FINAL REPORT

BEAVER DAM CREEK WATERSHED MANAGEMENT PLAN

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June 2009

This report was prepared for the New York State Department of State and the Long Island South Shore Estuary Reserve Council with funds provided under Title 3 of the Environmental Protection Fund.

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Acknowledgements

The Beaver Dam Creek Watershed Management Plan was prepared with the efforts of the following government officials, agencies, community advisors and consultants.

State of New York
Dennis Mildner, Coastal Resource Specialist, New York State Department of State (DOS)
Tracey O'Malley, Coastal Resource Specialist, New York State Department of State (DOS)
Jeffrey Fullmer, Director, Long Island South Shore Estuary Reserve Office (SSER)
Clare O'Reilly, Program Implementation Specialist (SSER)
Sherry Forgash, Program Implementation Specialist (SSER)
Chart Guthrie, Fisheries Specialist, New York State Department of Environmental Conservation (NYSDEC)

Suffolk County
Robert Higgins, Suffolk County Planning Commission
Nancy Panarese, Suffolk County Department of Health Services (SCDHS)
Andy Rapiejko, Suffolk County Department of Health Services (SCDHS)
Nicole Spinnelli, Suffolk County Soil & Water Conservation District (SCSWCD)
Robert Waters, Suffolk County Department of Health Services (SCDHS)

Watershed Advisory Committee
Bethany Bearmore, National Oceanic and Atmospheric Administration (NOAA)
Ken Budny, Post-Morrow Foundation
Craig Ferris, Ducks Unlimited
Walter Dawydiak, Suffolk County Department of Health Services (SCDHS)
Derek Rogers, Suffolk County Department of Health Services (SCDHS)
Dick Watson, Suffolk County Planning Commission
Anthony Graves, Town of Brookhaven Department of Planning
Michael Jensen, Suffolk County Department of Health Services (SCDHS)
Karen Blumer, Open Space Preservation Trust
Jake Kritzer, Environmental Defense
Martin Van Lith, Open Space Commission
Mary Jane Cullen, Brookhaven Village Association
Michael Mule, Suffolk County Planning Commission
Dan O'Connor, Teacher, Bellport High School/Students for Environmental Quality (SEQ)
Alan Svoboda, Town of Brookhaven Department of Environmental Protection
Paul TeNyenhuis, Suffolk County Soil & Water Conservation District
Robert Waters, Suffolk County Department of Health Services (SCDHS)
Ray Whittemore, Ducks Unlimited
Thomas Williams, President, Post-Morrow Foundation and Cornell Cooperative Extension
Ron Verbarg, Suffolk County Planning Commission
Tony Leung, New York State Department of Environmental Conservation

Bellport High School's Students for Environmental Quality (SEQ)
Carolina Calderon
Romina Calderon
Danielle Christensen
Jamie Cunningham
Samantha Freedman
Steve Gazzola
Dina Milano
Brittany Miller
Francesco Nunez
Rebecca Ronstadt
Aubrey Russo
Gee Toronto
Kayla Zimering

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Charles Voorhis, Principal
Carrie O'Farrell, Project Manager
Sara N. da Silva, Environmental Scientist
Lara Pomi-Urbat, Environmental Analyst

EXECUTIVE SUMMARY

This Watershed Management Plan (WMP) focuses on Beaver Dam Creek in the Town of Brookhaven, Suffolk County, New York. Beaver Dam Creek is a priority tributary which flows into Great South Bay and is included within the Long Island South Shore Estuary Reserve (SSER) established by New York State in 1993. This document characterizes the natural resources, identifies known impairments, inventories existing land uses and open space, provides a comprehensive stormwater infrastructure inventory, determines critical stormwater runoff areas, recommends actions to prevent further degradation, as well as develops an implementation strategy to restore the watershed.

The specific goals of the WMP include:

- Protecting and restoring natural resources.
- Inventorying pollution sources and improving water quality.
- Increasing public knowledge and understanding of the surrounding natural as well as cultural resources.
- Promoting environmental stewardship.
- Maintaining/promoting appropriate uses within the watershed.

It is clear that the leachate plume emanating from the Town of Brookhaven landfill is of utmost concern to the community. Specific remediation measures to address the plume are not within the scope of this document, as Town and County officials are specifically working with the Beaver Dam Creek Water Quality Group to assess the current status of the plume so that mitigation measures and a detailed plan of action can be devised. This WMP recognizes the plume as a serious threat to natural resources and public health and provides recommendations for continued efforts and coordination to monitor, track and mitigate the plume. However, a myriad of other pollutant sources and impairments also impact the watershed and are extensively addressed within this document to provide a holistic approach for achieving the goals of the Beaver Dam Creek Watershed Management Plan. Recommendations are consistent with the findings and recommendations of earlier studies, including the 1995 *Brookhaven/Southaven*

Hamlet Study, the 2001 *SSER Comprehensive Management Plan (CMP)*, and the 2008 *Inventory and Analysis of Barriers to Fish Passage for Six Long Island South Shore Estuary Reserve Tributaries.* These recommendations are broken down into watershed-wide recommendations, as well as target projects and priority actions within **Section 4.0** of this document. Implementation measures, including recommended revisions to local land and water use controls, are identified within **Section 5.0** of this document.

The greatest benefit for improvement of localized water quality and natural resources can be achieved by focusing on subwatersheds identified as contributing the largest pollutant loads or having the greatest sensitivity. Recommended projects within these target subwatersheds include:

- Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Montauk Highway, South Country Road and several other smaller roadways within the watershed to either redirect stormwater from the existing catch basins that directly discharge to the tributary, or to capture stormwater and recharge it in areas where it currently enters the tributary as overland runoff.
- Exploring opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas (such as cul-de-sacs) with porous pavement or grass pave.
- Initiation of inspections and enforcement of surrounding businesses to monitor potential discharge violations and to prevent further chemical discharges to the tributary.
- Coordination between the Town, SCDHS and NYSDEC to further monitor the plume to track the full extent of its reaches and establish options and secure funding for plume remediation to prevent further spread of the plume into the tributary and groundwater.
- Routine monitoring and clean out of existing catch basins to remove leaf debris, sediments and floatables.

- Pursuing resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).
- Reducing existing pavement at the terminus of Bay Road in close proximity to the water (i.e., replace unused concrete area with native plantings and four foot wide access path or evaluate feasibility of bioretention area installation to provide stormwater storage and treatment prior to overflows into the Bay.
- Requiring installation of stormwater drainage improvements and consider conversion of existing impervious parking area to pervious pavement or gravel parking/storage areas during any future site plan or building department application for Beaver Dam Boat Marina to reduce runoff and improve stormwater recharge
- Requiring the installation of stormwater retention for any newly proposed impervious surfaces.
- Pursuing the purchase of existing vacant land for the creation of a recharge basin to redirect stormwater to recharge facilities and away from the tributary.
- Reducing impervious surface area which contributes stormwater runoff to the tributary by educating and working with homeowners to consider pervious alternatives to paved areas and on-site stormwater recharge options (e.g. rain gardens, rainwater collection systems for reuse as irrigation, dry wells, etc.).
- Remediation of the three temporary barriers to fish passage which occur within the tributary, specifically:
    - Fish Barrier Crossing 50 - Replace the collapsed culvert below the LIRR to allow for unimpeded passage of fish and wildlife.
    - Fish Barrier Crossing 51 - Remove the short section of chain link fence which currently crosses through Beaver Dam Creek on the north side of the LIRR.
    - Fish Barrier Crossing 46 – Remove log jam which is currently impeding fish passage near the vicinity of Beaverbrook Drive.

SECTION 1.0

1.0 INTRODUCTION

1.1 Purpose

This Watershed Management Plan (WMP) identifies important resources within the Beaver Dam Creek watershed and recommends appropriate long-term management measures to maintain and improve the water quality and natural resources of this tributary within the South Shore Estuary Reserve (SSER). The *SSER Comprehensive Management Plan* (CMP) was completed in 2001 and aims to improve the Reserve's water quality, restore its living resources, protect its rich maritime heritage, and expand its estuary-related economy. This document is consistent with the objectives of the SSER CMP, which identifies the Beaver Dam Creek watershed as a priority for restoration, and serves to advance its recommendations. Specifically, the SSER CMP identified the Beaver Dam Creek watershed as a priority for the following implementation measures:

- Construction of stormwater abatement projects in significant nonpoint source contributing areas associated with closed shellfish beds, impaired living resources, and bathing beaches that experience periodic closures due to water quality concerns (Implementation Action 1-1).
- Habitat restoration in tributaries (Implementation Action 4-4).
- Acquisition of open space (Implementation Action 5-5).

