Town of Oyster Bay

Final Massapequa Creek Watershed Management and Corridor Restoration Plan

December 2009

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Town of Oyster Bay

MASSAPEQUA CREEK WATERSHED MANAGEMENT AND CORRIDOR RESTORATION PLAN

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SECTION ES

Executive Summary

ES-1.0 EXECUTIVE SUMMARY

ES-1.1 Description, Purpose, and Need for Plan

Massapequa Creek (Creek) is a vital natural resource in the Town of Oyster Bay (Town). The Creek, its associated ponds, the Massapequa Park and Massapequa Preserve, and other areas that surround it comprise a mix of woodland, freshwater wetland, tidal wetland, tidal marine, and aquatic environments. The Creek and adjacent uplands are important not only from a surface water quality standpoint, but from groundwater, ecological, open space, recreational, drainage and flood control, and aesthetic perspectives as well. The Creek is a valued resource that ultimately empties into the South Oyster Bay/South Shore Estuary, influencing this critical natural resource's water quality and biological systems. The presence of these and other sensitive resources along the south shore of Long Island, along with the ever-present threat from dense development, growth-induced pollution, potentially incompatible land use, and insufficient resource management, prompted the drafting and adoption of the *Long Island South Shore Estuary Reserve Comprehensive Management Plan* and, consequently, this plan.

The *Massapequa Creek Watershed Management and Corridor Restoration Plan* is a key component of the Town of Oyster Bay's commitment to the implementation of the *South Shore Estuary Reserve Comprehensive Management Plan*. It is testament to the Town's stewardship of its vital natural resources; its promotion of the health, safety, and general welfare of its citizens; and its overriding goal to perpetuate the use, enjoyment, and protection of these resources for current and future generations.

ES-1.2 Goals

The specific goals of the *Massapequa Creek Watershed Management and Corridor Restoration Plan* are as follows:

- Improve the quality of water discharging from Massapequa Creek into South Oyster Bay
- Enhance and maintain the biological integrity and values of the Massapequa Creek corridor
- Protect the natural and open space values of the watershed for public enjoyment and preservation of community character
- Restore, where practical, habitats and living resources within the corridor

- Provide a comprehensive framework of guidance by which government entities, citizens, and non-governmental organizations can restore, manage, and preserve the Massapequa Creek and its watershed
- Support and encourage educational programs and public outreach that promote the protection and restoration of the Massapequa Creek and watershed corridor
- Recommend methods to improve legal jurisdiction to control nonpoint source pollution
- Provide a process to measure the creek corridor restoration progress

ES-1.3 Study Area

The study area for this plan is the Massapequa Creek watershed. The 6.67-square mile watershed is located in the south-central portion of the Town of Oyster Bay. The watershed extends from the southern end of Bethpage State Park and includes portions of the Incorporated Villages of Farmingdale and Massapequa Park and the neighborhoods and communities of Bethpage, South Farmingdale, North Massapequa, Massapequa, and Biltmore Shores before ending at South Oyster Bay. The boundaries of the watershed and study area (Map 1) are provided in Section 1.

ES-1.4 Methodology

The methodology of the plan's development involved several steps and tasks as follows:

- Creating the Massapequa Creek Watershed Management and Corridor Restoration Planning Committee
- Providing inventory, description, and assessment of existing watershed conditions
- Gathering relevant information regarding the Massapequa Creek and its watershed from applicable agencies and resources
- Developing goals and objectives to facilitate the preservation, protection, and restoration of the Creek
- Identifying significant nonpoint source contributing areas and locations of problematic surface flooding
- Identifying possible capital projects or other actions to abate adverse conditions
- Suggesting actions that local jurisdictions can employ for long-term, nonpoint source pollution control, watershed management, and water quality improvement

- Establishing timetables, funding strategies, and administrative procedures for implementing mitigation projects

ES-1.5 Community and Agency Outreach

- A Massapequa Creek Watershed Management and Corridor Restoration Planning Committee was formed to assist with the planning process. The committee included a wide variety of individuals and organizations. The committee held a total of six meetings to discuss various topics and issues. In addition, during these meetings, two drafts of the plan were reviewed and commented on by committee members.

ES-1.6 Recommendations

The recommendations of the plan are divided into two general resource protection categories consisting of "preventative" and "corrective" measures as follows:

Preventative Measures

Preventative measures are those that help to prevent impacts before they occur. They include the following:

- Implementation of existing State laws, policies, resource protection plans, and permit programs affecting the watershed:
  - NYSDEC Phase II stormwater controls
  - NYSDEC State Pollution Discharge Elimination System (SPDES) general permits
  - NYSDEC Stormwater Pollution Prevention Planning
  - NYSDEC wetlands permits
  - New York State Environmental Quality Review Act (SEQRA) requirements
  - Solid waste disposal, recycling, hazardous waste, and pollution prevention laws
  - Implementation of resource management plans such as the *Long Island South Shore Estuary Reserve Comprehensive Management Plan*

- Implementation of existing local laws and plans relating to land use, zoning, waterfront revitalization, stormwater management, and environmental protection (e.g., *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan*)

- Coordination of watershed protection strategies with other municipalities and agencies
- Identification of and application for funding that can be directed toward preventive impact measures
- Institution of appropriate data technology including GIS to assist in watershed management
- Development of public outreach, education, and training programs
- Continuation of monitoring watershed conditions
- Construction or upgrades of stormwater runoff controls as indicated in Section 5 of this plan, the Phase II program, and the Town's *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan*
- Pre-construction, construction, and post-construction stormwater management
- Periodic streetsweeping and maintenance of existing stormwater infrastructure

Corrective Measures

Corrective measures are those that address existing problems through amendments to rules and regulations, capital improvements, maintenance, repairs and renovations of drainage infrastructure, streambank stabilization and vegetative restoration, and similar practices. They specifically include the following:

- Modifications to existing environmental rules and regulations
- Identification and application for funding for corrective watershed impact measures
- Construction of new or improved stormwater runoff controls or replacement and upgrade of existing facilities as indicated in Section 5 of this plan, the Phase II program, and the Town's *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan*
- Maintenance of existing stormwater control facilities
- Remediation of hazardous sites or areas of contamination such as the Liberty Finishing Plant in South Farmingdale
- Implementation of habitat restoration and enhancement plans as noted in Section 5 of this plan

SECTION 1

Introduction

1.0 INTRODUCTION

1.1 Purpose of the Plan

This watershed management and corridor restoration plan analyzes these impacts as they relate to the watershed and corridor by examining water quality, natural resources, wildlife habitats, and the surrounding man-made environment. The plan identifies impairments and examines options to either eliminate or mitigate the source or sources of the impairment. It proposes actions within the watershed based on resources, policies, priorities, and regulatory responsibilities that, if implemented, will protect the creek from further degradation. Preparation of the watershed management and corridor restoration plan is also a vital step toward implementing the South Shore Estuary Reserve Comprehensive Management Plan (CMP). This action, in conjunction with other necessary strategies outlined in the CMP, will help protect, preserve, and manage the estuary's vital resources.

The *Massapequa Creek Watershed Management and Corridor Restoration Plan* will serve as a blueprint for actions that government agencies and non-governmental organizations can utilize to protect the natural resources of the Massapequa Creek watershed. The plan creates a vision for the watershed and identifies those projects and opportunities that, when implemented, will help in achieving this vision. The framework of this plan follows and adheres to the accepted NYSDOS framework for watershed management, will guide future decisions, and become a point of reference by which progress can be measured.

1.2 The Massapequa Creek Watershed

The Massapequa Creek Watershed is located on the south shore of Long Island and is the largest watershed basin in the Town of Oyster Bay. The current surface water runoff area of the watershed covers an estimated 6.67 square miles and is a major surface water contributor to South Oyster Bay. The Creek and surrounding riparian area (corridor) contain a variety of habitats consisting of coastal streams, ponds, lakes/reservoirs, freshwater and tidal wetlands, and upland wooded areas that support diverse vegetation and wildlife. The majority of the Creek corridor is located within the Massapequa Preserve (Preserve), and the Massapequa Creek Watershed is located within the boundaries of the South Shore Estuary Reserve (SSER).

However, the watershed area surrounding the corridor is highly developed and includes industrial, commercial, retail and residential areas. Development in the area peaked during the World War II era and, with the exception of the Preserve, the Massapequa Creek watershed of today is completely urbanized, thereby modifying and adversely affecting the natural environment of the stream corridor and surrounding area.

1.3 Goals

The goals of this management and restoration plan are to protect, preserve, and restore aquatic and riparian habitats of the Massapequa Creek watershed. The plan will implement actions that are expected to benefit the restoration and enhancement of native habitats and species populations, including diadromous fish, brook trout, and shellfish.

For the Massapequa Creek watershed, the specific goals are as follows:

- Improve the quality of the water discharging from Massapequa Creek into South Oyster Bay
- Enhance and maintain the biological integrity and values of the Massapequa Creek corridor
- Protect the natural and open space values of the watershed for public enjoyment and the preservation of community character
- Restore, where practical, habitats and living resources within the corridor
- Provide a comprehensive framework and guide by which government entities, citizens, and non-governmental organizations can restore, manage, and preserve Massapequa Creek and its watershed
- Support and encourage educational programs and public outreach that promote the protection and restoration of the Massapequa Creek watershed and corridor
- Provide recommendations on methods to improve legal jurisdiction to control nonpoint source pollution, including recommendations to address stormwater runoff through implementation of Best Management Practices.
- Provide a process to measure the stream corridor restoration process
- Identify gaps in local laws and practices and provide recommendations to fill those gaps.
    - Preventive Objectives
        - Assessment of Existing Point and Nonpoint Controls
        - Actions by Other Local, State, and Non-Governmental Organizations

- Corrective Objectives
    - Analysis of Characterization and Pollutant Loadings
    - Actions to Remove Pollutants and Restore Water Quality
    - Habitat Restoration and Enhancement Opportunities
    - Stormwater Remediation Measures
- Implementation Objectives
    - Changes in Institutional Arrangements
    - Revise Local Land and Water Use Controls
    - Actions to Achieve Compliance with Phase II
    - Implementation of the Town of Oyster Bay *Stormwater Discharge Identification and Mitigation Plan*
    - Identification of Funding Sources
    - Monitoring Strategy for Evaluating Performance

1.4 Community and Agency Outreach

A Massapequa Creek Watershed Management and Corridor Restoration Plan Committee was formed to assist with the planning process. Committee members who attended one or more of the six committee and sub-committee meetings included individuals from the following municipalities, state and county agencies, and environmental organizations:

Municipalities

- Town of Oyster Bay
- Incorporated Village of Farmingdale
- Incorporated Village of Massapequa Park

State Agencies

- New York State Department of State, NYS Department of State (NYSDOS)
- New York Sea Grant Nonpoint Education for Municipal Officials (NEMO)
- New York State Department of Environmental Conservation (NYSDEC)

Regional Agencies

- South Shore Estuary Reserve Office

County Agencies

- Nassau County Department of Public Works

Environmental Organizations

- Trout Unlimited, Long Island Chapter
- Ducks Unlimited, Long Island Chapter
- Friends of Massapequa Preserve
- Sierra Club
- Citizens Campaign for the Environment

Project Consultants

- Cashin Associates (planning and environmental consultants)

A total of six committee and sub-committee meetings were held: March 29, 2005, April 26, 2005, August 11, 2005, October 24, 2005, December 14, 2005, and March 6, 2006. During these meetings study area boundaries were identified, project sites were considered, related studies and plans were noted, presentations were made, issues were considered, various topics were discussed and two drafts of the plan were reviewed and commented on.

1.5 South Shore Estuary Reserve

According to the South Shore Estuary Reserve Comprehensive Management Plan, the New York State Legislature passed the Long Island South Shore Estuary Reserve Act in 1993 at the urging of Long Islanders concerned about the future health of the South Shore Estuary (Estuary). The Act declared the Estuary to be a resource of unparalleled biological, economic and social value, and created the South Shore Estuary Reserve (SSER) and called for its protection and prudent management.

The Act also created the South Shore Estuary Reserve Council (Council), designated the New York Secretary of State as its Chair, and provided for membership representing six south shore towns, thirty-

one villages, Nassau and Suffolk Counties, the City of Long Beach, and recreational, business, academic, environmental, and citizen interests. The Act also charged the Council with the preparation of a comprehensive management plan for the Reserve.

Development of the plan has followed a process in which many individuals have had opportunities to participate. In 1994, the Council held a series of scoping meetings during which public views and concerns about the estuary and its management were received. Monthly meetings which were open to the public, have allowed interested parties to learn about and participate in Council activities and those of its Technical Advisory Committee, Citizens Advisory Committee, and topic-based subcommittees and workgroups.

To assist the Council, the NYS Department of State, gathered information primarily through partnerships with local governments and federal agencies. The information addressed land and embayment uses, the estuarine economy, water quality, living resources, and other aspects of the SSER. Much of this information was analyzed by the NYSDOS through geographic information system technology, and this analysis served as a basis for the implementation actions offered in the plan.

The Council is pursuing the following multiple objectives by issuing this plan (CMP):

- To recommend and expand management actions for protecting and improving the health of the Estuary
- To sustain cooperation and commitment among all public and private stakeholders
- To build public awareness about the Estuary and involve the public in management of the Estuary
- To identify areas where further scientific information is needed to improve management actions

SECTION 2

Resource Description

2.0 RESOURCE DESCRIPTION

2.1 The Watershed and Creek Corridor

The purpose of characterizing the watershed is to address the management needs and restoration goals of the watershed (USEPA, 2005). The Massapequa Creek watershed is the largest drainage basin located along the south shore of the Town of Oyster Bay and has a surface water runoff area encompassing approximately 6.67 square miles. The Creek's headwaters originate in South Farmingdale and include a central channel and two small tributaries. The central channel is a perennial groundwater-fed freshwater channel and the two small tributaries are ephemeral which receive large inputs of point and nonpoint stormwater runoff during heavy rain events. The surface waters of the Creek discharge into the South Oyster Bay (Bay) at Massapequa Cove through two spillways located along the southern bank of Massapequa Lake. The entire southern end of Massapequa Creek's shoreline (south of Merrick Road) has been hardened and includes a network of man-made canals which provide safe harborage for vessels and easy access to the open bay.

The watershed is located entirely within the glacial outwash plain that extends south from the southern limits of the Harbor Hill Moraine, a distance of approximately 5.9 miles from the South Oyster Bay shoreline. The actual length of the Creek is approximately 4.8 miles along its main channel depending on seasonal fluctuations in groundwater levels, prevailing weather patterns, and resultant stormwater inputs. The Creek has been substantially modified and receives large loadings of contaminants via urban runoff (nonpoint and direct point discharges, groundwater inputs) as a result of intensive development in the watershed.

The changes in the Massapequa Creek corridor and its surrounding watershed area over the past two centuries have been significant. Since the mid-1800s, Massapequa Creek has been impacted by channel modification, shoreline hardening, filling of wetlands, dam construction restricting stream flow and fish passage, increased inputs of stormwater runoff, and base flow reduction.

2.2 The Massapequa Creek Watershed Boundary

Massapequa Creek's watershed boundaries can be divided into two separate watershed categories: groundwater input and surface water runoff (Map 1). Groundwater watershed input encompasses the largest area and, with the exception of reduction in base flow volume, has remained relatively the same as the watershed has become more urbanized. On the contrary, the watershed surface water runoff boundary has been constantly altered to meet development needs. Because it is not possible to establish an exact groundwater boundary from existing data, this plan will only infer the possible areas from which groundwater may be contributing to base flow of the creek. Although some adverse impacts to the watershed are associated with groundwater contamination, the majority of the impacts affecting the watershed are attributed to direct surface water contamination which is the major focus of this plan.

As stated previously, the majority of the Creek corridor and associated wetlands, streams, ponds, and lakes are located within the Preserve. However, most of the sources of impairments affecting the environmental stability of the Preserve derive from the surrounding watershed area outside the Preserve's boundaries, within the Town of Oyster Bay, Village of Massapequa Park (Massapequa Park), and the Village of Farmingdale (Farmingdale). In order to aid in the assessment of impairments associated with the surface water runoff affecting the Preserve and creek corridor, this report has divided the Massapequa Creek watershed into six different segments (Map 2):

Segment 1

Segment 1 includes the entire watershed area located south of Merrick Road. Due to the spillways located on the southern shore of Massapequa Lake, it is the only segment within the watershed that is tidally influenced. The area encompasses 277.16 acres (or 0.43 of a square mile) and the surface water boundary is Merrick Road to the north, Bayview Avenue to the east, Massapequa Cove to the south, and Harrison Avenue to the west. This area is under local jurisdiction of the Town. Merrick Road is under jurisdiction of the New York State Department of Transportation (NYSDOT).

Segment 2

This segment's northern and southern boundaries are Sunrise Highway and Merrick Road, respectively. Segment 2 is bordered by Division and Forest Avenues along the western edge of the Preserve and Harbor Avenue along the eastern edge. Massapequa Lake is located in this segment. There are spillways located on the southern end of Massapequa Lake and southern end of Massapequa Reservoir, which separate it from the rest of the watershed. Local management of this section is shared by Nassau County, the Town, and Massapequa Park. Sunrise Highway is managed by NYSDOT. The area of this watershed segment is 451.76 acres (or 0.71 of a square mile).

Segment 3

This segment's northern and southern boundaries are Southern State Parkway and Sunrise Highway, respectively. This is the longest and largest of all six segments as it encompasses approximately 1,593.71 acres (or 2.49 square miles). The majority of the Preserve is located within this segment including the Massapequa Reservoir. Local management of this section is shared by Nassau County, the Town, and Massapequa Park. Southern State Parkway is managed by NYSDOT.

Segment 4

This long and narrow segment runs in a northwest to southeast direction and consists primarily of the Bethpage State Parkway. The segment encompasses 146.68 acres (or 0.23 of a square mile). The majority of this segment is under jurisdiction of the NYSDOT and the New York State Office of Parks, Recreation and Historic Preservation.

Segment 5

This segment is located north of Southern State Parkway, east of Bethpage State Parkway, and falls within the Village of Farmingdale and the community of South Farmingdale. This segment encompasses 1,415.1 acres (or 2.21 square miles) and contains the majority of the industrial areas located within the watershed, including the abandoned Liberty Industrial Finishing Plant site. Its boundary to the east runs along Carman Avenue, Main Street, and Staples Street and the boundary to the west runs along Bethpage State Parkway and Merritt Road. Local management

BETHPAGE STATE PARK

SEAFORD OYSTER BAY EXPRESSWAY

BETHPAGE STATE PARKWAY

TOWN OF HEMPSTEAD

TOWN OF OYSTER BAY

WESTERN TRIBUTARY

CENTRAL CHANNEL

EASTERN TRIBUTARY

SOUTHERN STATE PARKWAY

RETENSION POND
POND #3

POND #2

TOWN OF BABYLON - SUFFOLK COUNTY

TOWN OF OYSTER BAY - NASSAU COUNTY

CREEK (MAIN) CHANNEL

MASSAPEQUA RESERVOIR

POND #1

LONG ISLAND RAILROAD

SUNRISE HIGHWAY

CREEK (MAIN) CHANNEL

MASSAPEQUA LAKE

HARRISON AVE

BAYVIEW AVE

MERRICK ROAD

SUSPECTED GROUNDWATER FLOW, TYP.

SURFACE WATER FLOW

SOUTH OYSTER BAY

N

0 2,400 Feet

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MASSAPEQUA CREEK WATERSHED MANAGEMENT AND CORRIDOR RESTORATION PLAN

CONTRIBUTING DRAINAGE AREAS

MAP 1

BETHPAGE STATE PARK

SEAFORD OYSTER BAY EXPRESSWAY

BETHPAGE STATE PARKWAY

SOUTHERN STATE PARKWAY

SUNRISE HIGHWAY

MERRICK ROAD

TOWN OF HEMPSTEAD

TOWN OF OYSTER BAY

TOWN OF BABYLON

SUFFOLK COUNTY

NASSAU COUNTY

SOUTH OYSTER BAY

1

2

3

4

5

6

N

0 2,100 4,200 Feet

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MASSAPEQUA CREEK WATERSHED MANAGEMENT AND CORRIDOR RESTORATION PLAN

SEGMENT AND TOPOGRAPHY

MAP 2

of the section is controlled by the Town and by the Village of Farmingdale. The United States Environmental Protection Agency (EPA) has jurisdiction over the ongoing remediation being conducted at the Superfund site located at the Liberty Industrial Finishing Plant.

Segment 6

This segment is located within the northernmost and northwestern extent of the watershed. It is more specifically located north of the intersection of Merritt Road and Bethpage State Parkway, south of the terminus of Bethpage State Parkway, east of the western edge of the Bethpage State Parkway right-of-way, and west of Segment 5. This segment encompasses 387.18 acres (or 0.60 of a square mile). This area is under the jurisdiction of New York State (Bethpage State Park, Bethpage State Parkway, and Hempstead Turnpike/Conklin Street), Long Island Railroad, Incorporated Farmingdale, and the Town.

2.3 Climate

Long Island has a climate similar to other coastal areas of the Northeastern United States; it has warm, humid summers and cold winters, but the Atlantic Ocean helps bring afternoon sea breezes that temper the heat in the warmer months and limit the frequency and severity of thunderstorms. However, severe thunderstorms are not uncommon, especially when they approach Long Island from the mainland areas of the Bronx, Westchester County and Connecticut in the northwest (Britannica Concise, 2007).

In the winter, Long Island's average temperature is 33^{o} F and, in summer, the average temperature is 72^{o} F. The total annual precipitation is 42 inches (of the 42 inches, 21 inches, or 50 percent, falls in April through September) and the average annual snowfall is 29.6 inches. The relative humidity is about 70 percent at dawn, on average, and is about 55 percent in the mid-afternoon. The sun shines 65 percent of the time possible in the summer and 50 percent in the winter. The prevailing wind is from the west-northwest and average wind speed is highest at 14 miles per hour in spring (Britannica Concise, 2007).

2.4 Topography

Characterizing the topography or natural features of a watershed can help determine surface runoff patterns, possible origins of pollution releases, and potential pollutant discharges to area waterbodies. The watershed essentially rests on a flat to gently sloping glacial outwash plain. However, the natural topography of the Massapequa Creek watershed has been physically altered to meet developmental needs (Map 2).

Segment 1

Historically, the majority of this segment was most likely wetlands that were filled to meet developmental pressures. Most of this segment is less than five feet above sea level. There are several man-made canals and the majority of the shoreline is hardened by bulkheading, virtually eliminating the natural slope of the riparian area associated with the stream corridor.

Segment 2

The Preserve encompasses approximately one-third of this segment and the elevation within the Preserve is 10 feet or less above mean sea level. The watershed area surrounding the Preserve ranges from 5 to 20 feet above sea level and appears to be gently sloping. Besides the developmental alterations of the natural topography affecting stormwater runoff (i.e., roadways and housing developments), the creation of the Massapequa Lake in the early 1900s is probably the largest manipulation of the natural topography in this segment.

