DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT

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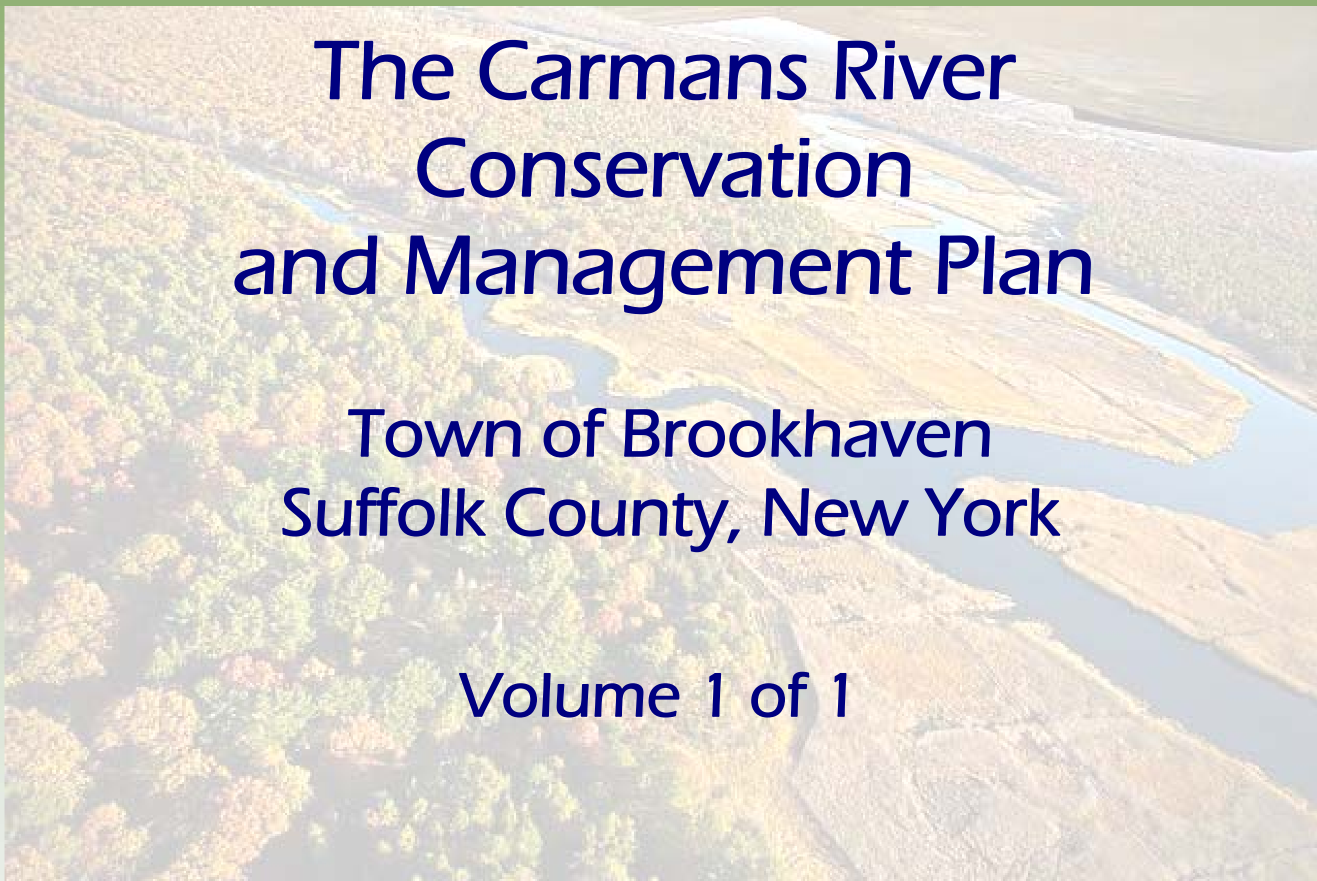

The Carmans River Conservation and Management Plan

Town of Brookhaven
Suffolk County, New York

Volume 1 of 1

Brookhaven Town Planning, Environmental & Land Management

Town of
Brookhaven
Long Island

JULY 2013

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DRAFT GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR THE CARMANS RIVER CONSERVATION AND MANAGEMENT PLAN

in the hamlets of Brookhaven, Middle Island, Shirley and Yaphank,
Town of Brookhaven, Suffolk County, New York

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Date of Acceptance: ____

Date of Public Hearing: ____

Date Written Comments Due: ____

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Executive Summary

Introduction

This Draft Generic Environmental Impact Statement (DGEIS) was prepared for the purposes of addressing the potential environmental impacts from adoption and implementation by the Town of Brookhaven of its Carmans River Conservation and Management Plan. The "Plan" (as it will be referred to in this document) covers the 0-100 year contributing area ("Study Area" as it will be referred to in this document) for the Carmans River in order to protect and manage the river and its resources.

The Study Area comprises the 100 year groundwater contributing area for the Carmans River as delineated by Camp, Dresser and McKee Inc. (CDM) and the area of surface water flow to the Carmans River. The Carmans River is fed by groundwater and is called the watershed, or the groundwater contributing area. This area has been the subject of extensive scientific investigation and has been mapped by qualified scientists at CDM, Inc. for the Suffolk County Department of Health Services (SCDHS) as part of Task 15 of the Suffolk County Comprehensive Water Resources Management Plan (SCCWRMP) update (CDM/SCDHS, 2009). It covers approximately 20,000 acres, 5,600 of which are owned by the Town of Brookhaven, Suffolk County, New York State and/or the Federal Government. Each day approximately 46 million gallons of water flow out of the Carmans River and into the Great South Bay, and over 95% of the river's flow originates from groundwater (Cashin Associates. 2002. Carmans River Assessment).

The primary intent of the Plan is to preserve and protect land within the Carmans River watershed and water quality within the river. This will be achieved by reducing future development and the impacts associated with development in the watershed thereby protecting groundwater quality and natural environments. This will have a beneficial effect on groundwater quality, as well as the water quality of the Carmans River. It is important to the residents of the Town of Brookhaven that the ecological integrity, aesthetic qualities, and recreational opportunities of the river and associated watershed be protected. The protections from development of the lands in the watershed are inextricably tied to these goals.

The Plan will achieve the two goals of water quality protection and of protecting the lands within the watershed by applying protective standards developed for the protection of the Central Pine Barrens, acquisition of lands, the rezoning of lands within the watershed and the utilization of Best Management Practices (BPM's) with regards to storm water runoff and by implementing a series of recommendations that will decrease adverse impacts associated with land use within the watershed.

1.0 Description of the Proposed Action

1.1 Overview of Generic Environmental Impact Statement

This document is part of the official record under the New York State Environmental Quality Review Act (SEQRA) process outlined in Title 6 of the New York Code of Rules and Regulations (6 NYCRR) Part 617, with statutory authority and enabling legislation under Article 8 of the NYS Environmental Conservation Law (ECL). It was determined that the proposal would be appropriate for the preparation of a GEIS. SEQRA Part 617.10 (a) indicates the following with regard to GEISs:

(a) Generic EIS's may be broader, and more general than site or project specific EIS's and should discuss the logic and rationale for the choices advanced. They may also include an assessment of specific impacts if such details are available. They may be based on conceptual information in some cases. They may identify the important elements of the natural resource base as well as the existing and projected cultural features, patterns and character. They may discuss in general terms the constraints and consequences of any narrowing of future options. They may present and analyze in general terms a few hypothetical scenarios that could and are likely to occur. A generic EIS may be used to assess the environmental impacts of:

(4) an entire program or plan having wide application or restricting the range of future alternative policies or projects, including new or significant changes to existing land use plans, development plans, zoning regulations or agency comprehensive resource management plans.

The above indicates that a Draft GEIS is the correct method of evaluating the significance of the proposed Plan. As noted in Part 617.10 (c), a Generic EIS and its findings should set forth specific conditions or criteria under which future actions will be undertaken or approved, including requirements for any subsequent SEQR compliance. They may include thresholds and criteria for a supplemental EIS to reflect specific significant impacts, such as site-specific impacts, that were not adequately addressed or analyzed in the generic EIS.

With respect to subsequent SEQRA procedures, Part 617.10 (d) states:

(d) When a final generic EIS has been filed under this part:
(1) No further SEQRA compliance is required if a subsequent proposed action will be carried out in conformance with the conditions and thresholds established for such actions in the generic EIS or its findings statement;
(2) An amended findings statement must be prepared if the subsequent proposed action was adequately addressed in the generic EIS but was not addressed or was not adequately addressed in the findings statement of the generic EIS;

(3) A negative declaration must be prepared if a subsequent proposed action was not addressed or was not adequately addressed in the generic EIS and the subsequent action will not result in any significant environmental impacts;
(4) A supplement to the final generic EIS must be prepared if the subsequent proposed action was not addressed or was not adequately addressed in the generic EIS and the subsequent action may have one or more significant adverse environmental impacts.

Thus, this Draft GEIS will be subject to the full procedures of Part 617, providing a proper and complete forum for interagency review and public comment.

6NYCRR Part 617 regulates the review of environmental consequences of an action as promulgated under SEQRA. The Brookhaven Town Board is the Lead Agency for the project, as the application that triggered the SEQRA process is under the jurisdiction of that Board. The attached Appendix to the DGEIS contains the Environmental Assessment Form (EAF) Parts I and II that were prepared for the Plan. The Town Board determined that the proposed project is a Type I Action pursuant to Chapter 80 of the Brookhaven Town Code.

The Brookhaven Town Board assumed Lead Agency status on the Plan and issued a Positive Declaration on June18, 2013, requiring the preparation of this Draft GEIS. Future stages of this SEQRA review include: Lead Agency review and acceptance of this Draft GEIS with respect to content and adequacy; a public comment period, a public hearing on the Draft GEIS; preparation of a Final GEIS (FGEIS) that addresses comments received during the Draft GEIS comment period; acceptance of the Final GEIS by the Lead Agency, and written Findings by the Lead Agency.

1.2 Components of the Carmans River Conservation and Management Plan

1.2.1 Land Acquisition for Carmans River Watershed Protection

<u>Overview</u>
The Town of Brookhaven has made it a priority to purchase environmentally sensitive lands throughout the Township to protect and preserve habitat, threatened and endangered species, historic and cultural uses, and for groundwater protection. While the Town of Brookhaven has limited financial resources the acquisition of properties for open space purposes is an integral part of the Town's efforts to protect natural resources for future generations. This Plan identifies land recommended for acquisition to protect the watershed and water quality of the Carmans River.

The Plan recommends for acquisition a list of environmentally sensitive parcels within the Study Area. This acquisition list was previously generated by the Open Space Committee and the Plan provides a further basis for acquisition and preservation of these parcels. Preservation of the parcels identified for acquisition in the plan uses public funds to preserve lands within the watershed in a natural state. Preserving lands in a natural state reduces potential impacts to the watershed from the development of the lands and the associated clearing of natural vegetation that both reduces and fragments natural habitat and results in the generation of contaminants associated with sanitary wastewater.

Creating contiguous blocks of natural vegetation also aids in the movement of wildlife and is a major component of New York State's Wild, Scenic and Recreational River (NYSWSRR) designation as well as the New York State Pine Barrens Commission's Core and Compatible Growth Area goals.

The Town has taken steps to ensure that a funding source for acquisition is available. The adoption of the Land Use Intensification Mitigation Fee requires that donations are made to the Joseph Macchia Environmental Preservation Capital Reserve Fund. This fee applies to change of zone applications that request a more intensive zoning category. The Joseph Macchia Fund can be used to purchase open space outright as well as development rights throughout the Town and thus is a crucial tool for land preservation funding.

<u>Parcel Ranking System to prioritize acquisitions:</u>
The Plan provides for ranking parcels as either Primary or Secondary acquisition rankings. The Primary acquisition parcels are those that were identified as natural and undisturbed lands within the Study Area. The Secondary acquisition parcels are those lands that have been identified as being disturbed or developed in some fashion and therefore receive the lowest priority in acquisition.

<u>Expansion of the Protections of the Central Pine Barrens Comprehensive Land Use Plan to the Carmans River Management Plan Area:</u>
The Central Pine Barrens Joint Planning and Policy Commission (CPBJPPC), also known as the Pine Barrens Commission, was created through State Law in 1993. Subsequent legislation for the protection of habitat and water quality was put into place. This legislation created two management areas within the Central Pine Barrens: the Compatible Growth Area (CGA) and the Core Preservation Area (CPA), known as the "Core". The Compatible Growth Area allows new development that meets standards which are protective of water quality and habitat preservation. The Core of the Pine Barrens does not allow development except for properties the meet a listed exemption. As part of the Plan, an expansion of the Pine Barrens Compatible Growth Area and Core Preservation Area will take place which will be instrumental in reducing the impacts to the river and its watershed from future development.

<u>Pine Barrens Compatible Growth Area</u>
Expanding the Compatible Growth Area requires the Town of Brookhaven to compile a list of properties which are ecologically significant to enhance ground and surface water protection and which create and enhance contiguity within the Management Plan Area and with the existing Pine Barrens Area.

The criteria for adding parcels to the CGA were the parcels located within the 0-5 year groundwater contributing area of the Carmans River as delineated by CDM that were not currently included within the CGA. This list of parcels was submitted to the New York

State Legislature for inclusion within the Central Pine Barrens and may be amended as necessary.

Pine Barrens Core

Expanding the Core Preservation Area requires the Town of Brookhaven to compile a list of properties which are ecologically critical for the protection of the deep ground water recharge aquifers that provide high quality drinking water, the immediate surface water flow to the Carmans River and which create and enhance contiguity of habitat within the watershed and with the existing Core Preservation Area. While some of these properties are publicly owned (such as Camp Olympia and Fox Lair), many of the parcels are privately held and are currently eligible for development. Additionally, some parcels were designated as receiving areas under the original Pine Barrens Protection Act. Adding these parcels to the Core, it not only prevents them from being developed and contributing to contaminants within the watershed, it also keeps them from receiving added development density through the existing Pine Barrens transfer of development program.

The criteria for adding undeveloped parcels to the Core consisted of location within the 0-5 year contributing area, residential zoning, and parcels that had been previously identified as appropriate for acquisition. These parcels were reviewed and added to the list of expanded Core parcels. This list was submitted to the New York State Legislature adopted bill and may be amended as necessary.

1.2.2 Land Use and Zoning

Overview

One basic way municipalities can control types of land use and development that adds contaminants to the watershed is through zoning. The Plan specifies that all privately owned residentially zoned properties within the 0-2 year groundwater contributing area as well as privately owned residentially zoned parcels within the 2-5 year groundwater contributing area that are currently zoned to allow more intensive use than A-Residential-2 zoning shall be rezoned to A-Residential-2 (two acre residential).

By re-zoning these properties to A-Residential-2, future development and subdivision of these properties will decrease the number of potential new sanitary systems that contribute contaminants to the Study Area to be installed, and will decrease the clearing of natural vegetation thus decreasing impacts to the watershed from lawn and landscaping that adds contaminants in the form of nutrients from fertilizer and herbicides and pesticides to the watershed. Studies, including the Long Island 208 Study (Koppelman, 1978), find that development patterns consistent with two acre zoning reduce the overall nitrogen loading to ground and surface waters when compared to a less restrictive zoning category.

Benefits

Because not all properties are appropriate for acquisition or addition to the Core, re-zoning them can accomplish many goals achieved through acquisition without creating additional density in areas outside of the Management Plan Area (which occurs when parcels are added to the Core and transferable development rights are created). When a parcel is up-zoned from A-Residential-1 to A-Residential-2, for example, the property can no longer be subdivided or split unless the resultant lots are a minimum of two acres. It should be noted that property owners can seek a variance from Town Code through the Town of Brookhaven Board of Zoning Appeals from the A-Residential-2 zoning requirements. Although, with the new zoning in place, development throughout the Management Plan Area will be significantly easier to control and potential impacts on the Management Plan Area will be reduced through reduced development.

1.3 Project Need/Purpose, Benefits

1.3.1 Water quality trends in the Carmans River

<u>Overview</u>
The Plan details the surface water quality in the freshwater section of the Carmans River. Water quality in the river is determined by the quality of groundwater that discharges into the river, atmospheric deposition of contaminants, runoff of contaminants into the river, and biological activity that can remove contaminants. Land use is a major factor in determining water quality as it affects the volume of sanitary waste discharged in the watershed, storm water runoff, spills, herbicide, pesticide and fertilizer use rates, and the nature and extent of vegetation.

With respect to the surface waters of the Carmans River, water quality has worsened over the last several decades based on data collected by the United States Geological Survey (USGS) and other agencies. By implementing the Plan, properties will be up-zoned, acquired or added to the Core and CGA of the Central Pine Barrens, storm water outfalls will be improved via remediation and agricultural lands will be required to use best management practices when using fertilizer. The implementation of these components of the plan will reduce the potential for further degradation of the water quality in the watershed.

1.3.2 Habitat loss in the Carmans River watershed

<u>Overview</u>
The watershed provides habitat for a diverse group of plants and animals. Due to the varied habitats present throughout the watershed, the fauna includes species ranging from common (white-tailed deer, eastern grey squirrels, grey catbirds), to uncommon (eastern box turtles, barrens buck moth, American bittern) and the rare (grey fox, tiger salamander). Habitat loss is a threat to flora and fauna species within the watershed. The Grey Fox, for example, was thought to have been extirpated from the Long Island region until a deceased individual was found in Yaphank during the review of a proposed subdivision. Further investigation discovered an active grey fox den and with the consideration of other environmental concerns, the parcel was preserved from development, thus protecting valuable habitat. Construction of residential and commercial structures, new and wider roads and greater energy/utility demands have

resulted in thousands of acres of forest and other habitats being lost to development or otherwise significantly altered.

By implementing the Plan, thousands of acres will be up-zoned, acquired or added to the Core of the Pine Barrens, minimizing the loss of valuable habitat and preserving water quality. An added benefit to reducing or eliminating development in areas of the watershed is the ability to create or maintain contiguous tracts of land which act as wildlife corridors. One species in particular, the River Otter, may benefit greatly from the preservation of contiguous lands along the Carmans River and surrounding areas. While River Otters were once extirpated from Long Island, in recent years they have been discovered living in both Nassau and Suffolk Counties with physical evidence of their presence in areas along the Carmans River. By preserving large blocks of land River Otters and other wildlife that are associated with the watershed and which are part of the natural heritage of Brookhaven residents will benefit.

Restoration of Degraded Properties

There are extensive publicly owned lands within the Management Plan Area that have had their natural quality degraded through illegal use of all-terrain vehicles (ATVs), illegal dumping and other disturbances. These illicit abuses of the public properties have caused erosion, pollution, habitat loss and a general decline in the aesthetic qualities of open space.

One of the recommendations of the plan is to restore degraded properties and to increase monitoring of public lands by local enforcement officers. Part of the Plan will identify open space properties, which are degraded and then develop and implement site-specific restoration plans. Areas that have been harmed by ATV use and dumping should be restored with native plantings and barriers to prevent future illicit use of the land.