A watershed is an area of land which drains to a certain low point on the landscape, such as a stream, river or lake. Generally defined by topography, a watershed boundary will follow the highest elevations surrounding a waterbody. Beyond this boundary, a drop of water which falls on the ground will typically run off and drain to another watershed (unless it is infiltrated into the ground). Consequently, development activities and land uses within a watershed can greatly affect the volume as well as the quality of the water which flows over the landscape to a stream.

Beaver Dam Creek and its watershed are located on Long Island's south shore and lie within the Town of Brookhaven, Suffolk County, New York. This tributary empties into Bellport Bay, which is within the Great South Bay portion of the SSER. The tributary's watershed and the watercourse itself are important natural and ecological resource features of the surrounding area.

Management of these resources is critical to maintaining the environmental integrity of Beaver Dam Creek and Great South Bay.

The *Brookhaven/Southaven Hamlet Study* (**Koppelman, 1995**) encompasses the majority of the watershed study area and provides several recommendations pertaining to the protection of Beaver Dam Creek through preservation of open space, zoning recommendations and stormwater runoff controls. While many of the recommendations in the Hamlet Study have already been undertaken (i.e. acquisition of key parcels such as Lohmann's Farm, which is also known as Deer Run Farm), this WMP incorporates many of the additional recommendations of the Hamlet Study that would further aid preservation of natural resources.

Since 2001, the Town of Brookhaven has been active in implementing stormwater abatement projects, as well as restoring tidal wetlands habitat with the aid of the Beaver Dam Creek Task Force. Additionally, the Town, Suffolk County, and the Post-Morrow Foundation have been instrumental in acquiring extensive acreages of land within the Beaver Dam Creek watershed for preservation.

NP&V recently completed an *Inventory and Analysis of Barriers to Fish Passage for Six Long Island South Shore Estuary Reserve Tributaries* (**NP&V, 2008**). The historic documentation of spawning runs and existing quality of natural habitat within Beaver Dam Creek led to its inclusion within this barrier assessment due to its potential for habitat restoration through fish passage improvements. Although there are no dams present on this tributary, a total of 14 crossings were identified during field investigations, 3 of which present temporary barriers to fish passage. Therefore, this WMP serves to incorporate the recommendations of the fish barrier report to remove the encountered barriers within Beaver Dam Creek.

The WMP will aid the implementation of goals from the SSER CMP and provide a basis for future decisions regarding land use and environmental resource protection within the watershed. It will also provide a foundation on which to monitor the progress of water quality and habitat restoration initiatives within Beaver Dam Creek.

1.2 Goals and Objectives

The primary goals of this WMP are to characterize the resources of Beaver Dam Creek in order to facilitate recommendations toward restoration of resources and implementation of improved protection measures for the Beaver Dam Creek watershed. Specific goals and objectives for the Beaver Dam Creek watershed are divided into four categories, as follows:

- **Natural Resource Goals**
  - Ensure protection of tidal and coastal freshwater wetlands for the benefits of water quality improvement, wildlife and diadromous fish habitat, marine food production, flood and storm control, open space and educational opportunities.
  - Restore wetland areas and wetland productivity where possible and appropriate.
  - Identify and protect important natural resources within the watershed.

- **Water Quality Goals**
  - Improve water quality through the identification, control and mitigation of nonpoint source pollution.
  - Inventory pollution sources and causes and examine remedial actions.

- **Educational Goals**
  - Promote environmental stewardship to increase awareness of watershed resources by partnering with existing organizations and watershed residents to implement stewardship activities, programs and outreach efforts.
  - Encourage and promote an understanding and appreciation of maritime historic uses and cultural resources (i.e. establish a historic trail and provide signage at key locations that tells a story about the historic boat building industry, interesting past residents, historic events, previous configuration of the tributary, etc.)
  - Encourage and promote an understanding and appreciation of natural environmental resources and habitats of the Beaver Dam Creek watershed.
  - Improve water quality education by informing watershed residents and businesses of common activities that cause water quality degradation and solutions to mitigate and eliminate impacts.

Use Management Goals

- Maintain, and expand where appropriate, public water access.
- Maintain and promote appropriate water-dependent land use.
- Improve and promote passive recreational and educational opportunities.
- Encourage appropriate land use that is sensitive to the natural resources of the creek.

SECTION 2.0

2.0 WATERSHED CHARACTERIZATION

This characterization of the Beaver Dam Creek watershed examines existing features and conditions including topography, soils, groundwater and surface water resources, upland and wetland habitat resources, known habitat impairments, land use and zoning, public access, recreation and open space areas, cultural resources and a comprehensive stormwater inventory.

2.1 Watershed Study Area

Beaver Dam Creek flows from north to south, emptying into Bellport Bay. The tributary is approximately 2.5 miles long and contains both a tidal segment below Beaver Dam Road, as well as a groundwater-fed freshwater portion that begins as far north as Sunrise Highway. The actual start of flow within the freshwater portion fluctuates from year to year with water table elevation, and can vary from the area immediately south of Sunrise Highway (Rt. 27) to Montauk Highway (Rt. 80). An aerial view of the watershed study area boundary is illustrated within **Figure 1-1**.

The watershed study area boundary for Beaver Dam Creek totals approximately 1,400 square acres within the Town of Brookhaven and is the area of overland surface flow from which stormwater runoff flows toward the tributary, contributing to its flow and water quality characteristics. The surface runoff area was delineated by the Suffolk County Soil & Water Conservation District (SWCD) using 2-foot topographic contours and then the contributing areas were field-truthed to account for field conditions and observed drainage infrastructure (**McMahon, 2003**). This boundary was used by Suffolk County Department of Health Services (SCDHS) in their water quality report for Beaver Dam Creek (**SCDHS, 2008**). The watershed boundary is defined as follows:

> Beginning east of the Town of Brookhaven landfill, approximately 2,500 feet north of Sunrise Highway at Horse Block Road, heading south approximately 500 feet west of Yaphank Avenue to Sunrise Highway, heading in an easterly direction along Sunrise Highway for approximately 1,000 feet before heading south along the west side of Yaphank Avenue for approximately 4,000 feet, before heading in a southeast direction

along Birchbrook Court to Chapel Avenue, before heading in a southwest direction for approximately 2,500 feet to Library Lane, before heading south for approximately 6,500 feet along Astor Avenue to the NYS Conservation Area, then bearing west for approximately 3,500 feet to Lindner Court, then bearing northwest for approximately 2,000 feet along Bellhaven Road, before heading northeast for approximately 1,500 feet to South Country Road, and then bearing north for approximately 3,500 feet to the junction of Montauk Highway and Cemetery Road, before bearing northwest for approximately 2,000 feet toward Martha Avenue, then bearing northeast for approximately 2,000 feet, before heading northwest for approximately 1,000 feet to Sunrise Highway, then bearing east along the Sunrise Highway North Service Road for approximately 3,000 feet, before bearing north for approximately 1,500 feet to Old Town Road, before heading east for approximately 750 feet, then bearing north for approximately 1,000 feet to the commencing position at Horse Block Road.

An alternative topographic watershed boundary prepared by the NYSDOS was initially considered for the study area. This watershed boundary was delineated using a United States Geological Survey (USGS) hydrologic data set based on 10 meter Digital Elevation Contours. Although this boundary included the Town of Brookhaven landfill, it was based on lower resolution topographic information and was not field-truthed. Although not within the surface flow contributing area, the presence and subsequent impacts of the landfill within the groundwater contributing area of Beaver Dam Creek are discussed in **Section 2.3.2**. Therefore, the consensus of the Watershed Advisory Committee was to utilize the SWCD watershed boundary to maintain consistency with the County's water quality study, as well as to utilize the most accurate topographic and ground-truthed information for characterization of the watershed and for stormwater pollutant load analyses for Beaver Dam Creek.