Segment 3

Similar to Segment 2, the Preserve encompasses approximately one-third of this segment; however its average elevation above sea level is about 20 feet. Besides the developmental alterations of the natural topography affecting stormwater runoff (i.e., roadways and housing developments), the creation of the Massapequa Reservoir is probably the largest manipulation of the natural topography in this segment.

Segment 4

The majority of this segment encompasses major highways. Its natural topography has been completely manipulated to support these roadways and associated maintenance requirements (i.e., stormwater runoff). The average height above mean sea level is approximately 65 feet.

Segment 5

The Preserve encompasses approximately one-quarter of the southern portion of this segment and this region is about 30 feet above sea level at its highest point. The northern section of this segment is highly industrialized and, as with the other sections, the natural topography of this area has been altered. This segment, along with Segment 6, has the highest elevations in the watershed (approximately 100 feet above mean sea level) in the northern portion of this segment.

Segment 6

This segment, along with Segment 5, has the highest elevations in the watershed. Elevations in this area range from approximately 50 feet above mean sea level at its south end to over 100 feet above mean sea level at its north end. Slopes range between flat to gentle to moderately steep. The area consists primarily of single-family residential development, roads, and a railroad; commercial land use exists along a small portion of Hempstead Turnpike/Conklin Street which traverses the segment area and part of Bethpage State Park.

2.5 Geology and Soils

2.5.1 Geology

Long Island is located on the eastern edge of what is known as the Atlantic Coastal Plain. The Atlantic Coastal Plain is part of a landform that extends under the ocean to become the Continental Shelf. Long Island is a glacial, depositional landform marking the southernmost limit of the last advance of the Laurentide ice sheet during the Wisconsinan stage of the Pleistocene Epoch, about 22,000 years ago. The upper Pleistocene deposits, which form the uppermost principal geologic unit on Long Island, include glacial moraine sediments of various sizes and shapes deposited directly by the glacier without reworking by meltwater (till), outwash, as well as glaciolacustrine sediments that were deposited during the Wisconsin glaciation. This unit

consists mostly of moderately to well-sorted sand and fine gravel, which is highly permeable in most places but locally contains fine-grained, poorly permeable layers of silt or clay. The saturated part of the upper Pleistocene deposits forms the upper glacial aquifer, which contains the water table throughout most of Long Island and is the source of base flow to streams, including Massapequa Creek.

According to a study, *New Observation on the Glacial Geomorphology of Long Island from a Digital Elevation Model (DEM)*, geomorphic features revealed by the DEM strongly suggest that Long Island is defined by three distinct moraines (not two as previously suggested): the Harbor Hill Moraine, the Roanoke Point Moraine, and the Ronkonkoma Moraine (Bennington, 2003). The Harbor Hill Moraine is a linear ridge trending southwest to northeast from Brooklyn to Port Jefferson. The Roanoke Point Moraine is a discontinuous kame moraine, trending west to east from Port Jefferson to Orient Point, which defines the North Fork of the island. The Ronkonkoma Moraine is also a kame moraine with a west to east trend, extending from Roslyn Heights in Nassau County across central Long Island, to the South Fork and Montauk Point. The Massapequa Creek is located in the outwash plain south of where the Harbor Hill truncates the Ronkonkoma Moraine.

2.5.2 Soils

Soils can be an important factor in determining the amount and rate of groundwater recharge, surface water runoff, and erosion that occurs in a watershed. Soils have inherent characteristics that control how much water is retained and how water is transmitted through the soil (USEPA, 2005).

In general, soils in the watershed area are similar to those found throughout the south shore of Long Island, since they are relatively young geologically and were formed as a result of glacial deposition. The United States Department of Agriculture Natural Resources Conservation Service (formerly "Soil Conservation Service") classifies soils in associations and defines these landscapes as having distinctive general soil properties. Each association is named for the major soil types it contains, and normally consists of one or more major soils and at least one minor soil. The following is a description of the soil types in each of the segments based on information

obtained from the *Soil Survey of Nassau County, New York* (USDA & CUAES, 1987). Map 3 depicts the locations and approximate extent of each soil map unit.

Segment 1

The soil in this entire segment is characterized as *Urban Land (Uw* and *Us)*. Urban land units consist of urban areas where a high percentage of the surface is man-made, impervious cover. The impervious cover consists of buildings, roads, parking lots, driveways, and other similar features. There are very few undisturbed areas in this segment and most of the precipitation is channeled to either stormwater catch basins (small water collection boxes located in the roadways) or directly into the stream corridor and South Oyster Bay.

Segment 2

This segment is comprised of several different soil map units, with the majority of units located in the Preserve and stream corridor:

Atsion loamy sand (At) is found in the stream corridor and is described as usually very deep, nearly level, poorly drained soil that is often found along the bottom of stream drainage ways. These soils are mostly associated with woodland or mixed woodland and bushy wetland areas, including red maple swamps. This soil map unit is also considered fairly suitable for wildlife habitat.

Berryland mucky loamy sand (Bd) is also located in the stream corridor and is described as very deep, nearly level, poorly drained soil. It is often found in drainage ways and swampy areas that remain wet most of the year. Most areas of this soil are in a native plant cover consisting of water-tolerant trees and brush, including sedges and cattails. This soil is very poorly suited to open land and woodland wildlife habitat but has fair suitability for wetland wildlife habitat.

Manahawkin muck (Ma) is very deep, poorly drained soil that is found in depressions along drainage ways or in low basins. Practically all of this soil is within woodland, much of which is in municipal parks and preserves. This soil is very poorly suited to open land and woodland wildlife habitat, but has fair suitability for wetland wildlife habitat.

Udipsamments, wet substratum (Ue) consists mainly of nearly level low areas that have been filled with sandy material dredged primarily from adjacent waterways. The majority of the association is located within the stream corridor and is most likely a result of the dredging operations to create Massapequa Lake.

Segment 3

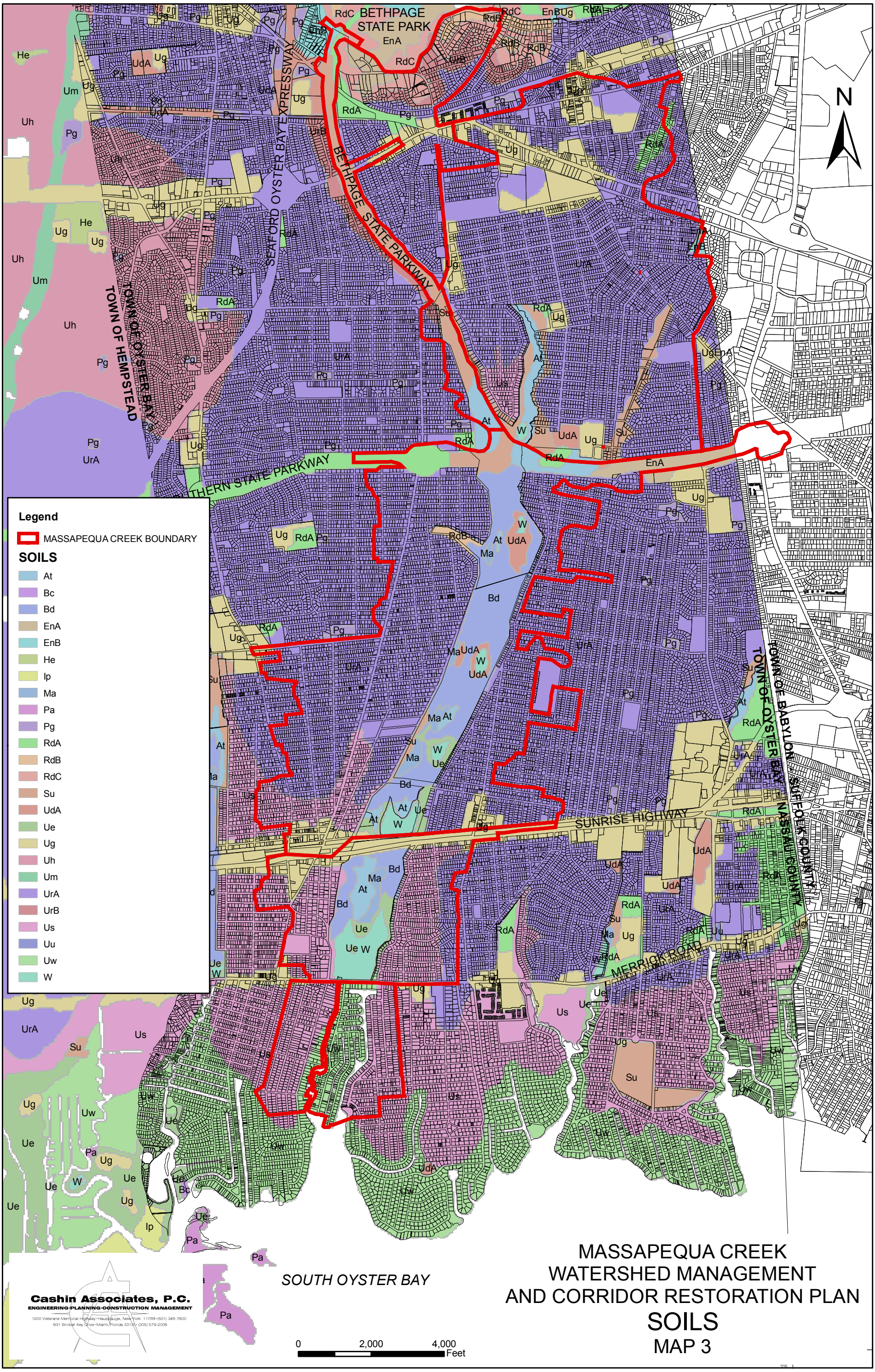
Similar to Segment 2, this segment has several different soil map units within its boundaries, with most units located in the Preserve and stream corridor (At, Bd, Ma, UdA, and Ue). The surrounding watershed consists of various types of "Urban Land".

Segment 4

This long, narrow segment encompasses mostly State highways and is made up of three soil map units.

Enfield silt loam, 0 to 3 percent slopes (EnA) consists of very deep, nearly level, well-drained soil that is usually found on plains and broad terraces. Most areas of this soil are low-density residential or commercial areas with few limitations as a site for dwellings with or without basements. This substratum is highly permeable making it a poor filter for septic systems which could result in a significant adverse effect on the water table. Frost action is a hazard for local streets and roads. However, using roadside ditches to remove surface runoff or adding a coarse-grained material to the road subgrade will reduce potential frost damage. Unprotected landscape areas are subject to erosion during intense rain events. This soil is well-suited to open land or woodland wildlife habitat.

Riverhead sandy loam, 0-3 percent slope (RdA) is very deep, nearly level, well-drained soil that is usually located on the tops of benches and ridges and on broad plains. The soil has few limitations as a site for dwellings with or without basements. In other areas, where septic systems are utilized, pollution is a hazard to the groundwater because the substratum is a poor filter of effluent. Frost action is the main limitation of the soil as a site for local streets and roads. The soil is well-suited for upland and woodland wildlife habitats.


BETHPAGE STATE PARK
SEAFORD OYSTER BAY EXPRESSWAY
BETHPAGE STATE PARKWAY
TOWN OF HEMPSTEAD
TOWN OF OYSTER BAY
SUNRISE HIGHWAY
MERRICK ROAD
TOWN OF BABYLON
SOUTH OYSTER BAY
N
Legend
MASSAPEQUA CREEK BOUNDARY
SOILS
At
Bc
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MASSAPEQUA CREEK
WATERSHED MANAGEMENT
AND CORRIDOR RESTORATION PLAN
SOILS
MAP 3

Sudbury sandy loam (Su) is very deep, moderately well–drained, and is usually found along shallow drainage ways. Most areas where this soil has formed fall within woodlands, municipal parks, or wildlife areas or along the parkway system's right-of-way. Seasonal wetness limits the soil as a site for dwellings and poor filtering capacity is a major limitation of the soil as a site for septic effluent disposal. The soil is well-suited for open land and woodland wildlife habitats.

Segment 5

With the exception of the two small areas of the stream corridor located in the southern portion of this segment, the majority of the soils are described as "Urban Land".

Segment 6

This area contains several soil map units including Sudbury sandy loam (Su), Riverhead sandy loam (RdA, 0-3 percent slope) and Enfield silt loam (EnA, 0 to 3 percent slopes) as described above under the "Segment 4" discussion as well as the following soil types:

Urban land Riverhead complex, 0 to 3 percent slopes (UrA) is described as very deep well drained soil in urban areas. Topography is generally flat and the soil occurs on benches, on plains, or on broad ridges. Surface runoff is slow; erosion potential is slight; permeability is moderately rapid in the surface layer and subsoil and very rapid in the substratum; and the water table is at least six feet below the surface.

Urban land Riverhead complex, 3 to 8 percent slopes (UrB) is a soil map unit with very similar characteristics to the UrA soil described above. However, UrB soils occur on slightly steeper slopes and the topography is sometimes undulating, tending to form on the tops of low hills and ridges and along the side slopes of drainageways as opposed to the benches, plains, and broad ridges that contain UrA soils.

Riverhead sandy loam, 8 to 15 percent slopes (RdC) is most commonly found along the sides of benches, plains, and drainageways. The soils are very deep, steeply sloping, and well-drained. Surface runoff potential is medium; erosion hazard is moderate; permeability is moderately rapid in the surface layer and subsoil, and very rapid in the substratum. (USDA Soil Conservation Service (USDA) & Cornell University Agriculture Experiment Station (CUAES), 1987)

2.6 Hydrology

The watershed areas of the south shore of Long Island are generally larger than those on the north shore because the main topographic drainage divide is north of the center of the island and the southern portion of the island is part of a gently sloping outwash plain. The main source of base flow for tributaries on the south shore of Long Island is the upper glacial aquifer found in the saturated part of the upper Pleistocene deposits.

The Massapequa Creek is typical of the streams located in the highly permeable glacial outwash deposits on the south shore of Long Island, as it is broad, straight, shallow and generally follows the course established by meltwater channels during the glacial retreat. The Creek's discharge can be divided into two distinct components: base flow and direct surface water runoff. Base flow is the discharge from groundwater that intercepts the stream channel; surface water runoff is the discharge caused by precipitation that falls on the Creek or is redirected to the Creek through overland flow, storm drains, and roadways.

Precipitation is the sole source of freshwater recharge to the watershed area. In undeveloped areas of the watershed about 50 percent of the precipitation that falls is lost through evapotranspiration or enters the stream corridor through surface water runoff. The other 50 percent infiltrates the soil and enters the groundwater system (Monti and Scorca, 2003).

Historically, groundwater as baseflow provided the main component of streamflow into the creek under natural (pre-development) conditions. Baseflow accounted for about 95 percent of annual streamflow (Franke and McClymonds, 1972). However, continuous development of the watershed area throughout the 20th century has substantially caused a decrease in the baseflow and increased the amount of surface water flow into the stream. The major contributors to this

change were: (1) groundwater withdrawals for water supplies, (2) disposal of wastewater to sanitary sewers which discharge offshore rather than in underground septic systems that return withdrawn water to the upper glacial aquifer, (3) construction of impervious surfaces, such as roads and parking lots, which increase surface water runoff and prevent the infiltration of precipitation, and (4) construction of stormwater management techniques that route stormwater runoff to the stream.

2.6.1 Stormwater

Stormwater that is conveyed through storm sewers and along many streets is discharged to streams and tidal waters. This has three main hydrologic consequences: (1) stormwater does not replenish the groundwater system, but instead is collected, directed, and discharged at a limited number of locations to surface waters; (2) peak stream discharges during individual storms are larger and more variable than in undeveloped areas; and (3) the ratio of surface runoff to baseflow in streams that receive street runoff has increased sharply.

The USEPA's Phase II Stormwater Guidelines on stormwater management techniques are designed to reduce pollutants entering the surface waters of Long Island; adhering to these guidelines in the watershed area surrounding Massapequa Creek could have a secondary beneficial effect on the hydrology of the Creek. When applicable, the installation of catch basins designed to reduce pollutant runoff allows for water that would have normally become sheet runoff entering the surface waters of the creek to be retained in these underground catch basins. This retention time will allow for water seepage into the groundwater table and possibly benefit the stream's baseflow.

The Massapequa Creek Watershed is one of the largest watersheds in the Town of Oyster Bay (Map 2). The following description of the surface water drainage area starts at the headwaters in the north and ends where it empties into South Oyster Bay. The drainage area consists of three tributaries that converge just south of the intersection of Bethpage and Southern State Parkways.

Western Tributary

The western most of the three tributaries receives drainage runoff from Bethpage State Parkway and a portion of Merritts Road where it intersects with the parkway. The parkway is drained with swales on either side of the roadway and Merritts Road, including the closely adjoining areas that drain with a positive system and empty into the eastern swale of Bethpage State Parkway. The western swale receives water from sheet flow off the surrounding streets. A culvert just north of the Southern State Parkway drains the western swale into the eastern swale and becomes the western most tributary. This tributary drains into a lake/retention pond just north of the Southern State Parkway.

Environmental concerns include untreated stormwater runoff for the entire area as well as retail stores and gas stations on Merritts Road. However, the entire drainage area, which is narrow and not that large, does drain through vegetated swales and into a lake/retention pond. The pollution potential is small and no remediation of significant worth is recommended.

Central Tributary

The Central Tributary is fed by a positive drain system that drains the areas south of the Long Island Railroad and west of Main Street as well as the entire central area to the north. A positive drain system operates on the principle of gravity by sloping downward away from the area to be drained. This positive system empties through a headwall and a dispersion pad to a channel which is the headwater of the Central Tributary. The channel receives flow from outfalls and direct sheet flow. The tributary drains into a lake/retention pond just north of the Southern State Parkway. An outfall, which is an overflow for the lake/retention pond, goes under the Southern State Parkway and merges with the East Tributary.

A major environmental concern in this area is the Liberty Industrial Finishing Superfund site on Motor Avenue in Farmingdale. This site does not contain its drainage and is a source of various pollutants (explained in greater detail in Section 5.1). The area on Roberts Street south of Fallwood Parkway apparently was a natural stream which was filled in. The water in this area flows through a comparatively short channel before reaching the lake/retention pond. A large area is drained into this channel which is the main feed for the lake/retention pond. Remediation

for this area could include widening the existing stream channel, installing settling bays, planting specialized vegetation to remove specific pollutants and modifying channels.

East Tributary

The headwaters of the east tributary are fed by a positive drain system that drains most of the areas northeast of Main Street. The outfall of this system is a channel that begins on the southwest side of Main Street and continues to Farmingdale High School. This is piped under the school tennis courts, merges with a swale draining the north side of the Southern State Parkway in the area, travels via a culvert under the Southern State Parkway, merges with the swale draining the south side of the Southern State Parkway in the area, merges with the channel from the lake/retention pond from the other two tributaries, and via a culvert crosses Linden Street. Most of the area between Fulton Street and the Long Island Rail Road consists of high density two-story attached apartments with self-contained drainage which drains east on Fulton Street via an enclosed positive system to Stapes Avenue. The trunk of this system turns south on Main Street to the headwaters of the tributary. The channels, which are the East Tributary of the Massapequa Creek, are straight and lightly vegetated.

The priority environmental concern in the east tributary area is stormwater runoff. This site would benefit from the implementation of stormwater best management practices (BMPs). The tributary channel can be modified from a straight, narrow, lightly vegetated channel to a broad, winding, vegetated wetland. A leaching field along Main Street is another possible remediation. However, use of the large publicly-owned and undeveloped area in this location is preferred. This remediation is also recommended, because unlike the other two branches of the Creek, this branch does not have any retention prior to joining the main branch of the Creek.

Main Branch

After the merge of the three tributaries and the drainage from the Southern State Parkway, the Creek crosses under Linden Street and flows south through the west side of the Massapequa Park. Two additional tributaries join the Creek at this branch: a small tributary to the west that is fed by street outfalls and meets the Creek near Hawthorne Street and Leslie Lane, and a longer tributary that runs along the east side of the Massapequa Park and meets the Creek at

Massapequa Reservoir. This Main Branch of the Creek empties into the Massapequa Reservoir, outfalls under Sunrise Highway into wetland areas in the Massapequa Preserve, and then further outfalls into Massapequa Lake. This outfalls under Merrick Road and becomes a canal which outfalls into South Oyster Bay (Map 2).

The watershed area to the east of Massapequa Preserve, between Linden Street and Sunrise Highway, is not large and is all residential, except for a few blocks on Park Boulevard between Clark and Front Streets. Remediation could potentially benefit the Creek with the installation of leaching pools prior to the outfalls entering the Creek. The watershed area to the west of the Preserve consists of a much larger area and is also mostly residential. Broadway is a commercial/retail street with some medical offices and gas stations. The northern streets with small areas have direct sheet flow which is not a concern since it must travel quite a distance through woodlands to reach the main branch of the Creek. The remainder of the watershed area outfalls into the Creek through drain pipes and some of these areas are good locations for mitigation (such as Water Quality Inlet Catch Basins). These outfalls account for a large area of drainage, and are located along roads where elevation is ten or more feet above the elevation of the Creek.

The Massapequa Preserve has two channels: the main channel and the southeastern channel. Both the channels have dams near the outfall and empty into the Massapequa Reservoir. Natural mitigation is occurring but additional mitigation could include widening and modifying the channels in the northern portion of the Preserve.

There is a small area in the western part of the watershed just north of Sunrise Highway that is generally industrial and commercial (e.g., auto-body shops, medical offices, an oil distributor and parking lots for the Long Island Rail Road). Much of the area drains into two large concrete sumps located successively just south of the intersection of Brooklyn Avenue and Parkside Boulevard. This is piped under the railroad and Sunrise Highway to an outfall entering the Preserve directly south of Sunrise Highway. This area has an extremely high pollution potential.

The watershed area between Sunrise Highway and Merrick Road is generally residential except for the properties fronting Sunrise Highway and Merrick Road. The water in these areas either directly outfalls into the Preserve through positive drain systems in the neighborhoods or becomes part of the stormwater runoff drainage for either Sunrise Highway or Merrick Road. The elevation of the surrounding area is not significantly higher than Massapequa Lake and any mitigation in this area should be performed in or around the lake itself.

2.6.2 Flood Zones

Identification of flood prone areas is an important consideration in watershed protection planning because drainage is the primary function of a watershed; poor drainage can cause human health and safety risks, property damage, water quality impacts, and erosion and siltation of wetlands, waterbodies, and drainage facilities. A review of current Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMS) reveals certain areas in the watershed that are within FEMA's "AE" flood zone ("Special Flood Hazard Areas Inundated by a 100-year Flood"); other, much smaller areas, are within designated X500 flood zones. AE zones include the entire Creek, its tributaries, and adjacent floodplains which are almost entirely within Massapequa Park and Preserve on the north side of Merrick Road, as well as much of the land within the watershed that is south of Merrick Road. X500 flood zones basically involve relatively small bands of property located adjacent to, but upland of, the AE flood zones. The remaining land within the watershed (particularly land that is north of Merrick Road and east, west and north of the Massapequa Park and Preserve) are within FEMA X zones. These X zones are considered upland areas that are outside of the 500-year floodplain and have little chance of flooding. Map 4 depicts FEMA flood zones within the Massapequa Creek watershed.