1.4 Management Plan Area

Overview

The Carmans River Management Plan Area is the area that affects the environmental health and quality of the Carmans River measured by the water quality, habitats, biodiversity, and species abundance and distribution, as well as the aquatic, riparian, and terrestrial communities that comprise the River's ecosystem. The water quality in the river is a primary determinant of the ecological conditions in the river. Thus, the Management Plan Area was determined to include the area that contributes groundwater and surface flow to the Carmans River.

Although the Plan studies all of the lands within the 100 year groundwater contributing area, The Carmans River Management Plan Area is defined as the area that contributes ground water to the river from the 0 to 5 year contributing areas as delineated by CDM. A major component of the Plan is to add environmentally important parcels to the Core of the Pine Barrens throughout the Management Plan Area in a way that creates contiguous open space and wildlife habitats. Additions to the CGA hope to achieve the clearing and fertilizer limitations afforded by the Pine Barrens Plan, south of the Long Island Expressway and within the Management Plan Area.

Critical Environmental Areas (CEAs)
The Management Plan Area is located entirely within State and/or Town designated Critical Environmental Areas (CEAs). As defined in Town Code, a CEA is a "...specific geographic area designated by a state or local agency, having exceptional or unique environmental characteristics."

In addition to being within a portion of the New York State Central Pine Barrens CEA, the Management Plan Area (or portions thereof)is located within the Central Suffolk Special Ground Water Protection Area (SGPA), the South Shore Estuary Reserve (SSER), the Suffolk County Department of Health Services (SCDHS) Groundwater Management Zone III and VI, the Town of Brookhaven (ToB) Hydrogeologic sensitive zone, ToB Central Pine Barrens CEA, and the ToB South Shore CEA East. The Carmans River was a critical component to the determination of boundaries and basis of some of the prescribed areas above.

Wild, Scenic, Recreational River
The Carmans River has been designated a Wild, Scenic and Recreational River (WSRR) by the State of New York. The WSRR Act was passed by the NY State Legislature in 1972 and allowed for rivers throughout the state to be nominated for WSRR designation. The Carmans River contains areas designated as both Wild and Scenic which reflect the different types of land use surrounding the River. The Northernmost portion of the River (from just south of Longwood Library to approximately one half mile north of the Upper Lake Dam) is classified as Scenic. The next portion which runs south to the Lower Lake Dam is classified as Recreational. From Lower Lake Dam to the C-Gate Dam has been classified as Scenic, and the remainder of the River and Hard's Lake (to Hard's Lake Dam) is Recreational. The final portion of the River which runs from Hard's Lake Dam to Bellport Bay through Wertheim National Wildlife Refuge has been designated Scenic.

1.4.1 Methodology

Groundwater Contributing Area
The groundwater contributing area was delineated using a groundwater model developed specifically for use in Suffolk County by CDM (formerly Camp, Dresser & McKee), a consulting firm with expertise on the hydrology of Long Island. The groundwater model is used by the Suffolk County Department of Health Services (SCDHS) and Suffolk County Water Authority (SCWA) and has been found to be accurate by qualified personnel.

Groundwater models are useful tools for synthesis of factors affecting groundwater and surface water flow into a comprehensive description of the entire system. This model was utilized to determine the groundwater contributing area of the Carmans River.

The Suffolk County Groundwater Flow Model is a three-dimensional computer model based upon the equations of groundwater flow. It is essentially based on conservation of mass and Darcy's Law. In summation, Darcy's Law is a mathematical formula used to determine the flow rate of a fluid, such as water, through a porous media, such as the sands and other sediments found in our groundwater aquifers. The equations of groundwater flow are differential equations that are solved simultaneously at thousands of locations (called nodes) throughout the aquifer system as represented by the model. The Suffolk County Groundwater Model uses DYNFLOW to solve these equations based on a finite element solution technique.

A detailed review of the DYNFLOW model code has been conducted. At that time, the model codes were approved and validated by the International Groundwater Modeling Center at the Colorado School of Mines in Golden Colorado. Subsequently, the United States Environmental Protection Agency (USEPA) approved use of the DYNFLOW (and the companion contaminant transport code, DYNTRACK) on Superfund sites. Since that time, the models have been successfully used for numerous projects throughout the United States, including Nassau County, Queens and Brooklyn, and further in Europe and the Middle East, to support water resource management project. More details on the DYNFLOW and DYNTRACK may be found at www.dynsystem.com.

Recognizing the importance of the County's groundwater resources, in 1996, Suffolk County commissioned the development of a modeling tool that could be used to better understand the aquifer system and to assist in the evaluation of management questions relating to the impacts of sanitary sewers, drought, public water supply pumping, salt water intrusion potential, the transport and fate of contaminants released from point sources, establishment of monitoring programs and the development and evaluation of remediation programs. The inputs to the numerical model that was ultimately developed are a combination of published information and field data. For example, the USGS hydrogeologic framework was the basis for the regional model hydrogeology; it was refined locally where detailed data from SCDHS and SCWA well logs were available.

The validity of a model in describing groundwater flow depends on how well it can represent the aquifer system's response to a variety of conditions. This is evaluated by comparing model-simulated piezometric heads and stream baseflows to measured values during a variety of conditions. The CDM model was calibrated to hundreds of water levels and to stream baseflows measured during two independent time periods representing different conditions of precipitation, recharge and development. The model was further validated to a third set of water level measurements and stream baseflows. The model's ability to represent the aquifer's response to changing conditions of recharge and water supply pumping was further confirmed by a semi-transient simulation of the period from 1981 through 1994. Development, calibration and application of the model have been summarized in a technical report entitled *Suffolk County Groundwater Model* (CDM, 2003).

In 2002, New York State Department of Health (NYSDOH) selected the model as the basis for Nassau and Suffolk County's portion of Long Island's Source Water

Assessment Program (SWAP) to delineate the groundwater contributing area for each of the public supply wells in the County in compliance with the requirements of the amendments to the Safe Drinking Water Act. The models were updated to respond to the NYSDOH's more focused questions under the guidance of the Long Island SWAP Steering Committee (comprised of representatives from USEPA, New York State Department of Environmental Conservation (NYSDEC), USGS, environmental organizations, State University of New York (SUNY), Long Island Water Conference, and etc.), stakeholders and water suppliers. It is expected that the resulting SWAP maps generated by this effort will be utilized by public agencies and entities in reviewing activities proposed within these groundwater contributing areas to determine whether or not they may result in potential impacts and making recommendations for mitigation measures where appropriate.

The Suffolk County groundwater model has also been used as the basis for a number of site-specific contaminant fate and transport assessments completed for the County, for USEPA and for the Department of Energy (DoE) to guide remediation efforts for private clients, and State-lead Superfund sites. As part of the SWAP project, and the more recent updates completed for the County as part of the Suffolk County Comprehensive Water Resources Management Plan, thousands of potential contaminant source locations obtained from NYSDEC, SCDHS, and USEPA have been included in the model domain.

Time-of-travel is a measure of the time required for water to travel from where it enters the groundwater system (recharge) to where it is discharged. The CDM model calculates 6 different time-of-travel zones: 0 to 2 years; 2 to 5 years; 5 to 10 years; 10 to 25 years; 25 to 50 years; and 50 to 100 years. According to the model, the relative (percent) contribution to the baseflow to the Carmans River from the respective time-of-travel zones is shown in Table 2, as follows:

Table 2. Area and relative and cumulative percent contributions to baseflow based on the time of travel zones under long term average conditions of recharge and precipitation.

Time of travel zone	**area (acres)**	**relative%**	**contribution(years) cumulative %**
0 – 2	3,891	20.0	20.0
2 – 5	3,023	15.5	35.5
5 – 10	3,366	17.3	52.8
10 – 25	5,020	25.8	78.6
25 – 50	2,832	14.6	93.2
50 – 100	1,311	6.7	100
Total	19,422	100	N/A

Thus, the groundwater that discharges into the Carmans River is a composite of the water recharged from the different time-of-travel zones (locations).

The CDM model of the groundwater contributing area to Carmans Rivers shows the northerly extent to be approximately one-quarter mile south of Middle Country Road, in the vicinity of the Cathedral Pines County Park. The northern reach of the Carmans River (from Bartlett Road to Middle Country Road) is an area of intermittent flow (the start of flow varies over time) where the groundwater contribution to river flow only occurs during periods of high precipitation or recharge; intermittent stream flow could be due to surface runoff rather than groundwater flow. A reasonable order-of-magnitude estimate of groundwater contributing area includes the area within a few hundred feet of the stream channel. Alternatively, the groundwater model could be recalibrated and used to estimate maximum contributing area based on conditions of high precipitation and recharge.

The CDM model is believed to adequately reflect the east and west boundaries of the groundwater contributing area as they adjoin the groundwater contributing areas to the adjacent Beaverdam Creek to the west and the Forge River and Peconic River to the east. The northern limit is the area of deep recharge where the groundwater flow is vertical so that boundary is not as easy to discern. In this area of greatest and deepest vertical recharge groundwater flows downward into the deepest aquifers underneath the surface, such as the Magothy and Lloyd, and after a long period of time eventually flows horizontally with ultimate discharge into the Great South Bay or beyond. Accordingly, groundwater in this area of maximum vertical recharge does not enter into or contribute to the baseflow of the Carmans River but in actuality bypasses the river (flows beneath it).

To better refine the groundwater contribution to the Carmans River, the 50-to-100 year time-of-travel zones was subsequently calculated. In addition, several enhancements to the model were also made:

- because ground elevations are an important input to the model, the model was re-run using 2 foot ground elevations based on LIDAR (Light Detection and Ranging) in place of the 5 foot ground elevation from USGS topography;
- the grid spacing was reduced to 200 to 700 feet in selected area;
- above average precipitation was modeled.

The enhanced model shows some expansion of the groundwater contributing area to the east and west and a somewhat larger expansion to the north, and the groundwater contributing area extended just north of Middle Country Road.

1.5 NYS Senate Bill S. 05727& NYS Assembly Bill A. 07905; June 7, 2013

1.5.1 State Legislation

<u>Description</u>
As part of the Plan to protect the River, a bill was sponsored in both the New York State Senate and the New York State Assembly to amend the Environmental Conservation Law (ECL) and expand the Central Pine Barrens Compatible Growth Area (CGA) and Core Preservation Area (CPA) boundaries of the Central Pine Barrens. While the Town has the ability to make changes to zoning and make specific changes to allowable uses on

private property, the Plan offers additional measures that are needed to protect the River. Recent studies have indicated that the surface water quality and ground water quality in and around the River is in decline and will continue this trend unless changes are made.

To protect the river it is vital to protect the surrounding lands through various means, including adding ecologically important parcels to the Core area of the Central Pine Barrens. This legislation will allow for environmental preservation of sensitive lands within the Management Plan as well as economic growth in other areas of the Town, through the Pine Barrens Credit Program.

The legislation calls for public open spaces which are located in close proximity to the River to be added to the Core. Additionally, the Core boundary north and south of the Long Island Expressway will be expanded to include privately owned parcels. Significant protection for surface waters, groundwater and vital habitats will be provided from expanding the Core. The legislation also calls for the expansion of the Pine Barrens Boundaries south of the LIE. By expanding the boundaries, additional lands will be included in the Compatible Growth Area. Development in the CGA is limited by clearing standards and limits of fertilized vegetation which will have a positive influence on surface waters and groundwater quality.

An amendment to the Central Pine Barrens Comprehensive Management Plan to protect the Management Plan Area will be made for this expanded Pine Barrens Area and Core Preservation Area which is intended to preserve the recreational, aesthetic and natural resources for present and current generations.

Implementation Timeline

This act shall take effect on the first of January next succeeding the date on which it shall have become a law provided that if the provisions of this act establishing a new description and boundaries of the Central Pine Barrens Area or the Core Preservation Area removes or excludes any of the lands of the Central Pine Barrens Area or the Core Preservation Area as such lands are described and bounded in chapter 286 of the laws of 1998, and/or protections established and/or provided by such act, this act shall be deemed repealed and of no force and effect and chapter 286 of the laws of 1998 shall remain in full force and effect. The state legislature shall notify the legislative bill drafting commission of any such decrease and resulting repeal in order that the commission may maintain an accurate and timely effective data base of the official text of the laws of the state of New York in furtherance of effectuating the provisions of section 44 of the legislative law and section 70-b of the public officers law.

Implementation Procedures

The Plan must be approved by the Central Pine Barrens Joint Policy and Planning Commission (CPBJPPC). Once the Plan has been ratified, the Town of Brookhaven shall adopt it as an amendment to the Pine Barrens Act as per Section 57-0121 of the Comprehensive Land Use Plan (CLUP). This amendment to the Pine Barrens Act will be implemented by the Town after the adoption and ratification have occurred. The Town shall adopt and/or amend their local laws to create conformity with the Plan. The Town shall then submit the proposed regulations to the Commission for review and approval. Upon adoption of the approved land use regulations, the amendment to the Pine Barrens Act shall be deemed implemented. Upon implementation of the new land use regulations, all provisions of the act shall apply.

1.5.2 Parcels Added to the Compatible Growth Area

A list of parcels which are to be added to the Compatible Growth Area of the Central Pine Barrens can be found as an appendix in the Plan. The list includes 2,941 parcels, totaling 2,187.4 acres and is shown on Figure 27 of the Plan.

A metes and bounds description of the Pine Barrens Expansion Area has been prepared and is included as an appendix in the Plan and is subject to approval by the New York State Legislature and the Central Pine Barrens Joint Planning and Policy Commission.

1.5.3 Parcels Added to the Core Preservation Area

A list of parcels which are to be added to the Core Preservation Area of the Pine Barrens can be found as an addendum to this document. The list includes 587 parcels, totaling 1,597.41 acres and is shown on Figure 27 of the Plan.

A metes and bounds description of the Pine Barrens Core Preservation Area Expansion Area has been prepared and is included as Appendix C in the Plan and is subject to approval by the New York State Legislature and the Central Pine Barrens Joint Planning and Policy Commission.

1.5.4 Pine Barrens Credit Program

As part of the State Legislation, a select group of parcels will be added to the Core of the Pine Barrens as discussed in Section 1.5.1. One of the goals of the Plan is to reduce and/or eliminate the potential for new development within the Management Plan Area, with particular emphasis on the 0-5 year groundwater contributing areas. In accordance with the Pine Barrens Comprehensive Land Use Plan, The Town of Brookhaven has taken steps to offer additional means for the redemption of Pine Barrens Credits (PBC).

The Town will continue to develop other innovative ways to redeem PBC’s in accordance with the recommendations contained in the Central Pine Barrens Comprehensive Land Use Plan 1995.

2.0 NATURAL RESOURCES

2.1 Topography

2.1.1 Description:

The major topographic features of Long Island, including those in the Carmans River area, originated in the moraines that were formed by the advance and retreat of glaciers during the Pleistocene Epoch, which commenced approximately one million years ago. As glaciers moved southward, they scraped and scoured the underlying bedrock which resulted in the production of sediment. Melting of the glaciers generated liquid water which flowed south and in doing so transported and sorted the sediments to form wide, relatively flat outwash plains containing unconsolidated material which comprises today's south shore areas. As the glaciers retreated northward due to melting, they also deposited glacial till containing unconsolidated material consisting of sands, gravels, pebbles, rock, and boulders (TOB, 1981; DEC, 2010). At the close of the glacial period, mud and silts are believed to have been deposited in swamps and lakes in the low lying area between the moraines (CPBJPPC, 1995).

The last two advances of the Pleistocene glacial ice formed the Ronkonkoma Moraine, approximately 60,000 years ago, and the Harbor Hill Moraine, 23,000 years ago, respectively. The Ronkonkoma Moraine is an interrupted, low-lying ridge (elevations generally less than 300 feet) that is oriented in a generally west-east direction through the center of Long Island. Its location depicts the southernmost advance of glacial movement (TOB, 1981). It is through a gap in the Ronkonkoma Moraine that the Carmans River flows south to the coastal outwash plain and finally to Bellport Bay in the South Shore Estuary (Cashin, 2002). The River represents exposed groundwater filling an existing valley that was carved into the sediments as a result of glacial activity, in contrast to a true river created by surface water drainage from uplands and melting snows (Koppelman, 1996).

In general, topography in the Carmans River watershed can be described as relatively flat to gently sloping along its banks, floodplains, and riparian wetlands, particularly in its southern reaches such as within the Wertheim National Wildlife Refuge and its surrounding salt marshes. Slopes where outwash plains and recent deposits can be found are generally even to gently rolling and range from 0 to 15% (CPBJPPC, 1995). However, slopes within the watershed steepen to the north of the Long Island Expressway, particularly in the northern areas of Yaphank and in Middle Island in areas that are parallel, but not adjacent to both the eastern and western sides of the river. In these locations, slopes of greater than 15 percent are achieved with prominent, steep hills overlooking the river as in the area just south of Cathedral Pines County Park and west of County Road 21. The moraine areas are very hilly and uneven containing slopes that range from 15 to 35% in many areas. As such, topography on the northern end of the watershed tends to roll and includes a number of small, shallow depressions or kettle kames forming knob and kettle topography (alternating hills and circular depressions) (Cashin, 2002).

Maximum topographic elevations within the watershed are approximately 200 feet above mean sea level north of Yaphank (east of the intersection of Barbara Lane and West Bartlett Road on the west side of the river and north of Shannon Boulevard and east of Middle Island Road on the east side of the river) (Cashin, 2002; CPBJPPC, 1995). Topographic contours on the USGS Quadrant Maps for Middle Island and Bellport, which cover the Carmans River watershed, illustrate 10 foot contour elevation changes roughly every half mile descending from the headwaters southward to the mouth of the River (USGS, 1967).

The Carmans River headwaters originate in the Pine Barrens area in Middle Island. Starting at an elevation of approximately 70 feet, the river descends in a southerly direction with an estimated average drop of roughly 4.4 feet per mile, at an estimated gradient of 0.083 percent. The actual gradient of the river bed is generally steeper on its north end than near the mouth of the river.

2.1.2 Potential impacts:

No impact on the topography of the watershed is expected due to the nature of the proposed land use plan that will discourage and/or prevent future development within the watershed.

2.1.3 Proposed mitigation:

As there are no expected impacts, mitigation is not needed.

2.2 Soils

2.2.1 Description

Geology

The Carmans River valley was formed thousands of years before the arrival of the last glacial advance. At that time, this valley originated in the area of Rocky Point, much further to the north, and extended southward as far as Yaphank. Subsequent glacial movements eliminated visible remains of the river valley in the area north of the moraine. As the glaciers retreated, water generated by their melting flowed into the remaining southern portions of the valley. Over time, the action of this melt water further transformed the valley by making it broader and deeper as well as altering its shape in some locations. Rainfall continued this process long after the glacier had retreated. The continuous flow of water scoured the bottom of the river bed and ultimately led to the exposure of the water table.

Once the groundwater table was exposed, the river became permanent. It appears that the Carmans remained generally unaltered by human activity until the arrival of Europeans in the 17th Century at which time river flow was interrupted by a number of artificial dams constructed for various purposes. Erection of these dams established impoundments which caused the water to back up, thereby creating several lakes (TOB, 1981).