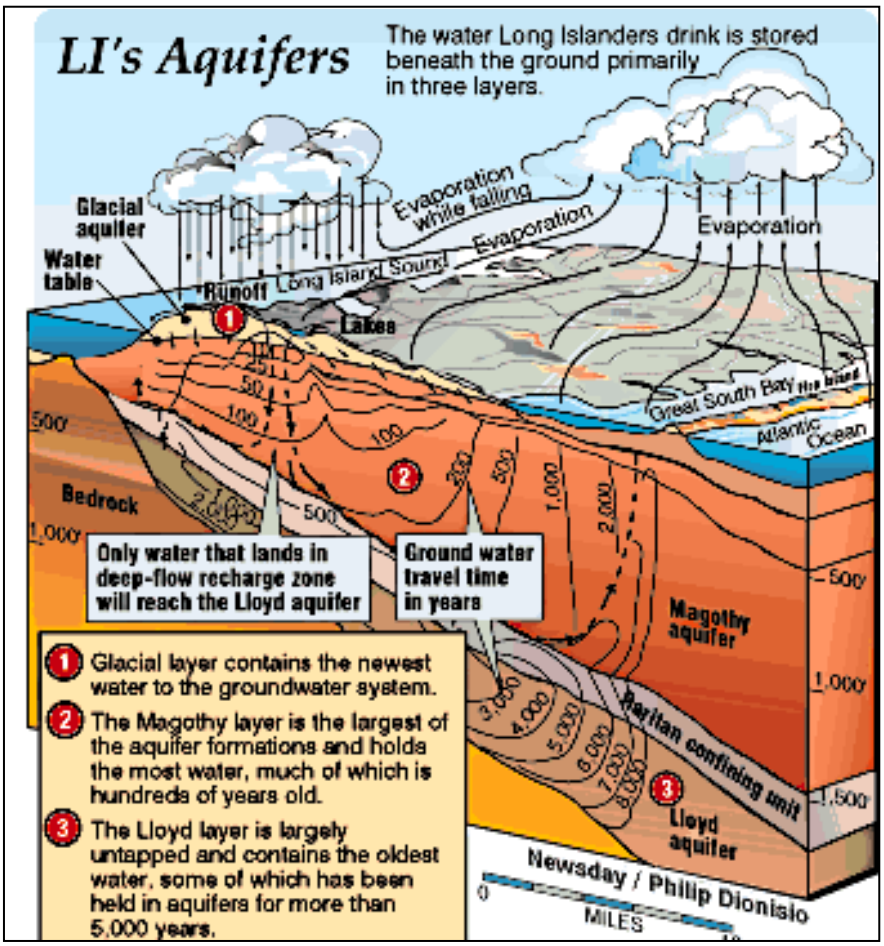
2.2 Geologic Resources

Geologic resources include topography, soils, hydrology and surface drainage area. Each of the resources examined is a contributing factor to the environmental characteristics of the watershed. Understanding these characteristics is important in assessing feasible management actions.

2.2.1 Topography

Long Island is located within the Atlantic Coastal Plain, a physiographic province in which substantial sediment deposits overlie bedrock **(Fuller, 1914).** The surface topography primarily reflects the glacial history of the Island and subsequent human activity. The bedrock which underlies Long Island"s Glacial, Magothy and Lloyd Aquifers (**see graphic below**) slopes south and east at a rate of approximately 70 feet per mile, and the overlying sediments increase in thickness toward the south **(Jensen and Soren, 1974; Smolensky, et al., 1989).**

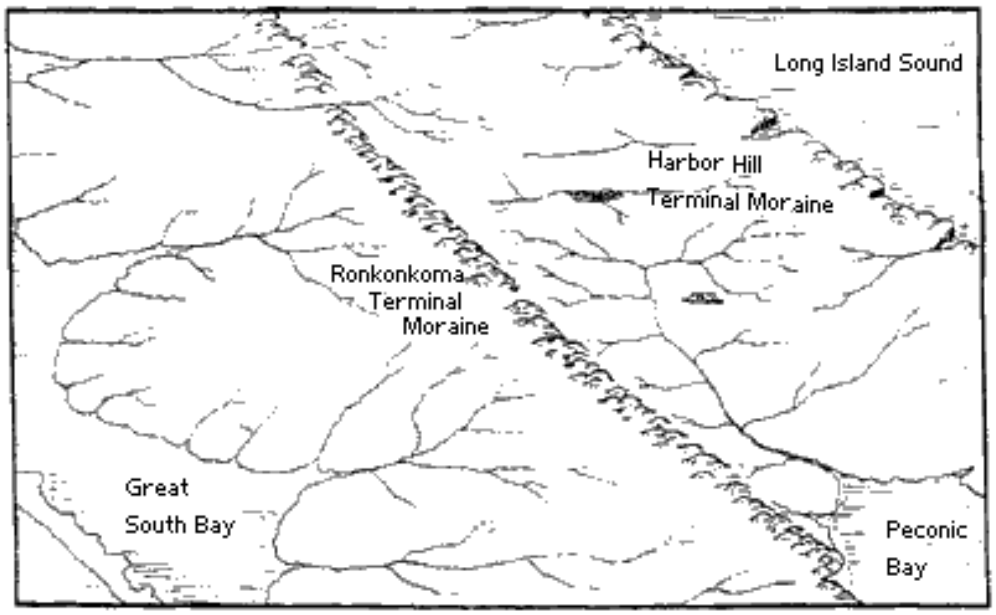
Long Island's Aquifers



Source: Newsday and *Suffolk County Water Authority*

The topography forming the watershed for Beaver Dam Creek is a glacial meltwater feature. Glacial advance during the Pleistocene Epoch resulted in the deposition of terminal moraines associated with the ridge in the center of the Island (Ronkonkoma Terminal Moraine) and the bluffs on Long Island"s north shore (Harbor Hill Terminal Moraine). During glacial retreat, the meltwater from the glaciers formed meltwater swales resulting in river systems and topographic swales through the glacial outwash plain deposits south of the terminal moraine (**see graphic below**). This geologic origin formed the swale now occupied by Beaver Dam Creek.

Terminal Moraines on Long Island



Source: *GarviesPointMuseum.com*

The watershed itself is an area of land surrounding Beaver Dam Creek from which stormwater runoff on the landscape will flow by gravity to the tributary. The watershed boundary generally follows the highest elevations surrounding Beaver Dam Creek. Development activities and land uses within the watershed can greatly affect the volume as well as the quality of the water which flows over the landscape. The quality of groundwater which recharges to the tributary can also be affected by land uses within a watershed. Defining the surface water and groundwater contributing area and establishing appropriate land use practice is critical in ensuring the long-term improvement of Beaver Dam Creek.

The topography of the watershed area, as depicted in **Figure 2-1** generally slopes from a northerly to southerly direction, with a maximum elevation of ±80 feet above sea level (asl). A greater amount of drainage to the creek occurs on the western bank, which has a greater variation in relief than the eastern bank.

2.2.2 Soils

The USDA Soil Survey of Suffolk County, New York **(Warner et al., 1975)** provides a complete categorization, mapping and description of soil types found in Suffolk County. Soils are classified by similar characteristics and depositional history into soil series, which are in turn grouped into associations. These classifications are based on profiles of the surface soils down to the parent material, which is little changed by leaching or the action of plant roots. An understanding of soil character is important in environmental planning as it aids in determining vegetation type, slope, engineering properties and land use limitations. These descriptions are general, however, and soils can vary greatly within an area, particularly soils of glacial origin. The slope identifiers named in this subsection are generalized based upon regional soil types.

Generally, the soils located within the Beaver Dam Creek watershed, as depicted in **Figure 2-2,** consist of Riverhead Sandy Loams (RdA, RdB, RhB, RhC), which are generally characterized as deep, nearly level to gently sloping, well-drained and moderately course textured. These soils are located primarily on the southern outwash plain. Other soils within the watershed include cut and fill land, Haven soils (HaA), Deerfield sand (De), Muck (Mc), Fill land dredged material (Fd), Carver soils (CpA, CpC), Plymouth soils (PlA, PlB, PlC), Sudbury soils (Su), Wareham soils (We), and Tidal Marsh (Tm).

2.3 Water Resources

The hydrology of the watershed is characterized by surface hydrology, flood zones, groundwater flow and water supply.

2.3.1 Groundwater

Groundwater Flow

A groundwater model was developed for the south shore of Suffolk County (**CDM, 2003**), but the model did not determine individual groundwater contributing areas for individual tributaries. Based upon the results of the Suffolk County model, the Beaver Dam Creek 500-year groundwater contributing area may extend as far north as County Route 25. However, a comprehensive groundwater contributing area to Beaver Dam Creek currently does not exist and is recommended to be delineated by a hydrogeologist to gain a better understanding of the water resources which may affect this tributary.

An earlier watershed boundary for Beaver Dam Creek watershed, as defined in the SSER CMP, extends farther to the northwest than the current surface water contributing boundary delineated by SWCD and utilized as the watershed study area boundary for this document. Much of the additional area within the earlier SSER CMP watershed, which includes the nearby Town of Brookhaven landfill, recharges directly to groundwater through soil infiltration on natural and man-made surfaces, leaching pools and recharge structures, rather than directly to the creek via overland flow. Water recharged within the groundwater contributing area will eventually enter the creek through groundwater outflow. The quality of recharge is important, particularly with respect to contaminants that persist in groundwater (e.g. MTBE, diethyl ether, DEET, ibuprofen, manganese); however, groundwater flow through porous aquifers will result in attenuation of some contaminants. As a result, groundwater recharge from typical land uses is generally less polluted than surface water runoff (particularly with respect to bacteria and metals that are attenuated in soil) due to the filtering properties of the soils through which the recharged water passes through.