2.7 Land Use and Developmental Trends

2.7.1 Land Use History

Prior to the early 1900s, the major land uses in the area were for open space and agriculture. However, as a result of several real estate ventures and the post-World War II building boom, the watershed area had become completely urbanized by the mid 1950s.

According to the Nassau County Department of Parks, Recreation and Museums historian, Ed Smits, the Massapequa Reservoir supplied New York City with drinking water from the late 1800s into the mid 1900s (Cameron, 2001). The Preserve was owned and managed by the City of Brooklyn until it merged with New York City in 1898. New York City had ownership and management responsibilities until 1984 when it was acquired by Nassau County Department of Parks, Recreation and Museums. The Preserve (south of Southern State Parkway) was entered into the County's "Perpetual Preservation Program" in 1989. Nassau County leases the portion of the Preserve north of Southern State Parkway from the State of New York. The Nassau County Department of Parks, Recreation and Museums currently manages the Preserve.

2.7.2 Current Land Use

Predominant land uses in this area include densely developed single-family, detached housing; multi-family apartment housing; commercial service and retail businesses (including a traditional central business district, and a large industrial area); local streets and highways; the Long Island Rail Road, in particular the Massapequa Rail Road Station and its large parking fields; and public parkland (Map 5).

The Massapequa Preserve encompasses about one-third of the area of Segments 2 and 3 of the watershed and extends approximately four miles from Merrick Road at its southern end to Boundary Avenue north of the Southern State Parkway at its northern end (Cameron, 2001). The 423-acre Preserve has a mix of wetlands, red maple swamps, streams, and woodlands and includes a remnant of the westernmost edge of the Long Island Pine Barrens. The Preserve serves as a habitat for a variety of birds, aquatic, and terrestrial plant life and several species of freshwater fish.

Most land uses have the potential of causing some pollution. However, certain land uses have historically demonstrated a greater propensity toward generating pollution.

BETHPAGE STATE PARK

Village of Farmingdale

SEAFORD OYSTER BAY EXPRESSWAY

BETHPAGE STATE PARKWAY

N

TOWN OF HEMPSTEAD

TOWN OF OYSTER BAY

Town of Oyster Bay

Town of Babylon

Legend

MASSAPEQUA CREEK WATERSHED

FEMA FLOOD ZONE

- A (100 YEAR FLOOD ZONE)
- AE (100 YEAR FLOOD ZONE W/ BASE FLOOD ELEVATIONS)
- UNDES (UNDESIGNATED)
- VE (100 YEAR FLOOD ZONE W/ BASE FLOOD ELEVATIONS SUBJECT TO STORM WAVES)
- X500 (BETWEEN 100 AND 500 YEAR FLOOD ZONE)
- X (OUTSIDE 500 YEAR FLOOD ZONE)

Town of Hempstead

Village of Massapequa Park

SUNRISE HIGHWAY

TOWN OF BABYLON

SUFFOLK COUNTY

NASSAU COUNTY

TOWN of OYSTER BAY

Town of Oyster Bay

MERRICK ROAD

SOUTH OYSTER BAY

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MASSAPEQUA CREEK WATERSHED MANAGEMENT AND CORRIDOR RESTORATION PLAN

FEMA FLOOD ZONE

MAP 4

BETHPAGE STATE PARK

SEAFORD OYSTER BAY EXPRESSWAY

BETHPAGE STATE PARKWAY

TOWN OF HEMPSTEAD

TOWN OF OYSTER BAY

SOUTHERN STATE PARKWAY

SUNRISE HIGHWAY

TOWN OF BABYLON

SUFFOLK COUNTY

NASSAU COUNTY

MERRICK ROAD

N

Legend

MASSAPEQUA CREEK BOUNDARY

LANDUSE

- AGRICULTURAL
- RESIDENTIAL
- VACANT
- COMMERCIAL
- RECREATION AND ENTERTAINMENT
- COMMUNITY SERVICE
- INDUSTRIAL
- PUBLIC SERVICE
- WILD, FORESTED, PUBLIC LANDS

SOUTH OYSTER BAY

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MASSAPEQUA CREEK WATERSHED MANAGEMENT AND CORRIDOR RESTORATION PLAN

LAND USE PLAN

MAP 5

2.7.3 Land Use and General Pollution Threats

Evaluating land use within a watershed is an important step in understanding watershed conditions and how related land use activities which cause pollutant inputs are being introduced into the system. Sources of pollutants are often specific to certain land use activities; therefore, examining these activities is a logical basis for identifying or evaluating sources of pollutants. The following is a synopsis of some of the more common types of land use activities found in the watershed area and the types of pollutants typically associated with them:

Residential

Residential developments can contribute a variety of pollutants to local surface waters and groundwater depending on the types of home maintenance practices and activities. Pollution associated with residential development may include a variety of stormwater contaminants such as nutrients from lawn fertilization, pesticides from landscape maintenance activities and pest extermination, and impurities from home heating oil, motor oil, gasoline, trace metals, pet wastes, and any number of other miscellaneous materials that may be derived from residential activities and captured in stormwater runoff. Although sanitary wastes from on-site septic systems and cesspools are a common concern in coastal communities, the watershed area is served by the Nassau County Sewer District and with the possible exception of any exfiltration from corroded or broken sewer distribution lines, little in the way of household sewage would be expected to be directly released to the surrounding environment.

Retail and Service Commercial Operations

Fuel storage facilities such as home heating oil storage and delivery operations can pose threats to ground and surface water quality. Most fuel oil distributors maintain large above-ground storage tanks on-site which allow for the periodic transfer of shipments to a fleet of fuel delivery trucks.

Leaks and spills from these facilities can cause considerable harm to the environment (depending on the volume released), including ground and surface waters if not properly managed, maintained, and operated. The watershed area includes such a facility within its boundaries, located in the Village of Farmingdale.

Deliveries for miscellaneous wholesale operations and warehousing involve the handling of materials during both shipping and receiving phases and are also a potential source of impairments. Containers that are carelessly handled, dropped, broken, spilled, or stored in an inappropriate manner can release their contents to the environment. Any spillage that is improperly contained, removed, and discarded, can end up in surface or groundwater. There are several such wholesale operations located in the northeastern portion of the watershed area.

Industry

Industrially-developed areas have historically demonstrated a greater propensity toward site contamination than other land uses. These contaminations can occur in a number of ways, but are often associated with activities such as the shipping and receiving of raw materials, processing and manufacturing procedures, and inappropriate disposal of wastes. These sites may support ongoing industrial operations or may simply contain closed and inactive facilities. Inactive and underutilized polluted sites are commonly referred to as "brownfields" and some of these industrial properties are degraded to the point that they are placed on state and/or federal cleanup lists (i.e., Superfund sites). The variety of pollutants generated from these facilities is dependent on the type of industry, the products they produced, and the activities that they performed. An example of a superfund site within the watershed area is the Liberty Industrial Finishing Superfund site located in South Farmingdale.

Transportation, Institutional, and Quasi-Public Uses

Roadways are significant generators of automotive-related pollutants as well as litter. Roadways near tributaries, ponds, and bays usually drain directly to these waterbodies or into nearby stormwater recharge basins and leaching pools. There are several roadways within the watershed area that allow stormwater runoff to drain directly into the Creek. Also, large parking lots associated with government buildings, public parks, and commuter parking facilities (such as the Massapequa Rail Road Station) can be sources of stormwater generated contaminants.

Public Parkland

Public parklands are prevalent in the Massapequa Creek watershed and provide several different recreational opportunities such as hiking, fishing, bicycling and jogging. Parklands are not

generally considered to be significant pollution generators as compared to other land uses, but this depends on the scale and type of recreational facilities and activities permitted, levels of usership, resource management and protection practices, as well as other factors. Public parklands can also sometimes include sensitive environmental resources that are vulnerable to the impacts of human encroachment and, therefore, warrant additional protection. Examples include areas that contain or are adjacent to bays, streams, ponds, wetlands, important wildlife habitats and the like. Parks can be affected by overuse, traffic, parking, and pollutants associated with automobiles, stormwater runoff, wastewater disposal, vegetation disturbances from foot or bicycle traffic, erosion, litter, and waste from large populations of geese, and other waterfowl.

Massapequa Preserve

Massapequa Preserve consists of 423 undeveloped acres of woodlands, ponds, lakes and freshwater wetlands that border the Creek for almost four miles, from Southern State Parkway to Merrick Road. According to the *Massapequa Preserve Streamflow Augmentation and Pond Restoration Report* (Cameron, 2001), the Preserve is home to hundreds of species of plants and animals. A complete list of the plants and animals observed during field investigations for that report can be found in Tables 9, 14, 15, and 18 of that report. Originally part of the New York City water supply property, the Preserve was acquired by Nassau County in 1981. The Preserve is managed by the Nassau County Department of Parks, Recreation and Museums, and is the largest passive use park in the County.

Mansfield Park

This facility is located at the northern part of the Village of Massapequa Park, west of Lake Shore Drive at Walker Street. It contains a baseball diamond and two football/soccer fields, a bicycle and jogging path and the meandering Creek. Motorized vehicles are prohibited and the natural setting provides residents with a peaceful sanctuary from the stress of daily living.

Brady Park

Located along Lake Shore Drive at Front Street, Brady Park is considered to be the most active park in Massapequa Park. This public facility contains a number of amenities including a little

league baseball field; a children's playground; basketball, bocce, shuffleboard, and horseshoe courts; and a community center (which is used by senior citizens and other local groups).

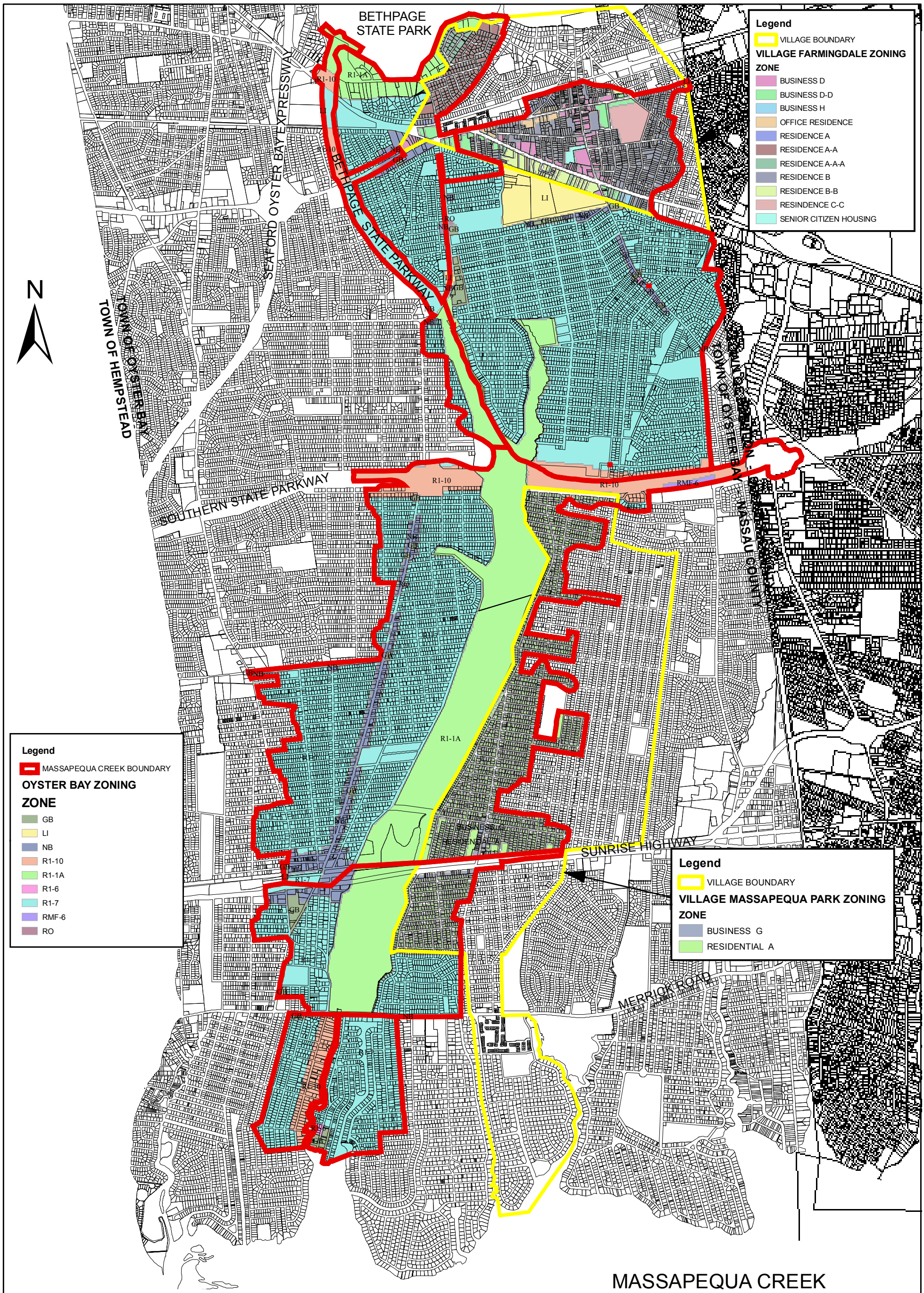
Biltmore Beach Club

This private club is located on the west side of Biltmore Boulevard. The site provides a bathing beach, playground, pool, restroom, game room, and a paved parking lot.

2.7.4 Zoning

Zoning within the watershed is divided up between the Town of Oyster Bay and the Village of Massapequa Park.

- Town of Oyster Bay – Chapter 246 of the Code of the Town of Oyster Bay regulates land uses and sets forth dimensional criteria and standards for the Town. A review of Chapter 246 and its zoning map revealed that the Town has fifteen residential districts and ten non-residential districts (Map 6). Five of the fifteen residential districts are found in the watershed area and their combined acreage makes up over 92% of the 3,405.64 Town acres found in the watershed.
- Village of Massapequa Park – Chapter 345 of the Incorporated Village of Massapequa Park regulates land uses and sets forth dimensional criteria and standards for the Village. The Village has five primary zoning districts and the only two found in the watershed are residential and business (Map 6). Residential districts account for 67.82% of the total district parcels of the 481.04 acres of Village parcels located in the watershed.
- Village of Farmingdale – There are four primary zoning districts in the Village that are located in the watershed (business, office residence, residence and senior citizen housing). The residential district represents the highest acreage (216.8 acres) and is 56.33 % of total 385.86 acres that the Village of Farmingdale occupies in the watershed.



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MASSAPEQUA CREEK WATERSHED MANAGEMENT AND CORRIDOR RESTORATION PLAN

ZONING

MAP 6

2.8 Political Jurisdiction

Jurisdiction over the Massapequa Creek watershed and its corridor is divided among numerous entities at multiple levels of government. Although the Town of Oyster Bay maintains the authority over decisions pertaining to the watershed, there are a number of federal, state, county, municipal, and local private entities that have a variety of responsibilities concerning the management and uses in this area.

The following section provides a brief description of the roles played by federal, state, county, town, and municipal agencies, as well as by private entities and their expected involvement in the implementation of this plan.

2.8.1 Federal

United States Environmental Protection Agency (USEPA)

USEPA's mission is to safeguard human health by protecting the integrity of the environment. USEPA pursues this goal by developing legislation and national environmental protection programs and by administering funding to states and municipalities for the development and implementation of environmental plans, policies, projects, and programs. USEPA sponsors a number of programs that advocate the protection of natural resources such as surface water quality, including various Clean Water Act (CWA) programs, and publishes a variety of environmental protection and planning guidance documents to provide technical support and educational assistance to the public. Presently, the USEPA is involved in a remediation program for the Liberty Industrial Finishing Superfund site located in the Village of Farmingdale.

2.8.2 New York State

New York State Department of Environmental Conservation (NYSDEC)

NYSDEC manages the State's recreational and commercial fisheries, tidal and freshwater wetlands, and other natural resources common to the coastal environment. NYSDEC is responsible for the preservation of water quality throughout the state, especially through the administration of the State Pollution Discharge Elimination System (SPDES) permit program.

NYSDEC also oversees the implementation of the requirements of the National Shellfish Sanitation Program. NYSDEC's roles within the Massapequa Watershed Restoration Plan include the following:

- Establishing and implementing a number of natural resource protection programs such as: environmental education programs, state wildlife grant program and the small business centers environmental results (ERP).
- Enforcing the State's environmental laws
- Freshwater fish stocking and licensing
- Resource management and planning
- Conducting site inspections, scientific research, and water quality testing
- Providing technical assistance to private entities and municipalities

New York State Department of State (NYSDOS)

NYSDOS provides technical and financial assistance to governments, businesses, and private organizations for the improvement of waterfronts, and specifies policies on issues that affect coastal areas. NYSDOS is responsible for administering the mandates of the Federal Coastal Zone Management Act of 1972 and the State Waterfront Revitalization Act of 1981, including its responsibility for reviewing Watershed Management Plans (WMP), Creek Corridor Restoration Plans (CCRP), Local Waterfront Revitalization Programs (LWRP), Harbor Management Plans (HMP), and various coastal projects for consistency with the State's coastal management laws.

New York State Department of Health (NYSDOH)

NYSDOH identifies waterbodies that have compromised water quality and may have adversely affected the suitability of bathing and human consumption of fish and shellfish.

2.8.3 Nassau County

Nassau County Department of Public Works (NCDPW)

NCDPW manages the Preserve which encompasses a large portion of the Massapequa Creek corridor. NCDPW is the agency responsible for maintaining the approximately 500 miles of county roadway and corresponding drainage infrastructure in Nassau County.

Nassau County Department of Health (NCDH)

NCDH conducts a sampling program during the summer season to monitor total and fecal coliform bacteria levels which determine whether the waters at public bathing beaches are suitable for swimming. Samples are collected twice weekly from mid-April to the end of September of each year. The NCDH collects samples at the mainland beach facilities throughout the county, including one private beach (the only one located in the study area) within the Biltmore Shores community of Massapequa Park. Beach facilities are closed if test results indicate that bacteria levels exceed State bathing beach standards.

Nassau County Planning Commission (NCPC)

NCPC has discretionary approval authority over subdivision applications in accordance with the provisions in its *Regulations for the Subdivision of Land.* NCPC is authorized to review and comment on any application involving a local zoning action, special permit use or site plan that is proposed within 500 feet of a municipal boundary, a state or county park, the right-of-way of a state or county roadway, county drainage way, and any public building or institution on state or county-owned land. NCPC is also responsible for conducting planning research and preparing regional/county-wide plans.

2.8.4 Town of Oyster Bay (Town)

The Town has the authority to regulate land use activities in its respective unincorporated communities and, in turn, exercises primary authority over decisions pertaining to development within the Massapequa Creek watershed. Exceptions to Town authority include activities that occur within state and county rights-of-way or within other lands owned and managed by state and county agencies. The Town also

regulates the use of underwater lands, the over-water use of coastal waters, and the placement of structures on underwater lands within its respective boundary.

Supervisor/Town Board (Board)

The Board is the legislative body that exercises its authority in the form of local laws, ordinances and resolutions. The Board conducts regularly scheduled public meetings on matters relating to zoning, budget and public safety. The principal duty of the Board is to regulate land use within the Town in such a way that it advances the health, safety, and welfare of Town residents.

Planning Advisory Board

The Planning Advisory Board is empowered to review applications for projects in certain designated zoning districts and recommends approval or disapproval of proposed plans to the Board. It is comprised of seven members, five of whom are citizens of the Town.

Division of Planning

The Division of Planning in the Department of Planning and Development is responsible for preparing studies, reports, plans, and programs for the Board for the purpose of fostering, maintaining and monitoring the orderly growth and development of the Town, and in seeking to achieve the highest and most efficient available levels of service for the Town and its residents.

Board of Zoning Appeals

The Board of Zoning Appeals issues variances and exemptions from the Town's zoning ordinances and conducts public hearings on such requests.

Department of Public Works

The Department of Public Works provides a variety of services including sanitation and recycling collection and disposal, road maintenance and repair, street sweeping, maintenance of street lights, and curbside tree planting and removal. The Administrative Division is responsible for personnel, security, communications, payment of claims and preparation of the fiscal budget for the entire department. The Central Vehicle Maintenance Division purchases and services all vehicles owned by the Town of Oyster Bay. The division also services all types of mechanical and electrical equipment and handles the removal of abandoned cars from Town roadways. The Engineering Division is responsible for supervising the design and construction of Town road and drainage projects. The Highway and Public Parking Division oversees the maintenance, repair, and snow, ice and flood control of the more than 724 miles of road under Town jurisdiction. The division maintains all public parking fields and the Town parking garage in Hicksville; directs the operation of the Drainage, Public Lighting and Sign Bureaus; and administers the Town's curbside tree planting and removal program. This division also installs and maintains all traffic control signs, parking signs and street name signs in the Town. Roadwork permits and block party permits are issued by this division. The Sanitation and Recycling Collection Division picks up approximately 800 tons of garbage every collection day with each of the more than 71,000 households and 2,000 businesses in the Town collection district receiving two collections a week. Once a week, the division picks up rigid plastics, glass, metal, newsprint, and magazines/mixed paper from 79,000 homes under the S.O.R.T. (Separate Oyster Bay's Recyclables Today) program.

Environmental Planning, Conservation and Outreach Division

This division oversees a range of planning activities related to protecting and enhancing environmental resources, disposing of solid waste, and managing the Town's recycling program. They assist the Town's departments with obtaining environmental permits and grants. They also develop, implement, and coordinate programs for water conservation, preservation of the marine environment and marine life, and protection of wetlands.

Environmental Quality Review Division

This division reviews, analyzes, investigates, and processes applications for development with respect to their environmental impacts and is responsible for the Town's implementation of the State Environmental Quality Review Act (SEQR). The division replaced the Town's Environmental Quality Review Commission, but is still known by the same acronym, TEQR.

Parks Department

The Parks Department is responsible for maintaining Town-owned park facilities and beaches, developing and supervising recreational activities, managing all marinas and boat launching ramps, and operating the Town's golf course. The department also oversees the operations of the Town's bay constables and harbor masters.

2.8.5 Adjacent Municipalities

The Town of Oyster Bay shares the borders of the Massapequa Watershed with the Village of Massapequa Park and Village of Farmingdale (although, both villages are a part of the Town of Oyster Bay, they are treated as separate entities in this document). Each of these municipalities has the authority to regulate activities (e.g. stormwater runoff, wildlife conservation practices, and control of point and nonpoint pollution sources) within its boundaries.

Village of Massapequa Park (Massapequa Park)

Massapequa Park encompasses almost the entire eastern section of the Massapequa Watershed and, although Massapequa Park is a part of the Advisory Committee of this plan, it is considered a separate entity with its involvement in the plan's development. However, because the plan does involve the entire watershed area, Massapequa Park has certain responsibilities, interests, and authorities over actions within their jurisdiction.

Massapequa Park consists of several departments including, the Highway Department, which maintains more than 60 miles of roads within the Village including resurfacing, snow removal, street-sweeping, clearing catch basins, and maintaining Village parks.

The Village also administers certain services to its residents that are provided by the Town to non-village residents in unincorporated areas (parking, recreation, animal control, zoning licenses and permits).