The Carmans River watershed is underlain by a number of distinct geologic units ranging from its basement bedrock situated some 1,600 feet below surface grade to its surficial geology. The sequence of stratigraphic units is summarized as follows:

- Early Paleozoic to Precambrian Bedrock (more than 400 million years old): impermeable, crystalline basement rock.
- Late Cretaceous Deposits (60 to 100 million years old): deltaic clays, sands, and gravels deposited by streams along the continental margin or as marine sediments comprising the Lloyd Sand (aquifer), Raritan clay (confining unit of lower permeability which retards flow), Magothy Formation (aquifer), and Monmouth Group (confining unit) (CPBJPPC, 1995).
- Pleistocene (Wisconsinan) Deposits (20,000 to 200,000 years old): various glacial sediments, such a till, outwash sand and gravel, and intermorainal clay comprising the upper glacial aquifer, as well as the Gardiners Clay.
- Holocene Deposits (12 thousand years old): recent beach and marsh deposits (CPBJPPC, 1995).

<u>Limitations of Soils</u>

In 1975, a soil survey was prepared for Suffolk County by the United States Department of Agriculture (USDA). This soil survey is a comprehensive evaluation and map of soils located within Suffolk County. The document defines and describes the various types of soils, explains how they function in Suffolk County and explains the management practices for these soils. One of the most useful pieces of information contained in this document is a table of soil limitations with regards to various parameters (sewage disposal sites, home sites, street and parking lots and lawns, landscaping and golf fairways among others). For the watershed, the soils were analyzed using data from the Suffolk County Soil Survey and Arc Map GIS 9.3.

Soils were grouped by their limitation status (as per Table 7 of the Suffolk County Soil Survey) and graphically expressed on a map of the 0-100 year groundwater contributing area. There were four separate classifications for soils with regards to their limitations in sewage disposal fields:

1. Slight
2. Slight-Moderate
3. Moderate
4. Severe

In addition to the above classifications, there were soils classified as “Not Applicable” (gravel pits, re-charge basins and urban lands), tidal marsh and open water. Figure 6 depicts the soils associated with these classifications within the 0-100 year groundwater contributing area. The resulting map shows that areas within the immediate area of the

River contain soils that are severely limited with respect to sewage disposal fields (as would be expected).

When this map is paired with the map of proposed properties to be added to the Core Preservation Area, there are several parcels which contain soils that are severely or moderately limited for sewage disposal fields. This is further evidence of the environmental sensitivity of these lands and supports preserving these parcels in perpetuity. Developing parcels as-of-right with single family dwellings and associated sanitary systems on parcels that contain soils which are severely or moderately limited increases potential for nitrogen pollution into the underlying groundwater and the Carmans River.

2.2.2 Potential impacts:

No impacts to the soils of the watershed are expected due to the nature of the proposed land use plan that will discourage and/or prevent future development within the watershed.

2.2.3 Proposed mitigation:

As there are no expected impacts, mitigation is not needed.

2.3 Groundwater Movement and Quality

2.3.1 Description: Model, Times of Travel, Quality

<u>Hydrogeology</u>
The Carmans River receives its primary source of water (its baseflow) from groundwater, where the groundwater table intersects the surface topography of the river channel. Secondary input is received from storm water runoff. The river, near its head waters, can best be described as consisting of a narrow, intermittently flowing stream channel with small, adjacent, sporadic, freshwater riparian wetlands. The exact location of the river's headwaters varies dependent on local groundwater levels which are a function of season, temperature, and precipitation. From its headwaters, the river meanders a distance of roughly 11.4 miles (approximately eight linear miles) to its mouth at Bellport Bay. Over its length, the Carmans River descends from an elevation of approximately 50 feet above mean sea level near Middle Country Road to sea level at Bellport Bay (Cashin, 2002).

The Groundwater Divide is located north of the headwaters of the Carmans (north of Middle County Road). In the Carmans watershed, groundwater generally flows south-southeast. In the area to the east, water flows southwest toward the Carmans River. On the north side of the Divide, groundwater generally flows north toward Long Island Sound.

The river flows through three small lakes known as Upper Lake, Lower Lake and Hard's Lake. The average mean annual streamflow at the USGS stream gauging station near the railroad crossing in Southaven Park is approximately 24 cubic feet per second (0.68 cubic meters per second) (Cashin, 2002).

In addition, several small ponds are located within the Carmans River study area. These ponds include: Weeks Pond, Woods Hold Pond and Big Fish Creek Pond (which feeds Big Fish Creek); Little Fish Creek Pond (which serves as the headwaters of Little Fish Creek); two small unnamed freshwater ponds (one located adjacent to Hard's Lake, Artist Lake, Twin Ponds); several located in Warbler Woods and a series of small ponds located in the vicinity of East Bartlett Road; and a very small pond known as Moon Lake. A number of storm water recharge basins exist within the study area and a variety of fresh, brackish, and salt water wetlands fringe the river, its tributaries, and nearby ponds and lakes (Cashin, 2002).

A number of small tributary streams located within the Wertheim National Wildlife Refuge discharge into the river. These surface water bodies include Yaphank Creek and Little Neck Creek from the west side of the river, and Big Fish Creek and Little Fish Creek from the east, near the mouth of the Carmans. With the exception of very small portions near the headwaters of Yaphank Creek and Little Neck Creek, the four tributaries are located entirely within Wertheim National Wildlife Refuge (Cashin).

Under natural conditions, the ultimate source of groundwater recharge is infiltration of precipitation due to loss by evapotranspiration into the zone of aeration and subsequent downward percolation through the zone of aeration to the water table. Recharge ranges roughly from 10 to 35 inches per year, with an estimated annual average of 22 to 23 inches (approximately one half of the average annual precipitation). This corresponds to about one million gallons per day per square mile. Recharge of the Magothy aquifer from the upper glacial aquifer is greatest near the main groundwater divide, and gradually decreases seaward, until it is negligible at the deep recharge zone boundaries (CPBJPPC, 1995).

The rate of vertical flow in the Upper Glacial Aquifer is greatest at about 6 feet per year on either side of the groundwater divide. The directions of horizontal flow follow water table gradients, and are primarily north and south on the respective sides of the main groundwater divide (which is located north of Middle Country Road), with a small easterly component throughout most of the Central Pine Barrens, except directly to the east of the Carmans where flow is south-southwest. The water table within the Central Pine Barrens reaches a maximum elevation of 50-55 feet above mean sea level along the divide in the westernmost portion of the area, and drops off to the north, south, and east, to approximately 25-35 feet at North Country Road (Route 25A), 40-45 feet at the Long Island Expressway in Medford, 35-50 feet at Brookhaven National Laboratory, and generally less than 30 feet on the South Fork (CPBJPPC, 1995).

The upper reaches of the Carmans River drain the east-central and south-central portions of Hydrogeologic Zone III, a deep recharge area. The Central Pine Barrens region includes areas surrounding the lower freshwater portion of the Carmans River, which extends into the adjacent shallow-flow Hydrogeologic Zone VI (CPBJPPC).

Groundwater Water Quality

Water quality is indicated by the concentrations of the suite of chemical substances, sediments, and harmful microorganisms in surface water and in groundwater. Because water quality is impacted by a variety of human activities, ambient water quality is often compared to the water quality that existed in the absence of human activities and/or to the threshold concentration (a maximum limit) that adversely impacts human health and/or resident biota.

The goal of management is to prevent the concentration of water quality constituents from exceeding the threshold concentrations. If the ambient concentration already exceeds the threshold, the goal is to reduce the concentration to below the threshold. While all constituents in water contribute to its quality, volatile organic chemicals (VOCs), pesticides, sodium chloride, and nitrogen, particularly nitrate-nitrogen, are often of greatest concern because their impacts are particularly significant.

Nutrient Inputs

Phosphorous is an essential nutrient in all living organisms, and is required for all necessary components of life to occur. Natural inorganic phosphorous deposits occur primarily as phosphate in a mineral state. Phosphate is usually not readily available for absorption by soils. A byproduct of phosphate, when released into the environment, is orthophosphate. The transformation is directly correlated to the pH of the surrounding soil. Most of the orthophosphate in soils is adsorbed to soil particles or incorporated into organic matter (Smith, 1990; Craig et al., 1988; Holtan et al., 1988).

Phosphorous in freshwater and marine systems exists either as particulate matter, including living and dead plankton, precipitates of phosphorous, phosphorous adsorbed to particulates, and fluid phosphorous, or in a dissolved phase, in the form of inorganic phosphorous(generally in the soluble orthophosphate form), or organic phosphorous excreted by organisms.

The organic and inorganic particulate and soluble forms of phosphorous are constantly under going rapid transformations. The dissolved orthophosphate is absorbed by phytoplankton and reverted into organic phosphorous. The phytoplankton is then ingested by other organisms such as zooplankton. Over half of the organic phosphorous taken up by zooplankton is excreted as inorganic orthophosphate. Continuing the cycle, the inorganic orthophosphate is rapidly again absorbed by phytoplankton (Smith, 1990; Holtan et al., 1988).

Lakes and reservoir sediments serve as phosphorous sinks. Phosphorous-containing particles settle to the substrate and are rapidly covered by sediment. Continuous accumulation of sediment will leave some phosphorous too deep within the substrate to be reintroduced to the water column. Thus, some phosphorous is removed permanently from biocirculation (Smith, 1990; Holtan et al., 1988).

A portion of the phosphorous in the substrate may be reintroduced to the water column. Phosphorous stored in the uppermost layers of bottom sediments of lakes and reservoirs is subject to reintroduction by the movement of benthic invertebrates and chemical transformations by water chemistry changes. For example, the cooling of the bottom-most layer of a water body during the summer months may stimulate the release of phosphorous from the benthos. This recycling of phosphorous often stimulates blooms of phytoplankton. Because of this, a reduction in anthropogenic phosphorous loading may not be effective in reducing algal blooms for a number of years (Maki et al., 1983).

Generally, phosphorous (as orthophosphate) is the limiting nutrient in freshwater aquatic systems. That is, if all phosphorous is used, plant growth will cease, no matter how much nitrogen is available. The natural background levels of total phosphorous are generally less than 0.03 mg/l. The natural levels of orthophosphate usually range from 0.005 to 0.05 mg/l (Dunne and Leopold, 1978).

In contrast to freshwater, nitrogen is generally the primary limiting nutrient in the seaward portions of estuarine systems (Paerl, 1993); such is the case in the southern most reaches of the Carmans River. Here, nitrogen levels control the rate of primary production. If the system is supplied with high levels of nitrogen, algal blooms will occur. Systems may be phosphorous limited, however, or become so when nitrogen concentrations are high and N:P>16:1 (Jaworski, 1981). In such cases, excess phosphorous will trigger eutrophic conditions. The recommended level of total phosphorous in estuaries and coastal ecosystems to avoid algal blooms is 0.01 to .1 mg/l and 0.1 to 1 mg/l of nitrogen (a 10:1 ratio of N:P). The higher concentrations support less diversity (NOAA/EPA, 1988).

The EPA water quality criteria states that phosphates should not exceed .05 mg/l if streams discharge into lakes or reservoirs, .025 mg/l within a lake or reservoir, and .1 mg/l in streams or flowing waters not discharging into lakes or reservoirs to control algal growth (USEPA, 1986). Therefore, phosphorous in the watershed should not exceed 0.1 mg/l, since the river flows into a marine environment. Annual studies performed by the Suffolk County Department of Health Services showed that at each of the 10 sampling stations the Carmans River samples were below standards. Surface waters that are maintained at .01 to .03 mg/l of total phosphorous tend to remain uncontaminated by algal blooms. The growth of macrophytes and phytoplankton is stimulated principally by nutrients such as phosphorous and nitrogen. Nutrient-stimulated primary production is of most concern in lakes and estuaries, because primary production in flowing water is thought to be controlled by physical factors, such as light penetration, timing of flow, and type of substrate available, instead of by nutrients (McCabe et al., 1985).

Concentrations of anthropogenic phosphorous, or inorganic orthophosphate, are directly related to population density, land cover and land use, water use, and waste disposal. Studies have shown that the two leading contributing factors in the contamination by orthophosphate are agricultural activities, mainly the application of commercial fertilizers, manure, and pesticides, and sewage treatment plants.

There are several significantly sized farms within the study area. The largest of which being the Suffolk County Farm located in the southwest corridor of the Long Island Expressway and Yaphank Avenue in Yaphank. The site is a 308 acre parcel comprised of County buildings and an active working farm. Just to the southeast of this parcel is another 50 acre privately owned active working farm. Two large privately owned farms are located just off of the Carmans River in Middle Island; one being an active working farm of 102 acres in the southeast corridor of Yaphank-Middle Island Road and Longwood Road, and the other being a 46 acre parcel in the southwest corridor of Yaphank-Middle Island Road and East Bartlett Road. Being that agricultural activities are a leading cause of phosphorous contamination, due largely to the eroded sediments from agricultural areas carrying the adsorbed phosphorous to the water body, storm water runoff is of utmost concern. The Town of Brookhaven has mapped all of the storm water outfall areas along the Carmans River and can monitor these outfall pipes for phosphorous levels in the future. Additionally, the Town of Brookhaven has recently mapped the location of all catch basins within the 0-100 year study area (see Figure 17). This data is crucial in managing inputs into the River and associated creeks, ponds and other bodies of water associated with the River.

Sewage treatment plants provide most of the available phosphorous to surface water bodies. The average phosphorous output per person per day is approximately 1.3 - 1.5 g, with additional phosphorous inputs coming from the use of industrial products, such as toothpaste, detergents, pharmaceuticals, and food-treating compounds. Primary treatment removes only 10% of the phosphorous from the waste stream with secondary treatment removing an additional 30%. The remaining phosphorous is discharged to the water body. Tertiary treatment at STPs is required to remove additional phosphorous from the water (Smith, 1990). The amount of additional phosphorous that can be removed varies with the success of the treatment technologies used.

The most notable sewage treatment plant in operation within the study area is the 11.09 acre Dorade STP site. This site currently receives flow from the Whispering Pines/Colonial Woods developments and Suffolk County Sewer District No. 8 and holds a State Pollution Discharge Elimination System (SPDES) permit for 140,000 gallons per day. The STP was built in the early 1970’s to accept 450,000 gal/day of waste from the then-planned Colonial Woods/Whispering Pines condominiums along with the anticipated development on the racetrack and Brookhaven Town Center sites. The existing STP has two tanks, building and recharge beds located in the central and northwest corner of the parcel and is accessed via an access road from the adjacent Colonial Woods/Whispering Pines development. The permit for the facility limits the facility to output of 10 milligrams per liter of nitrogen; however the plant has often exceeded this standard over its operating history. At 10milligrams per liter of nitrogen and a flow of 140,000 gallons per day the plant adds 5,299,570 milligrams of nitrogen per day, which equals 11 pounds/day or approximately 4000 pounds per year of nitrogen to the watershed.

Though the facility currently operates at one quarter of its capacity, the plant is proposed to be upgraded to treat the existing flow (140,000 gallons per day) and the anticipated flow from the proposed Meadows at Yaphank project, which is expected to generate an additional 275,050 gallons per day, which at currently permitted nitrogen discharge levels of 10milligrams per liter would result in 35 pounds per day or 12,600 pounds per year. The increased flow of the project has been evaluated in regards to nitrogen loading, and it has been found that with the proposed mitigation measures, the total nitrogen load (pounds per year of nitrogen) will be reduced as compared with "as-of-right" industrial/commercial development with on-site discharge. However, a study of phosphorous output has not been conducted.

Several additional sewage treatment plants within the study area are currently being proposed. A new STP is in construction within the southeast corridor of the Long Island Expressway and William Floyd Parkway. The expected capacity of this STP is 200,000 gal/day, receiving waste from 235 developed acres in the surrounding area, with a proposal to develop an additional 95 acres. A second STP is proposed on the Brookhaven Town owned Calabro Airport property. Monitoring of nitrogen is required by the Suffolk County Department of Health Services; however, monitoring of phosphates is not required.

Other than the primary anthropogenic sources of phosphorous from agricultural runoff and sewage treatment plants, additional sources of phosphorous include private septic systems leaching into groundwater, fertilizer use and road runoff from developed areas. Road runoff is a significant concern because phosphorous will enter the River if there is no treatment of the storm water prior reaching the surface waters. Suffolk County recently banned fertilizers containing phosphorus. This is anticipated to have a beneficial effect on water quality.

In addition to the aforementioned orthophosphate, one semi-volatile organic compound, triphenyl phosphate, was noticed at higher than average levels within the watershed. Triphenyl Phosphate (TPP) is an organo-phosphate. All organo-phosphates are neuro-toxins, meaning they attack the nervous system or interfere with its proper functions. TPP synergizes pesticides and thus is often associated with agricultural uses.

The Suffolk County Department of Health Services performs annual water sampling of the Carmans River, testing for a variety of compounds including volatile and semi-volatile organic compounds. Elevated levels of TPP were noticed throughout the watershed. Surrogate standards which are acceptable as per the US EPA for VOC's fall between 70%-130%. TPP ranges fell between 99% & 118% for the years 2010 and 2011. Although these ranges are acceptable under the current standards, they are slightly elevated when compared to the ranges of other VOC's tested in the watershed, which fall well under 100%.

One of the uses of TPP is in the concrete making process and there is a major concrete manufacturer within the study area on Middle Island Rd. in Middle Island. Potential point sources will be investigated as part of the plan, and mitigation measures to reduce or eliminate impacts from verified point sources will be identified and prioritized for implementation.

2.3.2 Potential impacts:

The Plan will substantially reduce potential future development and associated contaminant loading within the watershed. Additionally, actions and measures will be put into place that will decrease nutrient inputs into the groundwater which will benefit water quality in the River. Therefore, adoption of the Plan will not have a potential negative impact on groundwater quality within the watershed.

2.3.3 Proposed mitigation:

As no potential negative impacts are expected on the groundwater quality within the Management Plan Area by adoption of the Plan, no mitigation is proposed.

2.4 **River Segments &Quality**

2.4.1 Description:

Start of Flow:
Data characterizing the start of flow for the Carmans River has been collected by various agencies since 1965. Over the last forty-five years the location of the river's start of flow has varied by approximately 12,491 feet; with the southernmost point documented in 1967, located adjacent to Suffolk County property (SCTM# 0200-52900-0100-028002) and the northernmost point documented in 1991, located south of the Longwood Library property.

Data Analysis
The US Geological Survey documented the start of flow for the Carmans River from 1983 to 1990, and again in 2009. Suffolk County documented the start flow from 1990 to 2006. Historic data was compiled for the Suffolk County Flow Augmentation Needs Study (FANS) report, which documented start flow from 1965 to 1983. Methodologies for all sets of data are unknown at this time.

Numerous variables pose a challenge in identifying causes for the fluctuation in start of flow locations. The amount and timing of precipitation, groundwater level and mean stream flow were all analyzed to determine a correlation between these variables and patterns in start of flow. Additional variables include human influences such as road and culvert construction and the potential residential impacts from neighboring properties along the northern reaches of the river. Other known past variables include the 1989 collapse and subsequent rehabilitation of the East Bartlett Road culvert and headwall, the 1989 reconstruction and repositioning of Yaphank- Middle Island Road, and the installation of five catch basins and the creation of a 15,000 square foot natural retention area at the intersection of East Bartlett Road and Yaphank-Middle Island Road (County Road 21).