Based on the regional topography of the watershed and a USGS Water Resources Investigations Report #86-4207 (**Wexler, 1988**), depth to groundwater ranges from 0 to 60 feet asl within the watershed. Groundwater generally flows in a southeasterly direction, but does have a small area of southwesterly flow near the center of the creek (**Figure 2-3**).

Beaver Dam Creek and its watershed are not located in a Special Groundwater Protection Area. According to the *Suffolk County Comprehensive Water Resources Management Plan* (**Dvirka and Bartilucci, 1986**), the watershed is located within Groundwater Management Zone VI, which is characterized as "…a region of primarily horizontal flow, with upward flow and discharge at the shoreline." Horizontal flow has the highest velocity in the Upper Glacial aquifer, and becomes progressively slower through the Magothy and Lloyd aquifers, respectively. Shallow groundwater, as distinguished by the Upper Glacial aquifer, is more susceptible to impacts from land use practices occurring on the lands overlying the water table, and as a result, may experience impacts and localized degraded water quality depending upon the land use. Deeper groundwater in the lower Upper Glacial and deeper Magothy and Lloyd aquifers, is generally of excellent quality except where degraded by migration of shallow contamination to deep aquifers over time, or by introduction of contaminants through injection conduits. Shallow groundwater entering the Beaver Dam Creek will have an effect on the water quality of the tributary.

Water Supply

Public water is available from the local water purveyor, the Suffolk County Water Authority (SCWA) within the majority of the watershed and throughout all existing residential areas. Most private wells draw from the Upper Glacial aquifer, and as a result are more susceptible to contamination depending upon the quality of water recharged in the contributing area of the well. Public drinking water within the watershed is drawn from wells outside of the watershed. SCWA water mains delivering public water are illustrated in **Figure 2-4**. Although water mains are already provided, the Town and County have been identifying people within the path of the leachate plume from the nearby Town of Brookhaven landfill to verify whether or not they are already using water from the SCWA. Suffolk County Department of Health Services (SCDHS) has been sending representatives door-to-door to test drinking water wells, and those not receiving SCWA water will be given the chance to connect to public water free of charge if they are presently utilizing private water wells within the affected area. A plan is being devised to adopt SCDHS recommendations for addressing the plume, which includes increasing the sampling and monitoring network for tracking the plume. Approximately 70 of the previous monitoring wells have already been located and monitoring is proceeding. As of April 2009, 22

wells have been sampled and additional soil borings have been conducted by Dvirka & Bartilucci with funding from the Town. The County has also conducted sampling of wells within the area. Sampling results are expected within the next two months. Following, an evaluation of results, a course of action will be implemented.

2.3.2 Surface Water

Surface Hydrology

Surface hydrology within the watershed is determined by the topography of the watershed. The quantity of runoff entering the tributary is affected by development in the surrounding area. Generally, runoff entering the tributary occurs from roadways, rooftops, lawns and landscaped areas where the natural vegetation no longer exists. Much of the stormwater runoff to the tributary is conveyed through stormwater infrastructure and impervious surfaces near surface water, as described in more detail in **Section 2.6.2**. Only localized overland flow will enter the tributary in areas where topography directs runoff toward the lower tributary elevation at times when the infiltration capacity of the soil is exceeded.

Surface Drainage Area

The topographic watershed boundary, as described in **Section 1.2**, was delineated by the Suffolk County Soil & Water Conservation District (SWCD) in 2002 using 2-foot topographic contours. The surface water contributing area was then field-truthed to account for true elevations and observed drainage infrastructure. This boundary was used by the Suffolk County Department of Health Services in their water quality report for Beaver Dam Creek (**SCDHS, 2008**).

Flood Zones

The flood zones of the tributary are illustrated in **Figure 2-5**. The 100-year flood zone extends to just south of Montauk Highway, at the crossing near Beaverbrook Lane. **Table 2-1** provides descriptions of each flood zone. **Figure 2-6** illustrates the Sea, Lake and Overland Surges from Hurricanes (SLOSH) area within the watershed. The area south of Beaver Dam Road has zones which include vulnerability from category 1 to category 5 hurricanes. A narrow area surrounding the tributary north of Beaver Dam Road and south of the LIRR have zones which

include vulnerability from category 2 to category 5 hurricanes. No SLOSH zones are identified north of the LIRR within the watershed.

Surface Water Quality Classifications

The Federal Clean Water Act requires states to periodically assess and report on the quality of waters in their state. The NYS Department of Environmental Conservation"s (DEC) most recent Atlantic/Long Island Sound Basin Waterbody Inventory/Priority Waterbodies List (PWL) Report for the Long Island region was issued in April of 2002. This report includes an overall evaluation of water quality in the Atlantic/Long Island Sound Basin, as well as assessments for specific waterbody segments in the basin. The freshwater portion of Beaver Dam Creek (PWL #1701-0104; WIN #AO-GSB-178) was listed as unassessed. However, the tidal lower portion is listed along with the lower portion of nearby Motts Creek (PWL #1701-0324, located to the adjacent west) as an impacted segment within which recreation is known to be stressed (**Appendix A**). Pathogens are listed as the primary cause of impairment, with urban runoff, storm sewers and „other" listed as sources. An update of water quality assessments for waters in this basin are scheduled to be conducted.

Currently, NYSDEC classifies the tidal portion of the creek as having SC water quality. Above Beaver Dam Road is the freshwater portion of the creek which is classified as C(TS). A water quality class of SC reflects marine waters that are best used for fishing, while a class of C(TS) is a higher classification which reflects freshwater suitable for both fishing and trout spawning. **Table 2-2** provides a listing of NYSDEC surface water quality classifications and their descriptions.

TABLE 2-1

FEMA FLOOD HAZARD AREA DESCRIPTIONS

FLOOD ZONES	Description of Flooding Conditions
Zone VE	Coastal flood with velocity hazard wave action; base flood elevations determined.
Zone X	Area determined to be out of 500-year floodplain; area of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 sq. mile; and areas protected by levees from 100-year flood.
Zone X500	Area determined to be in 500-year floodplain; area of 500-year flood with average depths of less than 1 foot or with drainage areas less than 1 sq. mile; and areas protected by levees from 500-year flood.
Zone A	Areas with a 1% annual chance of flooding and a 26% chance of flooding over the life of a 30-year mortgage. No depths or base flood elevations are shown within these zones.
Zone AE	Base Flood Elevations determined.
Zone UNDES	No defined flood plain hazard.
Source: Federal Emergency Management Agency (FEMA)	

TABLE 2-2

NYSDEC SURFACE WATER QUALITY CLASSIFICATIONS

Freshwater Classification	Best Usage
AA	Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. Suitable for fish propagation and survival.
A	Source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. Suitable for fish propagation and survival.
B	Primary and secondary contact recreation and fishing. Suitable for fish propagation and survival.
C	Suitable for fish propagation and survival. Also, for primary and secondary contact recreation, although other factors may limit the use for these purposes.
D	Due to such natural conditions as intermittency of flow, water conditions not being conducive to propagation of game fishery, or unsuitable stream bed conditions, the waters will not support fish propagation. Suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
Marine Water Classification	**Best Usage**
SA	Shellfishing for market purposes, primary and secondary contact recreation and fishing. Suitable for fish propagation and survival.
SB	Primary or secondary contact recreation and any fishing. Suitable for fish propagation and survival.
SC	Suitable for fish propagation and survival. Also, suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes.
I	Secondary contact recreation and fishing. Suitable for fish propagation and survival.
SD	Suitable for fish survival. This classification may be given to those waters that cannot meet the requirements for primary and secondary contact recreation and fish propagation for reasons of natural or man-made conditions.

Source: 6NYCRR Parts 700-705, Water Quality Regulations for Surface Waters and Groundwaters, effective September 1, 1991.
Note: Examples of *Primary contact recreation* include swimming, diving, and surfing. Examples of *Secondary contact recreation* include fishing and boating.

Suffolk County recently completed a water quality report for Beaver Dam Creek (**SCDHS, 2008**), which compiles the results of 30 years of water quality studies relevant to the tributary. The following findings are cited from the County"s 2008 report:

Sampling results indicate that Beaver Dam Creek is periodically subject to a combination of impacts from the surrounding watershed, predominantly due to stormwater runoff and a leachate plume from the Town of Brookhaven landfill, but also likely including a marina [Beaver Dam Boat Marina] located in the northern tidal reaches of the tributary, various other nearby commercial establishments, and possibly in certain locations, failing or poorly operating on-site septic systems.

Significant findings are summarized as follows:

- Dissolved oxygen levels in the freshwater reaches of the tributary were frequently depressed below established standards, possibly due to the low flow and shallow nature of the tributary, and likely exasperated by the hypoxic waters of the landfill leachate plume.