Village of Farmingdale (Farmingdale)

Farmingdale encompasses almost the entire northern section of the Massapequa Watershed and is also on the Advisory Committee, but considered a separate entity in the Town of Oyster Bay's Watershed Development Plan. It has certain responsibilities, interests, and authorities over actions in the watershed and is, therefore, involved with the Massapequa Creek Watershed Management and Corridor Restoration Plan. South Farmingdale is where the Liberty Industrial Finishing Superfund site is located and the majority of the east tributary of the Creek.

2.8.6 Citizen/Civic Groups

In addition to federal, state, county and local governmental agencies, there are a variety of private organizations that have been created to oversee, protect and preserve significant environmental features that are important to their region or municipality. Some private organizations that may have an interest in the Massapequa Watershed Area include the following:

- The Friends of the Massapequa Preserve
- Audubon Society
- Nature Conservancy – Long Island Chapter
- Sierra Club – Long Island Chapter
- South Shore Estuary Reserve Council (SSERC)
- Citizens Campaign for the Environment
- Ducks Unlimited
- Trout Unlimited
- Various civic groups and local property owner associations

2.9 Extent and Distribution of Vegetated areas

The Preserve, although altered to serve the development of the surrounding area, remains relatively natural. Areas outside the Preserve are highly developed with mostly residential dwellings and commercial businesses. Vegetated areas in the surrounding watershed include manicured lawns, ornamental shrubbery, and some parkland with woodland and wetland habitats.

2.10 Impervious Cover

The majority of land within the watershed surrounding the Preserve is completely urbanized with associated changes in surface land cover. The conversion of land with permeable soils to impervious surfaces (such as streets, sidewalks, driveways and parking lots) prevents infiltration of precipitation to the water table and creates large volumes of stormwater runoff which flow into stormwater drainage systems that discharge to nearby streams, tidal waters or man-made recharge basins.

2.11 Habitats

As mentioned previously, the watershed supports a diversity of wildlife habitats and its environmental stability is a major focus of this plan. In order to characterize the Massapequa Creek watershed, it is important to gather data not only to identify potential pollutant sources, but also to identify areas for protection. Maintaining high-quality wildlife and aquatic habitats is typically an important goal when developing a watershed and corridor restoration plan.

Where applicable, the habitats of the watershed were divided into two classifications: natural and cultural. The major difference being that cultural classifications are those created or maintained by human activities or modified by human influence to such a degree that the physical conformation of the land or the biological composition of the resident community is significantly different from the character of the habitat prior to modern human influence (Edinger et al., 2002). Listed below are typical habitats found within the watershed:

Terrestrial/Upland Habitats

The terrestrial/upland habitats consist of well-drained soils that are xeric (dry) to mesic (moderate moisture content), but never hydric (wet), and vegetative cover that is never predominantly hydrophytic, even if the soil surface is occasionally or seasonally flooded or saturated (Edinger et al., 2002).

- Natural – The majority of natural habitats within the watershed are located in the Preserve: successional southern hardwoods; pitch pine-oak forest; oak tulip tree forest and successional old field/shrubland. These ecological communities are described briefly below:

  - Successional southern hardwoods – Edinger *et al*. (2002) define this habitat as a mixed forest that has reclaimed a former disturbed or cleared area. The term "succession" refers specifically to the orderly and progressive replacement of one ecological community by another until a relatively stable community known as a "climax" community is established. The woodlands at the headwaters of Massapequa Creek, north of Boundary Road is an example of a successional southern hardwood habitat (G5, S5)[1] (Cameron, 2001).

  - Pitch pine-oak – According to Edinger *et al.* (2002), this ecological community consists of a mixed forest habitat, generally dominated by pitch pine (*Pinus rigida*) but having a variable representation by pines and oaks. This community type is nestled between the two tributaries that drain into Massapequa Reservoir as well as Massapequa Lake (G4G5, S4) (Cameron, 2001).

  - Oak tulip forest – This community typically occupies moist, well drained sites within the watershed. This habitat occupies nearly the entire westerly edge of the Preserve, and intersperses along the edge of both the pitch pine oak and red maple-black gum swamp communities (G4/S2S3) (Cameron, 2001).

[1] The community rarity and vulnerability indexes provided are defined by NYSDEC's Natural Heritage Program as follows: "G" for "global" ranking and "S" for "state" ranking. Numerals 1 through 5 indicate the rarity or vulnerability of the community on both a global and state scale with 5 being the most secure/least vulnerable and 1 being the least secure/most vulnerable.

- Successional old field/shrubland – As described by Edinger *et al.* (2002), both of these communities are typically a product of recent development, disturbances or clearing activities, which are then left fallow and relatively undisturbed (http://www.dec.ny.gov/animals/29392.html). These habitats are found between the ponds in the upper portion of the Preserve, isolated sections along the walkways through the westerly side of the red maple-black gum swamp (G4, S4).

- Cultural – As stated previously, the entire watershed area outside the Preserve boundaries is highly urbanized and most, if not all, of the surrounding terrestrial habitats are considered cultural and consist of the following:

  - Mowed lawn/mowed lawn with trees – This habitat is found throughout the watershed on residential, recreational, and commercial land. Its ground cover is dominated by clipped grasses and forbs; when trees are present, they shade at least 30 percent of the habitat (G5, S5).

  - Mowed roadside – This habitat is usually a narrow strip of mowed vegetation along the side of a road and is found throughout the watershed along municipal roads. The vegetation is usually dominated by grasses, sedges, and rushes; or may be dominated by forbs, vines, and low shrubs that can tolerate infrequent mowing (G5, S5) (Edinger et al., 2002).

  - Railroad – The entire right-of-way for the Long Island Rail Road's Babylon branch is raised above natural grade within the watershed. The sloped sides have scrubland, mowed grass and mixed forest habitats. The upper portions of the grade are made up of gravel and sparse vegetation rooted in the gravel (G5, S5).

Aquatic Habitats

The Massapequa Creek is considered a coastal plain stream and consists of several different aquatic habitats including coastal streams, wetlands, ponds and lakes. The ponds and lakes are artificial impoundments or reservoirs.

- Coastal Plain Stream – Coastal plain streams are defined by Edinger *et al.* (2002) as aquatic communities of slow-moving, often darkly-stained streams that commonly support abundant populations of submergent and emergent vegetation. This type of habitat occurrence in New York State is restricted to Long Island (G3G4, S1).

- Wetlands – Wetlands can be considered a transitional habitat that occurs between upland and aquatic environments where water is the primary controlling factor of the associated plants and wildlife. Typical types of wetlands found in the coastal plain stream watershed like Massapequa Creek are described briefly below:

  - Tidal wetlands – These are marshes that occur along coastlines and are influenced by tides and often by freshwater from runoff, rivers, or groundwater. As stated previously in this document, Segment 1 is the only segment in the watershed that is tidally influenced. Due to development needs and subsequent hardening of the shoreline in this area of the watershed, there are no tidal marshes found in the watershed.

  - Non-tidal freshwater wetlands – These wetlands are dominated by herbaceous plants and frequently occur in poorly drained depressions, floodplains, and shallow water areas along edges of lakes and streams. Non-tidal freshwater wetlands are characterized by periodic or permanent shallow water, little or no peat deposition, and mineral soils. They typically derive most of their water from surface waters (including stormwater and runoff), groundwater and precipitation.

Natural

- Shallow emergent marsh – This habitat is a marsh meadow community that occurs on mineral soils or deep muck soils that are permanently saturated and seasonally flooded (Edinger *et al.,* 2002). A typical example of this habitat in the watershed is the cattail (*Typha latifolia*) dominated wetland located along the northeast corner of Mansfield Memorial Park (G5, S5).

- Shrub swamp – This habitat is an inland wetland dominated by tall shrubs that occurs along the shores of lakes or streams, in wet depressions or valleys not associated with a lake, or as

a transition zone between a wetland and upland community (Edinger *et al*., 2002). Cameron (2001) identified one such habitat along the northern side of Massapequa Lake, between the two ephemeral tributaries (G5, S5).

- Red maple-black gum swamp – This habitat is a maritime, coastal, or inland hardwood swamp that occurs in poorly drained depressions, sometimes in a narrow band between a stream and upland. According to Cameron (2001), by applying the current New York Natural Heritage Programs classification system, the majority of the woodlands in the Preserve would be considered a red maple-black gum swamp or a variant thereof (G3G4, S2).

Cultural

- Reedgrass/purple loosestrife marsh – This habitat is a marsh that has been disturbed by draining, filling, road salts, etc. in which reed grass (*Phragmites australis*) or purple loosestrife (*Lythrum salicaria*) has become dominant (Edinger et al., 2002). This habitat is common along highways and railroads. Typical examples of these habitats are located along the westerly tributaries to both Massapequa Lake and the Reservoir, as well as along the banks of Ponds 2 and 3 (G5, S5) (Cameron, 2001).

  Reservoir/artificial impoundment – This habitat is an aquatic community of an artificial lake created by the impoundment of a stream with a dam. Reservoirs are constructed to collect water for municipal and/or agricultural water use, to provide hydroelectric power, and to improve opportunities for recreational activities (e.g. boating, swimming, or fishing), and development (Edinger et al., 2002). The Massapequa Reservoir and Massapequa Lake are two such habitats (G5, S5). The reservoir was originally constructed to supply drinking water to New York City.

  Pond – Utilizing Edinger (2002) definitions, these waterbodies can best be characterized by one of two combined classifications (reservoir/artificial impoundment and eutrophic pond). Many natural ponds were altered in the past to serve as stormwater detention basins and flood control devices. Modification to the natural characteristics of these waterbodies has led them to more closely resemble reservoirs/artificial impoundments. As a result, however,

they have become shallow, nutrient-rich, waterbodies and are too shallow to remain stratified throughout the summer; the water is murky with low transparency, rich in plant nutrients, and has a high primary productivity and a weedy shoreline, which is characteristic of a eutrophic pond (G4, S4).

2.12 Aquatic Resources

Fish and wildlife species are directly dependent upon the waterbodies and associated wetlands they visit or inhabit. Each of the waterbodies within the Massapequa Creek watershed provides a unique habitat which relates directly to the wide diversity of species found within the watershed.

The diversity of the fisheries located within the watershed has been influenced by factors such as fish-stocking programs; invasive and non-native fish releases; native and introduced predators; streamflow rates; fluctuations in groundwater levels; terrestrial and aquatic vegetation changes; siltation of the ponds, lakes and reservoir; and varying water quality. The species identified to be utilizing the Massapequa Creek watershed can be divided into three different categories: naturally reproducing, stocked, and introduced (non-native)/alien.

There are over fourteen species of fish that have been recorded as naturally reproducing within the watershed. Several of these species are considered of high recreational value, such as largemouth bass (*Micropterus salmoides*), black crappie (*Pomoxis nigromaculatus*), white perch (*Morone americana*), pumpkinseed (*Lepomis gibbosus*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ictalurus nebulosus*), and carp (*Cyprinus carpio*). Other species documented as naturally reproducing in the watershed, although not considered of recreational importance, are of ecological value: eastern mudminnow (*Umbra pygmaea*), banded killifish (*Fundulus diaphanous*), golden shiner (*Notemigonus crysoleucas*), three-spine stickleback (*Gasterosteus aculeatus*), four-spine stickleback (*Apeltes quadracus*), pirate perch (*Aprododerus sayanus*), and tessellated darter (*Etheostoma olmstedi*).

Massapequa Creek is the only stream in Nassau County stocked with trout by the New York State Department of Environmental Conservation (NYSDEC). NYSDEC stocks three different

species of trout: brown trout (*Salmo trutta*), rainbow trout (*Salmo gairdneri*), and brook trout (*Salvelinus fontinalis*) of which brook trout is the only native species. Water quality decline and decreased groundwater base flow (due to stormwater runoff and other factors) prevent the stream from holding trout year-round.

The Nassau County Department of Public Works, in their *Massapequa Preserve Streamflow Augmentation and Pond Restoration* report (2001), documented two species of introduced and/or alien species that are present in the watershed. The first is the goldfish (*Carassius auratus*) which is most likely a result of uncontrolled release of former pets by local residents. The second, the redfin pickerel (*Esox americanus*) was most likely a controlled release, as a predator fish introduced to control over-population of certain species.

There are a number of diadromous species native to Long Island waters, meaning they either spend most of their life in brackish/freshwater and migrate out to sea to spawn (catadromous) or spend most of their life in the sea and migrate to brackish/freshwater to spawn (anadromous). The only catadromous species common to the south shore tributaries is the American eel (*Anguilla rostrata*), which has been documented to be utilizing the surface waters of the watershed by the Nassau County Department of Public Works, in their *Massapequa Preserve Streamflow Augmentation and Pond Restoration* report (2001).

Alewife (*Alsoa pseudoharengus*) is a diadromous species that is known to inhabit the south shore waters of Long Island and whose migratory habits include both fresh and brackish waterbodies. During the spring of 2006, the SSER office conducted an alewife survey along the south shore of Long Island which resulted in no documented presence of this species in the Massapequa Creek. However, because of the historic presence of alewife in most of the freshwater tributaries and brackish waters along the south shore, it is a safe assumption that prior to the anthropogenic interference of the natural migration route in the creek, alewife did migrate into the Massapequa Creek to spawn.

Because of the spillways located at the downstream ends of the Massapequa Lake and the Massapequa Reservoir, it is highly unlikely that these diadromous species are utilizing the surface waters of the watershed to the fullest extent.

2.13 Rare, Threatened, and Endangered Species (RTE)

According to NCDPW's *Massapequa Preserve Streamflow Augmentation and Pond Restoration* report (2001), there are eighteen rare plants having an historical presence and fourteen rare bird species documented as being observed in the watershed area. The report states that the New York State Natural Heritage Program (NYSNHP) had suggested that seven of the eighteen rare plant occurrences were reported within the last twenty years. In addition, all fourteen avian species are state-listed and one species also carries federal protection. A detailed list of all the RTE species can be found in the NCDPW report.

The United States Fish and Wildlife Service's (USFWS) list of Significant Habitats and Habitat Complexes of the New York Bight Watershed (Hempstead Bays – South Oyster Bay Complex) describes the Massapequa Preserve as a linear preserve along Massapequa Creek between the Southern State Parkway and South Oyster Bay. It is described as one of the few large blocks of open space existing along the south shore of Long Island in Nassau County. The Preserve's wet pine barrens support several rare plant species, including the only New York State occurrence of false China root (*Smilax pseudochina*); the largest state occurrence of button sedge (*Carex bullata*); exemplary occurrences of Barratt's sedge (*Carex barrattii*) and pinweed (*Lechea racemulosa*); and small populations of whip nutrush (*Scleria triglomerata*) and St. Andrews cross (*Hupericum hypericoides spp.*).

The NCDPW report also lists vegetative communities that were identified as occurring in the Preserve. Their community names listed below are representative of NYSNHP classification/ranking as rare or vulnerable to extinction in New York State:

- Red Maple-Black Gum Swamp – The state rank S2 indicates that there are typically 6 to 20 occurrences with few remaining individuals, acres, or miles of stream, or factors demonstrably making it very vulnerable in New York State. Currently the NYSNHP

state ranking justification has estimated that there are 20 to 30 extant occurrences of this community statewide which would classify this community as rare in NY State.

- Coastal Plain Stream –The state rank S1 indicates there are typically 5 or fewer occurrences with very few remaining individuals, acres, or miles of stream, or some factor of its biology making is especially vulnerable in New York State. Although, NYSNHP does not list a state ranking justification for this community, the fact that a state rank of S1 indicates that there are typically 5 or fewer occurrences state wide, this community could also be considered rare in NY State.
- Variant of Oak-Tulip Tree Forest – The state ranks S2 and S3 indicates there are typically 21 to 100 occurrences with limited acreage, or miles of stream in New York State. Currently the NYSNHP state ranking justification has estimated that there are 20 to 30 extant occurrences of this community statewide and this community has declined substantially from historical numbers. This is likely correlated with past logging, agriculture, and other development practices.

As stated above, 14 different species of RTE birds have been reported near the Massapequa Preserve. Although the field surveys conducted for the NCDPW report identified only two of those species, it is a safe assumption that all of those species listed by NYSNHP can be found in the area. All of those species listed in the report have been historically recorded throughout Long Island during certain times of year, in similar habitats as those found in the Massapequa Creek watershed.

In 2004, Ducks Unlimited and its partners initiated a multi-year study to examine wintering ecology and to quantify food resources and carrying capacity for wintering and spring staging Black Ducks on Long Island. As a result of this survey, it was revealed that the SSER is an important wintering area for Black Ducks on Long Island and while Black Ducks do not feed in Massapequa Creek (they feed in the bay), they do use the Creek as a resting and preening area. Ducks Unlimited believes that the Creek is an important area for the Black Duck and they would like to see research and habitat restoration continue as part of the management plan.

Habitat Loss

Habitat loss within the Massapequa watershed can be attributed to a number of conditions: population increases since the early 1900s resulting in vegetative clearing and the straining of infrastructure and local resources; contamination of local groundwater supplies by development activities; decreases in groundwater levels with increased groundwater demand and wastewater disposal outside the area, thereby affecting stream flow; and untreated stormwater being released directly into surface waters of the watershed.

2.14 Exotic and Invasive Species

Exotic species include any non-native species that may have been released directly into the watershed area or have expanded populations in the surrounding area and eventually entered into the watershed. Invasive species may include either exotics or genetic variants of species otherwise considered native, that have developed adaptive strategies to successfully compete with local native populations for limited habitat resources. These species are of concern due to their potential to displace indigenous species and threaten native local populations. Field investigation conducted as part of a report issued by Nassau County Department of Public Works (*Massapequa Preserve Streamflow Augmentation and Pond Restoration* report (2001)), identified many exotic and invasive species within the watershed area, including:

- Flora – Norway maple, various ornamental viburnums, multiflora rose, privey, Euonymus, Japanese holly, Japanese honeysuckle, Japanese knotweed, barberry, English ivy, Asiatic bittersweet, daylilies, lily-of-the-valley, common mugwort, garlic mustard, and silver-dollar plant
- Fauna – Norway rat, house mouse, mute swan, resident Canada geese, Egyptian goose, Peking duck and hybrid crosses, bullfrog, red-eared slider, goldfish, carp, and Asian clam.

2.15 Open Space Opportunities

During the development boom of recent decades, many small and moderately-sized Long Island communities saw their populations increase dramatically, straining infrastructure and local resources and, in some respects, degrading the quality of life that originally attracted people to the area. As a result, open space resources diminished and recreational facilities were strained.

Land maintained as open space provides a community with many types of benefits. For example, it provides a place for recreation, as well as mental, and physical revitalization. Also, because ground and surface water contamination are generally directly proportional to land development and specific land use occurring in a watershed, open space also serves as a buffer from potential contamination of local ground and surface water and can provide a certain level of pollution treatment.

The entire watershed area surrounding the Preserve is highly developed and there are very few, if any, opportunities for acquiring new existing natural areas for open space preservation. There may be, however, opportunities to acquire abandoned or underutilized industrial, commercial, or brownfield parcels for conversion to open space, especially in the northern portions of the watershed.

2.16 Significant Coastal Fish and Wildlife Habitat

The tidal portion of the Creek (south of Montauk Highway) is located in NYSDOS Significant Coastal Fish and Wildlife Habitat – South Oyster Bay designation. South Oyster Bay comprises one of the largest, undeveloped, coastal wetland ecosystems in New York State. This area is an important feeding and nesting area for many species of birds and one of the most important waterfowl wintering areas on Long Island. In addition to having significant bird concentrations, South Oyster Bay is a productive area for marine finfish, shellfish, and other wildlife. The majority of this significance is attributed to the extensive salt marshes, intertidal flats, and shallows which provide valuable habitat for many of these species.

Unfortunately through anthropogenic activities, the majority of the area located within the tidal portion of the Creek has suffered significant adverse environmental impacts. These activities have substantially degraded the water quality and adversely affected the biological productivity of the Creek's tidal area. The majority of the shoreline has been hardened eliminating the beneficial habitat associated with the wetland-intertidal interface and any diadromous pathways that historically existed in the Creek have been eliminated preventing migratory passage. Therefore, the tidal portion of the Creek as it exists today provides very little support to the significant fish and wildlife habitats of South Oyster Bay.

SECTION 3

Current Conditions

3.0 CURRENT CONDITIONS

3.1 Key Resources Needing Protection or Restoration

Massapequa Preserve

The majority of the creek corridor is found within the Massapequa Preserve which is described in the Nassau County Department of Public Works, *Massapequa Preserve Streamflow Augmentation and Pond Restoration* report (2001) as follows:

> "The Massapequa Preserve is located less than three miles west of the Nassau Suffolk boundary. It extends approximately four miles from Merrick Road at its southern end to Boundary Avenue north of the Southern State Parkway at its northern end. The 423-acre Massapequa Preserve is a mix of wetlands, red maple swamps, streams, ponds, lakes/reservoirs and woodlands. North of Massapequa Lake (Caroon's Lake) there is a remnant of the westernmost edge of the Long Island Pine Barrens. The Preserve is home to an unusual variety of birds, a rich diversity of aquatic and terrestrial plants and a diverse fish population. The Preserve's miles of paved paths are very popular for hiking, bicycling, walking, and skate-boarding".

The Preserve is under the jurisdiction of the Nassau County Department of Public Works. The NCDPW is in the process of mitigating the impacts of sewering on the ecology of the Preserve and is proposing to accomplish this by augmenting creek streamflow, making improvements to the streams and ponds and better managing stormwater. According to Cameron (2001), the NCDPW anticipates that by implementing the proposed improvements, the wetlands and open water environment of the Preserve will be: a) enhanced for passive recreational use; b) more suitable for restoration of native trout populations to include a fish ladder that has been installed as part of the County's Streamflow Augmentaion plan at the western spillway on Merrick Road; and c) cleaner as it discharges to the receiving waters of the South Shore Estuary.

3.2 Other Key Resources Warranting Special Protection

South Oyster Bay

South Oyster Bay is a back-barrier lagoon comprising a subsection of the South Shore Estuary. It is situated between the mainland of the Town of Oyster Bay and Jones Beach barrier island which was formed during the Holocene (or Recent) Epoch as a result of the transport, deposition, and reworking of glacial deposits by winds, glacial meltwater, streams, flowing tides, longshore currents and storm surges.

The Bay is considered by the U.S. Fish and Wildlife Service as a "Significant Coastal Habitat" and by New York State as a "Significant Coastal Fish and Wildlife Habitat". The Bay is one of the largest undeveloped coastal wetland ecosystems in New York State. Approximately half of the Bay acreage is in tidal saltmarsh and the remainder is open water. The Bay provides outstanding habitat for a diversity of valuable commercial and recreational fishes and supports other wildlife resources of regional and international significance. It is an important component of the Atlantic Flyway because the extensive mudflats and sandy shoreline areas are a major staging area for migratory shorebirds.

The Bay is vulnerable to effects from human activity because of proximity to centers of population and development. Fauna and flora are impacted by water quality degradation caused by both point and nonpoint source pollution. Degradation of water quality has already resulted in the closing of most of South Oyster Bay to shellfishing. It is imperative that the marine and terrestrial environments of South Oyster Bay be protected and managed accordingly.