Water Quality Analysis

Water quality is indicated by the concentrations of the suite of chemical substances, sediments, and harmful microorganisms in surface water and in groundwater. Because water quality is impacted by a variety of human activities, ambient water quality is often compared to the water quality that existed in the absence of human activities and/or to the threshold concentration (a maximum limit) that adversely impacts human health and/or resident biota.

The goal of management is to prevent the concentration of water quality constituents from exceeding the threshold concentrations. If the ambient concentration already exceeds the threshold, the goal is to reduce the concentration to below the threshold. While all constituents in water contribute to its quality, volatile organic chemicals (VOCs), pesticides, sodium chloride, and nitrogen, particularly nitrate-nitrogen, are often of greatest concern because their impacts are particularly significant.

Surface Water Quality: Volatile Organic Chemicals (VOCs) and Pesticides

Volatile organic chemicals (VOCs) are organic compounds which can affect environmental and human health. Pesticides are any substance, often a chemical formulation, which is intended to kill, prevent or repel a pest. Human activity can introduce both VOCs and pesticides to groundwater or to stormwater runoff; and therefore enter surface waters. Between 1966 and 2005 Suffolk County Department of Health Services collected and compiled water quality data from over 113 streams, including the Carmans River.

The Suffolk County Department of Health Services has detected the following VOCs and pesticides in the Carmans River as reported by CDM (2010) from 1981 through 2005. The number in parentheses is the highest observed concentration in parts per billion.

- 1,1 DCA (2)
- 1,1,1-TCA (2)
- Bis(2-ethylhexyl) phthalate (8.5)
- Carbon disulfide (5)
- Carbon tetrachloride (0.6)
- Chloroform (2)
- Methyl sulfide (0.9)
- MTBE (53)
- Tert-amyl-methyl-ether (12)
- Methoprene (0.73)

In Suffolk County, VOCs are generally detected in very low concentrations in streams. According to an analysis done by CDM of Suffolk County Department of Health Services data (CDM, 2010), the median concentration of VOCs detected in Suffolk County streams from 1981 through 2005 was 1 part per billion. Of 128 samples analyzed, VOCs were detected in 48 (38%) of the samples. By comparison, VOCs were detected in other streams in the following frequencies:

- Santapogue Creek 100%
- Sampawams Creek 98%
- Champlins Creek 92%
- Carlls River 81%
- Nissequogue River 67%
- Connetquot River 45%
- Forge River 44%
- Peconic River 40%
- Brushes Creek 33%
- Sawmill Creek 23%
- Meetinghouse Creek 17%

From 2000 through 2005, the Suffolk County Department of Health Services, as reported by CDM (2010), detected pesticides in 3 of 128 samples analyzed (2%). By comparison, pesticides were detected in other streams in the following frequencies:

- Meetinghouse Creek 90%
- Brushes Creek 85%
- Sawmill Creek 23%
- Peconic River 5%
- Sampawams Creek 2%
- Carlls River 0%
- Champlins Creek 0%
- Connetquot River 0%
- Forge River 0%
- Nissequoque River 0%
- Santapogue Creek 0%

<u>Surface Water Quality: Sodium Chloride</u>

Sodium chloride originates primarily from road deicing and septic systems and can adversely impact aquatic fauna. According to Nelson Pope & Voorhis (NP&V, 2010), sodium and chloride in the surface water of the Carmans River increased with increasing distance downstream, from approximately .4 mg/l to 8 mg/l. The concentrations were correlated with road density along the river: the greater the road density, the higher the concentration. Trend analysis of water quality at the USGS Carmans River gauging station showed increasing sodium and chloride since the 1960s, which probably reflects the increase in roadways as the area surrounding the river was developed.

<u>Surface Water Quality: Nitrogen</u>

Nitrogen is a naturally occurring element in streams and groundwater. It occurs in many chemical forms including nitrate, ammonia and nitrite. Nitrate is of particular concern because excessive amounts can lead to eutrophication, the process by which a body of water becomes enriched in dissolved nutrients such as phosphates, which stimulate the growth of aquatic plant life usually resulting in the depletion of dissolved oxygen. This can result in hypoxia, reduced dissolved oxygen concentrations, and anoxia, no dissolved oxygen and/or shifts in species composition and abundance. Nitrogen is introduced into the environment through a number of sources including chemical fertilizers, manure and animal waste, wastewater (sewage and septic system effluent) and atmospheric deposition. Nitrate is highly soluble in water and mobile, moving conservatively through sediments into groundwater and via streams through surface runoff.

Valiela and Kinney (2008) undertook a modeling study of the inputs and fates of nitrogen within a watershed they delineated for the Carmans River. According to the model they used, the nitrogen loading to the Carmans River watershed (their Table 3) was as follows:

Atmospheric:	182,472 kilograms of nitrogen per year (43% of total)
Wastewater:	167,295 kilograms of nitrogen per year (40% of total)
Fertilizer:	70,772 kilograms of nitrogen per year (17% of total)

Long Term Trends in Nitrogen

The USGS maintains a gauging station on the Carmans River south of the Long Island Railroad tracks. From 1971 to 1997 they analyzed 231 samples for a number of chemical constituents. For nitrate, the maximum concentration was 8.3 mg/l (which may have been due to a rainfall event prior to the collection of the sample), the minimum concentration was 0.53 mg/l, and the median was 1.25 mg/liter.

Nitrate concentrations in the Carmans River as determined by the Suffolk County Department of Health Services from the 1960s to the 2000s, as reported by CDM (2010), are as follows (all concentrations in mg/L):

	1960s	**1970s**	**1980s**	**1990s**	**2000s**
Number of samples	11	47	21	18	103
Average	1.3	1.1	1.1	1.4	1.4
Maximum	2.5	4.8	1.5	1.9	4.1
Minimum	0.3	0.1	0.6	0.7	0.1
10^{th} percentile	0.4	0.2	0.7	0.8	0.7
50^{th} percentile (median)	1.2	0.8	1.0	1.5	1.4
90^{th} percentile	2.3	2.9	1.4	1.7	2.0

Spatial Trends in Nitrogen

As part of the investigation into the aquatic invasive species in the Carmans River, Nelson, Pope & Voorhis (2010A) undertook synoptic water quality (nitrate) sampling in July and October 2005 and July 2006 along the length of the river beginning at the start of flow. An analysis of the data revealed the following trends:

- average nitrate concentration was 5.5 mg/l
- nitrate concentrations peaked at Bartlett Road at 9.64 mg/l, near the farm
- nitrate peaks decreased with distance downstream
- nitrate levels were highest north of the Upper Lake dam
- nitrate levels rose immediately north of the Lower Lake dam

- nitrate concentrations were approximately 4 mg/l and increased to approximately 6 mg/l south of the Lower Lake Dam

Nitrate Concentrations in Upper and Lower Lakes

Water column sampling in Upper Lake and Lower Lake was conducted by the SUNY Stony Brook School of Marine and Atmospheric Sciences in October 2009, April 2010, June 2010, and August 2010 at four sites in each lake. The nitrate concentrations as reported by Nelson Pope & Voorhis (2010B) were as follows:

Lower Lake

	October	April	June	August
LL1	1.347	1.214	1.591	2.173
LL2	1.402	0.839	1.374	1.384
LL3	1.629	0.933	1.369	1.738
LL4	N/A	1.150	0.799	0.760

Upper Lake

	October	April	June	August
UL1	1.741	1.206	1.546	1.757
UL2	1.400	1.002	0.977	1.782
UL3	1.085	1.045	1.135	1.412
UL4	N/A	1.169	1.075	1.167

Nitrogen in Groundwater

According to CDM (2009), the pre-development nitrate levels in the upper glacial aquifer were less than 1 mg/l and the pre-development nitrate levels in the deeper Magothy and Lloyd aquifers were less than 0.05 mg/l. According Nelson Pope & Voorhis (2010), quoting R. Paulsen (2008), groundwater well data from Yaphank averages 1.23 to 1.37 mg/l of nitrate.

Nitrogen Transformations

Groundwater discharge accounts for approximately 94 percent of the flow of the Carmans River; the relationship between groundwater nitrogen concentrations and surface water nitrogen concentrations is of great interest. Unfortunately, the relationship is not obvious as nitrogen can undergo a series of transformations as it enters and leaves the groundwater. These transformations are described below.

Organic nitrogen comprises over 95% of the nitrogen found in soils (Barbarick 2006). This nitrogen cannot be directly utilized or absorbed by plants. However, under a process known as mineralization, microorganisms in the soil transform this nitrogen to ammonium ($NH4+$) that may be used by plants.

Nitrification is the conversion of ammonium nitrogen to nitrate nitrogen ($NO3-$). Nitrate-nitrogen ($NO3-$) is easily absorbed by plants and as an anion easily leaches through soil. In another transformation process known as denitrification, nitrate nitrogen is converted to gaseous nitrogen. In saturated anaerobic or microaerophilic soils, microorganisms use the oxygen from nitrate-nitrogen (NO3-) in place of air and convert the nitrate to nitrogen oxide and nitrogen gas. This process removes nitrogen from the system and returns it to the atmosphere.

Thus, the aforementioned loss of nitrate in streams is the expected result of denitrification, as described above, as the water from the aquifer upwells into the stream, and by natural biological uptake from adjacent wetlands and submerged vegetation and algae.

Storm Water Reduction

The following nutrient concentrations were estimated using data from the USEPA's National Urban Runoff Program (1983) and the National Stormwater Quality Database (2005):

Mean Concentrations by Land Use

Nutrient mg/L	**Residential**	**Commercial**	**Open Space / Non-Urban**
Total Phosphorus	0.38	0.20	0.12
Nitrate and Nitrite	0.60	0.60	0.59

Source: International Stormwater Best Management Practices (BMP) Database *Pollutant Category Summary: Nutrients*

Structural Stormwater Management Practices

As per the 2010 NYS Stormwater Management Design Manual, the following structural storm water management practices are recommended to meet water quality treatment goals for the removal of nitrogen and phosphorus:

Storm water Ponds – constructed storm water retention basin that has a permanent pool. Runoff from each rain event is detained and treated in the pool through settling and biological uptake.

Storm water Wetlands (constructed wetlands) – structural practices that incorporate wetland plants into the design to both store and treat runoff. As storm water runoff flows through the wetland, pollutant removal is achieved through settling and biological uptake within the practice.

Infiltration Practices – excavated trench or basin used to capture and allow infiltration of storm water runoff into the surrounding soils from the bottom and sides of the basin or trench.

Sand/Organic Filters – multi-chamber structure designed to treat storm water runoff through filtration, using a sediment forebay, a primary filter media and typically and under drain collection system.

Bioretention Areas – shallow storm water basin or landscaped area which utilizes engineered soils and vegetation to capture ad treat runoff. The practice is often located in parking lot islands, and can also be used to treat residential areas.

Open Channels (phosphorus removal only) – vegetated channels that are explicitly designed and constructed to capture and treat storm water runoff within dry or wet cells formed by check dams or other means.

Success of the above referenced treatment methods is reliant upon site-specific treatment systems designed to accommodate contributing surface area, soil type, flow volume, and retention time.

System Analysis

Treatment System	**Total phosphorus % removal**	**Dissolved inorganic Nitrogen % removal**
Low Impact Development Systems		
Biorention System (30" BSM)	5%	29%
Gravel wetlands	55%	99%
Porous Pavement	38%	No treatment
Surface Sand Filter	33%	No treatment
Tree Box Filter	No treatment	37%
Manufactured Systems		
Water Quality Unit & Infiltration System	81%	No treatment
Aqua-filter Storm water Filtration System	26%	No treatment
Hydrodynamic Separators	1%	No treatment
Conventional Structural Systems		
Retention Pond	16%	54%
Stone Swale	Not tested	No treatment
Vegetated Swale	No treatment	No Treatment

A. At the request of USEPA Region 1, the following treatment options were analyzed in a controlled research environment near a nine-acre commuter parking lot intended to replicate an urban setting. Data was collected over a two year period by the University of New Hampshire Stormwater Center, and reported in their 2007 Annual Report.

Source: University of New Hampshire Stormwater Center 2007 Annual Report

B. The following treatment option information was prepared by the Delaware Department of Natural Resources and Environmental Control's Whole Basin Team for the Nanticoke Watershed. Typical nitrogen loading to this system ranges from 10 to 15 pounds per acre per year. Typical phosphorus loading to this system ranges from 0.75 to 1.25 pounds per acre per year. Data source was not provided.

Best Management Practice	**Total Phosphorus % reduction**	**Total Nitrogen % reduction**
Storm water Wet Ponds	51%	33%
Filtering Practices	59%	38%
Storm water Dry Ponds	19%	25%
Storm water Wetlands	49%	30%
Infiltration Practices	70%	51%
Water Quality Swales	34%	84%

Source: Urban Stormwater Runoff fact sheet

C. The following data results from a 1997 / 1998 USEPA study of storm water best management practices. The resulting report summarized existing information and data regarding the effectiveness of BMPs to reduce pollutant loads in urban runoff.

Best Management Practice	**Total Phosphorus % reduction**	**Total Nitrogen % reduction**
Infiltration	65%	83%
Retention	46%	30%
Constructed Wetlands	46%	24%
Filtration	45%	32%
Open Channel Vegetation	15%	11%

Source: National Pollutant Removal Performance Database of Current Urban Stormwater Best Management Practices

D. The following practices were identified by the Center for Watershed Protection and Chesapeake Stormwater Network as having an ability to remove pollutant concentration from storm water runoff:

Best Management Practice	**Total Phosphorus % reduction**	**Total Nitrogen % reduction**
Wet Pond	50-75%	30-40%
Wetland	50-75%	25-55%
Filtration (Sand)	60-65%	30-45%
Dry Pond (extended detention)	15%	10%
Swales	20-40%	25-35%
Bioretention	25-50%	40-60%
Grass Channel	15%	20%
Permeable Pavement	25%	25%
Green Roof	0%	0%

Source: Technical Memorandum: The Runoff Reduction Method

2.4.2 Potential impacts:

The Plan proposes to reduce future residential and commercial development within the Management Plan Area which will help reduce potential degradation of the River. Additionally, the plan sets forth recommendations, ranging from water quality monitoring to managing and remediation of storm water and flooding that, when implemented, will aid in improving surface water quality. The Plan intends to rezone private properties in the Management Plan Area in order to achieve a nitrate-nitrogen standard of 2.5 mg/l at the property line consistent with the recommendations of the 208 Study. For properties that require a treatment system, as defined in Article 6 of the Suffolk County Department of Health Services Code, the Plan recommends that Suffolk County and the Suffolk

County Department of Health Services make use of new and innovative methods of treatment that have shown to reduce nitrate-nitrogen loading.

2.4.3 Proposed mitigation:

No mitigation is proposed as the Plan contains many recommendations that will decrease nitrogen loading and which may reduce existing pollutant inputs into the River.

2.5 Land Cover

2.5.1 Description:

Cameron Engineering & Associates were retained by the Town to prepare an analysis of land cover using spectral analysis (Cameron Engineering & Associates, 2011). Using 2005 color-infrared images covering the Study Area obtained from the New York State GIS Clearinghouse and the spectral ranges for different land uses, the land cover classes were identified and mapped (Figure 22) and represented in Table 20.

Land Cover Class	**Area (Acres)**	**Percentage of Total**
Bare Ground	927.41	4.09%
Conifer	3821.82	16.86%
Cultivated	862.53	3.80%
Deciduous	9459.62	41.73%
Developed (Impervious)	3259.73	14.38%
Shrub	213.40	0.94%
Swamp Wetland	440.86	1.94%
Turf	2334.01	10.30%
Un-managed Grass	978.53	4.32%
Water	371.93	1.64%
Total	**22669.88**	**100.00%**

The Plan proposes to reduce future development within the Management Plan Area which will help reduce potential disturbance of the land, limit additional impervious surfaces and reduce the potential for additional fertilizer dependent vegetation. The proposed limitations on future development represent limitations on additional sanitary treatment facilities including individual septic systems.

2.5.2 Potential impacts:

The Plan will not have any adverse impacts to the lands within the watershed as future potential for development will be decreased which will preserve land as open space.

2.5.3 Proposed mitigation:

No mitigation is required as the Plan will not negatively impact the existing land cover within the watershed.

2.6 Aquatic Ecology

2.6.1 Description:

Eight miles of the freshwater segments of the Carmans River vary from 10 to 30 feet in width and up to 10 feet in depth (2'-6' in Lower Lake and 2'-5' in Upper Lake). In Upper and Lower Lakes, maximum water column depths which occur at their southern ends are 7 and 6 feet, respectively, and depth of soft sediments range from 0 to 3+ feet. The undeveloped freshwater and tidal wetlands of the river provide outstanding habitat for a great diversity of fish and wildlife species.

The watershed has been evaluated under the New York State Water Quality Classification. This program is responsible for setting New York State ambient water quality standards and guidance for surface water and groundwater, and is responsible for the classification of surface waters for their best usage (www.dec.ny.gov).

The length of the river is designated either "Class B" or "Class C". The best usage of "Class B" and "Class C" waters is fishing, and the water is suitable for primary and secondary contact recreation. Parts of the river are also designated as "Subclass T" and "Subclass TS." The subclass listed as "T" means that the classified waters are trout waters; the subclass listed at "TS" means that the classified waters are trout spawning waters.

The freshwater and tidal portions of the Carmans River support over 40 species of fish (Coastal Fish & Wildlife Habitat Assessment Form, NYSDOS). Freshwater fish in the river and ponds include a naturally reproducing population of brook trout, as well as brown trout, rainbow trout, yellow perch, and carp. Pirate perch, which are unusual to Long Island watersheds, are abundant. Furthermore, American eel are abundant in the watershed; they are considered a declining species in the United States to the point that they are being considered for eligibility as a species of concern by the United States Fish and Wildlife Service.

New York State also stocks trout in the river each year. In the spring of 2004, approximately 1,210 brown trout and 1,620 rainbow trout were placed in Carmans River (Coastal Fish & Wildlife Habitat Assessment Form, NYSDOS).

The mouth of the Carmans River encompasses 26 acres of submerged rooted aquatic vegetation beds. These beds are dominated primarily by eelgrass (Zostera marina), with some wigeon grass (Ruppia maritima) (Coastal Fish & Wildlife Habitat Assessment Form, NYSDOS). These submerged aquatic vegetation beds provide spawning and foraging habitat, as well as protection for many species of mollusks, crustaceans and juvenile fish. The distribution and abundance of benthic species in these communities is likely controlled by a number of factors that include eelgrass density, water temperature and salinity, sediment type, predation, food supply, and human harvest.

Filter feeders, such as the bivalve mollusks occurring at the mouth of the Carmans River, filter nutrients from the water column for nourishment and therefore are especially susceptible to exposure to pathogenic bacteria that may inhabit the water column or bottom sediment of water bodies. For example, high levels of coliform bacteria due to increased population levels, land development, storm water runoff and wildfowl populations, has resulted in year round closure of the mouth of the Carmans River and portions of Bellport Bay to shell fishing.