- Dissolved oxygen levels in the northern tidal portion of the tributary were also depressed on a number of occasions, particularly during the warmer summer months and in deeper bottom waters. Limited tidal flushing, nutrient inputs leading to algal blooms, and effects from sediment oxygen demand are likely contributing factors.

- Levels of total and fecal coliform bacteria were persistently elevated throughout the tributary, often exceeding various water quality standards, including those for surface waters, shellfishing areas, and bathing beaches. A strong relationship between coliform levels and stormwater runoff (rainfall) was clearly evident from results of wet-weather sampling.

- House barges moored at a marina [Beaver Dam Boat Marina] located in the northern tidal reaches of the tributary were found to be actively discharging untreated wastes to surface waters of the tributary. The discharges have since been removed, but were likely ongoing for a number of years. Effects on area nutrient and bacterial levels may have been significant, but have not been specifically assessed.

- Average chloride levels (measured only in the freshwater reaches of the tributary) were similar to those found in tributaries adjacent to densely populated and developed areas of the county, and significantly greater than averages found in nearby Forge River and Carmans River. The landfill leachate plume was likely a source of chlorides to the tributary, although in some areas other potential sources such as road salt and cesspool discharges may also exist.

- The nutrient results showed a periodic detection of unusually high levels of ammonia in the upper freshwater portion of the tributary, ranging from 20-40 mg/l. This may be associated with the leachate plume from the Brookhaven landfill.

- Elevated ammonia concentrations found at station 41 in Little Neck Run in the fall of 2007 (an average of 16.1 mg/l) were also likely leachate related, as were levels of a number of other constituents also noted at that site (barium, calcium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, bisphenol-A,

diethyl ether, and 1,4- dichlorobenzene).

- Concentrations of nitrite+nitrate in the freshwater reaches of the tributary were frequently insignificant compared to ammonia levels, and on average lower than levels found in other area tributaries. This pattern may have been related to effects from the anoxic, reducing conditions present in the landfill plume, where ammonification (the conversion of organic nitrogen to ammonia) and denitrification (the reduction of nitrate to ammonia and nitrogen) are dominant processes.

- Despite the high concentrations of ammonia noted in the upper reaches of the tributary, results show that levels were significantly attenuated by the time they reached Great South Bay. This can probably be attributed to uptake by bacteria and algae as well as to dilution and nitrification processes.

- Results from numerous studies done on the effects of un-ionized ammonia on a variety of aquatic organisms suggest that the high levels found in Beaver Dam Creek may be acutely toxic, and lower levels possibly chronically toxic to many species.

- Despite the potential for toxicity posed by the levels of ammonia in the tributary, a 1996 electrofishing survey conducted by the NYSDEC in an area just downstream of South Country Road documented an abundant population of brook trout existing in the tributary. [A total of 26 brook trout were observed, as well as 9 eels and 2 Eastern mudminnows (**Guthrie, 2008**)].

- A survey of macroinvertebrates conducted in 2003 by the Stream Biomonitoring Unit of the NYSDEC, however, found a low level of biodiversity (poor species richness), and concluded that the tributary was moderately impacted, of poor water quality, and likely impacted by decomposable wastes.

- Of the 229 organic constituents that were tested for, 16 volatile organic compounds (VOCs) and 5 semi-volatile organic compounds (SVOCs) were detected in the tributary. The most commonly detected chemicals included MTBE, diethyl ether, chlorobenzene, 1,4-dichlorobenzene, DEET, ibuprofen, and bisphenol-A. Both groups of compounds have multiple potential sources, including road and land runoff, septic systems, boat discharges, point source spills/dumping, and the leachate plume from the Brookhaven landfill.

- With the exception of iron and zinc, and to a lesser extent, aluminum and lead, metal concentrations in Beaver Dam Creek were generally below NYSDEC standards for Class C waters [**Table 2-2**]. Levels of cadmium, copper, cobalt, and nickel were occasionally elevated above criteria, and concentrations of manganese, for which there is no applicable standard for Class C waters, were frequently elevated above standards for groundwater (Class GA) and other freshwaters (Class A & AA).

Additionally, the USDA Natural Resources Conservation Service has helped develop a comprehensive conservation plan, as per the NYS Agricultural Environmental Management Program (AEM) planning guidelines, for Deer Run Farm (formerly Lohman‟s Farm), a 33-acre vegetable farm bordering the west side of Beaver Dam Creek that grows lettuce, spinach and cabbage. The plan identifies conservation practices necessary to improve soil quality, reduce and filter runoff, and protect groundwater. In 2003, the SWCD implemented a stormwater remediation project to curtail erosion from the farm into the tributary, and an eroded swale has since been stabilized with vegetation.

2.4 Natural Resources

Natural resources within the Beaver Dam Creek watershed include upland as well as freshwater and tidal wetland habitats, other aquatic resources and special resource management areas. Each of these is further examined below.

2.4.1 Upland, Freshwater and Tidal Wetland Habitats

The overall watershed includes a variety of habitats from "built" environment, to forest and other upland vegetated areas, to freshwater and tidal wetlands. Retention of natural area through land preservation and careful management of land use activities is critical to maintaining and improving the water quality and natural resource characteristics of the watershed. Upland habitats are evident in aerial photography included in **Figure 1-1**.

Of critical importance are the identification, protection and improvement of wetlands due to their beneficial qualities in terms of habitat, productivity, pollutant attenuation, shoreline protection and overall environmental sensitivity and benefit. Freshwater and tidal wetlands are illustrated in **Figure 2-7**. Two specific NYSDEC regulated freshwater wetlands within the watershed include wetlands #B-5 and #B-9. Wetland #B-5 is considered a Class 1 freshwater wetland, which is the most highly regulated, while #B-9 is a Class 2 wetland that is less restrictive in regulations.

All NYSDEC-regulated tidal wetlands within the watershed study area are located south of Beaver Dam Road. Tidal wetland classes within the watershed include intertidal marsh, coastal shoals, bars and mudflats, the littoral zone, fresh marsh, formerly connected marsh and dredge spoil areas. High marsh wetlands extend the farthest north.

2.4.2 Aquatic Resources

Aquatic resources along Beaver Dam Creek (**Figure 2-8**) include waterfowl focus areas, State-designated Significant Coastal Fish and Wildlife Habitats, shellfish areas and finfish. Waterfowl focus areas extend through much of the southern portion of the watershed, ending just north of Beaver Dam Road. Significant Coastal Fish and Wildlife Habitats have a similar distribution, with the designated tidal wetland area ending just south of Beaver Dam Road. Salmonids and alewives have been known to occur along the entire length of the tributary (**USFWS, 2005**). Electrofishing data from 1996 recorded abundant brook trout (26 observed), but small numbers of American eel and Eastern mudminnow (9 and 2, respectively) within freshwater portions of the tributary. However, the water quality within the freshwater portion of Beaver Dam Creek is currently degraded and not capable of supporting salmonid or alewife populations. The NYSDEC has scheduled another electrofishing survey for 2009.

The 1.1 mile tidal portion of the tributary, up to the Beaver Dam Road bridge, received the designation of a Significant Coastal Fish and Wildlife Habitat due to its fish and wildlife values, which include relatively undeveloped tidal channels bordered by substantial tidal marshlands, and concentrations of sea-run brown trout which support an autumn recreational fishery of county-level significance.

2.4.3 Known Habitat Impairments

Beaver Dam Creek has areas of shellfish closure, as well as three identified barriers to fish passage. Shellfish areas located within the watershed, as depicted in **Figure 2-9**, are currently closed all year. Areas just south of the watershed study area are considered seasonal shellfish areas.

Potential barriers to fish passage which may impact varying life stages of different species of fish were identified in 2007 by NP&V staff as part of a larger inventory for the SSER (**NP&V, 2008**) and are illustrated in **Figure 2-10**. The three barriers (Crossings 46, 50 and 51) were identified as temporary barriers because they can be remediated relatively easily to fully restore physical fish passage. Crossing 46 is a log jam which is currently preventing fish passage. Crossings 50 and 51 consist of a collapsed culvert and its associated fence, which present barriers to larger fish.

Channel modifications are currently present near the mouth of the tributary. They consist of an area south of Beaver Dam Creek Road which was dredged in the early 20th century. More specifically, this area was known as "Brookhaven Shores," a resort style development that is now known as the Bellhaven Community. Three canals were dredged for this development in 1956 in order to give residents waterfront vessel access. The dredge spoil from the main channel, a former tributary stream, and the three canals was used to fill in wetlands upon which the development was built. This was the single largest development that occurred within the watershed which had a substantial impact on the tributary itself, specifically the direct loss of wetlands and subsequent indirect impacts to water quality from associated stormwater and sanitary systems.

