewer lines. Many open green spaces are populated with wildlife, especially Canada geese (*Branta canadensis*), throughout the Tenakill Brook Watershed. The green spaces throughout the watershed become potential sources of bacteria due to the animal waste left behind each day by local wildlife. Green spaces that are not equipped with a proper BMP to treat the stormwater runoff generated from sites with excess wildlife waste should be considered sources of bacteria. The Tenakill Brook that runs through Memorial Park has a poorly vegetated buffer and unstable streambanks. These conditions need to be improved to reduce stormwater pollutants from entering Tenakill Brook.

Existing Conditions:
Memorial Park is located in Closter Borough along Harrington Avenue. Memorial Park covers approximately 6.3 acres, and the entire park drains to the Tenakill Brook. Geese are often found at the park, contributing to excessive amounts of bacteria in the water from their feces. There is little to no vegetative buffer in certain areas along the Tenakill Brook, so water is easily accessible by Canada geese from the grassy areas of the park. Also, the streambanks are heavily incised and very unstable. Upon conducting the Channel Evolution Model, the Water Resources Program determined that the Brook is in stage 2. A stream in stage 2 has headcuts present, exposed bedrock, exposed cultural features, sediment deposits are absent or sparse, and the streambank slopes are greater than 1:1, which are contributing factors to excessive erosion of the banks as sediment is washed into the Tenakill Brook.

Proposed Solutions:
First, Closter Borough should hire 'Geese Police' or other geese deterrent service to scare the geese away from the site. Geese deterrent services periodically visit sites with dogs to scare geese away from the location at different times of the day and at varying intervals to keep geese from returning to the site.

Second, plans to stabilize the streambanks and create a vegetated buffer surrounding Tenakill Brook to cut off any access Canada geese have to it need to be developed and implemented. The streambank stabilization should have the goal of transforming the stream from a stage 2 in the Channel Evolution Model into a more stable stage. Stable stages are characterized as well developed bank full and base flow channels and streambank slopes greater than or equal to 1:1. A 15 meter buffer will be installed to prevent any access to the waterway by Canada geese from the park. The buffer will be comprised of warm season grasses and herbaceous vegetation. The streambanks need to be stabilized as part of this plan to protect the buffer and ensure it doesn't erode away in the near future.

A year after the streambank stabilization occurs and the buffer has been installed, the goose deterrent service should be stopped. The geese should not return to the site, and this source of bacteria will be eliminated.

Anticipated Benefits:
During the development of the Tenakill Brook Watershed Restoration and Protection Plan, a project similar to the solution described above was installed. The Roosevelt Commons Park has a small pond that was

frequented by many Canada geese. The outfall of the pond was a sampling location for the Tenakill Brook Watershed project and was visited two times a month. The number of geese around the pond was counted at each visit. The number of geese surrounding the pond was regularly above 30 animals. A geese deterrent service was hired and a buffer was installed (this park did not have a stream with unstable streambanks so there was no need for streambank stabilization, unlike at Memorial Park). Post-construction sampling showed one year after the buffer was installed the amount of bacteria exiting the pond was reduced (by 91% for fecal coliform and 84% for *E. coli*) from two years prior. Similar results are expected from this project if implemented.

Major Implementation Issues:

The only serious implementation issue foreseen is permitting. This project would require a stream encroachment permit to stabilize the streambanks and install the buffer. This type of permit can be difficult to receive. The permit will allow contractors to reshape the stream slope and size of the streambank to make them more stable. Without this part of the project the proposed buffer would erode away a few years after installation. The Water Resources Program will work with the New Jersey Department of Environmental Protection (NJDEP) to carefully design the plans to meet the permit requirements for a stream encroachment permit.

A minor implementation issue is aesthetics. The new design will change the landscape of the park and residents who live near the park or use the park frequently may object to such changes. This kind of issue can be taken care of by working closely with municipal officials and communicating with the public about the need for the buffer and additional changes proposed in this project.

Possible Funding Sources:

NJDEP Nonpoint Source Pollution 319(h) Grants (http://www.state.nj.us/dep/watershedmgt/319grant.htm)
Watershed Institute Grant Program (http://www.thewatershedinstitute.org/resources/twig/)

Partners/Stakeholders:

The municipality of Closter, NJ.

Task	Task Description			Cost
1	Prepare concept plan and present to Borough officials			$6,000
2	Complete topographic survey and soils test			$4,000
3	Prepare final design			$4,000
4	Prepare maintenance plan			$2,000
5	Prepare construction documents and solicit quotes from contractors			$4,000
6	BMP Installation			
	Activities for BMP Installation	Unit Costs	Quantity	
	Re-grade streambanks	10,000	1	$10,000
	Install buffer	$1/sq. ft.	63,900 sq. ft.*	$63,900
	Soil erosion and goose prevention measures	$3,000	1	$3,000
	'Geese Police'	$5,000	1	$5,000
	Contingency (20%)			$16,380
	Total BMP Installation Costs			$98,280
Total Project Cost				$118,280
Annual Operation and Maintenance Cost				$500

Supplemental Maps, Graphs and/or Photos:
Figure 1: Location of Memorial Park.
Figure 2: Photograph of unstable streambanks along Tenakill Brook at Memorial Park.
Figure 3: Photograph of the poor quality buffer along Tenakill Brook at Memorial Park.

Figure 1: Location of Memorial Park.

Figure 2: Photograph of unstable streambanks along Tenakill Brook at Memorial Park.

Figure 3: Photograph of the poor quality buffer along Tenakill Brook at Memorial Park.