In addition to these fish and shellfish species, the Carmans River is also home to several species of benthic macroinvertebrates (aquatic insects). Macroinvertebrate populations play an important role in the functioning of freshwater ecosystems, and directly affect human welfare. Macroinvertebrate populations are good indicators of localized conditions because many benthic macroinvertebrates integrate the effects of short term environmental variations and have limited migration patterns or a sessile mode of life (Winslow 2009). Even the slightest changes in a specific habitat may adversely affect physical and chemical characteristics of the environment, resulting in water quality problems or lower macroinvertebrate rates. Healthy aquatic environments have many different sensitive species of macroinvertebrates, while unhealthy environments will possess only a few species of tolerant aquatic insects.

Benthic macroinvertebrates in the Carmans River are of ecological importance as they are valuable for the assessment of environmental quality using biomonitoring techniques. A benthic study conducted between 1994 and 2008 examined species richness throughout the Carmans River. Data was available for one site, located at the NYSDEC fishing access point, north of Montauk Highway. The site had a depth of approximately 0.4 meters and a slow current. According to the available data, species richness declined during the course of those years. In the first year of the survey, 23 different species were identified, declining to only 12 species found in the last year of the survey, leading to a moderately impacted assessment at this particular site.

A biological macroinvertebrate study of the Carmans River was conducted by the New York State Department of Environmental Conservation in 1990 and 1998. Sampling results indicated non-impacted water quality conditions in both years, particularly in the upper reaches of the river. This study, known as a Rotating Integrated Basin Study (RIBS), is designed to assess water quality of the waters of the state, documenting the good quality waters and identifying the water quality problems. Long-term water quality trends are identified, naturally occurring or background conditions are characterized, and baseline conditions for use in measuring the effectiveness of site-specific restoration and protection activities are established. The program is designed so that all major drainage basins in the state are monitored every five years (www.dec.ny.gov).

Another study performed by New York State Department of Environmental Conservation examined the community structure of the macroinvertebrates within the Carmans River and how it correlates to water quality. The presence of certain species can provide an indication of water condition and provide information on further measures that may be used to assist with the preservation of the ecosystem. Results from this study showed that there was no correlation between macroinvertebrates and water quality parameters, which were all within standards implying that no adverse effects on the environment exist (Smith 2008). The abundance of black fly larvae, Diptera, indicated a potentially impaired system. However, the presence of other invertebrates more suited for healthy stream environments suggested otherwise.

Yet another study of the Carmans River, performed under the direction of the Natural Resources and Waste Management Division at Brookhaven National Laboratory, used physical and chemical variations of water quality as well as benthic macroinvertebrate distributions to determine the health of the river. This study showed a direct correlation between temperature and diversity of benthic macroinvertebrates. This was more pronounced in the run habitats with faster moving water, rather than in the riffle and pool habitats with more stagnant water patterns (Winslow 2009). Therefore, one can assume that velocity can be positively correlated to diversity. However, the structure type of the habitat being sampled also has a significant influence on the diversity and quantity of organisms encountered.

Riffle habitats (shallow areas generally with a mix of cobble) tend to be the most diverse habitats within a stream reach because they have fast enough flow to keep fine sediments from settling and filling in invertebrate habitat, but they also provide an abundance of crevices and small sheltered areas for a wide array of invertebrates to utilize. Riffles are generally not stagnant unless there is substantially reduced amount of water in the stream, creating pools in place of riffles. In addition, the shallow nature of riffle habitat enables them to be easily sampled. Therefore, they are the most typically sampled habitats when conducting biomonitoring. However, riffles are not always available in every stream reach and variations in habitat will therefore affect the assemblage of invertebrates found. Fast-flowing sections of stream typically harbor organisms with flat, stream-lined bodies that can cling to rocks without being swept away. A slow-moving section of the river is likely to have greater abundance of fine sediment which fills in the habitat of more desirable inverts (e.g. stoneflies, mayflies, caddis flies) and may instead harbor higher concentrations of organisms such as black fly larvae and worms.

Habitat Assessments for aquatic organisms as well as rapid bioassessment of invertebrates within the Carmans River was conducted by Nelson Pope & Voorhis in 2007 as part of the South Shore Estuary Reserve Fish Barrier Inventory finalized in 2008. It was found that the macroinvertebrate community was dominated by Group I invertebrates - pollution-intolerant species with good diversity (e.g. caddis flies, mayflies, stoneflies, hellgrammites) at two sections of the river, crossing beneath the Long Island Expressway and at Mill Road, just south of Upper Lake. The remaining road crossings inventoried were characterized as having Group II invertebrate assemblages – facultative species which are more tolerant of habitat impairments (e.g. damselflies, dragonflies, aquatic sow bugs, blackflies, and crayfish). In-stream and riparian habitat scores using the US EPA's Habitat Assessment Worksheet for low-gradient streams (Barbour et al., 1999), were utilized to provide a measure of waterway reach condition and ecological value. These habitat assessment scores rank a multitude of habitat conditions (e.g. available cover, pool variability, sediment deposition, sinuosity, bank stability, vegetative protection) with optimal conditions earning a highest possible cumulative score of 200 points. Poor in-stream and riparian habitat conditions will earn a stream the lowest numerical score. Results found scores to be among the highest in comparison to other inventoried dams and stream crossings along the south shore.

In conclusion, macroinvertebrates are an essential aspect of biodiversity in stream ecosystems, and furthermore, an important indicator of the health of a particular stream ecosystem. An understanding of patterns in species richness is important in preventing the loss of biodiversity, and will provide valuable information for conservation planning.

Invasive Species:

Along with the presence of native aquatic vegetation, there is a significant abundance of aquatic invasive species in the Carmans River. Common reed (Phragmites australis) is a tall-growing emergent reed found throughout the watershed area and is especially concentrated in the southern tidal portion of the river. In the Upper Lake, fanwort (Cabomba caroliniana) is dominant, although there is a small amount of variable watermilfoil (Myriophyllum heterophyllum). In the Lower Lake, watermilfoil is found, though fanwort has not yet been detected. All three plants have been included on Suffolk County's list of banned plants.

Both variable watermilfoil (Myriophyllum heterophyllum) and fanwort (Cabomba caroliniana) are native to the southern United States, but are considered invasive in much of the northeast. These submerged aquatic invasive species which occur during the warmer months have been choking the normally open waters of Upper and Lower Lakes. Reports of these nuisance species in the Yaphank lakes began within the past 10 years, but have significantly worsened and expanded in the past two years.

Optimum conditions for fanwort and variable watermilfoil include slow moving waters high in nutrients, warm temperatures, soft bottoms, and shallow depths generally up to 10 feet, making the lakes a hospitable place for their inhabitance. Both species spread by fragmentation. They can be introduced through transport by waterfowl, boat propellers or improper disposal from aquariums. Once introduced, these perennial weeds have rapid growth rates and form dense mats which exclude other native species and cause unfavorable conditions for fish and native ecological systems. In addition, the presence of these species is a nuisance which alters the recreational, economic and environmental values of these water bodies. The dense mats prevent other submerged aquatic vegetation from receiving sunlight, thus, killing other plants. The decaying vegetation sinks to the lake bottoms, making conditions shallower. Decaying of the dense mats also creates anoxic conditions in the water column which leads to the death of fish and other aquatic inhabitants.

Detailed field surveys conducted by B. Laing Associates in conjunction with Nelson, Pope & Voorhis in 2009 mapped the current distribution and density of aquatic invasive plants within Upper and Lower Lakes. In Upper Lake, fanwort (Cabomba caroliniana) is dominant, though there is a small amount of variable-leaf watermilfoil (Myriophyllum heterophyllum) at its southeast corner. In Lower Lake, variable-leaf watermilfoil currently dominates the system. Though no fanwort was detected in Lower Lake during the 2009 survey, it has been reported by residents as occurring in previous years. Phragmites occurs as small stands at the southern ends of both water bodies. All three plants have been included on Suffolk County's list of banned plants. Solutions to control invasive aquatic plants within Upper and Lower Lakes are currently being sought.

Barriers to Fish Passage

Healthy fisheries are important for commercial, economic, recreational, and ecological reasons. Many types of fish require access to both fresh and salt water habitats in order to survive and reproduce. In the Carmans River, herring (alewives and blue back herring), brook trout, and the American eel are important species that require access to both fresh and salt water to thrive. Unfortunately, these species also face a number of obstacles.

Dams have been constructed on almost every river within the Town. They change stream flow patterns, encourage upstream siltation and physically prevent fish from reaching upstream spawning habitat. This is part of a national fisheries problem; estimates indicate there are 2.5 million barriers to fish in the United States. These barriers are a significant factor in the decline in the populations of the affected fish. Many of the barriers no longer serve their original purpose but still harm the fishery resource by preventing fish from accessing the habitat they need.

Nelson, Pope & Voorhis documented the presence of barriers to fish passage in the South Shore Estuary Reserve Fish Barrier Inventory finalized in 2008. Nine barriers block or inhibit fish passage on the Carmans River. Barriers as documented in this inventory are from downstream to upstream.

Big Fish Creek Dam

Big Fish Creek is a tributary on the eastern side, 1,500 feet from the mouth of the river. The dam is located at the head of Big Fish Creek one-half mile east of the main stem of the Carmans River.

This dam creates an impoundment at the head of Big Fish Creek, and is a tidal tributary of the Carmans. It is located very close to the mouth of the river near Bellport Bay and is within the Wertheim National Wildlife Refuge. This dam is owned by the United States Fish and Wildlife Service (USFWS).

Yaphank Creek Headwaters Railroad Trestle Culvert

This culvert is also within Wertheim National Wildlife Refuge and is at the headwaters of Yaphank Creek 2.07 miles upstream from the mouth of the river. The culvert runs underneath the Long Island Railroad.

Brook trout have been documented above and below the culvert, indicating that while the culvert may restrict passage, it does not entirely block passage of fish. The United States Fish & Wildlife Service has plans for improvements to the culvert to allow fish passage.

Hard's Lake Dam

Hard's Lake Dam is located on the main stem, 2.84 miles from the mouth of the river, immediately north of Sunrise Highway. In 2008, an Alaskan steep-pass fish passage was installed by the New York State Department of Transportation to allow fish to pass over the dam. There is documented evidence that the fish passage is functioning and that fish, in particular Alewives, are making their way upstream above the Hard's Lake Dam. It is notable that Alewives have been documented upstream of this barrier, as alewives are the weakest swimmers of the target species; therefore, blue back herring and brook trout should be able to use the fish passage. American eels are observed to pass this barrier by climbing a portion of the dam's face that remains wet. The Hards Lake dam is nine feet high and impounds approximately 25 acre-feet of water within a 30 acre area.

C-Gate Dam

A small concrete low-head dam with timber weir boards, C-Gate is located 3.88 miles from the mouth of the river and within Southaven County Park. There is evidence that alewives are able to swim up the spillway and continue upstream. The dam shows slight signs of disrepair as evidenced by cracks in the concrete and currently creates a small impoundment upstream. It is primarily used for fishing and crossing the river within Southaven Park.

This recreational dam was recently improved circa 2007-2008 when the top-most and center weir board was removed to improve fish passage, effectively notching the dam by 4 inches (Gibbons, 2009). At C-Gate Dam, further minor modifications to the dam structure are possible and warranted to enable greater passage of fish and wildlife. Given the low volume of impoundment and negligible risk of flooding impacts downstream, this structure could be easily modified at no cost by removing more of the center weir boards, if not all year then at least for the 2 1/2 months out of the year during the alewife spawning season.

United States Geological Survey (USGS) Office Gauging Station

Located 4.73 miles above the mouth of the river, a 14 inch concrete weir (or a barrier across the river) creates a dam. Eels and brook trout are most likely not impeded by the weir, although river herring are likely to be impeded. The weir was constructed in association with a USGS Gauge and impounds about 1/10 acre foot of water. The purpose of the gauge is to collect long-term flow and level information for the Carmans River. It is maintained by the USGS and is located in Southaven County Park.

Observations by experienced fishermen and from volunteers associated with the SSER alewife monitoring program (a program implemented through Seatuck Environmental Association and led by Brian Kelder), have documented the presence of many alewife above the Hard's Lake fish ladder, and in 2010, a small school of alewife above the

USGS Gauge (Kelder, 2009). This demonstrates that at least some alewife are able to pass the C-Gate Dam and USGS Gauge, but it is not likely that large alewife are able to pass the structures and those that do may possibly only be able to do so during elevated flows (e.g. following rain events). Slight modifications should be made on both of these structures to further facilitate the passage of fish at these locations, particularly the less agile alewife. According to conversations between Brian Kelder and USGS during a 2010 Diadromous Fish Work Group meeting, the USGS is amenable to modifying their weirs if found to be necessary for wildlife passage. Costs to do this are associated with personnel time to re-rate the flow curve for the weir to adjust for collection of flow monitoring data and would be in the range of approximately $7,300. Per Nelson, Pope & Voorhis observations, the gauge still appears to be an obstruction to alewife during most flows, but appears to pass some alewife, likely during high flows from storm events. It is recommended by Nelson Pope & Voorhis that notching the weir be pursued. Any alterations of the structure should be coordinated with the USGS to preserve the integrity of the gauging station.

Lower Lake Dam

A 12 foot high earthen dam, Lower Lake dam was originally constructed in 1762 as a mill dam and was reconstructed in 1940. Located 5.24 miles from the mouth of the river, it impounds 78 acre-feet of water over a 26 acre area. County Road 21 runs along the top of the dam. The dam is currently showing indications of need for renovation; wing walls on the downstream side are shifting and leaning.

Upper Lake Dam

Upper Lake dam is an 8 foot high earthen mill dam originally constructed in the 1740's and re-constructed in 1932. It currently shows significant signs of disrepair as evidenced by erosion and deterioration of the wood and concrete. Water regularly seeps through the bulkhead and wingwalls, further weakening each structure and circumventing the spillway. Located 6 miles above the mouth of the river, it impounds 56 acre-feet over a 19 acre area.

County Earthen Dam Adjacent to South End of Szuster Farm Property

Located 7.3 miles from the mouth of the river, this is the final dam located on the Carmans River. It is a low-head dam and is located on County owned open space property. It impounds about one acre foot of water. A 12 inch culvert flows under the dam and appears passable by fish, although it may impede fish because some will not enter dark culverts.

Cathedral Pines County Park Entrance Road Culverts

Located 7.7 miles from the mouth of the river, this is the last crossing encountered on the Carmans River and consists of two culverts. The first culvert, round-shaped and constructed of plastic, is in good condition. This culvert does not present a barrier to fish passage. The second culvert is an embedded elliptical culvert constructed of concrete and is in disrepair. Despite the adjacent functioning culvert, the collapsed culvert presents a potential barrier to fish and should be replaced with a larger culvert to further facilitate fish passage.

2.6.2 Potential impacts

The Plan will not have any potential adverse impacts upon the aquatic ecology and implementation of the plan recommendations are intended to provide ecological benefits for the entire watershed.

2.6.3 Proposed mitigation: none required

No mitigation is required as the Plan will not negatively impact the aquatic ecology within the watershed.

2.7 Terrestrial Ecology

2.7.1 Description:

The watershed of the Carmans River is comprised of more than one dozen wetland and upland natural communities that collectively provide habitat for thousands of species of plants, animals, and other life forms. These communities vary in distribution and extent within the watershed depending upon the influences of soil type, presence and abundance of water, wildfire, topography, current and past human use and disturbance. Depending on their unique life history characteristics, these species may be restricted to one community type or may be distributed across several.

<u>Natural Communities</u>
The natural communities situated within the Carmans River watershed can be broken into two general categories: terrestrial (or upland) and wetland communities. Upland communities include human altered habitats, successional old fields and various forest types, while wetland communities range from forested wetlands to emergent and sub-emergent wetlands. Common communities include maple-tupelo swamp, emergent herbaceous wetlands, and salt or tidal marshes.

Specific terrestrial and wetland communities observed in the Carmans River watershed include the following:

- Pitch pine-oak forest
- Coastal plain pond
- Pitch pine-oak-heath woodlands
- Coastal plain-pond shore
- Red maple hardwood swamp
- Red maple-black gum swamp
- Pine plantation
- Pine barrens shrub swamp
- High salt marsh
- Low salt marsh

Three natural communities occur within the watershed are ranked by the New York Natural Heritage Program. This is the primary means by which ecologists prioritize and rank natural communities. They are coastal plain ponds (ranked G3G4,S2), red maple-black gum swamp (ranked G3G4, S2), and brackish tidal marsh (ranked G4,S3S4). The heritage rankings refer to the rarity of the element occurrence, with a “G” prefix representing the global status of the element and the “S” prefix representing its status in New York State. A report obtained from the National Heritage Program dated 2009 provided a listing of the rare or state listed animals and plants, significant natural communities, and other significant habitats, in their database that occur in the watershed.

Successional old fields are communities established on previously disturbed land, typically cleared for agriculture or some other purpose. In early stages herbaceous or non-woody plants, such as grasses and numerous wildflower species, dominate old-field communities. In later stages, trees often become established; common species in this regard are red cedar and black cherry.

Various forests form a mosaic of community types in upland environments. These range from mixed oak forests, to oak-pine forests to pine-oak forests. They vary in relative proportion of species due to disturbance and soil characteristics. They typically contain a variety of heath species in the understory, including black huckleberry and several lowbush blueberry species. Bracken fern can form monotypic stands in certain locations within these forests. Successfully propagating white pine populations can be found on county parkland in the northern portion of the river.

Moving toward the river, depth to groundwater lessens to the point that the water table is at or near the surface. Plants that tolerate or are adapted to saturated soil conditions become present and begin to dominate. The dominant woodland community in these environments is red maple-black tupelo forests. These forests often contain a well-developed tree canopy below which a number of wetland adapted shrubs and herbaceous plants grow, including swamp azalea, buttonbush, fetterbush and sweet pepperbush, skunk cabbage, tussock sedge, and cinnamon fern.

As land contours drop near the river, the water table intersects the land surface resulting in an expression of water. A variety of emergent plants grow along the edges of the river forming, in some cases, extensive lateral herbaceous wetlands that through time have filled significant portions of the river channel. Representative species of these freshwater communities include swamp loosestrife or water willow, cardinal flower, several species of sedge including bur-reed (whose seeds are valued by waterfowl), nutrushes, spikerushes, rushes, and two species of cattail.

Fauna

Due to the diversity of habitats existing within the numerous natural communities, it is not surprising that a large diversity of animals is found within the Carmans River and surrounding upland environments. In these habitats, indigenous species find the resources they need to survive and reproduce. Following is a brief description of the fauna occurring in the watershed, conveniently categorized into mammals, birds, reptiles and amphibians and butterflies.

Three animal species occur within the watershed that is ranked by the New York Natural Heritage Program as very rare. They are barn owl (ranked G5,S1S2), eastern mud turtle (ranked G5,S1), and eastern tiger salamander (ranked G5,S1S2).

Mammals

A few dozen native mammal species utilize habitats within the watershed. Wide ranging species such as raccoon, opossum, eastern cottontail rabbits, eastern chipmunk, white-tailed deer, woodchuck, and grey squirrel are common in suitable field and forested habitats. Meadow voles, white-footed mice, both short-tailed and masked shrews and eastern moles are common as well. Pine voles can also be found, although probably in slightly lesser abundance. The status of the star-nosed mole is unclear. However, the wetlands habitat preferred by this species is still extensive along the river and throughout the watershed.