2.4.4 Special Resource Management Areas

Extensive conservation areas, open space, and parklands exist within the Beaver Dam Creek watershed. Most of these areas are located in the southern portion of the watershed. The major conservation area within the watershed is the Bellport Bay State Tidal Wetlands. A portion of the Fireplace Neck State Tidal Wetlands occurs within the southeast corner of the watershed. Numerous parcels illustrated in **Figure 2-11** are owned by the Town of Brookhaven and are preserved as open space. Additionally, several parcels (primarily within the southern area of the watershed) are owned and maintained by the Post-Morrow Foundation. Several other parcels are currently vacant, and have potential to be acquired by an entity such as the Post-Morrow Foundation or the Town of Brookhaven for preservation. Parcels to the west of Beaver Dam

Creek which have not been developed should specifically be targeted for preservation due to their location within the watershed, which makes them important in the preservation of ecological resources.

2.4.5 Current Habitat Protection and Land Management

Currently, all wetlands along the tributary are protected by NYSDEC Article 24 (Freshwater Wetlands Act) and Article 25 (Tidal Wetlands Act) laws, the Town of Brookhaven‟s Town Code Chapter 81: Wetlands and Waterways, as well as federally under Section 404 of the Clean Water Act. More specifically, lands owned by the State, such as the wetlands along the southern portion of the tributary, are managed and maintained by the State. Lands acquired and designated as open space by the Town of Brookhaven are also maintained and managed by the Town, and are intended to be left natural.

Development and land uses within the watershed are regulated in accordance with the Code of the Town of Brookhaven. Additionally, the Brookhaven Village Association (BVA) also provides comments on any proposed development in accordance with the BVA‟s adopted Zoning and Development Policy. This policy aims to preserve wetlands and retain the local character of the historic district through the use of the following four guiding principles:

- ***Wetlands.*** *No development should take place on wetlands, either construction of buildings or any kind of fill. Existing filled wetlands should be restored. State and Town wetland laws should be strictly enforced, particularly provisions pertaining to setbacks from wetlands. Furthermore, if proposed developments contain wetlands, these wetlands should not be included in yield calculation and no wetlands should be destroyed in exchange for the creation of other wetlands.*
- ***Agricultural property.*** *The BVA encourages the continuation of agricultural use of farmland within the Hamlet. We would like to encourage farmers who have decided to sell or develop their land to first meet with groups such as the Peconic Land Trust who can council farm owners on ways to preserve open land while still having the same economic results. We also encourage farmers to look into Suffolk County's Farm Preservation program, in which they could sell development rights to the County,*
- ***Trees.*** *Strict adherence to the Brookhaven Town Tree Law, which requires a permit to*

remove trees from all commercial and industrial property and residential parcels in excess of two acres.

- ***Roadways.*** *In order to preserve the rural character of the Hamlet we wish to avoid wide roads with curbing. Because the Hamlet is an historic district, developers have the option to go either with the standard 50-foot-wide road and curbs or with country lanes, such as the ones we presently have. We also feel that street lights are not in keeping with the rural character of the community.*

The Town, Suffolk County, and the Post-Morrow Foundation have been instrumental in acquiring extensive acreages of land within the Beaver Dam Creek watershed for preservation. As a private foundation, the Post-Morrow Foundation, Inc. has been particularly active in open space preservation efforts within the community since 1969, as well as restoration of tidal wetlands, public education and quarterly distribution of the Post-Morrow Foundation Newsletter documenting the goals and achievements of the organization. Lands are acquired by the Foundation, either through gifts or purchase, to establish a nature preserve and sanctuary for the benefit and enjoyment of the immediate community. The Foundation has purchased approximately ±155 acres of land along the tributary and within the watershed, totaling approximately 37 percent of the open space in the study area. Additionally, the development rights from several privately-owned parcels have been acquired by Suffolk County for the purpose of groundwater protection in the area. **Figure 2-11** illustrates those lands which are currently preserved or otherwise restricted from future development by the State, Town, County, and the Post-Morrow Foundation.

The NYS Department of Transportation (DOT) currently owns a large parcel of land located on the south side of the Sunrise Highway South Service Road, within which the Beaver Dam Creek headwaters originate. It is important to note that the DOT is currently conducting a Sunrise Highway Corridor Sustainable Transportation Study which may have implications for this parcel and the Creek‟s headwaters.

Post-Morrow currently owns the Fireplace Boat Basin (sometimes referred to as Gould‟s Marina) on the east bank of the tributary. This marina has been in operation since the 1940's for summer

dockage of approximately 39 boats and is affiliated with prior shipbuilding at this location. The Basin is operated by the Carmans River Maritime Center, which leases out spaces to local residents, and which utilizes earth-friendly marina best management practices. With the assistance of the Foundation, the Basin was recently renovated with a new low sill bulkhead and creation of an associated low marsh wetland area beneath the boardwalk on the south side of the marina.

The Foundation has strived to educate residents about the natural resources of the tributary, as well as impacts of pet waste on stormwater entering the tributary. Post-Morrow has maintained pet waste disposal buckets with a supply of bags at the entrances to several of their properties to make it convenient for residents to pick up after their pets when utilizing these properties, and included this information in their quarterly newsletter. Most recently, the Post-Morrow Foundation and the local Brookhaven Village Association have also been instrumental in getting the Town of Brookhaven to renew their efforts to relocate and monitor testing wells for the tracking of the leachate plume from the nearby Town landfill.

Several of the cells at the adjacent Town landfill have been closed and capped, which should prevent further contamination of groundwater from these cells. Cells 5 and 6 are lined but not capped and continue to operate. These two cells have been accepting construction/demolition waste and incinerator ash. The leachate that results from rainfall penetrating through the waste is currently pumped off and disposed off site. It is believed that a past liner failure or prior overtopping of the liner caused leachate to enter groundwater, resulting in an extensive plume of contaminated leachate from the landfill (**Dermody, 2009**).

In 1990, the Long Island Regional Planning Board prepared the *Evaluation of Land Use Impacts on Environmental Quality in Urban and Semi-rural Streams Tributary to Great South Bay, Long Island, New York* which identified the protection and restoration needs of Beaver Dam Creek. In 1996, a stormwater inventory of the south shore area was prepared for the Town of Brookhaven by Charles Voorhis & Associates (CVA) and identified numerous stormwater discharge points into the tributary. Many of these discharge points were from the Bellhaven Community in the southwest corner of the watershed.

A New York State Nonpoint Source Pollution Abatement and Control Program Grant for the Bellhaven Community was subsequently awarded to the Town of Brookhaven for implementation of stormwater improvements. In association with this grant, the Bellhaven Road Watershed Management Plan was prepared for the Town of Brookhaven Highway Department by Suffolk County SWCD with the goals of reducing nonpoint source pollution and improving water quality within Beaver Dam Creek and Bellport Bay. The Bellhaven plan identified drainage improvements within the Highview Boulevard subarea as being top priority because the greatest volume of runoff occurs from this area during frequent rainfall events. The plan recommended the installation of leaching catch basins with curb inlets, which are commonly installed by the Town‟s Highway Department. The Bellhaven-N subarea was identified as second highest priority due to the large amount of runoff which is directly discharged into the adjacent canals and Beaver Dam Creek. Due to the presence of a high groundwater table in this subarea, conventional vertical leaching structures were not thought to be feasible and instead, the installation of linear "infiltrators" beneath the pavement of Overlook Road was recommended. Recent drainage improvements on Bellhaven Road now discharge nearly all of the Bellhaven-S subareas' surface runoff into the canals and Beaverdam Creek. Therefore, the construction of a grass swale in the Bellhaven Road right-of-way along the road‟s western shoulder was recommended. However, this swale would be located directly adjacent to a NYS-owned tidal wetland. Although SWCD determined the proposed grass swale would be capable of containing and infiltrating the runoff from a 10-year, 24-hour storm, there was concern that there may be opposition to this practice due to the close proximity to the tidal wetlands.

Since preparation of the Bellhaven plan, several leaching pools have been installed in the Highview Boulevard area north of Overlook Road with the aid of the awarded funds, but not all of the funding has yet been used and further improvements are still warranted. According to the Town‟s Department of Public Works, potential infiltration projects include the removal of the last 200 feet of asphalt and creation of a bioretention area or swale at the end of Bellhaven Road.

The Beaver Dam Creek Tributary Corridor Restoration Task Force was formed following the convening of the regional Long Island Wetland Restoration Initiative in January 2001, when

Beaver Dam Creek was identified as a candidate restoration site. Comprised of federal, state and local government partners, non-governmental organizations and academic institutions, the Task Force was charged with developing and implementing a restoration plan for Beaver Dam Creek that was consistent with the implementation actions identified in the SSER Comprehensive Management Plan. Coordinated and facilitated by Ducks Unlimited, this plan was aimed at improving the tributary's water quality and aquatic habitats through the implementation of stormwater abatement projects, tidal wetland restoration, public education and other best management practices.