3.3 Special Resource and Habitat Management Areas

Mid-Atlantic Flyway

The Massapequa watershed is located along the mid-Atlantic flyway which is an important migratory bird pathway along the eastern coast of North America. According to Cameron (2001), the Preserve serves as an important migratory "rest stop" in the middle of heavily developed Nassau County that offers rest, cover, and food to migratory birds. An estimated group of fifty-eight species of birds utilize the Preserve as a migratory stop over.

Diadromous Fish Habitat

Historically, prior to the construction of the dams in the mid 1800s, Massapequa Creek (like most tributaries along the south shore of Long Island) was most likely utilized by diadromous fishes. Diadromous fishes are those that either migrate upstream to spawn in freshwater and return to the ocean for their adult lives (anadromous) or vice versa (catadromous). The catadromous American eel (*Anguilla rostrata*), and the anadromous alewife (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*) habitats have been severely impacted by the urbanization (dam construction) of the watershed. These species have an important place in the ecology and cultural history of Long Island waters and are of particular concern in this plan.

Brook Trout Habitat

The brook trout (*Salvelinus fontinalis*) is the official state fish of New York State and historically was a native inhabitant of Massapequa Creek. Unfortunately, due to increased water temperatures, siltation of the streambed, and reduced groundwater base flow, there is currently no native reproduction of brook trout occurring in the Creek. Additionally, the NYSDEC stocks the Creek with several different species of trout (including brook trout) each year; however, there is no evidence to indicate that they are able to sustain themselves from year to year.

3.4 Aquatic Resource Impairments

Impairments to waterbodies can often be described in terms of effects on the fisheries within the waterbody. The New York State Department of Health issues health advisories concerning the consumption of sport fish caught in New York State waters. The New York State Department of Health has issued the following advisory: "Eat no more than one meal per month" of white perch (*Morone americana*) from the Upper Massapequa Reservoir (NYSDOH, 2007). The chemical of concern is the pesticide Chlordane and its source is classified as contaminated sediment ((NYSDOH, 2007 and NYSDEC, 2004). More information regarding NYS Department of Health fish consumption advisories can be found at: http://www.dec.ny.gov/outdoor/7736.html. Table 1 below lists the aquatic resource impairments found in the Massapequa Creek watershed.

Table 1

List of Some Use Impairments Found in the Massapequa Watershed			
Waterbody	**Use Impairments**	**Pollution Source**	**Pollution Type**
Massapequa Lake	-Fishing -Fish Propagation	-Stormwater -Waterfowl -Contaminated sediment	-Nutrients (high nitrates) -Silt and sediment deposition -Priority Organics (Chlordane)
Massapequa Reservoir	-Fish Consumption -Fishing	-Stormwater -Contaminated sediment	-Priority Organics (Chlordane) -Nutrients (extremely high nitrate level) -Silt and sediment deposition
Massapequa Creek	-Fishing -Fish Propagation -Fish Survival -Aesthetics	-Stormwater -Storm sewers -Land disposal	-Water level -Nutrients -Thermal changes -Priority Organics (Cadmium, Chromium, Volatile Organics) -Silt and sediment deposition -Floatables -Metals -Oxygen demand

(NYSDEC, 2004)

3.5 Water Quality

Information regarding water quality trends is essential for determining mitigation priorities and identifying the types of controls and techniques that would be most suitable for achieving mitigation objectives. The NYSDEC, pursuant to Title 6, Chapter 10 of the *Codes, Rules and Regulations of New York State*, developed discharge standards and water quality use classifications for large surface waters such as South Oyster Bay and its tributaries. These classifications do not represent existing water quality conditions but instead prescribe what the waterbody can be used for if the system is maintained above certain water quality standards considered suitable for that particular use (e.g., drinking, swimming, shellfishing and fish consumption, etc.) The classifications also serve as goals or standards for water quality mitigation and improvement projects.

The water quality of Massapequa Creek has been adversely impacted by the urbanization of the watershed. Contaminants are entering the creek from both groundwater and surface water/nonpoint runoff sources. The water quality conditions of the watershed are a result of seasonal and yearly fluctuations in precipitation, seasonal changes in groundwater levels, increased urbanization and respective changes to drainage systems, and the pattern and extension of municipal wastewater and drinking water systems which affect typical water withdrawal and replenishment budgets. In addition, common developmental impacts such as removal of vegetation, compaction of soils, and construction of impervious surfaces significantly affect normal hydrologic processes by increasing surface water inputs. These activities can also cause waters to become stagnant or turbulent, decrease soil permeability, promote erosion and sedimentation, aggravate flood conditions, and affect water pollutant residence times, and settling times of soil particles in the water column, which then affects the overall water quality of the watershed and South Oyster Bay.

3.6 Water Quality Classifications/Designated Uses

In compliance with Section 305(b) of the Federal Clean Water Act, the state has assessed the condition of its waters to determine the degree to which its waterbodies comply with the state's designated water use standards. According to the New York State regulation 6NYCRR Part 885-*Nassau County Waters*, the classifications and best uses of the surface waters of the Massapequa Creek watershed are as depicted in Table 2.

Table 2

State Water Quality Classifications			
Waterbody	**Description**	**Water Classification**	**Best Usage**
Massapequa Lake	Massapequa State Park	C	These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Massapequa Reservoir	Massapequa State Park	A	Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. This classification may be given to those waters that, if subjected to approved treatment equal to coagulation, sedimentation, filtration, and disinfection, with additional treatment if necessary to reduce naturally present impurities, meet or will meet New York State Department of Health drinking water standards and/or will be considered safe and satisfactory for drinking water purposes. The reservoir is not used for drinking supply presently; but did supply New York City with drinking water from the 1800s into the mid 1900s..
Massapequa Creek	From mouth to Seacrest Place	SB	The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival.
Massapequa Creek	From Seacrest Place to Merrick Road	SC	The best usage of Class SC waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Massapequa Creek	From Merrick Road to source	C	These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Minor Tributaries of Massapequa Creek	Massapequa State Park	C	These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.

3.7 Water Quality Impairments

The specific usage of surface waters is dependent upon naturally functioning ecosystems commonly characterized by a number of water quality parameters. The two major parameters include dissolved oxygen and coliform bacteria concentrations. Adequate dissolved oxygen is essential to the growth and reproduction of finfish and shellfish. Dissolved oxygen is also required in the natural decomposition of organic wastes in water. Current public health standards use bacteriological indicators in determining acceptability of water quality since the presence of such bacteria is regarded as an indication of potentially pathogenic contamination due to human or animal wastes. According to the NY State Sanitary Code Chapter 1 Subpart 6-2 – Bathing Beaches, the following bacteriological levels determine acceptability:

- 1,000 fecal coliform bacterial per 100 ml; or
- 61 enterococci per 100ml for freshwater; or
- 104 enterococci per 100ml for marine water; or
- 235 E. coli per 100ml for freshwater (E. coli is not to be used as an indicator in marine water).

Pollutants are being delivered to the Creek from various point and nonpoint sources. The identification and characterization of these sources is critical to the successful development and implementation of a watershed management and corridor restoration plan. Characterizing and quantifying watershed pollutant sources can provide information on the relative magnitude and influence of each source and its impact on the Creek's water quality conditions.

Toxic Substances – Toxic substances encompass a broad range of materials that can have adverse impacts on the environment or human health. These substances include oil, organic and metallic chemical residues from manufacturing, anthropogenic (human-made) chemicals, and agricultural and horticultural pesticides. Many of these toxic substances are a result of human development and activity. One of the major contributors to this impairment is the abandoned Liberty Industrial Finishing plant in South Farmingdale and roadway stormwater runoff. Historic toxic contamination in Massapequa Reservoir fish and the Preserve Pond are provided in Tables 3 and Table 4.

Table 3

Massapequa Preserve Pond and Stream Metal Concentrations (mg/L)									
Location	**Cadmium**		**Chromium**		**Lead**		**Zinc**		**Sediment**
	Min	Max	Min	Max	Min	Max	Min	Max	
Unnamed Pond	0.78	248.0	24.8	839.0	17.7	1160	16.2	801	Sand, silt
Pond 1	13.90	13.0	53.4	449.0	242.0	1860	113.0	731	Sand, silt
Pond 2	20.90	68.3	48.7	202.0	186.0	787	132.0	486	Sand, silt
Pond 3	1.10	63.5	84.8	160.0	265.0	792	45.0	419	Sand, silt
Reservoir	10.30	42.4	72.1	414.0	276.0	522	134.0	321	Sand, silt
Massapequa Lake	28.50	59.7	77.3	158.0	648.0	1070	321.0	736	Sand, silt
Streams	0.05	17.0	1.9	69.6	-		-		Gravel, sand, silt
ASWS*	0.89		11.0						
SEL**	9.00		110.0		110.0		270.0		(sand, silt=peat)

*ASWS=Ambient Surface Water Standard
**SEL=Severe Effects Level
Source: URS, 2000 in Cameron Engineering & Associates, LLP, 2001.

Table 4

Contaminants Found in Massapequa Reservoir Fish Flesh (mg/kg)			
Compound	**White perch**	**Pumpkinseed**	**Bluegill**
Chlordane	0.363 - 0.502	0.056 - 0.110	0.059 - 0.083
PCB	0.428 - 0.649	0.080 - 0.137	0.076 - 0.120
DDT	0.418 - 0.567	0.076 - 0.137	0.076 - 0.120
Mirex	ND*	ND	ND
HCB	0.006 - 0.006	ND	ND
Dieldrin	0.123 - 0.192	0.029 - 0.055	0.018 - 0.035
% Lipid	3.90 - 4.26	0.71 - 1.10	0.52 - 0.88

* ND=No detection
Source: NYSDEC, 1992 and Cameron Engineering & Associates, LLP, 2001

Pathogens and Pathogen-Indicating Organisms – The primary objective of most on-going water quality monitoring programs in New York State is to prevent human health impacts from exposure to pathogenic bacteria and viruses (e.g., the hepatitis and Norwalk viruses, and Salmonella bacteria), which can result from either direct contact with contaminated water or the consumption of tainted shellfish**.** Pathogens can cause human illnesses such as hepatitis A.

Common pathogens and pathogen indicator organisms include bacteria such as *E. coli* and protozoa such as *Giardia lamblia* and *Cryptosporidium* sp. (the latter two in freshwater only). *E. coli* is an enteric (intestinal) bacteria usually not harmful in and of itself. *E. coli* is easily detected and its presence is used to indicate the possible presence of pathogens that are both more serious and more difficult to detect. Since the area is sewered, a significant potential source of pathogens has been eliminated as long as the system infrastructure remains in good repair. The suspected cause of this impairment within the watershed is stormwater runoff and waterfowl wastes.

Nutrients – Nutrients usually refer primarily to phosphorus and nitrogen, two elements necessary for plant growth. In freshwater systems, phosphorus is commonly the least available element or "limiting nutrient" relative to nutrient demand. That is, when these nutrients are introduced into a waterbody in greater than ambient concentrations, they have the effect of triggering accelerated emergent and submergent plant and algae blooms. In marine systems, nitrogen is often the limiting nutrient or controlling factor that causes this reaction. These pollutants are important because of their indirect impacts. They stimulate the growth of plants and algae, which can cause odors, aesthetic impairments, and undesirable swimming conditions. Furthermore, as the accumulated plant mass dies, the process of bacterial decomposition depletes dissolved oxygen in the water.

Oxygen deprivation can cause mobile animals to leave an area, which is one reason areas low in oxygen (hypoxic) often have low numbers of fish. In more serious cases and for species which cannot flee, hypoxia can stunt growth or kill. Stormwater runoff is a major contributor to this impairment.

Historically, Massapequa Creek has exhibited high nitrogen concentrations. A study of 13 streams discharging to the South Shore Estuary by Monti and Scorca (2003) found that Massapequa Creek had the highest median total nitrogen concentration in mg/L of all thirteen streams between 1971 and 1997. However, long term nitrogen concentrations in Massapequa Creek, as well as seven other south shore streams, indicate a trend toward decreasing nitrogen concentrations during the 1971 and 1997 period due to the construction of sewage treatment plants (Monti and Scorca, 2003). This reduction in nitrogen concentrations may have also been

affected by a growing awareness of environmental issues during this period and the implementation of other environmental protection plans, policies, and practices.

Oxygen Demanding Wastes – Oxygen demanding wastes include pollutants such as sewage which require oxygen for decomposition. By stripping oxygen from the water column, these materials induce hypoxia. In extreme cases, when all oxygen has been removed from an environment, anaerobic conditions prevail. The organisms which flourish in such conditions are very different from those which thrive in aerobic conditions and much of the chemistry of the system changes. Stormwater runoff containing animal feces from local resident pets and waterfowl are the major contributors in the watershed to this impairment.

Floatables – Debris such as paper and plastic trash from careless littering and road runoff can affect the aesthetic appeal of a waterbody. Similarly, even a small amount of oil or other petroleum products can create a sheen on the water surface that forebodes of negative water quality. The aesthetic impact can be separate from the other adverse effects of the same pollutant. The major contributor to this impairment in the Massapequa watershed is stormwater runoff from streets.

Silt and Sediment – Silt and sediment can cause water quality problems in several ways. For example, sediment can alter the composition of bottom substrate and such shifts may affect the survival of various ecological communities in a given area. The covering or blanketing of immobile or sessile organisms can also be a problem.

Increased turbidity from silt and sediment entering a water system impacts the biota through light attenuation or burial and smothering. Turbidity has economic impacts by reducing recreational use (closing of beaches because of turbidity) and increasing the need for maintenance dredging. In addition, some common contaminants adhere to sediment thereby causing a secondary pollutant effect. The major contributors to this impairment are road runoff and erosion.

3.8 Stormwater Drainage Infrastructures

The SSER Comprehensive Management Plan calls for local governments in the Reserve to conduct stormwater abatement projects in significant nonpoint source contributing areas. The plan also calls for each entity to complete watershed action plans that, as the highest priority, identify such significant contributing areas and identify and rank potential stormwater improvement capital projects in each of them.

In order to comply with the SSER CMP and in meeting the requirements of the United States Environmental Protection Agency's Phase II Storm Water Regulations, the four local governmental entities (Nassau County, Town of Oyster Bay, Village of Massapequa Park and Village of Farmingdale) have developed a partnership to address the common requirements of the regulations and are discussed in Nonpoint Source Pollution Control Assessment Reports. These detailed assessments of the nonpoint source pollution control practices in place by each entity and the means through which these practices are or will be implemented for each major source of pollution are listed and organized in four categories: (1) land and water use regulations, design standards and construction specifications; (2) capital improvements; (3) operation and maintenance; and (4) outreach.

3.9 Liberty Industrial Finishing Plant

The Liberty Industrial Finishing Superfund site was used for airplane parts manufacturing and associated metal finishing activities during World War II and the Korean War. In the late 1950s, the site was converted to an industrial park and was used for a variety of industrial operations including metal plating and finishing, as well as fiberglass product manufacturing. Since the 1980s, the site has been used for light manufacturing and warehousing. A groundwater plume contaminated with organic and inorganic substances underlies the 30-acre site and extends approximately a mile to the south (designated as Plume A). Portions of the Massapequa Preserve are also contaminated from the past activities and are being addressed as part of the Superfund cleanup. A second plume (designated as Plume B) originates to the north of the site and migrates in a southerly direction before commingling with a portion of Plume A. Section 4.1 of this document goes into greater detail about this site.

3.10 Conclusion

As a result of anthropogenic actions over the last several decades, the Massapequa Creek, Massapequa Lake and Massapequa Reservior are listed in the NYSDEC 2000 Priority Waterbodies List as stressed (NYSDEC, 2002).

Massapequa Creek

According to the waterbodies list, aquatic life support in the creek is impacted by siltation, sediment, nutrients and other pollutants from stormwater and urban non-point sources. A biological assessment in 1998 indicated the water quality as slightly impacted and in 1999 moderately impacted. These impacts were attributed to flow-dependent urban runoff. Aesthetics along the stream in this highly developed and densely populated suburban area is also degraded (NYSDEC, 2002).

A study conducted by the NYSDEC in 1999 found high concentrations of fecal and total coliform, ammonia and temperature values. Although, the NYSDEC stocks the creek with trout, declines in water quality and baseflow (due to sewering) prevent the stream from holding trout year-round. Fish consumption is also stressed by impacts from Liberty Finishing Plant and other sources upstream which have contaminated the groundwater feeding the creek (NYSDEC, 2002).

Massapequa Lake

According to the waterbodies list, aquatic life support and recreational uses (swimming, boating, fishing) in the lake have been affected by high nutrient loads, excessive aquatic weed growth, occasional algal blooms and reduced water clarity. In 1998, water quality readings indicated extremely high nitrate levels and low dissolved oxygen and the extremely shallow water depths noted limit development of a desirable recreation area or fishery. Although, fish consumption is stressed due to the presence of chlordane contamination in some species, no health advisories are in affect (NYSDEC, 2002).

Massapequa Reservoir

According to the waterbodies list, fish consumption in the reservoir is impaired (particularly in white perch) due to elevated chlordane concentrations. Also the sedimentation is detriment of the fishery. In addition, past water quality analysis noted extremely high nitrate and phosphorus levels and low dissolved oxygen within the reservoir. The Nassau County Suburban Pond Management Plan has recommended rehabilitation measures which include construction of a stormwater treatment system, restoration of eroding pond/stream banks and construction of a flow augmentation system (NYSDEC, 2002).

SECTION 4

Preventative Component

4.0 PREVENTATIVE COMPONENT

Preventative measures can be used to address various concerns such as protecting water resources, aquatic and wildlife habitats, as well as minimizing pollution, erosion, sedimentation, and flood risks. Preventative measures can also help reduce pollutant loads from entering receiving waters by:

- Reducing the availability of pollutants
- Reducing the pollutants generated
- Minimizing the transport and delivery of pollutants by reducing the amount of water transported or by causing the pollutant to be deposited near the point of origin
- Depositing pollutants off-site before it reaches the waterbody
- Remediating or intercepting the pollutant before or after it is delivered to the water resource through chemical or biological transformation

4.1 Assessment of Existing Point and Nonpoint Source Controls

Pollutants are being delivered to Massapequa Creek from various point and nonpoint sources. Identification and characterization of these sources is critical to the successful development and implementation of the watershed management and corridor restoration plan. Characterizing and quantifying watershed pollutant sources can provide information on the relative magnitude and influence of each source and its impact on in-stream water quality conditions (USEPA, 2005).

Point Sources – Pollutant sources permitted to discharge at specific locations from pipes, outfalls, and conveyance channels are point sources. Many point sources are regulated under the New York State Pollutant Discharge Elimination System (SPDES) permit program.

- Liberty Industrial Finishing Plant – The Liberty Industrial Finishing Superfund site is a thirty-acre parcel located on Motor Avenue in the Village of Farmingdale. The site was used for a variety of industrial operations including metal plating and finishing and fiberglass product manufacturing. A groundwater plume (known as "Plume A") which contains organic and inorganic substances underlies the area. This plume extends approximately one mile to the south and is known to be affecting the water quality at the Preserve. A separate plume of organic contamination, designated as "Plume B", originates to the north of the Liberty site and migrates in a southerly direction before comingling with a portion of Plume A. The site is being addressed through federal, state, and

potentially responsible party (PRP) actions. In August of 2004, a Consent Judgment between USEPA and responsible parties went into effect. The Consent Judgment required the responsible parties to implement the primary remedial action described below. Additional studies are being undertaken by federal and state authorities in connection with Plume B.

Groundwater and soils are contaminated with heavy metals including cadmium, chromium and volatile organic compounds (VOCs). Risk characterizations conducted as part of USEPAs initial remedial investigation and supplemental investigations concluded that the site does not pose current-use risks to site workers, nearby residents, and those who frequent the adjacent Ellsworth Allen Park and the nearby Massapequa Nature Preserve. Threats posed by elevated concentrations of polychlorinated biphenyls (PCBs) in soil adjacent to current and former electrical transformers were eliminated in early 1996 through a removal action described below.

Table 5. List of contaminants associated with Liberty Industrial Finishing Plant. Concentration levels were not available.

Contaminant Name	Contaminated Media	Area of Site Found
Aroclor 1260	Liquid Waste	Entire Site
Benzo(A) Pyrene	Liquid Waste	Entire Site
Cadmium	Ground Water and Sediment	Entire Site
Chromium	Ground Water and Sediment	Entire Site
Dibenzo(A,H) Anthracene	Liquid Waste	Entire Site
Manganese	Ground Water	Entire Site
TCE	Ground Water	Entire Site
Trichloroethene	Ground Water	Entire Site
Vinyl Chloride	Ground Water	Entire Site

Note: The information for this table was taken from USEPA Superfund Information Systems, *Contaminants of Concern at the Liberty Industrial Finishing Site.* Information can be found at: http://cfpub.epa.gov/supercpad/SiteProfiles/index.cfm?fuseactio`n=second.contams&id=0201184.

The site is being addressed in two stages: immediate actions and a long-term remedial phase focusing on cleanup of the entire site. The immediate action consists of several cleanup efforts that were undertaken by the PRP for the Liberty site and under orders issued by the NYSDEC. These actions involved the removal of contaminated soils and sludge from industrial waste disposal basins. According to a USEPA NPL Listing History document dated February 4, 2009, the USEPA released

a supplemental report in April 2001 which describes the nature and extent of contamination in site soils, groundwater, and contamination in pond sediments in Massapequa Creek downstream of the site and in Plume B, as well as an evaluation of alternatives for comprehensive site cleanup. The listing document also stated that in a report dated July 2001, the USEPA released a Proposed Plan that outlined the preferred long-term comprehensive remedy for the site, which included excavation and off-site disposal of 73,100 cubic yards of contaminated soils; construction and operation of a conventional pump-and-treat system to address on-site and off-site groundwater; an excavation and off-site disposal of 2,600 cubic yards of contaminated pond sediments at the Massapequa Preserve (USEPA, 2009).

Map 7. Map depicts the approximate extent of the Liberty Finishing Plant Plume.

Nonpoint Sources – Nonpoint source pollution, unlike point source pollution could come from many different sources, not specific to pipes or conveyances. Nonpoint source pollution is normally associated

with surface water or sheetflow caused by rainfall or snowmelt moving over and through the ground, carrying natural and man-made pollutants and finally depositing them into surface waters.