The meadow jumping mouse is listed as a mammal species present in the watershed in “The Carmans River Story” but there is no description of its abundance or distribution, even though its preferred habitat, a dry sandy environment, is still extensive along the river and throughout the watershed. However, in Mammals of Long Island (O’Connor, 1971), it is note that this species “is still found thinly spread through the full length of Suffolk County” and that “in the pine barrens of Suffolk County, jumping mice are found in some of the more luxuriant areas near water.” In addition, this species has been observed at Wertheim National Wildlife Refuge and at Robinson Duck Farm County Park (see Bibliography for links to more information).

Southern flying squirrels have been reported from numerous locations along the course of the river. Numerous bat species, both resident and migratory, such as big brown bats and little brown Myotis, and red and hoary bats, respectively, take advantage of the abundant hatch of aquatic insects that occur over the river.

Historically, river otters are believed to have been found within the river; the most recent evidence is one road-kill animal being recorded in the early 1990’s on Victory Avenue near where the river flows under the road, adjacent to Southaven County Park (Bottini 2009). Muskrat are numerous, finding the river’s wetland environments ideal habitat. Mink, the muskrat’s main predator, has also been reported. Long-tailed weasel are known to frequent forest habitats within the watershed while the status of short-tailed weasels in the watershed is not known; if it does occur it is probably quite rare, given its apparent scarcity throughout Long Island.

Grey and red fox can be found in both field and forested environments throughout the watershed. Grey fox, the rarer of the two species (once thought to be on the verge of extirpation), has been confirmed with two fox dens occurring on properties situated on the west side of the river. The status of both New England cottontail (a New York State Special Concern Species) and striped skunk within the watershed is unclear, although given the skunk's apparent resurgence on the east end of Long Island, it may occur near the river. Non-native mammals such as feral cats, Norway and black rats, and house mice occur, with the first two probably growing in abundance.

Due to the relatively small size and shallow depth of the Carmans River, and the fact that it empties into a shallow embayment (eastern section of Great South Bay), the presence of marine mammals such as harbor porpoise and common and bottle-nosed dolphins is not expected. An occasional harbor seal, however, may frequent the lower reaches of the river.

Birds

Nearly one hundred bird species occur in and near the river and the terrestrial environment bracketing it. The following overview is not meant to provide a complete, up-to-date inventory, but includes both resident and breeding species and species which utilize habitats within the watershed during migration.

On an annual basis, surveys are conducted of bird species that breed in New York State. A grid system was established for the entire state, resulting individual census blocks to which observed species are referenced. Breeding Bird Atlas census blocks 6652B, 6752A, 6652D, 6752C, 6751A and 6751C encompasses the majority of the Carmans River.

Not surprisingly, wetland frequenting or dependent species are especially prevalent. More than a dozen species of waterfowl overwinter in the river, feeding on the abundant stems, seeds, and tubers produced by a large number of sub-emergent and emergent plant species. Species include dabbling ducks, such as American widgeon, gadwall, green-winged teal, and mallard, and diving ducks, such as ring-necked, canvasback, and bufflehead. The main river channel and adjacent tidal marshes provide significant overwintering habitat for black duck, a species that has experienced significant long-term decline. Wood ducks find suitable habitat in the upper reaches of the river, where the wooded wetland habitats it prefers are found.

Over the past several years, a pair of trumpeter swans has been overwintering on Upper Lake in Yaphank. The mute swan, a non-native species, introduced at the turn of the last century, is also common. Due to their aggressive, territorial behavior towards other birds and their significant destruction of aquatic plants (which they uproot), mute swans can have adverse ecological effects.

The extensive vegetated freshwater and tidal wetlands situated along the river provide suitable habitat to a number of wading bird species. Both egret species - American and snowy – occur here, as do great blue herons, yellow- and black-crowned night herons, and tri-colored and little blue herons. Green herons prefer the narrower, freshwater portions dominated by assorted trees and woody shrubs.

Osprey, a New York State Special Concern Species and sometimes referred to as the fish hawk, are common along the Carmans River during both spring and fall migration, as well as during the several month long breeding season. Numerous platforms have been erected along the river to provide desirable nesting substrate upon which the birds build their distinctive bulky nests made of large sticks. Bald eagles, a New York State Threatened Species, both adult and immature, are becoming increasingly common during migration and are common winter visitors in the river's environs. Red-tailed hawks are often seen drawing lazy circles in the sky as they hunt for prey. Short-eared owls, a New York State Endangered Species, are regular winter visitors to the tidal marshes that fringe the mouth of the river. Merlins can be observed during fall migration catching dragonflies which are common along the river. Both great horned and screech owls nest in woodlands in the terrestrial portions of the watershed.

The belted kingfisher is a common species encountered during canoe and kayak trips along the river. When they are not hovering over the water in search of small fish below the surface, they are found perching in trees along the river's edge.

Several species of game birds occur in suitable upland habitats. Wild turkeys, the subject of a successful reintroduction effort undertaken more than a decade ago, are common throughout the watershed. Bobwhite quail and ring-necked pheasant are found as well, although probably in lesser abundance. The status of ruffed grouse is unclear.

During both the breeding season and migration, several species of swallows take advantage of the abundance of aerial insects that emerge during the warmer months, feeding actively on the wing over the river and adjacent wetland areas. In the fall, large flocks of swallows (mostly tree swallows) can be seen descending into common reed beds where they spend the night. These flocks often number in the thousands.

Several tern and gull species can also be found. These species are especially common along some of the freshwater impoundments as well as the lower reaches of the river. Common and least terns (both of which are New York State Threatened Species) are the most noticeable tern species seen.

At least six species of woodpeckers inhabit woodlands and other habitats within the watershed during the course of the year. These include downy, hairy, red-bellied, and red-headed woodpeckers (the last of which is listed by New York State as Special Concern Species), along with northern flicker and yellow-bellied sapsuckers.

Several dozen songbird species utilize suitable wetland and terrestrial environments. As with some of the other species mentioned above, songbirds use these habitats for breeding, overwintering, and during migration. Species groups include sparrows, warblers, thrushes (including the eastern bluebird, New York State's official bird), cuckoos, grosbeaks, tanagers, finches, buntings, chickadees, wrens, and titmice.

A number of songbirds, including those mentioned above, are neotropical migratory species. These are birds that overwinter in southern climates, such as the Caribbean and South America, and migrate to North America during the spring for nesting and mating. The Carmans River area is especially important for many of these species, which are decreasing in numbers due to habitat loss both in North America and their overwintering habitat. The large amount of contiguous forested habitat present in the Carmans River watershed is significant for such forest-interior dependent or area-sensitive species. The Warbler Woods area of the Carmans River watershed in particular is renowned for the large variety of warblers that either breed there or spend some part of their life cycle there. This includes more than 30 species of warblers that have been observed there.

A number of other rare bird species have been found in the watershed, such as in the Wertheim National Wildlife Refuge. As of the summer of 2013, a pair of Bald Eagles has constructed a nest in the lower portion of the Carmans River (off of Little Neck Run) in the National Wildlife Refuge. Bald Eagles have become a regularly seen species in the lower portion of the River and it is believed that this is the first pair of Eagles to have attempted to nest in the Wildlife Refuge since its official designation. There are no other current known sites on the mainland in either Suffolk or Nassau County where Bald Eagles have been discovered nesting (or attempting to nest). Their presence along the Carmans River further demonstrates the importance of the river, its water quality and the surrounding natural areas. Additional bird species which have been seen feeding, breeding or over-wintering within the refuge are as follow. They include (with their associated NYS protection status):

- Bald Eagle (NYS Threatened)
- Northern harrier (NYS Threatened)
- Sharp-skinned hawk (NYS Special Concern)
- Cooper’s hawk (NYS Special Concern)
- Northern goshawk (NYS Special Concern)
- Red-shouldered hawk (NYS Special Concern)
- Peregrine falcon (NYS Endangered)
- Black rail (NYS Endangered)
- King rail (NYS Threatened)
- Upland Sandpiper (NYS Threatened)
- Roseate tern (Federal and NYS Endangered)
- Black tern (NYS Endangered)
- Black skimmer (NYS Special Concern)
- Common nighthawk (NYS Special Concern)
- Whip-poor-will (NYS Special Concern)
- Horned lark (NYS Special Concern)
- Sedge wren (NYS Threatened)
- Loggerhead shrike (NYS Endangered)
- Golden-winged warbler (NYS Special Concern)
- Cerulean warbler (NYS Special Concern)
- Yellow-breasted chat (NYS Special Concern)
- Grasshopper sparrow (NYS Special Concern)
- Seaside sparrow (NYS Special Concern)
- Vesper sparrow (NYS Special Concern)

In addition, it should be noted that the National Audubon Society has established and maintained a database of bird species entitled "The Watchlist." A number of species on this list have not attained the threshold of endangered, threatened or special concern status, but are in significant decline nonetheless. There are a number of these found within the Carmans River Watershed, including the Blue-winged warbler, Prairie warbler and Wood thrush.

Reptiles and Amphibians

Several dozen reptile and amphibian species occur within the Carmans River watershed, including a few species that are listed as "endangered," pursuant to NYS Environmental Conservation Law. Anurans include green and bullfrogs, common in permanent wetlands. Fowler's toads, wood frogs and Spring peepers can be found in upland environments throughout the watershed. Eastern spadefoot toads have been recorded at Wertheim National Wildlife Refuge.

Several salamander species occur in the watershed. By far the most abundant is the red-backed salamander which is common in woodlands throughout the study area. Three of the native mole salamanders – the Eastern tiger salamander (a NYS endangered species), spotted salamander and marbled salamander (NYS Special Concern Species) occur in seasonal wetlands or vernal ponds located throughout the watershed. Eastern newt also occurs. The status of four-toed salamander has not been documented, and the northern two-lined salamander is not likely to occur since the habitat it prefers - cooler, clear running streams - does not occur within the watershed.

Approximately eight reptiles are found within the bounds of the river's watershed, including ten snake and eight turtle species. Some of these snakes are fossorial (soil dwelling) and are rarely seen. These include the eastern worm (NYS Special Concern Species), brown, and ring-necked snake. The status of the red-bellied snake is unclear. The Eastern hognose snake (NYS Special Concern Species) occurs at the Wertheim Refuge and likely exists in other sandy habitats within the watershed. Northern watersnake, black racer, eastern milk, ribbon and garter snakes occur in varying abundance in suitable habitats. The Northern watersnake, as its name suggests, inhabits open water and wetland environments. The status of Long Island's rough green snake is uncertain within the river's watershed, although it has been reported by Wertheim National Wildlife Refuge and has been observed and tracked at Brookhaven National Laboratory.

A number of turtles are also found within the watershed. The eastern box turtle, a terrestrial tortoise and NYS Species of Special Concern, is the most widespread turtle species, occurring in a variety of upland habitats. It is declining in abundance due to habitat fragmentation, most notably from roads and associated vehicular traffic, as it is easily killed attempting to cross roads. A population of Eastern Mud Turtle (an Endangered Species, it is restricted in New York State to Long Island) is found in the lower reaches of the river. Snapping and painted turtles are widespread throughout the river. False map turtles and red-eared sliders, two non-native introduced species, also occur throughout the river, especially in impoundments. Diamondback terrapins, a turtle that frequents brackish water, can be encountered in lower reaches of the river. Scattered populations of spotted turtle, a NYS Special Concern Species, exist at Wertheim and other large public land holdings.

Butterflies

Several dozen butterfly species are found within the Carmans River watershed. Families with species representation within the watershed include: swallowtails, whites and sulfurs, coppers, hairstreaks, blues, brush-footed butterflies, browns, milkweed butterflies (monarch), and skippers.

Flora

Several hundred species of woody and herbaceous plant species grow throughout the watershed of the Carmans River. Common woody plants include red maple, black tupelo, pitch pine, flowering dogwood, black cherry, sassafras, spicebush, scarlet, white, and black oak, shadbush, sweet pepperbush, swamp azalea, buttonbush, northern arrow-wood, and various heath species including fetterbush, high bush blueberry and black huckleberry.

There are nine plant species that are ranked by the New York Natural Heritage program occurring within the watershed. They are Blunt-lobe grape fern (G4,S3S4), Button sedge (G5,S1), two occurrences of Collins' sedge (G4S1), featherfoil (G4,S2), few-flowered nutrush (G5,S4), fibrous bladderwort (G4G5,S2), screw-stem (G5,S1), two occurrences of trinerved white boneset (G5,S2S3), water pygmyweed (G5,S1), and whip nutrush (G5,S1).

Other rare plant species are found in the Carmans River watershed. These include:

- Screw stem (Bartonia paniculata ssp. Panuculata)
- Rose coreopsis (Coreopsis rosea)
- Water pygmyweed (Crassula aquatica)
- Little-leaf tick-trefoil (Desmodium ciliare)
- Three-ribbed spikerushy (Eleocharis tricostata)
- Purple everlasting (Gamochaeta purpurea)
- Slender pinweed (Lechea tenuifolia)
- Narrow-leafed bush clover (Lespedeza augustifolia)
- Velvety bush-clover (Lespedeza stuevei)
- Dwarf bulrush (Lipocarpha micrantha)
- Clustered bluets (Oldenlandia uniflora)
- Carey's smartweed (Persicaria careyi)
- Rough hedge-nettle (Stachys hyssopifolia)
- Small floating bladderwort (Utricularia radiata)

Due to the variety and extent of wetland habitats, more than a dozen fern species occur in the wetter portions of the watershed. Cinnamon, Marsh, and Netted Chain Fern are especially common. Several dozen herbaceous plants occur in the freshwater wetlands that fringe the river's banks. These include bulrush, water-hemlock, cardinal flower, blue flag iris, and several species of sedges and rushes and allied plants; many species found in this habitat are important food sources for muskrats and waterfowl that depend, respectively, upon their tubers and seeds.

Pink–lady's slipper, also known as Indian moccasin, is one of about a half dozen orchid species that are found within the watershed. Two groups of carnivorous plants – sundews and bladderworts are found in wetland habitats along the river. A large population of round-leaved sundew occurs in a wetland at the headwaters to Yaphank Creek.

2.7.2 Potential impacts

The Plan will not have any potential adverse impacts upon the terrestrial ecology and implementation of the Plan recommendations may improve the ecology.

2.7.3 Proposed mitigation

No mitigation is required as the Plan will not negatively impact the terrestrial ecology within the watershed.

3.0 HUMAN ENVIRONMENT

3.1 Land use and zoning

3.1.1 Existing Conditions

The Carmans River runs through the four hamlets of Middle Island, Yaphank, Shirley and Brookhaven. The land use section inventories and analyzes existing land uses and zoning in the Study Area. Based on this information, it makes land use and zoning recommendations for the Carmans River Management Plan Area. The Plan identifies and recommends various strategies and techniques that will implement the goals and objectives of the Plan including, changes to the zoning map, Pine Barrens expansion, and proposed open space acquisitions.

3.1.2 Existing Land use

A land cover analysis was provided in the Plan. Tables 12 and 13 include the land use within the Management Plan Area including and 0-2 and 2-5 year groundwater contributing areas. Undeveloped land has minimal adverse impacts on the environment and as the intensity of development increases so to do the negative environmental impacts. Tables 14-17 include all the land uses within the entire Study Area.

Table 12. Land uses in the Management Plan Area 0 to 2 year time of travel zone under long term average conditions of recharge and precipitation (CDM, 2011a).

Land use	acres by land use	percentage
Open space	2,269	58.3
Medium density residential	461	11.8
Vacant	191	4.9
Transportation	398	10.2
Institutional	80	2.1
Low density residential	347	8.9
Agricultural	67	1.7
Industrial	35	0.9
Waste disposal	0	0
Commercial	15	0.4
High density residential	6	0.2
Utilities	21	0.5
Unclassified	0	0
Total	3,891	100

Table 13. Land uses in the Management Plan Area 2 to 5 year time of travel zone under long term average conditions of recharge and precipitation (CDM, 2011a).

Land use	acres by land use	percentage
Open space	1,184	39.2
Medium density residential	475	15.7
Vacant	457	15.1
Transportation	361	11.9
Institutional	136	4.5
Low density residential	186	6.1
Agricultural	118	3.9
Industrial	47	1.6
Waste disposal	8	0.3
Commercial	21	0.7
High density residential	15	0.5
Utilities	15	0.5
Unclassified	0	0
Total	3,023	100

In the Management Plan area approximately 3,453 acres are in an open space category and 1,469 acres devoted to single family residential. There are 15 acres in High-density residential development and approximately 648 acres are vacant. 185 acres are devoted to agricultural purposes.

The Plan proposes to limit new development within the 0-2 and 2-5 year groundwater contributing areas through a series of programs designed to protect the remaining vacant lands within the Management Plan Area.

3.1.3 Existing residential development within the Management Plan Area

Single and multi-family residentially developed properties were identified in the Plan to determine the extent of residential development and to provide a basis for estimating population size and septic system density and distribution. Within the Study Area there are a total of 11,068 dwelling units in the 30.6 square miles of the Study Area, the residential housing density is 361.7 dwelling units per square mile.

In comparison to the entire Town of Brookhaven, in the 259 square miles of land within the Town of Brookhaven, residential development totals 86.72 square miles or 39.74% of Brookhaven's total land area. The vast majority, 80.43 square miles or 93%, of residential development in Brookhaven is single-family residential development including approximately 157,886 households. While approximately 6.21 square miles is devoted to multi-family units, apartments, condominiums and co-ops. According to

Suffolk County Planning, there are 12,596 Apartment units, 15,143 Condo units, 2,720 Co-Op units, and 10,614 senior units totaling 41,073 housing units.

Table 18. Developed land in the Study Area

Area	Single-Family Lots	Two-Family Lots[1]	Three-Family Lots[4]	MF Developed Sites by Centroid[3]	Total Res. Lots/ Sites	MF DUs[2] by Zone	Total Non-Res. Lots	Total Lots/ Sites	Total DUs
0-2 yr time of travel	984	97	5	0	1,086	0	43	1,129	1,193
2-5 yr time of travel	1,124	104	0	0	1,228	0	28	1,256	1,332
5-10 yr time of travel	1,395	91	4	0	1,490	12	32	1,522	1,601
10-25 yr time of travel	1,555	105	3	1	1,664	426	66	1,730	2,200
25-50 yr time of travel	745	42	1	2	790	851	81	871	1,683
50-100 yr time of travel	341	24	0	2	367	611	33	400	1,000
North of the 100 year time of travel	837	25	0	5	867	1,172	42	909	2,059
Total Lots	**6,981**	**488**	**13**	**10**	**7,492**	**N/A**	**325**	**7.817**	**N/A**
Total Dwelling Units	**6,981**	**976**	**39**	**N/A**	**N/A**	**3,072**	**N/A**	**N/A**	**11,068**

3.1.4 Acquisition Program

The Plan proposes an aggressive acquisition program. The proposal to include vacant and undisturbed lands within the 0-2 and 2-5 year groundwater contributing areas into the existing Pine Barrens Core Preservation Area is a useful tool to guarantee the preservation of these sensitive lands and benefits the watershed by transferring development elsewhere.