Suffolk County, under the leadership of Cornell Cooperative Extension, has made efforts to educate residents about stormwater pollution and established a storm drain marking program to remind people not to dump anything down storm drains. Storm drain medallions have been placed along sidewalks on South Country Road (C.R. 36) between Bellport and Brookhaven as well as on storm drains at the intersection of Beaver Dam and South Country roads.

In addition to the land and water use regulations established within the Code of the Town of Brookhaven, several Town programs have been implemented to increase citizen stewardship within their communities and reduce pollutants that can potentially impact ground and surface water resources. These programs include the following:

- **Stop Throwing Out Pollutants (STOP)** – a household hazardous waste collection program run through the Department of Waste Management.
- **CURBY** – a curb-side recycling program that accepts #1 and #2 plastics, aluminum, glass and metal.
- **Battery Collection Program** – another Department of Waste Management program to collect household batteries, button batteries and 6-volt batteries.
- **Leaf and Mulch Program** – a program which provides residents with brown bags to drop off leaves, and which in turn provides free mulch to residents.
- **Commercial Cardboard Pick-Up** – a service provided through Department of Waste Management.
- **Adopt-A-Preserve Program** – encourages community stewardship in conjunction with the Nature Preserve Program.
- **Stormwater Management Program** – implemented in accordance with the requirements of the NYSDEC State Pollutant Discharge Elimination System (SPDES) Phase II Stormwater Management Program. Phase II requires municipal separate storm sewer systems (MS4s), which ultimately discharge into local surface waters without treatment, to reduce the quantity of pollutants that are carried into storm sewer systems via runoff during rain events. The Phase II Program incorporates six minimum measures established by EPA (**Public Education and Outreach, Public Participation/Involvement, Illicit Discharge Detection and Elimination,**

Construction Site Runoff Control, Post-Construction Runoff Control, and Pollution Prevention/Good Housekeeping), for which each municipality must address and report progress achieved concerning each of these measures on an annual basis. As per the Town‟s *2008 Annual Stormwater Management Plan*, significant progress regarding each of these measures continues to be made. Implemented actions for each measure include:

Public Education and Outreach

- *Environmental Education Program.* Continuance of successful environmental education program at the Town of Brookhaven Nature Center, and proposed development/implementation of program effectiveness assessment tools. Stewardship brochures developed/distributed to educate students on stormwater best management practices.
- *Maintain and update of a stormwater display*. A nonpoint source pollution stormwater display is prominently featured at the Town of Brookhaven Ecology Center and the Town Nature Center.
- *Feature stormwater information in the Town Environmental Newsletter.* The "Green Gazette" is mailed to all Town of Brookhaven residents, schools and libraries to keep citizens informed on the Town‟s environmental policies and initiatives.
- *Development of brochures and outreach materials.* "Your Forge River Watershed" is a nonpoint source pollution guide targeted for residents of the Forge River. The brochure was completed and mailed to all residences within the watershed as an insert within the Summer 2008 Green Gazette. An environmental stewardship brochure with a stormwater emphasis was also disturbed to visitors of the Town‟s Nature Center in 2007.
- *Development of watershed signage.* Signs instructing residents to clean up after pets, not feed waterfowl, and limit fertilize use were designed and presented to Forge River advisory committee for comment and ultimate posting at watershed boundaries.
- *Mt. Sinai Natural History Tour*. Completed in May 2008, this project included creation of a brochure and interpretive signage that included information on the importance of stormwater management (supported by DOS grant).

Public Participation/Involvement

- *Annual report and hearing.* Report presented at public hearing and posted on Town‟s Stormwater Management web page.
- *Beach and shore cleanups.* "Great Brookhaven Cleanup" – a town-wide litter collection effort coordinated by a citizen-based Anti-Litter Task Force. Other clean-ups occur throughout summer months.
- *Forge River Watershed Task Force.* Meets monthly to consider BMPs and education/outreach materials for implementation; will assist in development of comprehensive Watershed Management Plan and initiation of nitrogen TMDL. Nonpoint source guide brochure was designed and scheduled to be mailed to residents in 2008.
- *Conservation Advisory Committee (CAC).* Identifies erosion and stormwater management projects and applies for grants to conduct stormwater infrastructure improvements.

Illicit Discharge Detection and Elimination (IDDE)

- *Illicit Discharge Detection in remaining areas of the Town*. Continued IDDE in remaining areas of Town (through contract with Cornell Cooperative Extension), with results entered into Town‟s GIS for use in devising a strategy to addressing the problem.
- *Address non-stormwater discharges in remaining areas of Town.* Strategy will include education, outreach and appropriate enforcement of its recently adopted Illicit Discharge ordinance.

- *Inventory and map outfall in the un-inventoried areas of the Town.* Comprehensive mapping of locations substantially complete. Continued gathering of attribute information for all Town stormwater infrastructure.
- *Illicit Discharge Reporting and Response Program.* Education and training of public employees (with assistance from Cornell Cooperative Extension) for Town of Brookhaven and 6 adjoining villages concerning establishment of responsibilities and lines of communication for responses to ID reports, as well as development of a web page to educate public on ID and how to report them. ID contact person is Town‟s Stormwater Manager.

Construction Site Stormwater Runoff Control

- *SWPPP Procedures.* Adoption of Chapter 86 (Erosion and Sediment Control Law) to Town Code to regulate construction that disturbs greater than one acre of property and conforms to the Erosion and Sediment Control Model Ordinance. A Town Storm Water Pollution Prevention Plan (SWPPP) Guidance Document was prepared in March 2008 and Town‟s consultant contracted for review of SWPPP‟s submitted to the Town. Commissioner of Planning is vested with authority to establish/modify SWPPP procedures following evaluation of program effectiveness.
- *Private sector review*. LI Builders Institute aided in review of SWPPP exemption criteria (non-impact upon surface waters).
- *Public review of plans.* All commercial site plans and subdivisions are logged and made available to public at planning counter. Verification required from applicant concerning initiation of contact with appropriate local civic organization, and public hearings for all applications requiring Planning or Town Board approval.
- *Training of construction site operators.* Scheduled to commence in November 2008.

Post-Construction Stormwater Management

- *Revise post-construction stormwater management controls/practices/ enforcement.* Review and subsequent revisions, as necessary, to occur one year from full implementation of SWPPP review procedures (anticipated in September 2009). Review/revisions/enforcement to follow procedures outlined in Town‟s SWPPP Guidance Document.
- *Site Plan Review, Preparations for SWPPP's.* Familiarization of Town engineering and drainage review staff with DEC Stormwater Management Design Manual and SWPPP flow chart; tracking of all submitted SWPPPs within GIS database.

Pollution Prevention/Good Housekeeping

- *Pollution prevention priorities set by Inter-Departmental Stormwater Management Committee (IDSMC).* Monthly meetings to develop policy, coordinate and track stormwater mitigation projects that specifically address sediment, fertilizers and pesticides.
- *Stormwater calendar.* To track all stormwater-related meetings, seminars, training, and all target deadlines referenced in annual stormwater reports.
- *Dog Waste Ordinance Development.* Approval of "Pooper Scooper" Law in September 2008.
- *Information gathering, LIDAR*. Town-wide acquisition of LIDAR topographic information to enable more accurate delineation of contributing storm-sewer-sheds, particularly for impaired and TMDL water bodies.
- *Highway Yard and Parks Department Audits and Training.* Yard operations and maintenance facilities to be audited to determine shortcomings and management/staff to be trained in implementation of BMPs that address shortcomings.
- *Street sweeping and catch basin maintenance*. Annual street sweeping of all Town roads at least once, plus additional as-needed (often driven by resident complaints). Catch basin cleaning/maintenance, and sweeping of municipal parking facilities on an

as-needed basis. GIS-based tracking system for current maintenance operations currently being developed to aid in future proactive planning and prioritization of maintenance, especially for impaired watershed areas.