- Stormwater – In accordance with the provisions of the Federal Clean Water Act, operators of small municipal separate storm sewer systems (MS4s) located in New York State are authorized to discharge stormwater runoff to the waters of the United States in accordance with the conditions and requirements of the SPDES general permit GP-0-08-002 (Effective date: May 1, 2008 – Expiration Date: April 30, 2010). Federal regulations require certain municipalities, generally those in urban areas, to obtain municipal stormwater permits. These permits require each municipality to develop a stormwater management plan (SWMP) that describes how the municipality will prevent stormwater pollution. As a requirement of the SPDES general permit, there are six Minimum Control Measures (MCMs) that must be implemented as measurement goals. The SWMP for small MS4s must be comprised of the 6 MCMs listed below:
  - Public Education and Outreach in Stormwater Impacts
  - Public Involvement/Participation
  - Illicit Discharge Detection and Elimination
  - Construction Site Stormwater Runoff Control
  - Post-construction Stormwater Management
  - Pollution Prevention/Good Housekeeping for Municipal Operations

  Continuing permittees (authorized by GP-02-02) were required to develop a SWMP with the MCM requirement listed above, by January 8, 2008. Under the general SPDES permit, the continuing permittees are required to implement their SWMP, including the MCM requirement listed above. (NYSDEC SPDES General Permit for Stormwater Discharges from MS4s, Permit no. GP-0-08-002)

There are several municipalities involved in controlling stormwater pollution inputs into the Massapequa Creek and whose control assessments are described below:

- Nassau County Department of Public Works – NCDPW has made significant progress on all six MCMs including the award of a $50,000 grant from the NYSDEC that will be used for implementation of the six MCMs. In addition, the County passed its own $150 million

Environmental Bond Act (2004 Bond Act was for $50 million; 2006 Bond Act was for $100 million) that will fund projects to purchase open space and improve the quality of stormwater runoff. The NCDPW has also reached out to local municipalities to form a coalition that would allow all MS4s to work together to address the requirements of the SPDES permit.

Some major accomplishments completed include:

- NCDPW solicited an RFP to draft a Drainage Use Ordinance that can be utilized by all members of the coalition. The goal is to provide a framework for control of the use of the County's municipal storm sewer system.
- Municipal supervisors from both the County and municipal partners were trained on pollution prevention and good housekeeping practices.
- High priority stream segments identified during the Year-One (March 2003 – March 2004) dry weather flow study were investigated further during Year Two (March 2004 – March 2005).
- NCDPW established the Illicit Discharge Hotline.
- Modifications to the County's *Drainage Requirements within Subdivisions* were finalized and include reference to the Phase II requirements at construction sites.
- A workshop on sediment and erosion control at construction sites attracted over 130 people including representatives from 35 villages.
- A link from the Nassau County government website to a Stormwater Webpage was created providing information, links and key documentation relative to Nassau County's *Stormwater Management Program*.

- Town of Oyster Bay – The Town has prepared an initial Phase II stormwater management program with the aim to control stormwater runoff discharges from Town facilities to the waters of the United States. The program proposed by the Town is to reduce to the "maximum extent practicable" pollutants in stormwater discharges.

  The Town's zoning code states several purposes that would pertain to the protection of the Massapequa watershed in regards to existing land use:

- Encourage the preservation and protection of the Town's natural resources, including surface and groundwater quality and quantity, vegetation and wildlife habitats and waterfronts, and to ensure appropriate development with relation to those natural resources.

- Minimize stormwater runoff and maximize the quality and quantity of groundwater recharge; minimize flooding and erosion by protecting the functions of wetlands, waterbodies, watercourses, floodplains, areas of high water table, steep slopes, erosion hazard areas and natural vegetative cover; and encourage the appropriate use, protection, and sound management of natural resources throughout the Town.

- Encourage the protection of scenic vistas, historical buildings and sites, sensitive archaeological areas and other important visual and cultural resources.

Various existing Town programs already encourage or mandate many of the best management practices recommended by the NYSDEC general permit to prevent stormwater pollution and include:

- Separate Oyster Bay's Recyclables Today (S.O.R.T.) – Program operates a curbside recycling program, with related printed outreach material and a hotline phone number, which includes a composting component with associated printed promotional material and information wheel.

- Stop Throwing Out Pollutants (S.T.O.P.) – Program which was created in order to provide a means to ensure that household hazardous wastes such as pesticides, aerosol cans, waste motor oil, paints, thinners, household cleaners, batteries, propane tanks, and tires are properly disposed. The proper disposal of hazardous materials helps to protect both surface and groundwater.

- Street Sweeping Program – A major portion of sediment and other potential pollutants is controlled by street sweeping. A schedule and map has been provided to all residents. The Town also encourages active participation in community-based volunteer programs to clean roadways, streams, and other sites with its "Adopt-a-Highway" and "Adopt-a-Spot" programs.

- Please Don't Feed the Waterfowl Program – This program was directed at educating the residents of Oyster Bay about the impacts that feeding waterfowl can have on the environment as well as the waterfowl themselves. It included the posting of signs at areas known to attract residents that were feeding the waterfowl and also included a handout directed at elementary school age groups with mazes and word puzzles to help educate the children on the impacts associated with feeding waterfowl.

- Popper Scooper Law – This ordinance, Section 103-5, requires residents to clean up after their dogs if they curb them or use any land other than their own without the express permission of the landowner. The Town believes dog wastes are contributing to polluting our groundwater and bays, it is hazardous to human health, it is a nuisance for the residents of the Town, and, most important, it is illegal not to in the Town of Oyster Bay. Also, a concern is that dog excrement poses a threat to human health and can transmit potentially serious diseases. For instance, if a dog has toxocarisis (roundworms), it can be passed on the humans. Bacterial infections such campylobacteriosis and salmonellosis can also be contracted by humans coming into contact with infected feces.

- Catch Basins (and Sumps) Brochure – The Town has also published a pamphlet designed to educate the residents of the importance of trying to reduce pollutants entering the groundwater and surface water through catch basins. The pamphlet explains ways to reduce inputs of pollutants such as oil, anti-freeze, pesticides, and pet wastes entering the ecosystem through catch basins and sumps.

- Incorporated Village of Massapequa Park – Massapequa Park has the means by which to regulate various activities in an effort to reduce nonpoint source pollution. Massapequa Park currently has regulations pertaining to animal waste, sewage waste disposal, littering, as well as garbage and recycling. Massapequa Park intends to establish an erosion and sedimentation control plan and ordinance that will address issues pertaining to design and construction standards, as well as other key areas that currently are not formalized in the village code. These key areas include, but are not limited to, the benefits of using native species for landscaping and beautification projects, and the practices of composting kitchen and yard waste.

The Massapequa Park Public Works Department conducts as-needed retrofit activities at outfalls, drainage areas, and other related structures, including when roadways are improved. Massapequa Park and the Town of Oyster Bay currently maintain maps identifying the locations of outfalls, drainage structures, sewer outfalls, and such. The Town has received funding to complete this identification and prioritize the retrofit projects for the Town and the Village.

Massapequa Park is not currently actively involved in many public outreach efforts, though there is an Adopt-A-Spot program. There are also annual clean-up activities associated with Earth Day celebrations, in which local volunteers lend their help and support. Massapequa Park intends to begin disseminating stormwater-related public education materials to its residents. These efforts include compilation of resources at the local library, the creation of a website, and resident mailings. These steps would be implemented at varying intervals over the next few years.

- Incorporated Village of Farmingdale – Farmingdale has the means by which to regulate various activities in an effort to reduce nonpoint source pollution. Farmingdale currently has regulations pertaining to water conservation, animal waste, landscaping guidelines, and drainage facilities.

  Farmingdale is currently implementing a major roadways project. Farmingdale is in the process of re-grading the roadways, replacing curbs, constructing drainage improvements and applying new pavement.

  The Farmingdale Department of Public Works conducts as-needed retrofit activities at outfalls, drainage sites, and related structures, including when roadways are improved. Farmingdale has a street sweeping program, in which all streets are swept on a recurring basis. Farmingdale performs maintenance sweeps during the year as time and conditions dictate.

  Farmingdale re-landscapes its parks and other holdings on an as-needed basis, but does not require the use of native plant species. However, all plantings must be approved by Farmingdale prior to the commencement of any work. Also, Farmingdale plans to review its existing landscaping and lawn maintenance procedures and policies for village-owned properties. This will then be modified and improved where deemed necessary.

Farmingdale is currently designing several outreach programs to raise public awareness of drainage and associated issues of concern. Farmingdale intends to disseminate more stormwater-related public education materials to residents and an educational display will be maintained at the public library. Also, a school curriculum is being developed to teach local students about stormwater related issues. These steps will be implemented at varying intervals over the next few years.

Farmingdale currently has regulations pertaining to accommodating increased stormwater runoff as well as erosion and sedimentation associated with development activities. Farmingdale intends to establish an erosion and sediment control plan and ordinance that will address the issues pertaining to design and construction standards, as well as other key areas that currently are not formalized in the village codes.

4.2 Actions by Other Local, State, and Non-Government Organizations

There are a number of other entities involved in the protection and management of the watershed. These entities will play a major role in the future of the Massapequa Creek system. Some have legislative, regulatory, and administrative authority, while others provide technical support, educational information or are active at the grassroots level.

South Shore Estuary Reserve

Long Islanders concerned with the future health of the South Shore Estuary urged the New York State Legislature to pass the Long Island South Shore Estuary Reserve Act. The South Shore Estuary Reserve was created from this act to protect and manage the estuary. The act also created the South Shore Estuary Reserve Council (Council), which was charged with preparation of a comprehensive management plan for the Reserve.

According to an SSER comprehensive management plan accomplishment report from 2003-2005, New York State awarded eighty-two Clean water/Clean Air Bond Act, Environmental Protection Fund, Environmental Protection Fund Local Waterfront Revitalization Program, Quality Communities Program and Brownfield Opportunities Area Program grants to the Reserve's local governments for implementation of the plan. Through these awards, approximately $14 million of State funds have leveraged a comparable amount of local government match.

The *South Shore Estuary Reserve Comprehensive Management Plan* has followed a process in which many individuals have had opportunities to participate. In 1994, the Council held a series of scoping meetings during which public views and concerns about the estuary and its management were received. Regular meetings, open to the public, have allowed interested parties to learn about and participate in Council activities and those of its Technical Advisory Committee, Citizens Advisory Committee, and topic-based subcommittees and workgroups.

To assist the Council, the NYS Department of State, working through partnerships with local governments and federal agencies, gathered and analyzed information on land and embayment uses, the estuarine economy, water quality, living resources, and other aspects of the Reserve. Much of this information was analyzed by the Department of State through geographic information system technology, and the analyses have served as a basis for the implementation actions offered in the plan. Important data were also supplied by the six towns and two counties in the Reserve as part of assessments of their nonpoint source management practices conducted in conjunction with the Department.

Friends of Massapequa Preserve

The Friends of Massapequa Preserve are a dedicated group of citizens who live in the greater Massapequa area or use the Preserve and who have formed a not-for-profit organization to enhance the protection, restoration, uses and appreciation of the Preserve. They work in cooperation with the Nassau County Department of Parks, Recreation and Museums and the Nassau County Police Department.

Their goals are to work with the community to increase public awareness, promote educational activities, and encourage proper stewardship of the valuable natural resources in the Preserve. They have achieved their mission through outreach and coordination with local schools, homeowners, civic and business groups, public officials, and volunteer organizations, and through the creation of a coalition of preserve stewards. They have also organized a civilian "park watch" to be the "eyes and ears" for identifying and reporting misuse and vandalism in the Preserve.

Trout Unlimited

Trout Unlimited (TU) is a private conservation organization with over 150,000 volunteers. TU was formed in 1959 in Grayling, Michigan and now has 450 chapters nationwide with headquarters in Washington, D.C. The organization's primary mission is to conserve, protect, and restore America's coldwater fisheries and their watersheds. It publishes a quarterly magazine, hires experts to testify before Congress, and develops programs and activities to protect and restore fish and their habitat, as well as to promote and perpetuate the sport of fishing. The Long Island Chapter of TU is involved at the committee level as well as with conducting water quality monitoring in the Creek.

Ducks Unlimited

Ducks Unlimited (DU) is a grassroots volunteer-based organization. Its mission is to conserve, restore and manage wetlands and associated habitats for North America's waterfowl for the benefit of wildlife and humans alike. The organization was formed in 1937 and has approximately 800,000 members in the United States, Mexico, and Canada. Core values of the organization include conserving waterfowl and wetlands; aspiring to a code of ethics that treats both people and wildlife with respect; making science-based decisions; encouraging teamwork and partnering with people who share common goals and values; and enjoying and valuing the sport and heritage of hunting. DU has conducted Black Duck studies in the Preserve.

SECTION 5

Corrective Component

5.0 CORRECTIVE COMPONENT

5.1 Analysis of Characterization and Pollutant Loadings

This section is designed to address the major pollutant loading sources of the Massapequa Creek watershed. This characterization identifies gaps in municipal nonpoint source assessments that are major contributors to the closure of surface waters for bathing, fish consumption, and shellfish harvesting from point and nonpoint sources. These sources include stormwater runoff from street and highway collection systems, and to a lesser extent, waterfowl that inhabit the many freshwater ponds and lakes of the Preserve.

Sources

Mineral and organic sediment is generally considered the largest surface water pollutant per mass and volume. Each year, soil is transported from streets, parking lots, and construction sites, via sheetflow, rill and gully erosion, and stormwater runoff. The eroded material is often captured within man-made drainage infrastructure or discharged directly to receiving waters. In addition to concerns over siltation of wetlands and ponds, soil erosion is a major factor in the depletion of soil resources by the removal of valuable top soil.

Typically, water turbidity is its highest during and immediately after the completion of the "first flush" of a storm event as a result of increased river, stormwater, and pollutant load discharge. Pollutant loading is further exacerbated by both absorption and adsorption of other contaminants such as oil, bacteria, metals, and organic chemicals which are often attached to soil particles. Dissolved or suspended solids may carry oxygen-dependent substances which can contribute to the depletion of dissolved oxygen in water and potentially affect aquatic organisms.

Large-scale deposition of soil can also inhibit natural pollutant attenuation processes, silt-up stream channels and wetlands, decrease flood storage capacity, reduce the effectiveness of stormwater pollution treatment devices, and inhibit the natural functions of waterbodies, including use by fish and wildlife for feeding, breeding, and cover. Also, mineral soil particulate matter, organic detritus, and man-made pollutants can act in concert to increase the level of turbidity in streams, rivers and shallow, low-energy, coastal systems. The resultant decrease in

water clarity diminishes sunlight penetration and inhibits the process of photosynthesis in submerged aquatic vegetation. Finally, when solids settle in low-energy/low flow environments, they can bury benthic flora and fauna, including aquatic plant life and invertebrates.

Large populations of waterfowl are present within South Oyster Bay and its tributary ponds and streams on a year-round basis. In natural balance, waterfowl are an integral component of the coastal ecosystem, serving as a key group of herbivores that make plant energy available to other aquatic and terrestrial organisms. However, humans have altered this balance in several ways, which has caused the populations of certain waterfowl to expand beyond their normal levels, which in turn has resulted in a range of significant environmental impacts. Canada geese, in particular, have reached a nuisance level at many local parks and golf courses.

- Runoff and Loadings

  Stormwater runoff contributes contaminants to receiving waters. Human activities such as land development are major contributors to contaminated stormwater discharges. Land development alters stormwater drainage characteristics within a watershed, which can have a profound effect on the water quality of adjacent waterbodies. Development results in the replacement of permeable natural land surfaces (i.e., woodlands, meadows, etc.) with impervious surfaces such as roadways, building, walkways, and such. Even in areas cleared for development that are subsequently replaced with landscaping, the planted vegetation generally has a lower capacity for absorbing rainwater than the original, indigenous vegetation; this is especially true with respect to turf areas. The overall consequence of these conditions is that development generally increases the amount of runoff generated on a given parcel of land. The augmented volume of runoff from developed properties results in an increase in the amount of pathogens and other deleterious substances carried from the land surface to receiving waters.

  A land reconnaissance performed by Mr. Richard Schary (Friends of Massapequa Preserve) during November 2005, within the Preserve and along the surrounding properties, and supplemented by Cashin Associates for Segments 1, 4, and 6 revealed the following:

- Segment 1
  - Runoff from numerous street ends which terminate at bulkheads along the Creek.
  - Runoff from adjacent residential properties throughout most of the area.

- Segment 2
  - Runoff into Massapequa Lake from the unpaved parking lot at the east end of Front Street.
  - Direct runoff into the Creek from both sides of Sunrise Highway, especially from the unpaved parking lot near old pump house.
  - Direct runoff into Massapequa Lake from several sloping lawns along Shoreline Drive. No undergrowth was noted near creek to control runoff.

- Segment 3
  - Most of the dead end streets along the western side of the Preserve between Linden Street and Manhattan Avenue have been used for illegal dumping and there is direct runoff into the Preserve.
  - Direct runoff from dirt lot near Walker Street.
  - Direct runoff and landscaping waste dumping off Parkside Boulevard along the eastern border of Preserve.
  - Dumping along numerous homes along Lake Shore Drive.

- Segment 4
  - Runoff and recharge from Bethpage State Parkway into the Preserve. This area contains the headwaters of the northwestern-most branch of the Creek.

- Segment 5
  - Severe erosion and runoff problems caused by illegal ATV racing within the Preserve north of Southern State Parkway and along the Eastern Tributary in the Village of Farmingdale.
  - Direct runoff and illegal dumping behind many of the homes along both East and West Drive.

- Direct runoff and illegal dumping along the western boundary of the Preserve between West Virginia and Rutherford Avenue.

- Liberty Industrial Finishing Plant (LIF)

LIF operated in the Farmingdale area from 1948 to 1977. The site is surrounded on three sides by residential areas, the nearest within 1,000 feet. The site consisted of three buildings, three acid vats, a sludge-drying lagoon, two leaching basins, a number of finishing vats, and a basin for holding stormwater. Activities at this site included electroplating, anodizing, and painting. In 1977, LIF was cited for discharging wastewater into two leaching basins in violation of its permit limits. The discharge exceeded the established limits for hexavalent chromium and cadmium. Further investigations undertaken by the Nassau County Department of Health in 1979 and 1980 indicated that two leaching basins and a sludge-drying bed failed Extraction Procedure (E.P.) Toxicity tests for cadmium. Elevated levels of trichloroethene and 1,2-dichloreoethene, as well as cadmium, chromium, and cyanide, were detected in soils and shallow monitoring wells that were installed on and off the LIF site, in the Upper Glacial deposits. In addition to being a federal Superfund site, LIF is also categorized as a Class 2 site on the New York State Registry of Inactive Hazardous Waste Disposal Sites (New York State Superfund list). Class 2 sites are defined as posing a significant threat to public health or the environment, thereby requiring mitigative action. Historic monitoring of a plume of contamination from the site has indicated that the property has been a source of contamination to the upper reaches of the Massapequa Creek system.

Following the issuance in July of 2001 of the EPA's Proposed Plan that outlined the Agency's preferred long-term comprehensive remedy for the site, the Town of Oyster Bay announced its intention to acquire a fifteen-acre portion of the former facility for expansion of the adjacent Ellsworth Allen Park for community recreational activities. In September 2003, the Town acquired the 15-acre portion of the Liberty site. Following the cleanup, the Town will construct the recreational facilities and establish the new community park.

- Segment 6
  - This section is not adjacent to the Creek.

5.2 Actions to Remove Pollutants and Restore Water Quality

5.2.1 Stormwater Remediation Measures

In a letter submitted to the Massapequa Creek Watershed Management Committee by Ms. Eileen Keenan (NYSDEC) on November 14, 2005, the following stormwater remediation measures are recommended:

The *Long Island South Shore Estuary Reserve Comprehensive Management Plan* calls for local governments in the Reserve to complete watershed action plans that identify and prioritize a broad suite of management options that coordinate with municipal Phase II Stormwater Management Programs (PH II) and other related efforts. It is recommended that the Massapequa Creek Watershed Management and Corridor Restoration Plan (Massapequa Creek Plan) utilize the *Draft Generic Work Plan for Stormwater Management Plan/Watershed Action Plans in the South Shore Estuary Reserve* as its framework. It would be advisable to develop, adopt and implement the Massapequa Creek Plan as an SSER Watershed Action Plan (SSER WAP), comprised of joint municipal PH II stormwater management measures. This approach has the potential to be mutually advantageous in that it would concurrently advance municipal PH II objectives as well as SSER CMP objectives for several reasons:

- Watershed-based, shared PH II implementation is encouraged.
- Municipal PH II stormwater management programs are comprehensive watershed management programs. The six PH II minimum control measures cover all aspects (structural as well as non-structural) of watershed management.
- To be effective, the Massapequa Creek Watershed Management and Corridor Restoration Plan needs the support and participation of all local governments within the watershed.
- Municipal PH II programs are most effective in protecting water quality and most cost-effective, when they are implemented on an inter-municipal basis.
- Municipalities have not traditionally coordinated such efforts.
- The Massapequa Creek WAP process can be used to facilitate multi-jurisdictional PH II stormwater management.

Table 6. Table compiled by Ms. Eileen Keenan (NYSDEC and submitted with her November 14, 2005 letter).

SSER WAP/PH II Integration		
WAP Background Component	**WAP Corrective Component**	**WAP Preventive Component**
PH II priority audiences, pollutants and geographic areas PH II MEP (maximum extent practicable) /intermunicipal implementation	PH II Pollution Prevention and Good Housekeeping	PH II Pollution Prevention and Good Housekeeping
PH II Illicit Discharge Detection and Elimination	PH II Illicit Discharge Detection and Elimination	PH II Education and Outreach
PH II Post Construction Stormwater Management	PH II Post Construction Stormwater Management	PH II Public Involvement and Participation
	PH II Public Involvement and Participation	PH II Post Construction Stormwater Management
		PH II Construction Site Runoff Control

5.2.2 Reduction of Untreated Stormwater Input

Stormwater enters the Massapequa Creek system from streets, parking lots, driveways and other impervious surfaces of the drainage area with little or no treatment. There are a number of storm pipes that discharge either directly or indirectly into the ponds and creek channels located within the corridor including those listed under section 5.1.

The extent of urbanization within the watershed presents significant challenges in proposing effective remedial strategies for addressing stormwater pollution. The shortcomings are particularly obvious where buffering, easements, land acquisition, provision of large retention and detention basins, and development of constructed wetlands and swales are not feasible due to the limited availability of undeveloped land.

The Town of Oyster Bay's *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan* (Cashin Associates, 2004), describes in great detail the major practices and devices that are used for stormwater treatment and could be used in the watershed. The plan groups them into three major classifications: vegetative practices, structural devices, and non-structural

(operational) practices. A brief description of these practices and applicability to the watershed are given below:

- Vegetative Stormwater Treatment Practices – This stormwater treatment practice uses the natural pollution treatment capabilities of soil and vegetation to treat stormwater runoff. They can be very effective when they are properly designed, sited, and maintained. As a secondary benefit, they can provide aesthetic and ecological amenities. Table 7 represents possible remediation methods/practices that could be used to mitigate some of the stormwater issues. In order to establish exact locations where these practices could be incorporated, a more detailed analysis of stormwater movement would need to be conducted.

- Structural Stormwater Treatment Devices – Structural watershed management practices involve the construction and installation of man-made improvements that capture stormwater and the pollutants it contains. The effectiveness of these stormwater management tools are contingent upon the type of control, its design, construction, siting, and installation. Implementation of these management practices takes place during the initial development of a watershed or as a retrofit to an existing stormwater system (as would generally be the case in the Massapequa Creek watershed). A quick summary of these devices and applicable suitability in the watershed can be found in Table 8.