Additional lands within the Study Area were identified for potential acquisition and sorted into Primary and Secondary Acquisition lists. The Primary Acquisition parcels were identified as those within the 100 year groundwater contributing areas that are undeveloped or underdeveloped and met certain criteria for public acquisition. The Secondary Acquisition parcels were identified as those within the 100 year groundwater contributing areas that are developed or disturbed and could possibly be acquired in the long range future.

The Town of Brookhaven established the Joseph Macchia Environmental Preservation Capital Reserve Fund to provide funds to pay costs associated with the acquisition of environmentally sensitive, undeveloped lands within the Town of Brookhaven. The Town has also authorized funding for immediate use to acquire lands within the Carmans River Watershed. Additional funding sources for the acquisition program include public and private partnerships with other municipal agencies such as, New York State and Suffolk County as well as private partnerships with organizations such as Post Morrow Foundation and Nature Conservancy. The Town of Brookhaven has also recently adopted a Town Code amendment in order to create a permanent revenue stream to the Macchia Fund.

3.1.5 Pine Barrens

As previously discussed, in 1993, the New York State Legislature passed the Long Island Pine Barrens Protection Act (New York State Environmental Conservation Law Article 57). In 1995, the Central Pine Barrens Joint Planning and Policy Commission (CPBJPPC) adopted the Central Pine Barrens Comprehensive Land Use Plan (CLUP), which was amended in 1996 to take into account comments received after the adoption of the Act (Central Pine Barrens Joint Planning and Policy Commission, 1996). On lands that are designated as "Core Preservation Area," development is prohibited unless a hardship permit is granted by the CPBJPPC. Property in the Pine Barrens Core Preservation Area is eligible for "Pine Barrens Credits," transferable development rights.

The New York State Legislature has approved a measure to amend the 1993 Long Island Pine Barrens Protection Act. The legislation added certain properties in the Management Plan Area to the Pine Barrens Core Preservation Area and the Pine Barrens Compatible Growth Area. When signed by the Governor, the Central Pine Barrens Joint Planning and Policy Commission should also amend the 1995 Central Pine Barrens Comprehensive Land Use Plan.

The Carmans River Conservation and Management Plan recommends that 2,187 acres of land, consisting of 2,941 parcels, be included in the Central Pine Barrens Compatible Growth Area. Of those lands, approximately 298 acres, 379 parcels, are currently vacant. These lands would be subject to the Standards and Guidelines provided in the Central Pine Barrens Land Use Plan, including fertilizer standards, offering an additional benefit to the Carmans River.

The Carmans River Conservation and Management Plan also recommends that 1,597 acres of land, consisting of 587 parcels, be included in the Core Preservation Area of the Central Pine Barrens. Of those lands approximately 486 acres, 322 parcels, are currently in private ownership. These lands could not developed without a hardship permit from the CPBJPPC, and would be eligible for Pine Barrens Credits. Approximately 135 additional Pine Barrens Credits would be created with the proposed Core Area expansion.

3.1.5.1. Pine Barrens Credit Program

As indicated in the 1995 Pine Barrens Comprehensive Land Use Plan, "[i]t is a goal of this Plan to advocate the use of fee simple acquisition as the principal protection measure – the tool of choice – for the majority of the privately held, undeveloped and currently unprotected lands within the Core Preservation Area." The Carmans River Conservation and Management Plan also considers the fee simple acquisition of lands as the principal protection measure.

The goal of PBC redemption for the Town of Brookhaven continues to be 75% acquisition of the lands within the Core Preservation Area. Appling that goal to the addition of approximately 135 new Pine Barrens Credits as a result of the Core Area expansion, the Carmans River Conservation and Management Plan recommends that the

Town of Brookhaven, with other municipalities, purchase the private lands, potentially extinguishing 99 of the approximately 135 PBC's.

The Town of Brookhaven Town Code, and the Pine Barrens Plan, provide means for PBC redemption through various methods. According to the Central Pine Barrens Joint Planning and Policy Commission, Pine Barrens Credit program for the Town of Brookhaven has redeemed a total of 244.41 PBC's. The method of use for these credits has primarily been sewage flow intensity for commercial and industrial development projects, redeeming over 116 PBC's. Approximately 57 PBC's have been redeemed for Residential Subdivision (ROD).

Residential Subdivision (ROD)	57.44 PBC
Commercial/ Industrial Sewage Flow	116.07 PBC
Multi-Family PRC/MF	68 PBC
Single Family Residential Sewage Flow	2.9 PBC
TOTAL	244.41 PBC

The Brookhaven Town Code Article XXXVII, Central Pine Barrens District, provides PBC redemption through a Residential Overlay District and Incentive Zoning. Additionally, PBC's may be redeemed pursuant to Brookhaven Town Code Article IX, MF Residence District. Brookhaven Town Code Article V, Amendments also requires payment to the Joseph Macchia Environmental Preservation Capital Reserve Fund in connection with certain change of zone approvals, to aid in the Town's purchase of parcels located within the Core Area expansion. The Plan also indicates that the Town should continue to develop other innovative ways to redeem PBC's in accordance with the Recommendations contained in the Central Barrens Comprehensive Land Use Plan.

3.1.6 Zoning

Chapter 85 of the Code of the Town of Brookhaven sets forth the Town's zoning and land use requirements for the unincorporated areas of the Town. The Plan provides an analysis of existing conditions regarding zoning as shown on Table 22.

Table 22.Number of parcels and acreage for each of the zoning districts in the Study Area.

Zoning	Parcels	Acreage
A1	10,196	17,309.74
A2	405	697.87
A5	1,206	2,905.61
A10	68	7,013
B	19	34.78
B1	9	64.76
HF	4	32.18
J	9	5.18
J2	131	338.79
J4	9	11.72
J5	14	12.58
J6	46	21.49
J8	2	1.89
L1	549	2,121.32
L2	14	146.28
MF	978	156.31
PC	1	25.43
PRC	3	90.77
A1, J2	69	236.79
A1, A2	1	0.5
A1, A5	2	42.34
A1, B, L1	1	32.24
A1, B, L1, ROW	1	28.59
A1, J2, L1	1	21
A1, J2, L1, L2	1	91.4
A1, J2, L2	1	5.16
A1, J4	1	0.75
A1, L1	4	491.94
A1, MF	1	46.41
A1, NHH	1	11.47
A1, ROW	2	2.18
A2, J2	2	16.89
A10, MF, PRC	1	149.04
J2, J6, ROW	1	6.28
J5, L1	1	0.7
L1, ROW	9	50.78
L1, L2	1	8.75
	Total Parcels	Total Acreage
	13,764	32,232.91

3.1.6.1 Rezoning

The Plan recommends an ambitious rezoning effort. Consistent with other adopted land use plans and studies the Plan is designed to achieve reduced nitrogen loading by providing for greater natural and undisturbed lands and reduced population density. In the late 1990's the Town of Brookhaven undertook a similar rezoning effort which rezoned privately held lands along most of the stream and river corridors along the south shore to an A-2 Residential Zoning District. Table XX, shown below indicates the number of parcels and the total acreage of lands proposed for each zoning district.

	# Parcels	Acreage	Zoning
Total	2142	2,084.32	A2
Total	137	1471.55	A5
Total	194	605.49	A10
Private	1994	1783	A2
Private	89	385.18	A5
Private	23	29.39	A10

The proposed zoning action will help to reduce overall population density as well as reducing potential increases in nitrate loading to the groundwater and eventually the surface water of the Carmans River.

3.1.7 Potential impacts

The Plan is not anticipated to result in potential adverse impacts upon the land use. Implementation of the plan recommendations are intended to improve the overall groundwater and surface water quality of the Management Plan Area by acquisition of lands, rezoning of lands and limiting new development within the watershed area.

3.1.8 Proposed mitigation

No mitigation is required as the Plan will not negatively impact the land uses within the watershed.

3.2 Transportation

3.2.1 Existing Conditions

The Watershed consists of over 17,000 acres and is crossed by major thoroughfares including the Long Island Expressway, Sunrise Highway, William Floyd Parkway, Montauk Hwy and NYS Route 25. The Long Island Railroad also runs through this area via the Montauk Branch (on the southern end) and the Greenport Branch (near the center). The Yaphank Train Station is a mere half mile from the River and is located within the 2-5 year groundwater contributing area.

Not only are there major thoroughfares which cross the Management Plan Area, but there are extensive networks of Town and County roadways that are utilized to reach residential areas and which connect to the major highways. There are several roads within the Management Plan Area that are used as scenic bypasses including River Rd. in Shirley and Yaphank-Middle Island Road in Yaphank which both offer views of the River. Throughout the Management Plan Area lie miles of off-road bike trails, hiking trails and walking trails which are popular throughout the year.

Within the 10-25 and the 25-50 year groundwater contributing areas lies the Yaphank Rail Yard which use is regulated by Federal Laws and therefore is outside of the Town of Brookhaven’s jurisdiction. The rail yard will be a new hub for moving bulk materials via rail which will reduce the number of trucks that must utilize the highways throughout Brookhaven Town. While dozens of acres of trees are being cleared for the project, roads will be less congested with commercial truck traffic and there will be a reduction in fossil fuel usage resulting in a decrease of air pollution from vehicle emissions.

3.2.2 Potential Impacts

No potential adverse impacts to the transportation of people are expected from the proposed Plan as the potential for future commercial and residential development will be significantly decreased. Because new projects will be limited within the Watershed, increases in traffic and the need to move people will be minimal compared to the potential increase if no plan were implemented.

3.2.3 Mitigation

Due to the fact that the potential for development within the Watershed will be significantly decreased, no mitigation is needed.

3.3 Air

3.3.1 Existing Conditions

Air quality is a reflection of pollutants that are present in the air we breathe. These air pollutants come almost exclusively from anthropogenic sources such as vehicle emissions, power equipment, heavy industry manufacturing, chemical manufacturing, fugitive dust from outdoor operations and from energy facilities that burn natural resources (coal, natural gas, oil). While many of these pollutants may move higher into the atmosphere (such as those pollutants released from smoke stacks) wind and rain can transport these particles to areas away from the original pollution source.

Pollutants of Concern

During the summer, the potential for Ozone creation (O_3formed by NO_x) and fine particulate matter is increased as the temperatures rise. Both of these pollutants are known elements of concern to human health. Additionally, acid rain can have significant impacts on flora and fauna. These pollutants are the result of human activities combined with atmospheric conditions (precipitation, temperature changes) and are monitored by New York State in order to comply with the federal government's Environmental Protection Agency (EPA) requirements.

Ozone

New York State must monitor six air pollutants to comply with EPA. The six pollutants are sulfur dioxide, nitrogen dioxide, ozone, carbon monoxide, particulate matter less than 2.5 microns (micrometers) in size, and lead.Suffolk County was listed as a *moderatenon-attainment* (a designation by the EPA for non-compliance) area for ozone in 2004 by the EPA. In 2007, this classification was changed to *serious non-attainment*. Attainment must be achieved by New York State in Suffolk County by 2013 as part of the State Implementation Plan (SIP) that was put into place by the New York State Department of Conservation (NYS DEC).

Vehicular Emissions in the Management Plan Area

Because the Plan is a watershed protection and management plan, air pollutants are not a major concern or a foreseen problem with regards to implementation of the Plan. Vehicular emissions are a major cause of local air pollutants and these emissions are generally the result of traffic to and from residential areas. The Plan will reduce the future potential for increased residential development within the Management Plan Area and thus will not result in a major increase in vehicular trips per hour anywhere within the Management Plan Area.

3.3.2 Potential Impacts

Because the Plan will significantly decrease potential commercial and residential development within the Carmans River Watershed, the resultant air quality will be better than if no plan were to be implemented. Expansion of the Core of the Central Pine Barrens and tighter development regulations will allow more vegetation to be preserved and reduce the potential for increased vehicular trips to and from residential and commercial areas.

3.3.3 Mitigation

Due to the fact that the potential for development within the Watershed will be significantly decreased and there will be no measurable impacts to air quality, no mitigation is needed.

3.4 Community Facilities and Services

3.4.1 Existing Conditions

The Management Plan Area is of over 17,000 acres and is served by a large number of community services and facilities including the following:

- Fire Departments
    a. Middle Island
    b. Ridge
    c. Gordon Heights
    d. Yaphank
    e. Mastic
    f. Brookhaven

- Ambulance Districts
    a. Mastic
    b. Shirley
    c. South Country

- Suffolk County Police Department

- Suffolk County Sherriff's Office

- New York State Police

- U.S. Fish and Wildlife Service

- Libraries
    a. Longwood Public Library

- School Districts
    a. Longwood
    b. William Floyd
    c. South Country

- PSEG – formerly LIPA (Long Island Power Authority)

- SCWA (Suffolk County Water Authority)

- National Grid (Natural Gas)

- Brookhaven Town Waste Management Facility (Solid Waste Disposal)

The following public recreational facilities are located within the Management Plan Area:

- Brookhaven Town Parks
  a. Middle Island Dog Park
  b. Mill Pond Public Golf Course
  c. Longwood Estate

- Suffolk County Parks
  a. Prosser Pines County Park
  b. Southaven County Park
  c. Robinson Duck Farm Dog Park

- New York State Parks
  a. New York DEC Rocky Point Area (Southern Portion)

- National Wildlife Refuges
  a. Wertheim National Wildlife Refuge

3.4.2 Potential Impacts

No significant negative impacts are expected to community facilities and services within the Management Plan Area due to the fact that the proposed Plan will reduce the potential for commercial and residential development, thus reducing the need for increased services.

Tax Revenue
Though tax revenue may decline in some communities due to properties being removed from the tax rolls via government acquisition as a consequence of the Plan, the potential for future development which would require increased services is removed through the same process.

Recreational Facilities
Recreational Facilities within the Management Plan Area (namely Wertheim National Wildlife Refuge, Southaven County Park and Cathedral Pines County Park) may benefit from the Plan as a result of acquisitions and/or preservation of adjacent vacant lands within the Management Plan Area.

3.4.3 Mitigation

No mitigation is required because the Plan will significantly decrease the potential for future commercial and residential development which would otherwise require increased community services. The overall potential negative impact to the revenue streams of these facilities and services is minor in nature and should have little to no effect on their ability to operate effectively and efficiently.

3.5 Community Character

3.5.1 Existing Conditions

The Management Plan Area comprises approximately 7,000 acres and thus is a diverse geographic and socio-economic area. Large swaths of the Watershed consist of thick Pine Barrens vegetation in large, undeveloped blocks (Cathedral Pines County Park, Brookhaven National Lab, Wertheim National Wildlife Refuge), areas of dense residential development (Shirley and portions of Yaphank), a patchwork of farmland including some substantial operations (such as the Suffolk County Farm which is approximately200 acres) as well as areas of substantial industrial and commercial development (the Brookhaven Town Waste Facility and the Brookhaven R&D Industrial Park). With nearly one-third of the Watershed being in public trust (almost entirely as open space), the Watershed is a geographic region with vast areas of undeveloped lands that are vital to groundwater quality, wildlife habitat and community aesthetics.

<u>Outdoor Activities</u>
The Management Plan Area is a unique geographic area on Long Island that is vitally important to the residents of the Town of Brookhaven. Due to the extensive swaths of open space and expansive parklands, residents can enjoy outdoor activities year round including horseback riding, hiking, canoeing, fishing, hunting, mountain biking and bird watching. Due to dense development throughout Nassau County and much of Suffolk County, opportunities to partake in these types of activities have dwindled significantly and the Management Plan Area is one of the few remaining areas where one has access to these opportunities. Kayaking, canoeing and boating the river are all popular summer activities within boat launches available at Lower Lake, the Lower Lake Dam and at the Town of Brookhaven's "Glacier Bay" facility.

<u>Historic Districts and Properties</u>
The Management Plan Area also consists of farms (small and large), rural neighborhoods and roads, historic districts as well as historic homes, landmarks and trails. The Yaphank Historic District, for example, encompasses both sides of the River from Upper Lake to Lower Lake and features many historic homes along Main Street (See Section 3.6 for more information). The Longwood Historic District (which is mostly within the 25-50 and 50-100 year contributing areas) features a historic property (the Longwood Estate) which is owned by the Town of Brookhaven and features many historic buildings on a well preserved property within the Core of the Pine Barrens. The Town of Brookhaven holds an annual country fair at this property which is one of the most popular events for the residents of the Town of Brookhaven. A third historic district located in Brookhaven Hamlet (Fireplace Historic District) features historic homes and churches and cemeteries.

3.5.2 Potential Impacts

The Plan will not degrade the existing community character of the Management Plan Area, and in fact, will enhance it through the purchase of environmentally sensitive parcels and the re-zoning and/or Core additions of other important privately owned parcels. There are no expected potential impacts to the Watershed as part of the implementation of this Plan.

3.5.3 Mitigation

No mitigation is being offered as there are no foreseen potential impacts to the existing Community Character of the Watershed.

3.6 Cultural Resources

3.6.1 Existing Conditions

Historic Resources

The Carmans River Watershed Management Plan Area encompasses three Town of Brookhaven historic districts, six town landmarks, and six properties listed on the National Register of Historic Places. Town historic districts are areas that contain buildings, structures or places that have unique character, are of historical value, have notable architectural features, and/or contribute to the cultural and aesthetic heritage of the community. They are distinct physical sections of the Town whose significance warrants their conservation, preservation, and protection from adverse influences. Each historic district has a designated transition zone extending for a distance of 500 feet from and adjacent to the perimeter of the district's boundary, which serves to mitigate environmental, visual and developmental influences that may compromise the unique qualities of the historic area. Currently, the Town of Brookhaven has 15 historic districts.

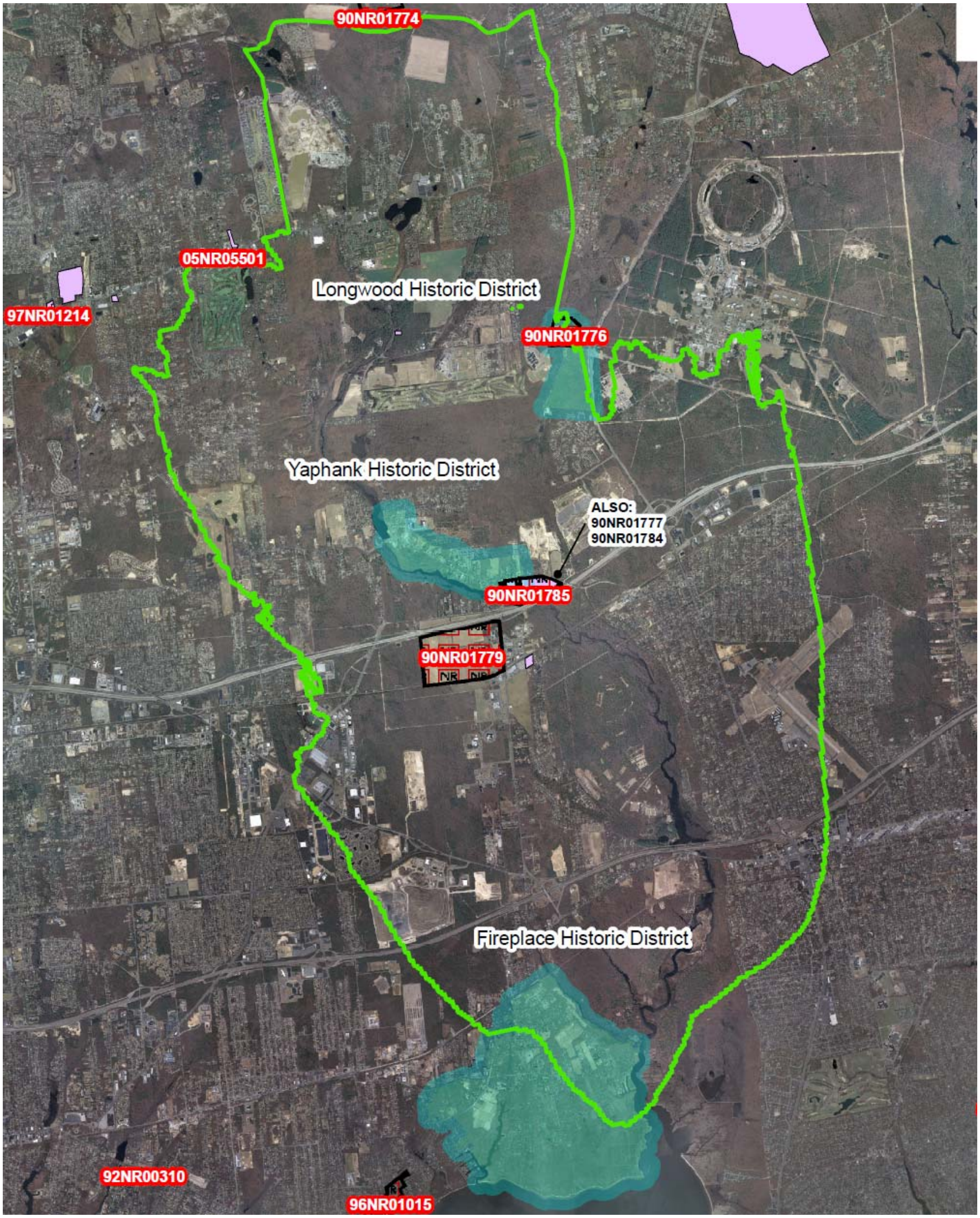
The Town also designates individual sites of historical significance as local landmarks; currently, there are 47 such sites. Individual sites or areas may also be included on the State and National Registers of Historic Places, based on criteria for designation set by the New York State Historic Preservation Office and the National Park Service. There are currently a total of 37 properties in Brookhaven Town listed on the National Register of Historic Places, including 11 located in incorporated villages within the town's boundaries.

The table below summarizes the names and locations of designated historic sites and districts located within the bounds of the Carmans River Watershed Management area.

Historic Designations		
Historic Districts		
Name		**Hamlet**
Yaphank Historic District		Yaphank
Longwood Historic District*		Ridge
Fireplace Historic District*		Brookhaven
Town Landmarks		
Name	**Location**	**Hamlet**
J. Brown House	49 Park Street	Yaphank
Yaphank Garage	S/W corner of Yaphank Ave. Main Street	Yaphank

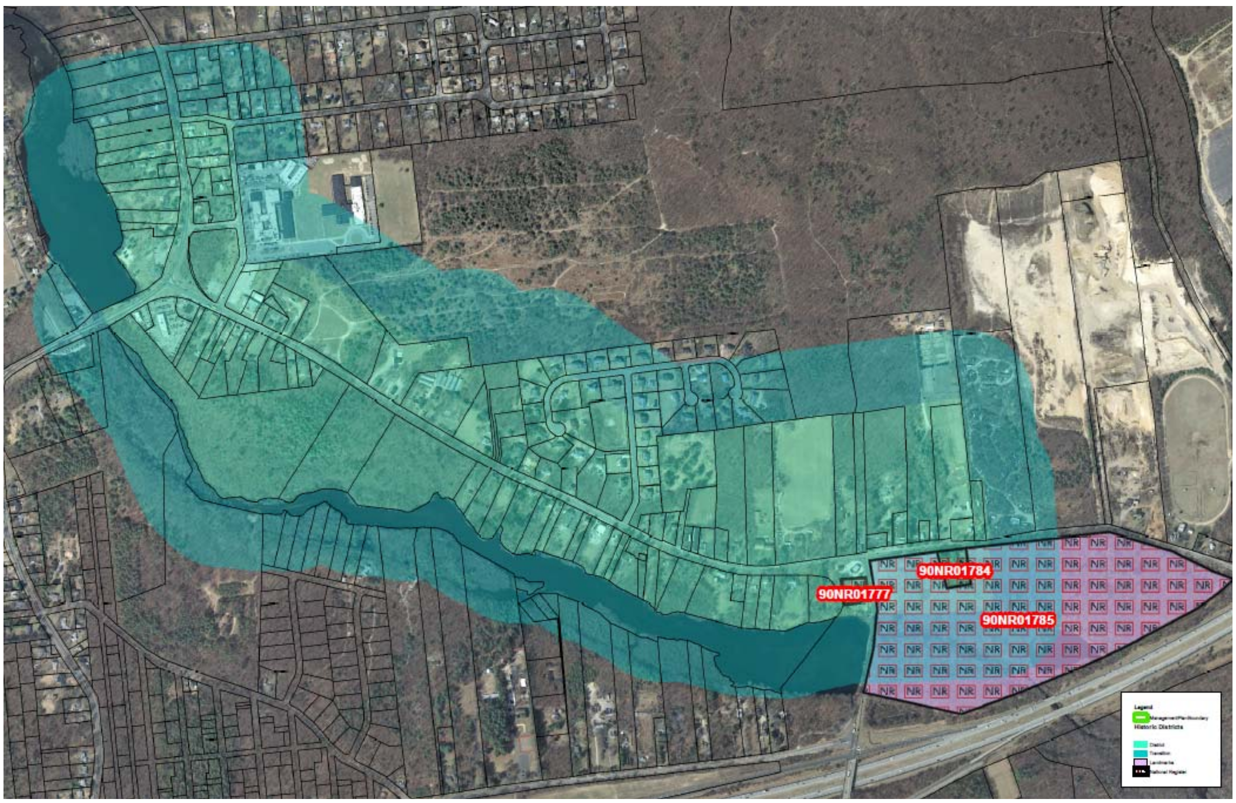
Homan-Gerard House and Mills	S/E corner of Main Street Yaphank Ave.	Yaphank
Holy Trinity Lutheran Church	Yaphank-Middle Island Road (County Road 21)	Middle Island
Union Cemetery*	Middle Country Road	Middle Island
Middle Island Presbyterian Church*	Middle Country Road	Middle Island
National Register		
Name	**Location**	**Hamlet**
Robert Hawkins Homestead 90NR01777	S/W corner of Main Street & Yaphank Avenue	Yaphank
Suffolk County Alms house Barn 90NR01779	Yaphank Avenue	Yaphank
Homan-Gerard House and Mills 90NR01785	S/E corner of Main Street &Yaphank Avenue	Yaphank
St. Andrews Episcopal Church 90NR01784	Main Street	Yaphank
Smith Estate 90NR01776	Longwood Road &Smith Road	Ridge
Middle Island Presbyterian Church* 05NR05501	Middle Country Road	Middle Island

**A portion of the parcel or historic district is included in the Carmans River Watershed Management Plan Area.*



Historic Districts, Landmarks, & National Register Listings

The history of the Carmans River is elaborately discussed in the main body of the Plan and the history of Yaphank is strongly tied to the Carmans River, which forms the southern boundary of the Yaphank Historic District. The River crosses directly through the property of the Homan-Gerard House, a National Register site located at the corner of Main Street and Yaphank Avenue in the historic district. The Homan-Gerard house, built prior to 1814, is now owned by Suffolk County and was the home of the Homan and Gerard families, who built and ran the earliest mills in Yaphank. The first sawmill was built on the site around 1762, and a gristmill was added around 1771. Later, the gristmill was replaced and operated until1918, when both mills burned. Because of the numerous mills that were built there in the 18th and 19th centuries, the area was once called “Millville”; it was later re-named “Yaphank,” taken from the Indian name “Yapmphank,” meaning “bank of a river.”



Yaphank Historic District

3.6.2 Potential Impacts

Due to the nature of the Plan, which will greatly reduce or eliminate future commercial and residential development within the Management Plan Area, there are no potential impacts expected to the historic and cultural resources found within the Management Plan Area.

3.6.3 Mitigation

No mitigation is needed as there are no expected negative impacts to the historic and cultural resources within the Management Plan Area.

3.7 Economics

3.7.1 Existing Conditions

Economic Conditions

Within the Management Plan Area there exist many large vacant parcels of land (along with smaller vacant parcels). Most of these parcels are eligible for residential or light industrial development (as the vast majorities are zoned A Residential 1 or L Industrial 1) and some of these residential parcels are currently eligible to receive transferred development rights from the existing Pine Barrens Core. While these parcels currently contribute to the tax base, the contribution is minimal (when compared to developed properties) and the parcels do not utilize the majority of the public services available (such as school districts, waste removal and police and fire departments).

Due to the current depressed economic state of the Country (and more specifically, Suffolk County) there has been a decline in residential development and industrial development and the demand for new housing has slowed. According to the most recent U.S. Census data, vacancies on Long Island (in Nassau and Suffolk County) have increased from 2.4% to 4%. Between 2000 and 2010, vacancies in Coram (which is within the Management Plan Area) rose from 253 housing units to 705 housing units. In the Village of Mastic Beach (which is just outside of the Management Plan Area, but within the Town of Brookhaven) vacancy rates as per the 2010 census were at 10%. Due to these current economic figures, it is not expected that these large tracts of land will be developed and occupied within the immediate future.

3.7.2 Potential Impacts

Tax Revenue
Though tax revenue may decline in some communities (i.e. school districts, ambulance districts, police precincts) due to properties being removed from the tax rolls via government acquisition, the potential for future development which would require increased services is removed through the same process. Data indicates that residential development costs more in services, in particular school services, on Long Island than it generates in tax revenues. Therefore it is anticipated there will be no overall economic impact.

Suburban Development
The Plan, when put into effect, will result in large tracts of residentially zoned land being removed from the tax base and having their development rights moved to areas outside of the Management Plan Area, being up-zoned, or purchased as open space. As a result of

these acquisitions, re-zonings and additions to the Core, total potential residential development within the Management Plan Area will be reduced which will lead to a reduction in available work for contractors and builders within the Management Plan Area.

Wages, Unemployment and Vacancy

It is not expected that the Plan will result in any changes in existing salary and wage scales, levels of unemployment or levels of commercial vacancy within the Management Plan Area or the remainder of the Town of Brookhaven.

3.7.3 Mitigation

Due to the minor nature of this and any other foreseeable economic impacts, no mitigation is required.

4.0 OTHER REQUIRED SECTIONS

4.1 Adverse Impacts that cannot be Avoided or Mitigated

Due to the nature of the Plan which is to protect and preserve the River water quality within the Management Plan Area by reducing or eliminating development, there are few adverse impacts that cannot be avoided and which cannot be mitigated. The following items are potential adverse impacts, located outside of the Study Area, which cannot be avoided:

Increased intensity of land outside of the study area that qualify for Pine Barrens Credit Redemption.

4.2 Growth Inducing Impacts

Within the Study Area there will be no growth inducing impacts. Potential future build-out (when compared to having no plan implemented) will be reduced through open space acquisition and expansion of the Pine Barrens Core. Development within the Management Plan Area will be significantly less than the potential development without a Plan and as such will not result in the creation of any growth inducing aspects.

4.3 Effects on the Use and Conservation of Energy

One of the goals of the Plan is to preserve existing resources and protect and improve the quality of habitat within and around the River. The Plan sets forth a series of recommendations which, when implemented, will aid in achieving the goal of habitat protection and preservation. The Plan will not create a significant demand for energy and will not cause or create a need for new energy sources (such as a power plant). Both short term and long term levels of energy consumption will be in keeping with the current demand within the Town of Brookhaven.

Indirect effects on energy consumption include vehicular traffic, construction of structures and facilities as well as the energy required to manufacture and transport materials for a specific project. Since the Plan does not result in the direct construction of any new facilities and since the Plan will reduce potential future development within the Management Plan Area (through open space acquisition and Core expansion) it is not expected that there will be an increase in vehicular trips or any other indirect effects on energy consumption. The Plan in and of itself is an energy conservation measure as it reduces potential build-out within the Management Plan Area which overall will result in less energy being consumed within the Management Plan Area when compared to implementing no plan and letting a full build-out occur.

5.0 ALTERNATIVES

5.1 Scenario 1: No Action

5.1.1 Description of Scenario 1

Under this scenario, no parcels would be added to the Core of the Pine Barrens. Additionally, the recommendations made in the Plan for various land use and best management practices would not be implemented. Without these recommendations, portions of the River (if not the entire River) are susceptible to becoming impaired with the potential for irreversible damage.

5.1.2 Anticipated Impacts

Invasive Species

Without implementation of the Plan, invasive species may increase within the Management Plan Area as there would be no prohibition on using invasive plants for landscaping purposes on private residential parcels. In addition, one of the goals of the Plan is to develop species-specific strategies to control, manage, and when feasible eliminate invasive species within the Management Plan Area. If the Plan does not go into effect, this may not occur and invasive plants may continue to proliferate without any intervention from the Town.

Re-Zonings

The potential for increased residential and commercial development, particularly in areas within the 0-2 and 2-5 year boundaries would not be abated and as such nitrogen inputs would likely increase until the areas reached its build-out capacity. Through incentive zoning, Planned Development Districts and overlay districts, the area may perpetually have the ability to be further developed. If the Plan were to not be adopted, parcels within the 0-5 year contributing area would have the potential to re-zone to any number of different zoning categories which could lead to a more intense use of the land which could lead to increased nitrogen inputs as well as detrimental effects on local traffic and air quality.

Core Expansion

One of the major components of the Plan is to add parcels to the Core of the Pine Barrens. While some of this land is already publicly owned and protected from commercial and/or residential development, the vast majority has little or no protection (beyond the existing restrictions that may be in effect as per the regulations of the Compatible Growth Area [CGA] of the Pine Barrens). By adding these parcels to the Core, they will no longer be eligible for development and thus will remain intact to aid in recharging the aquifer and filtering out pollutants before they reach the River. In addition, by not developing these parcels, there will be no increases in traffic generation or any degradation of air quality or loss of habitat for flora and fauna.

Open Space Acquisitions

In conjunction with the above Core expansion, one of the key points of the Plan is to purchase environmentally sensitive parcels within the Watershed and thus prevent these parcels from being developed. All of the benefits stated above apply to the potential open space acquisitions. If the Plan were not implemented, these open space acquisitions may still take place (as the Town of Brookhaven and other public agencies make it a point to purchase and preserve environmentally properties), however these parcels may not be as high on the priority list without the benefit the Plan or these properties could possibly be sold to private entities or developed before the Town of Brookhaven (or other public agency) is able to purchase the parcel outright, or purchase the development rights (in the case of agricultural lands).

Fish Barriers and Storm Water

The River contains six dams and several culverts (the culverts are all within Cathedral Pines County Park) which inhibit fish passage from the Great South Bay into the upper reaches of the River where these fish spawn. A fish passage was previously installed at the southernmost dam (Hard's Lake dam) and work has been done at the C-Gate dam (just up the river from the Hard's Lake dam) to aid in fish passage. A new fish dam, at the Upper Lake Dam is to be constructed allowing fish safe passage from Lower Lake to Upper Lake. The Plan recommends changes to the remaining four dams as well as the culverts. There are no anticipated changes to these projects.

5.2 Scenario 2: Core Expansion Only

5.2.1 Description of Scenario 2

By only expanding the Core of the Pine Barrens, the potential for development within the Management Plan Area, specifically the 0-2 and 2-5 year contributing areas, will be decreased. However, many other environmental issues that have the potential to negatively impact the River will not be addressed. As mentioned in Scenario 1 (6.1.1), some of the recommendations in the Plan may still occur (such as land acquisitions or storm water best management practices) but may have lengthier timelines or have lower priorities. This scenario assumes that aside from the addition of parcels to the Core of the Pine Barrens, land use within the Management Plan Area would continue unabated.

5.2.2 Anticipated Impacts

With the expansion of the Core being the only change within the Management Plan Area, there may be a reduction in groundwater quality or water quality within the River. Since the addition of parcels to the Core would solely prevent increased development on various tracts of lands, no changes would be made to the current nitrogen and other potential pollutant (pesticides, herbicides, etc.) inputs in the Watershed. The goals of the Plan would not be met and it is expected that water quality within the River would decline.

Adding parcels to the Core, while preventing development within the Management Plan Area, allows for increased development outside of the Management Plan Area (as explained in Section 6.1.1). Though any development which utilized credits from the expanded Core would need to undergo the appropriate SEQRA review, it is likely that the cumulative potential adverse environmental impacts within the Town of Brookhaven and outside of the Management Plan Area would be greater under this scenario than under the No Action scenario (6.1).

5.3 Scenario 3: Re-Zonings Only

5.3.1 Description of Scenario 3

If the only action taken by the Town of Brookhaven was to re-zone selected private and public parcels within the Management Plan Area, there would be a reduction in potential development within the boundaries of the Management Plan Area. However, re-zoning parcels does nothing to prevent other areas of the Management Plan Area from being developed and negatively impacting groundwater and surface waters through storm water runoff, sanitary waste and the use of fertilizers, pesticides and herbicides.

5.3.2 Anticipated Impacts

No negative impacts would be associated with re-zoning select private (and public) lands within the Management Plan Area. However, this scenario (similar to Scenario 2 – Core Expansion Only) would not result in an improvement of groundwater quality nor would it result in an improvement of the quality of the River. With this scenario, there is no requirement for offsetting the reduction in potential development (as there is with Core Expansion, Section 6.2.1), and as such this scenario would be an overall benefit to the Watershed over a No Action scenario (Section 6.1.1).

6.0 FUTURE ENVIRONMENTAL REVIEW

The Carmans River Conservation and Management Plan and this DGEIS will aid in assessing impacts. The GEIS is intended to consider in a generic way the environmental impacts that may be associated with implementation of the Plan and does not exclude implementation action actions from further SEQRA review. Any proposed actions to implement the Plan will need to demonstrate compliance with SEQR. Future site-specific impacts will be assessed individually and mitigation measures identified and required.

Pursuant to 6 NYRCC Part 617.10(d), "when a final generic EIS has been filed under this part:

1) No further SEQR compliance is required if a subsequent proposed action will be carried out in conformance with the conditions and thresholds established for such actions in the generic EIS or its Findings statement;
2) An amended Findings statement must be prepared if the subsequent proposed action was adequately addressed in the generic EIS but was not addressed or was not adequately addressed in the Findings statement for the generic EIS;
3) A negative declaration must be prepared if a subsequent proposed action was not addressed or was not adequately addressed in the generic EIS and the subsequent action will not result in any significant environmental impacts;
4) A supplement to the final generic EIS must be prepared if the subsequent proposed action was not addressed or was not adequately addressed in the generic EIS and the subsequent action may have one or more significant adverse environmental impacts.

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