- Non-Structural (Operational) Stormwater Management Practices – In addition to the construction and installation of vegetative and physical structures, a variety of operational or management practices can be employed to reduce the loadings of contaminants conveyed by stormwater runoff to receiving waters. The most common and effective non-structural/operational management practices are described in Table 9.

Table 7
Vegetative Stormwater Treatment Practices

Type of Practice	Advantages	Disadvantages	Suitability for Massapequa Creek Watershed
Constructed Wetlands	Can serve large developments; most cost effective for larger, intensively developed sites; provides peak flow control; enhances aesthetics & provides recreational benefits; the marsh fringe also protects shoreline from erosion; permanent pool in wet ponds helps to prevent scour & resuspension of sediments; has high pollutant removal capability.	Not economical for drainage areas less than 10 acres; can be an eyesore, breed mosquitoes, creates undesirable odors if not adequately maintained; requires considerable space, which limits use in densely urbanized areas with high land and property values; possible thermal discharge & oxygen depletion, may severely impact downstream aquatic life; may contribute to nutrient loadings during die-down periods of vegetation.	Low
Filter Strips	Low maintenance requirements; can be used as part of the runoff conveyance system to provide pretreatment; can effectively reduce particulate pollutant levels in areas where runoff velocity is low to moderate; provides excellent urban wildlife habitat; economical.	Often concentrates water, which significantly reduces effectiveness; ability to remove soluble pollutants is highly variable; limited feasibility in intensely urbanized areas where runoff velocities are high and flow is concentrated; requires periodic repair, re-grading, and sediment removal to prevent channelization.	Moderate
Grassed Swales & Grassed Waterways	Requires minimal land area; can be used as part of runoff conveyance system to provide pretreatment; can provide sufficient runoff control to replace curb and gutter systems in single-family residential subdivisions and on highway medians; economical.	Low pollutant removal rates; leaching from culverts and fertilized lawns may actually increase the presence of trace metals and nutrients.	High
Riparian Forest Buffers	Preserves wildlife habitat; can be effective at attenuating pollutants; prevents erosion and scoring of stream banks; protects riparian wetlands; provides areas of flood storage.	Establishment of buffers or easements is usually only feasible when vacant land is developed or subdivided; Most land in the study area is either already preserved or is developed.	Low
Stream Corridor Protection (Green-Belting)	Very effective way of protecting surface, groundwater, and wildlife resources; provides a recreational and scenic amenity for the community.	This method requires a substantial amount of woodlands, yet there is very little additional land available in the watershed area; costs involve the price of land acquisition and a loss in tax property revenue by removing lands form the tax rolls.	Low
Urban Forestry	Helps to provide a vegetative buffer between waterbodies and uplands; creates wildlife habitat; stabilizes the shoreline.	Can limit access to shoreline.	Low

Some of the information for Table 7 is taken from Town of Oyster Bay's *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan,* dated February 2004.

Table 8
Structural Stormwater Treatment Practices

Type of Structural Device	Advantages	Disadvantages	Suitability for Massapequa Creek Watershed
Water Quality Inlet Catch Basins	Provides high degree of removal of large particles & debris as pretreatment; requires minimal land area; flexibility to retrofit existing drainage systems & applicable to most urban areas.	Not feasible for drainage areas greater than 1 acre; marginal removal of small particles, heavy metals, & organic pollutants; not effective as water quality control for intense storms; minimal nutrient removal.	High
Water Quality Inlet, Catch Basins with Sand Filter	Provides high removal efficiencies of particulate materials; requires minimal land area; flexibility in retrofitting existing small drainage areas; higher removal of nutrients as compared to catch basins and oil/grit separators.	Not practicable for drainage areas greater than 5 acres; only feasible for areas that are stabilized and highly impervious; not effective as water quality control for intense storms.	High
Concrete Grids, Modular Pavement Porous Pavement	Provides groundwater recharge; provides water quality control without additional consumption of land; can provide peak flow control; high removal rates for sediment, nutrients, organic matter, and trace metals; when operating properly can replicate pre-development hydrology; eliminates the need for stormwater drainage, conveyance, and treatment systems off-site.	Requires regular maintenance; possible risk of contaminating groundwater; only feasible where soil is permeable, there is sufficient depth to water table and there are gentle slopes; not suitable for areas with high traffic volume; need extensive feasibility tests, inspections, & very high level of workmanship; high failure rate due to clogging; not suitable to serve large off-site pervious areas.	Low
Concrete Grid Pavement	Can control peak flows; provides groundwater recharge and water quality control without additional land consumption.	Requires regular maintenance; not suitable for area with high traffic volume; possible risk of contaminating groundwater; only feasible where soil is permeable, there is sufficient depth to water table and slopes are gentle.	Low
Diversions	Decrease erosion by diverting flow; can speed up or slow flow depending on need.	Not suitable for flows which carry a high sediment load; does not remove the total flood volume from the system the way infiltration devices do; requires a lot of land.	Low
Infiltration Basins	Provides groundwater recharge; can serve large developments; high removal capability for particulate pollutants & moderate removal for soluble pollutants; when basin works, it can replicate pre-development hydrology more closely than other BMPs; basins provide more habitat value than other infiltration systems.	Possible risk of contaminating groundwater; only feasible where soil is permeable and there is sufficient depth to groundwater; relatively high failure rate if not adequately maintained; can be an eyesore, breed mosquitoes, and create undesirable odors; infiltration basins best in large catchment areas and infiltration trenches best in small catchment areas; cannot prevent rapid clogging of infiltration basins; regular maintenance required.	Low
Infiltration Trenches and Wells	Provides groundwater recharge; can serve small drainage areas; can fit into medians, perimeters, and other unused areas of a development site; helps replicate pre-development hydrology; increases dry weather base flow; and reduces bankfull flooding frequency.	Possible risk of contaminating groundwater; only feasible where soil is permeable and there is sufficient depth to seasonally high groundwater; since not as visible as other BMPs, less likely to be maintained by residents; requires significant maintenance.	High

Table 8 (cont.)
Structural Stormwater Treatment Practices

Type of Structural Device	Advantages	Disadvantages	Suitability for Massapequa Creek Watershed
Leaching Wells	High levels of pollutants are removed; good for treating a variety of pollutants.	Works better when there is a greater separation distance between the bottom of the well and the groundwater table; treatment contingent upon soil type, percolation rate, etc.	Moderate
Fluid Flow Regulators	Good for treating the first flush of runoff.	Requires that the regulator be connected to a treatment facility which can increase the cost of treatment.	Low
Peat/Sand Filters (with water quality inlet catch basin)	Effective treatment device for removing a variety of pollutants.	Pretreatment is required; filters can become clogged; requires frequent maintenance.	Low
Extended Detention Basins (Dry Pond)	Can provide peak flow control; possible to provide good particulate removal; can serve large development; requires less capital cost & land area when compared with wet ponds; does not generally release warm or anoxic water downstream; provides excellent protection for downstream channel erosion; can create valuable wetland & meadow habitat when properly landscaped.	Removal rates for soluble pollutants are quite low; not economical for drainage area less than 10 acres; if not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors.	Low
Extended Detention Basins (wet pond)	Can provide peak flow control; can serve large developments; most effective for larger, more intensively developed sites; enhances aesthetics and provides recreation benefits; permanent pool in wet ponds helps to prevent scour and resuspension of sediments; provides better nutrient removal when compared to dry pond.	Not economical for drainage area less than 10 acres; potential safety hazards, can be an eyesore, breed mosquitoes, and create undesirable odors if not suitably maintained; requires considerable space, which limits use in densely urbanized areas with expensive land and property values; not suitable for hydrologic soil groups "A" and "B" (NRCS classification); with possible thermal discharge and oxygen depletion, may severely impact downstream aquatic life.	Low
Retention (wet) Ponds	Can provide peak flow control; can serve large developments; most cost-effective for larger, more intensively developed areas; enhances aesthetics & provides recreational benefits; little groundwater discharge; permanent pool in wet ponds helps to prevent scour & resuspension of sediments; provides moderate to high removal of both particulate & soluble urban stormwater pollutants.	Not economical for drainage area less than 10 acres; potential safety hazard, can be an eyesore, breed mosquitoes, & create undesirable odors if not suitably maintained; requires considerable space, which limits use in densely urbanized areas with expensive land and property values; not suitable for hydrologic soil groups "A" and "B" (NRCS classification).	Low

Table 8 (cont.)
Structural Stormwater Treatment Practices

Type of Structural Device	Advantages	Disadvantages	Suitability for Massapequa Creek Watershed
Roof Runoff System	Allows "clean" stormwater to be recharged before picking up and transporting pollutants; on-site recharge helps to prevent puddling; requirements for roof runoff systems for new structures are easily implemented.	Because the watershed area is essentially at build-out, implementation of technique would require retrofitting existing structures which may not be easily accomplished or viable.	Low
Water Quality Inlet/Oil/Grit Separator/Swirl Chamber	Captures coarse-grained sediments & hydrocarbons; requires minimal land area; flexibility to retrofit existing small drainage areas; applicable to most urban areas; shows some capacity to trap trash, debris & other floatables; can be adapted to all areas of the watershed.	Not feasible for drainage area greater than 1 acre; minimal nutrient & organic matter removal; not effective as water quality control for intense storms; concern exist over pollutant toxicity of trapped residuals; requires high maintenance.	High
Aeration Devices	Aerates oxygen-deficient water and aids in the propagation of aquatic life.	Does not treat contaminants, *per se*; can detract from natural environment.	Low

Some of the information for Table 8 was taken from Town of Oyster Bay's *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan,* dated February 2004.

Table 9
Non-Structural and Operational Stormwater Management Practices

Management Technique	Advantage	Disadvantage	Suitability for Massapequa Creek Watershed
Irrigation Water Management	Can limit the amount of stormwater runoff.	Difficult to get the public to follow recommendations.	Low
Integrated Pest Management	Effective at reducing the loading of hazardous materials to water bodies.	Requires training and private commitment; very few land uses in the area that could effectively use this technique.	Low
Pesticide Management Education	Can help to lower the release of some of the most toxic chemicals.	Requires the acceptance and cooperation of the pubic to be successful; requires public education and outreach.	Moderate
Animal Waste (Pathogen) Control	An effective program for lowering potential pathogen loading; helps to keep public walkways free and clear of wastes; inexpensive to implement.	Requires the acceptance and cooperation of the public to be successful; requires public education and outreach.	Moderate
Nutrient Management	Can reduce nutrient loading at the source.	Public acceptance and cooperation is required; necessitates public education and outreach.	Moderate
Composting	Can be promoted through public education; aside from the costs of preparing and distributing public information pamphlets, this too costs nothing.	Most property owners have limited space to create compost piles and potential odors may raise complaints from neighbors.	Moderate
Street Sweeping	Removes sediment and associated contaminants from streets and parking areas, thereby lowering both pollutant and sediment loads.	Must have a place to dispose of sediment; requires man power and machinery.	High
Maintenance of Natural Waterways	Provides cleanup of areas (waterways) that usually do not get maintenance attention.	Finding trash and junk in a creek or cove can be difficult due to turbid water and submergent vegetation, and requires wading the entire length of the stream segment.	Moderate
Streambank (shore) Stabilization	Helps to provide a vegetative buffer which can cleanse stormwater; enhances wildlife habitat; stabilizes lake shorelines and streambanks, thereby mitigation erosion and sedimentation; can provide aesthetic benefits.	Physical structures can detract from the "natural" quality of ponds, streams, and coastal shorelines, and must be periodically repaired and replaced. Vegetative stabilization techniques can restrict physical and visual access to the shoreline and waterbody.	Moderate-to-High
Traffic-Generated Pollution Reduction	Addresses an important source of relatively ubiquitous pollutants.	Some aspects of this approach, such as promoting vehicle maintenance may be difficult to gain cooperation and participation.	Moderate
Drainage Structure Maintenance Program	Removes garbage and sediment from stormwater system; ensures that existing stormwater control devices function optimally.	Must be able to allocate Town resources (dollars, equipment, and employees) toward implementing the program.	High
Catch Basin Stenciling	Easy way to educate the public as to effects of dumping; inexpensive.	The approach may prevent some limited unlawful dumping but does not involve remediation or existing contamination conditions.	High
Erosion and Sedimentation Control Ordinance	Requires techniques be implemented to prevent siltation and pollution from associated sediment.	Techniques are usually required as part of NYSDEC permits near waterbodies and wetlands.	High

Table 9 (cont).
Non-Structural and Operational Stormwater Management Practices

Management Technique	Advantage	Disadvantage	Suitability for Massapequa Creek Watershed
Land Use Planning	Regulates types of land uses adjacent to waterways, their development density, and setbacks; effective means of resource protection.	Most land in the watershed is already developed and most land adjacent to the creek corridor has been preserved; existing land uses would be "grandfathered"; new regulations would have to be drafted and would only apply to new development.	Low
Transfer of Development Rights (TDR) Program	Useful in preserving entire lots or tracts of land in environmentally sensitive areas.	Requires a great deal of land and a market for development rights; can be a controversial land management tool; is complex and not easily implemented; results in increased density in other areas.	Low
Purchase of Development Rights (PDR) Program	Useful in preserving entire lots or tracts of land in environmentally sensitive areas.	Mainly used in farmland applications where owners are deriving some monetary benefit from the land (agriculture) despite forfeiting their right to further develop.	Low
Town Wetland Ordinance	Local wetland ordinances are required to have more stringent standards and restrictions than State and Federal regulations for water quality.	Requires a great deal of staff, time and expense; must train personnel.	Moderate
Conservation Easements	Is effective at preserving the integrity of a waterbody.	Usually involves the dedication of easements on new commercial properties or residential subdivisions and multifamily housing projects; few opportunities exist for new development within the watershed.	Moderate
Land Acquisition	Can prevent future development that may affect water quality; keeps land natural and undeveloped; provides recreational opportunities as well as wildlife habitat.	Takes property off the tax roll; cost of purchasing property can be high; Town must maintain the property.	Low – due to highly developed watershed area
Public Education and Community Outreach	Provides general information and awareness to many individuals, including school age classroom lessons and public workshops.	Not everyone will read distributed literature; following the recommendations is voluntary.	Moderate - to - High
Household Hazardous Substance Management Program	The Town has an existing program in place; helps prevent illegal disposal of hazardous material.	Requires public acceptance and cooperation.	High (have existing program that could be augmented)
Citizens' Water Quality Monitoring Program	Provides a mechanism for monitoring the condition of surface waters; work provided by volunteers; promotes community involvement, civic pride, and appreciation for local natural resources; may help to identify pollution "hot spots" and overall trends in water quality.	Requires training in sampling techniques and quality assurance and control; does not directly involve pollution remediation.	Moderate

Some of the information for Table 9 is from the Town of Oyster Bay's *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan* (Cashin Associates, 2004).

5.2.3 Remediation of the Liberty Industrial Finishing Plant Plume

In 2002, the USEPA published their Record of Decision (ROD) for the Liberty site. The selected remedy addressed the following: the soil contamination present primarily on the western half of the property in the Wastewater Disposal Basin, the Building B basement, and the Northwest Disposal Area; numerous contaminated subsurface features present on the eastern portion of the property; the on-property and off-property groundwater contamination; and localized contamination in pond sediments in nearby Massapequa Creek.

The selected remedy will restore groundwater to its best beneficial use, as a source of drinking water, through active remediation of the aquifer and elimination of contaminants in the soils that continue to contaminate the groundwater. Remediation of contaminated sediments from Pond A will eliminate any potential adverse effects to ecological receptors within the Massapequa Creek from exposure to these contaminants. The major components of the selected remedy include:

Soils:

- Excavation and off-site disposal of all soils contaminated above groundwater protection levels (estimated at 73,100 cubic yards).
- Removal of contaminated aqueous and/or solid materials from underground storage tanks and other subsurface features (structures).
- Institutional controls to restrict the use of the site to commercial/industrial or where applicable, to recreational uses.

Groundwater:

- Continued operation of the ongoing interim groundwater treatment system that is being converted to a conventional pump-and-treat system to address the groundwater underlying the site property contaminated by previous operations.
- Continuation of the interim groundwater action by construction and operation of a conventional pump-and-treat system to address groundwater underlying the site property which is believed to have been contaminated by an up-gradient source.
- Construction and operation of a conventional pump-and-treat system to treat off-property groundwater contamination.
- Implementation of a groundwater monitoring program.

- Institutional controls to prohibit installation or use of groundwater wells for human consumption.

Massapequa Preserve:

- Excavation and off-site disposal of approximately 2,600 cubic yards of contaminated sediments within Pond A of the Massapequa Preserve.
- Implementation of a monitoring program for the remainder of the ponds within the Massapequa Preserve.

5.3 Habitat Restoration and Enhancement Opportunities

- **Segments 1 and 2**

  Both of these segments are highly developed with little to no opportunities for wildlife habitat restoration or enhancement. However, Massapequa Lake, part of the Preserve and under the jurisdiction of NCDPW, has the potential for several habitat enhancement opportunities such as installing fish ladders, dredging the lake, or creating a coldwater channel. The Town should discuss the possibility of these habitat enhancement opportunities with the NCDPW.

- **Segment 3**

  Long Island Rail Road Property

  The area between the Massapequa Reservoir and Sunrise Highway is a small patch of land where the stream corridor is located (just west of the old pump house). Up until 2007, the parking lots on both sides of this corridor where allowing large inputs of untreated stormwater runoff and associated impairments to enter the water system during storm events. However, in 2007, the New York State Department of Transportation (NYSDOT) in cooperation with the NYSDEC and NCDPW, completed a parking and roadway stormwater runoff improvement project that rehabilitated parking, drainage improvements, sediment removal and enhanced fishing access to Massapequa Lake and the Massapequa Preserve. The project included new off-street vehicular parking, the installation of three leaching basins, and extensive plantings to beautify the area and stabilize natural drainage.

This section of Creek has the potential to become an exceptional trout habitat area. It has a good gravel base, nice overhead cover, and strong streamflow. With minor manipulation (e.g. small riprap to induce oxygenation and some deep, cool water pockets for fish to reside during the warmer summer months) this objective could be achieved. In addition, since this area has several spots for viewing the creek and reservoir, visitors will be able to see fish swimming in the stream which will enhance the natural qualities as well as visual and aesthetic beauty of the area. The spillway just below the Massapequa Reservoir and just above this site could possibly be a suitable area for the installation of a fish ladder. The Town should discuss the feasibility of installing a fish ladder with the County who has jurisdiction over the spillway area.

Abandoned Pump House

The abandoned pump house just south of the reservoir was originally being considered as part of the NCDPW's augmentation report but was phased out during the final report. Under this plan, the site could be considered for renovation to an educational interpretive/nature center. It could house an interpretive display and literature, and could be manned by volunteers. Restrooms could also be made available for seasonal public use.

- **Segment 4**

  This segment encompasses mostly Bethpage State Parkway and, to a lesser extent, Southern State Parkway, where they pass through the watershed. The Creek runs through this segment, just south of Unnamed Pond under both parkways for approximately 0.5 miles. This section of Creek has the potential to become an exceptional trout habitat area. It has a good gravel base, nice overhead cover, and strong streamflow. With minor manipulation (e.g. small riprap to induce oxygenation; deep, cool water pockets for fish to reside during the warmer summer months) this objective could be achieved. Also, this area is inaccessible to humans and, therefore, an excellent holding area for breeding trout.

- **Segment 5**

  Eastern Tributary

  Stormwater pipes are feeding runoff directly into the eastern tributary throughout most of the corridor. The corridor is relatively dry during non-storm events, with the exception of a few small areas of standing water (infested with mosquito larvae). Streamflow augmentation to establish a continual water flow and create fish habitat could be an option to help control stagnant water and reduce mosquito breeding habitat, thus addressing the associated health concerns.

  In addition, the main surface water input into the Massapequa Creek system from this portion of the watershed occurs during the first-flush cycle (immediate influx of stormwater during storm event). This suggests that along with floodwater, there is a large input of impairments associated with this cycle. The installation of stormwater detainment/treatment structures would help eliminate this problem.

  South of Spielman Avenue

  The streambed located just south of Spielman Avenue has the potential to be an exceptional trout habitat if streamflow augmentation was implemented. The stream bottom in this area has a good pebble base preferential to brook trout spawning. Unfortunately, this location may be too close to the contaminated groundwater plume created by the Liberty Industrial Finishing site and augmentation may not be feasible. Besides augmentation allowing contaminated groundwater to enter the watershed surface water, it may also affect the movement of the plume. Prior to initiating any implementation plan, the Town must communicate with the USEPA about possible impacts to their remediation at the Liberty Superfund site.

- **Segment 6**

  This segment is located north of the headwaters of the Creek. It is densely developed with the primary land use being single-family residences. It also includes a portion of the southern tip of Bethpage State Park and greenways along both sides of the Bethpage State Parkway. There are little to no opportunities for wildlife habitat restoration or enhancement.

SECTION 6

Implementation Component

6.0 IMPLEMENTATION COMPONENT

It is the intention of this section to provide a long-term vision for the watershed and to describe a set of overall goals and objectives. The goals of the *Massapequa Creek Watershed Management and the Corridor Restoration Plan* are:

- Improve the quality of the water being discharged from the Creek into South Oyster Bay in order to protect water quality in the bay and to possibly reduce the extent of the area closed to shellfish harvesting.
- Maintain the biological integrity and values of the Massapequa Creek corridor.
- Protect the natural and open space values of the Massapequa Creek corridor for public enjoyment and the preservation of community character.
- Restore, where practical, habitats and living resources within the corridor.
- Provide a comprehensive framework and guide by which government entities, citizens, and non-governmental organizations can restore, manage, and preserve the Massapequa Creek corridor.
- Support and encourage educational programs and public outreach that promote the protection and restoration of the Massapequa Creek and watershed corridor.
- Recommend methods to improve legal jurisdiction to control nonpoint source pollution.
- Provide a process to measure the creek corridor restoration progress.

6.1 Changes in Institutional Arrangements

No significant changes in institutional arrangements are recommended at this time. However, each of the local municipalities should strive to work cooperatively with each other and with the NYSDEC and NCDPW to coordinate overall watershed protection and stormwater management efforts. Responsibility for implementation of the plan should be delegated to one individual (with support staff as necessary) from each affected community who is familiar with and involved in stormwater control, land management, and/or environmental resource and watershed protection. This delegated individual would oversee progress in implementing the plan within their respective jurisdictions and coordinate efforts to achieve watershed protection goals including implementation of municipal PH II, the South Oyster Bay stormwater mitigation plan, and this

plan. He or she also would ensure the effectuation and enforcement of existing laws and policies, seek funding for capital improvements and programs, and direct future plan updates and regulation amendments.

6.2 Steps to Revise Local Land and Water Use Controls to Protect and Restore Water Quality and Living Resources

Town	Implementation
Town of Oyster Bay	• amend land use planning to minimize the amount of land disturbed during development • protect natural vegetation and incorporate vegetative buffers into development approvals • promote the stabilization of soils as soon as possible after development • control erosion and sedimentation • require proper storage, application, and handling and disposal of trash, pesticides, fertilizers and other potentially harmful materials • ensure the proper operation and maintenance of drainage controls
Village of Massapequa Park	• consider amending code to more specifically address stormwater runoff associated with existing development to include regulations pertaining to soil stabilization • protect natural vegetation • control erosion • require the proper storage, operation, and maintenance of drainage facilities • consider revising its code or approval processes in a way to minimize the amount of land that is disturbed, place time limits on the duration that soil is exposed, and preserve natural features and vegetation
Village of Farmingdale	• consider revising its code or development review policies to minimize cut-and-fill operations • require proper grading of topsoil • require maintained runoff rates similar to pre-construction level • recharge all stormwater from a property on-site • preserve remaining previous areas

6.3 Actions to Achieve Compliance with Phase II

Nassau County

- The County should make a strong effort to identify and prioritize retrofit opportunities.
- The County should explore the feasibility of acquiring additional land for locating stormwater treatment facilities.

- The County should continue their storm drain stenciling program, expand its volunteer program to include an Adopt-a-Stream program, and assess its needs for other outreach programs that target specific water quality issues of concern.
- The County should work closely with the Town and with the Villages within the watershed to assure effective and uniform operation and maintenance practices that reduce the nonpoint pollution impacts of existing hydromodification activities.
- Nassau County should work closely with the SSER, Town, and Villages within its borders to develop comprehensive habitat restoration plans that identify and prioritize potential wetlands, streams, and riparian buffers for restoration.
- The County should continue to target training programs at contractors, building inspectors, and zoning and planning officials to help them promote effective nonpoint source management practices when they conduct site inspections, and to ensure the County's policies and requirements pertaining to hydromodification are uniformly understood, articulated and enforced.
- The County should consult guides such as *Native Species Planting Guide for New York City and Vicinity* (City of New York Parks and Recreation 1993) in its efforts to include a high percentage of native plants in new landscaping on public properties.

Town of Oyster Bay

- The Town should complete its inventory of contributing areas, stormwater outfalls, significant drainage sites, and catchment basins and retention structures, identify and prioritize retrofit and stream restoration opportunities, and implement comprehensive improvements according to a formal schedule.
- The Town should continue to incorporate stormwater retrofit projects into its Capital Construction Program, using federal and state funds to reduce local costs.
- The Town should continue to implement municipal PH II and *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan* policies and recommendations.
- The Town should consider expanding the issues addressed in its existing outreach and educational programs to include proper fertilizer and pesticide use around the home, the proper disposal of yard wastes, and the siting of compost piles.

- The Town should consider a simple publication for homeowners with information about the type and range of individual actions that impact stormwater runoff and surface water quality, and what measures can be taken to reduce these impacts.
- The Town should expand its cooperative outreach efforts with other entities, including private and non-governmental organizations, county offices (e.g. the Nassau County Soil and Water Conservation District), state and federal agencies, and local schools, universities and colleges.
- The Town should revise regulations to minimize the amount of land disturbed during development; conform development to the natural boundaries and alignment of waterbodies; protect natural vegetation; stabilize soils as soon as possible after development; control erosion and sedimentation prior to development; require the proper storage, application, handling and disposal of pesticides; and ensure the proper operation and maintenance of runoff management facilities.
- The Town should continue to target programs at contractors, construction workers, inspectors, and zoning and planning officials to ensure the Town's regulations and practices pertaining to nonpoint source management, impacts of hydromodification activities, and spill prevention and response are uniformly understood, articulated and enforced.
- The Town should work closely with the Villages of Massapequa Park and Farmingdale to ensure effective and uniform operation and maintenance practices that reduce the impacts of stormwater runoff from existing roads, highways, bridges and other municipal facilities.
- The Town should develop a habitat creation and restoration plan that identifies and prioritizes opportunities to create and restore tidal and freshwater wetlands and establish or reestablish riparian vegetative buffers.
- The Town should establish a policy to replace, when possible, impervious surfaces with pervious (planted) surfaces.

<u>Incorporated Village of Massapequa Park</u>

- Massapequa Park should consider modifying its code to include more restrictions on stormwater runoff associated with existing development. The modifications should include regulations pertaining to soil stabilization; protection of natural vegetation; erosion control; the proper storage, application, handling and disposal of trash, pesticides and hazardous

materials; and to ensure the proper operation and maintenance of runoff management facilities.

- Massapequa Park should consider establishing a GIS system to computerize the drainage mapping system, as well as other key Village resources. As the Town has already mapped the key drainage areas, it would be advisable for Massapequa Park to approach the Town to obtain the information that has been compiled thus far.
- Massapequa Park and the Town should both continue to incorporate stormwater retrofit projects into their respective Capital Construction Programs, using federal and State funds to reduce local costs.
- Massapequa Park should meet with landscaping contractors to review current practices and products used on municipal properties. Massapequa Park should make it mandatory for environmentally friendly products and practices to be used, and further educate the contractor on nonpoint source pollution concerns.
- Massapequa Park should consider expanding its public outreach educational materials to include all pertinent categories as well as providing information on the types and the range of activities that may impact stormwater runoff and surface water quality. Massapequa Park should also consider creating an outreach program aimed specifically at those residents who live along the waterfront, to encourage a program of environmental stewardship.
- Massapequa Park should revise its code in a way that will minimize the amount of land disturbance by placing time limits on the duration of land and topsoil disturbance, as well as preserving natural features and vegetation.
- Massapequa Park should establish an active inspection program for roadway and drainage systems that would evaluate impending repair needs and access current conditions to determine which areas may benefit from having existing drainage structures replaced with newer, more efficient systems.
- Massapequa Park should work more closely with the Town of Oyster Bay, teaming their efforts at combating nonpoint source pollution, particularly with regards to runoff from existing municipal roads, highways, bridges and other municipal facilities.
- Massapequa Park should formally recognize the environmental benefits associated with its bay front section, and promote boating regulations not only from the basis of safety, but also from the basis of protecting the environmental sensitivity of the area.

- Massapequa Park should evaluate and formalize its routine operation and maintenance procedures that address the nonpoint pollution impacts associated with municipal hydromodification activities.
- Massapequa Park should identify and prioritize opportunities to replace impervious surfaces with pervious ones.
- Massapequa Park should identify those areas within its jurisdiction where public feeding of waterfowl is a current or potential problem and develop an educational program to reduce waterfowl feeding in those areas.
- Massapequa Park should focus training programs on controlling nonpoint impacts of hydromodification activities and spill prevention and response. This would help inspectors, zoning and planning officials, contractors, and construction workers to become aware of relevant Town and State regulations and practices and promote uniform understanding and enforcement.

Village of Farmingdale

- Farmingdale has taken aggressive action toward addressing stormwater runoff, having identified several key projects that will aid in reducing the effects of nonpoint source pollution. Farmingdale should continue to incorporate stormwater retrofit projects into its regular operational practices using federal and state funds to reduce local costs.
- Farmingdale should plan to increase the number and frequency of inspections at drainage locations. Farmingdale should team with local schools to incorporate stormwater and pollution related issues into school curriculum. The enthusiasm of youth for various projects has proven a valuable tool for encouraging other family members to become more involved.
- Farmingdale should consider expanding the issues it plans to address with future educational materials to include all pertinent categories with regard to stormwater impacts and surface water quality.
- Farmingdale should revise the code to require the distribution of topsoil; the minimization of cut-and-fill operations; the maintenance of runoff rates similar to pre-construction levels; and the preservation of remnant pervious areas.

- Farmingdale should consider expanding its public outreach educational materials to include all pertinent categories as well as providing information on the types and the range of activities that may impact stormwater runoff and surface water quality.
- Farmingdale should consider expanding its training program to include outside contractors as well as municipal employees.
- Farmingdale should evaluate its routine operation and maintenance procedures that address the nonpoint pollution impacts associated with existing municipal hydromodification activities, and modify these where deemed appropriate in terms of Farmingdale's long-term plan.
- Farmingdale should identify and prioritize opportunities to replace impervious surfaces with pervious ones.

6.4 Implementation of the *Town of Oyster Bay South Oyster Bay Stormwater Discharge Identification and Mitigation Plan*

The Town should fully implement the *Town of Oyster Bay South Oyster Bay Stormwater Discharge Identification and Mitigation Plan*. Applicable conclusions and recommendations from the South Oyster Bay plan as set forth on page 110, Section 11.3, are as follows:

The Massapequa Creek watershed is considered to have relatively high pollution potential. Since stormwater from the entire watershed north of Linden Street converges before crossing the street, this roadway serves as a convenient and practical dividing line to address mitigation needs in the area.

North of Linden Street

The highest priority recommendations from the *Town of Oyster Bay South Oyster Bay Stormwater Discharge Identification and Mitigation Plan* in this area are as follows:

- Clean accumulated sediment from the lake, which stores the discharge from subareas MR-4, MR-6, MR-10, MR-11, MR-12 and MR-13, as described in the document's Table 23.
- Create settling basins in the channel between subareas MR-14 and MR-15. This action would benefit these two subareas, as well as subarea MR-1.

- Place leaching basins on Motor Avenue to capture the discharge from the Liberty Superfund site.

South of Linden Street

Except for subareas MR-5 and MR-16, all of the subareas in the Massapequa Creek watershed, south of Linden Street, are drained by numerous small positive drain systems, which discharge into subarea MR-5. The choices for treatment could either be placing swirl chambers at the outfalls of these systems or a shorter duration to the periodic cleaning of the drainage channels, detention ponds, and lakes. Work to clean the drainage channels, detention ponds and lakes is included in a NCDPW project currently under review.

Table 10. List of potential areas where the Stormwater Treatments suggested in the Plan can possibly be applied. In some locations more than one recommendation is applied.

Treatment	Practice/Device	Location
Vegetative Treatment	Grass Swales and Grassed Waterways	• Massapequa Park Maintenance Yard located just south of Brady Park. • Southeast corner of the parking lot of the Infinity car dealership located on the corner of Sunrise Highway and Ocean Avenue. • Western terminus of Terrace View Road in Farmingdale.
Structural Treatment	Water Quality Inlet Catch Basin	• 1st Avenue in Farmingdale
	Water Quality Inlet Catch Basin with Sand Filter	• Road leading to Mansfield Memorial Park • Several roads south of Merrick on the west side of the watershed (St. Mark, Neptune, Saltiare, and Beach) • 1st Avenue in Farmingdale (east side of Preserve) • 11th Avenue in Farmindale (east side of Preserve) • Eastern tributary at end of Orchard Street, Ludwig, Copland, Leroy and Sullivan • Eastern tributary at both sides of Washington • Eastern tributary at both through roads (Mathew and Lincoln)
	Water Quality Inlet Catch Basin with Oil/Grit Separator and Swirl Chamber	• Road leading to Mansfield Memorial Park • Several roads south of Merrick on the west side of the watershed (St. Mark, Neptune, Saltiare, and Beach) • 1st Avenue in Farmingdale (east side of Preserve) • 11th Avenue in Farmindale (east side of Preserve) • Eastern tributary at end of Orchard Street, Ludwig, Copland, Leroy and Sullivan • Eastern tributary at both sides of Washington • Eastern tributary at both through roads (Mathew and Lincoln)

6.5 Implementation of the *Massapequa Creek Watershed Management and Corridor Restoration Plan*

Plan implementation will involve many steps. The timing and prioritization of certain actions will vary depending on Town and or village preferences, priorities, staffing, and other factors. Below is the list of Town priorities for this plan:

Table 11. List of priorities and time of implementation once the program is adopted.

Time Table	Priority
Month 1	Identify and delegate responsibilities for overseeing the implementation of the plan in each respective jurisdiction
Months 1 through 3	Become thoroughly familiar with this plan, the *Long Island South Shore Estuary Reserve Comprehensive Management Plan, South Oyster Bay Stormwater Discharge Identification and Mitigation Plan,* municipal PH II program, and other applicable plans, programs and laws relating to watershed protection by involved individuals.
Months 2 through 4	Evaluate specific technological and resource needs such as GIS capabilities and staffing (including Village of Massapequa Park)
Months 2 through 12	Authorize, draft, revise, schedule public hearings, and adopt applicable zoning code amendments to address issues identified by this plan.
Months 4 through 12	Plan and organize for a comprehensive public education outreach and training program. Draft appropriate materials for distribution. This should be conducted jointly with adjoining municipalities involved and interested agencies and organizations.
Month 5 through Year 3	Consider and apply for grants or other funding based on the information outlined in this plan and budget for non-funded or grant matching requirements through municipal budgeting programs.
Months 8 through 12 (periodically thereafter)	Publish necessary pamphlets and other written or website educational materials
Year 2 and periodically thereafter	Carry out public outreach meetings and education programs.
Year 2 through Year 3	Develop and effectuate site specific habitat creation and restoration plans for identified areas (Section 5 of this plan) including infrastructure improvements sites.

Time Table (cont)	Priority (cont)
Year 2 through Year 3	Authorize drainage system construction and improvements as recommended by this plan (Section 5) and other adopted resource management (e.g., *South Oyster Bay Stormwater Discharge Identification and Mitigation Plan*), Phase II, and capital improvements plans and programs.
Year 2 through Year 5	Acquire needed technological improvements and train or hire appropriate personnel
Year 2 through Year 5 (implement accordingly)	Establish, coordinate, update, and implement a drainage structure maintenance and street sweeping schedule and identify responsible personnel
Year 2 through Year 5	Conduct final inspections of existing drainage facilities or areas known or identified as problematic and select exact approach to mitigation based on information provided in the plan
Quarterly through end of implementation phase	Schedule monthly meetings with other responsible parties and staff from other affected jurisdiction to coordinate efforts.
Ongoing	Oversee compliance with existing and proposed laws

6.6 Funding Sources

Department of Commerce, National Oceanic and Atmospheric Administration (NOAA)

NOAA is responsible for providing technical assistance through the Resource Conservation and Assessment/Coastal Resources Coordinator (CRC) program. The CRC program was established to restore coastal and marine environments affected by hazardous waste releases through the development of plans and projects to address the elimination of waste sources and the decontamination of affected sites. The CRC program offers technical assistance from a variety of professionals having expertise in evaluating ecological risk, the potential types and sources of pollutants, development and implementation of techniques for evaluating the magnitude and consequences of environmental degradation, assessment of the cost-effectiveness of strategies for remediation, and the design of monitoring protocol.

In addition the CRC program, NOAA's Community-based Restoration Program (CRP) applies a grassroots approach to restoration by actively engaging communities in on-the-ground restoration of fishery habitats around the nation. According to the NOAA website http://www.nmfs.noaa.gov/habitat/restoration/projects, the CRP emphasizes partnerships and

collaborative strategies built around restoring NOAA trust resource and improving the environmental quality of local communities. The program is instrumental in promoting the following:

- Providing seed money and technical expertise to help communities restore degraded fishery habitats
- Developing strong partnerships to accomplish sound coastal restoration projects
- Promoting significant community support and volunteer participation
- Instilling stewardship and an abiding conservation ethic
- Leveraging resources through national, regional, and local partnerships

Transportation Equity Act for the 21st Century (TEA-21)

The Nassau Suffolk Transportation Coordinating Committee (NSTCC) is authorized to administer the initiatives of TEA-21. TEA-21 provides funding for a number of transportation-related projects including stormwater control projects that are proposed for the purpose of improving environmental quality.

Clean Water Act (CWA), Section 319

In 1987, Congress amended the Federal CWA by adding Subsection 319, entitled the *Nonpoint Source Management Program*. The purpose of the amendment was to provide guidance and monetary support to states and local governments in the development and implementation of nonpoint source initiatives.

USEPA is authorized under subsection 319 of the CWA to distribute federal grants to states for use in state stormwater control programs and projects that have been subject to USEPA review and approval. Grants are available for a number of nonpoint source ventures including financing, procurement of technical expertise, educational instruction, technology transfer, implementation of pilot projects, and the monitoring of particular nonpoint source projects. NYSDEC implements many of the environmental programs developed at the federal level and is responsible for distributing some federal funds to local communities.

Clean Water Act State Revolving Loan Fund (CWASRF)

The primary purpose of the CWASRF is to promote water quality by funding proactive, reactive, and restoration projects and programs to protect water resources. Low-interest loans for water quality control improvements are offered to communities under the Federal CWA, State Revolving Loan Fund (SRLF). The SRLF was initially seeded by funds provided by federal grants and the matching funds of states to finance nonpoint pollution sources projects that are developed in accordance with the state's Nonpoint Source Management Plan. Projects considered to be eligible for funding include: acquisition of environmentally sensitive land; waterbody and wetland restoration projects; and erosion and sedimentation control projects. As SRLFs are amortized, the loan fund is replenished, and funds become available for dispersal to other entities for their projects. The self-sustaining nature of revolving loan programs is essential in ensuring the availability of future funding resources and the perpetuation of adequate stormwater treatment control.

Although funding may be used for a variety of reasons, the fund has often been used for projects that prevent and remediate contamination from what is known to be one of the most ubiquitous water quality contaminants in the United States: Methyl Tertiary Butyl Ether (MTBE). MTBE is an ingredient that was added to gasoline to increase oxygen content, yet is being phased-out due to its known adverse impacts on the environment. Over the past decade, MTBE was used in increasing quantities to meet the standards set forth under the Federal Reformulated Gasoline and Oxyfuels programs developed by Congress and incorporated into the 1990 amendments to the Clean Air Act.

New York State Environmental Protection Fund (EPF)

The EPF was created in 1993 to provide funding for environmental protection initiatives. NYSDOS, NYS Department of State has the authority to issue 50/50 matching grants for use in a range of activities, although priorities can differ from year to year. Types of projects assisted by EPF grants have included:

- Waterfront redevelopment including both planning and implementation of construction initiative, providing public access, and environmental enhancements;

- Development or effectuation of inter-municipal water management plans such as undertaking nonpoint stormwater control projects and restoration of aquatic habitats;
- Projects involving the creative use of dredge spoil;
- Coastal education programs, and tourism development; and
- Development and effectuation of Local Waterfront Revitalization Programs (LWRP) or other similar local initiatives.

Funds are also provided to the NYSDEC for stormwater mitigation projects, and the Office of Parks, Recreation and Historic Preservation for the acquisition and preservation of land to be included as public parklands under Title 7.

Waterfront Redevelopment

NYSDOS, in cooperation with the Empire State Development Corporation and other involved state agencies, offers funding and technical support to local governments for preparing and administering waterfront development plans for derelict and underutilized waterfronts, property, and structures which present a potential for redevelopment by being located within or in proximity to a business district that is served by adequate utilities and transportation infrastructure, and where development will have the following impacts:

- Result in the creation of public access opportunities between commercial districts and the waterfront
- Significantly revitalize economic vitality in existing business districts
- Promote and expand the recreational, cultural, and economic opportunities of the waterfront
- Augment the protection of environmental resources in project areas

Funding and technical guidance is provided for necessary planning, design, feasibility analyses, marketing, institution of economic development programs, and project completion.

Candidates for funding are chosen based upon demonstration of community leadership, the ability to effectively develop partnerships with the public and governmental agencies, a

willingness of the community at-large to endorse project objectives, and a reasonable expectation of economic success.

Save Our Environmental Assets Fund (SEA Fund)

By public referendum approved in November of 2001, the Town of Oyster Bay created SEA Fund. The conception of the fund involved the floating of a $30 million dollar bond to finance a variety of project types. The fund is specifically earmarked for land acquisition, preservation of environmentally significant and sensitive areas, implementation of water front enhancements, and improvements to parks and other recreational facilities. Because many of the Town's parklands and greenways are located adjacent to environmentally significant surface waterbodies in the study area, there is a potential to utilize some of these funds toward ensuring adequate stormwater controls and in the institution of other projects and activities which will support area water quality improvements, as well as enhance recreational facilities and open spaces.

The 2001 SEA Fund was so successful at meeting its intended goals that the Town decided to place another $30 million dollar bond initiative (SEA Fund II) on the November 2, 2004 ballot. The initiative which earmarks $20 million for open space and parkland acquisition and $10 million for park improvements was overwhelmingly approved by a margin of more than two to one. The funds will be dispensed in accordance with site selection criteria that will be established by a designated Environmental Bond Fund advisory committee.

For a third time on November 7, 2007, Town voters approved the $30 million environmental bond issue (SEA FUND III). Supervisor Venditto stated "Quality not quantity, will be the deciding factor when selecting projects or properties to acquire. They will be selected across the Town based on resident input and recommendations of the Advisory Committee."

Town Capital Improvement Funding/Municipal Bonds

The Town could also fund stormwater infrastructure projects through a variety of standard municipal financing mechanisms such as the use of Town Capital Improvement Funds and General Obligation Bonds (Municipal Bonds).

Although towns are eligible to receive lower interest rates than most other entities when they pledge the full faith and credit of their taxing authority to guarantee payment, bonds of less than one million dollars do not usually meet the minimum requirements for cost-effective underwriting and can, as a result, be prohibitively expensive to issue. One way to fund projects, such as stormwater control, is to create a multi-jurisdictional alliance that can integrate plans, financial need, and consolidate the debt incurred by the funding process.

Consolidation of debt may include the following:

- Development of a project-specific, multi-jurisdictional district
- Utilization of regional or State funding resources to finance projects
- Consolidation of bonds of a number of local municipal entities so as to have one joint issue

6.7 Monitoring Strategy for Evaluating Performance

In order to ensure smooth implementation and to measure progress toward meeting goals of this watershed management and corridor restoration plan, it is imperative to design a monitoring strategy for evaluating performance. It is necessary to have an adaptive management approach that is not linear but circular to allow for feedback and integration of results back into the plan. It is important to create decision points at which data collected can be reviewed and then a decision made as to whether to make changes to the plan or stay on course. The *Massapequa Creek Watershed Management and Corridor Restoration Plan* should be reviewed periodically by a designated local official and staff in order to monitor the plan's success. Implementation monitoring should be coordinated with other involved agencies, local officials, and the Incorporated Villages of Farmingdale and Massapequa Park. It should also be fully examined and amended as necessary in no more than five-year increments to address changing conditions.

SECTION 7

Conclusion

7.0 CONCLUSIONS

Massapequa Creek, in conjunction with the Massapequa Park and Preserve, is a unique and critical environmental resource as described in this report. There are various plans, programs, permitting requirements, and laws in place to address environmental and water quality impacts affecting the Massapequa Creek. However, additional protection and focus is warranted to ensure that the integrity of these resources is not further compromised, if not fully restored and enhanced. The *Long Island South Shore Estuary Reserve Comprehensive Management Plan (*CMP*)* in particular sets forth a number of general goals and recommendations for protecting the estuary and its contributing streams and watersheds. The *Massapequa Creek Watershed Management and Corridor Restoration Plan* builds off of the South Shore Estuary Reserve Plan by focusing on Massapequa Creek and its watershed and tailoring specific preventative and corrective actions toward the protection of this resource. The plan identifies environmental issues and concerns in the watershed and sets forth a number of viable techniques and strategies to safeguard the Creek's water quality, wildlife habitat, and other natural features and resources. Implementation of these actions will help to preserve and protect the creek for future generations and, along with other actions associated with the South Shore Estuary Reserve CMP and other plans, programs, and regulations, will have a positive influence on the health of South Oyster Bay.

SECTION 8

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8.0 References

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