- *Town-wide Constituent Response System (CRS)*. The system was implemented in 2007 to log constituent calls and track Town responses in a database. This system can also be used to track Highway Department infrastructure maintenance operations, but baseline information for current highway operations still need to be reported and summarized.
- *Salt spreading operations*. Annual inspection of salt spreaders and training of operators to calibrate spreaders so as to minimize de-icing materials. All Town salt storage facilities are covered.
- *Catch Basin installations*. Continued installation/use of leaching catch basins, most of which are installed in response to flooding issues, but also in response to watershed plan or Conservation Advisory Committee recommendations.
- *Street sweeping and catch basin cleaning equipment.* Street sweepers operate continuously (weather permitting) and catch basin maintenance occurs continuously. Town owned 19 sweepers in 2007, and proposed to order an additional 8-10 sweepers in 2008. The Town contracts for 4 vendor operated vacuum trucks and two Town operated vacuum trucks. Additionally, 7 clam shell bucket machines are used.
- *Inventory of Town-owned parks.* Completed in January 2007 (272 in total). An RFP for assessment of pollutant reduction and landscaping BMPs is proposed.
- *Dog park facility.* First Town dog park has been opened, requires owners to collect and dispose of dog waste, and may divert substantial amount of dog waste from town roadways.
- *Road end inventory.* Completed in 2007 and identified 90 Town road ends that terminate at surface waters. Road end assessment was proposed for 2008, including departmental jurisdiction, water body status, watershed management status, and preliminary evaluation of nutrient loadings and erosion potential.
- *Parks Department Operations Manual.* Completed in 2006 and follow-up auditing/training was planned for 2008, as indicated above.
- *Integrated Pest Management.* A very limited amount of pesticides are used by the Town and are applied by a certified contractor using IPM protocol. Baseline quantities should be reported for annual assessment.

Ducks Unlimited, Post-Morrow Foundation, U.S. Fish & Wildlife Service and several other partners have worked with volunteers and collaborated on tidal marsh habitat restoration projects within Beaver Dam Creek involving the control of the invasive *Phragmites australis* and planting of native salt marsh plants. Ducks Unlimited has coordinated the previous habitat restoration work on the east side of the tributary, which has been planned out in four phases. The first phase of the project, completed in the summer of 2003, removed most of the dredge spoil from an approximately 10-acre area. The second phase of the project, conducted in the winter of 2004, involved the partial removal of the dike along the east side of the tributary, control of common reed (*Phragmites*), removal of the remaining dredge spoil, and final grading of the site. The site was subsequently planted with native salt marsh grasses and shrubs in May-June 2004.

These restoration efforts were funded through a $40,000 Community-based Restoration Program grant from the National Oceanic and Atmospheric Administration; a $9,000 contribution from the Post-Morrow Foundation; two Clean Water/Clean Air Bond Act grants to the Town of Brookhaven, totaling $220,000, and an equal amount of Town matching funds; a $10,000 award from the US Fish and Wildlife Service Partners for Fish and Wildlife; and in-kind services contributed by Ducks Unlimited, the US Fish and Wildlife Service, and the Town of Brookhaven. Additional restoration activities to complete the remaining phases of earlier restoration work are currently being planned for implementation.

Further habitat restoration work is planned on the west side of the tributary just below Deer Run Farm, specifically on a Post-Morrow-owned tax parcel (#0200-978.3-01-3) and a portion of the adjacent County-owned Dennis Puleston Nature Preserve. *Phragmites* and former dredge spoils are proposed to be removed from this property to lower the elevation of the site and promote the establishment of marsh vegetation. These restoration efforts are proposed to be funded through a $285,000 grant from NYS Department of State‟s Environmental Protection Fund, and $85,000 from Suffolk County‟s quarter-percent sales tax. However, additional matching funds are committed from the County.

With the aid of NY Sea Grant and Ducks Unlimited, Cornell Cooperative Extension has authored and produced two pamphlets to further educate residents regarding restoration activities and how individuals can help save the tributary, "Beaver Dam Creek Restoration Project" and "Help Protect Beaver Dam Creek." Further information and collaborative public education materials can be accessed at http://counties.cce.cornell.edu/suffolk/Programs/MARhome.htm

Students for Environmental Quality (SEQ) is a student club organization at Bellport High School which lends a hand to environmental causes within the community. Over the years, SEQ has conducted environmental studies on Beaver Dam Creek, as well as participated in the Beaver Dam Creek WMP by assisting NP&V with verification of the location of previously mapped stormwater infrastructure, as well as locating additional visible catch basins, discharge pipes and problematic runoff areas for the watershed‟s stormwater inventory and associated mapping. SEQ will be participating in their third year of the alewife fish survey for the SSER and monitoring Beaver Dam Creek for the return of spawning alewife.

2.5 Land Use

Land use within the watershed is characterized by the predominant existing uses, impervious cover and significant features within the watershed. Land use is a major factor influencing the quantity and type of pollutants that enter a watershed from runoff and recharge. Detailed identification of current land use is important as a basis for input of pollutant load values for the purpose of modeling pollutant loads within the watershed.

2.5.1 Land Uses and Zoning

As illustrated in **Figure 2-12**, ten major land use categories were identified within the Beaver Dam Creek Watershed area, and are categorized as follows:

- Agricultural
- Residential
- Vacant
- Commercial
- Institutional
- Industrial
- Transportation
- Utilities
- Waste Handling and Management
- Parks, Open Space and Conservation Areas

Most of the watershed is comprised of residential and vacant uses. Parks, open space, and conservation areas, as well as institutional uses also comprise a large portion of the current land use.

As determined from land use data provided by the Town of Brookhaven and supplemented by NP&V, parks, open space and conservation areas comprise the largest land use category within

the watershed, which totals approximately 30 percent of the overall watershed. Residential uses comprise the second largest use within the watershed, and total approximately 28 percent of the watershed. Vacant land, transportation, and waste handling and management uses follow residential use in terms of area, which total approximately 12 percent, 9 percent and 7 percent, respectively. The remaining uses within the watershed consist of institutional use, commercial use, agricultural use, the tributary itself, utilities and industrial use.

As illustrated in **Figure 2-12**, the southern and northern land uses immediately along the tributary are primarily parks, open space and conservation areas. It is important to note that the land use surrounding the central portion of Beaver Dam Creek consists primarily of residential uses.

Figure 2-13 depicts zoning within the watershed boundary. Zoning within the watershed primarily consists of varying density allowances of residential zoning (95.8 percent). A small section of the watershed (1.6 percent) consists of commercially zoned areas primarily located near the intersection of Montauk Highway and Old Town Road. Industrial zoning also contributes a small portion (2.6 percent) of the overall zoning of the watershed, and is primarily located near the western boundary of the watershed.

2.5.2 Public Access, Recreation and Open Space

The total area of open space within the watershed is approximately 414 acres. No national parks or preserves are located within the watershed area, although Wertheim National Wildlife Refuge is located just to the east of the watershed boundary.

Two state conservation areas are located within the watershed, and are known as the Bellport Bay State Tidal Wetlands and the Fireplace Neck State Tidal Wetlands. These are both located along the southern portion of the tributary, but require a state permit for access.

Two town parks are located within the watershed. Zimmer Park is located at the junction of South Country Road, Fireplace Neck Road and the tributary itself. Brookhaven Tot Lot (a

playground) is located in the southwest portion of the watershed at Woodland Avenue.

Several parcels are owned by the Post-Morrow Foundation with the intent of preservation of open space. The locations of these parcels, which encompass several areas along the tributary, are illustrated in **Figure 2-11**.

In general, several areas encompassed by these preserved open space areas are also popular fishing areas. Other recreational resources are provided just beyond the watershed, such as the Martha Avenue Recreational Park and Wertheim National Wildlife Refuge. Two marinas presently existing within the watershed and provide for boating activities. The Beaver Dam Boat Marina is located on the south side of South Country Road and the western bank of the tributary. Fireplace Boat Basin (sometimes referred to as Gould‟s Marina), is owned by the Post-Morrow Foundation and located on the eastern bank of Beaver Dam Creek at the terminus of Fireplace Lane.

2.5.3 Cultural Resources

Valued features and critical areas were considered by consulting maps provided by the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) as well as publications regarding local cultural resources.

Brookhaven Hamlet, formerly known as Fire Place, was designated an Historic District by Brookhaven Town in 1985. The Hamlet lies entirely within the Town-defined Critical Environmental Area and is the largest historic district in Brookhaven Town. An extensive history of the area is documented within the Brookhaven/Southaven Hamlet Study (**Koppelman, 1995**) and is available on the Hamlet‟s website: http://brookhavensouthhaven.org/. The Hamlet Study distinguishes the key historic area (**see Figure 1-2**) as extending from the south side of Bellport High School, northeast along South Country Road to the railroad and Little Neck Creek, south along the Carmans River to Great South Bay, and west along Woodland Avenue up to Beaverdam Road across from VID Industries. OPRHP maps further indicate that the entire tributary and its watershed are within an archaeologically sensitive area.

Local cultural resources along Great South Bay and Beaver Dam Creek include both historic buildings and a rich fishing and boating history. The southern portion of the tributary and watershed is located within the Fire Place Historic District, which was designated by the Town of Brookhaven in 1986. Generally, the Great South Bay area was commercially fished beginning in the mid-19th century. Several houses of baymen and local fishermen still exist today, particularly along Beaver Dam Road.

The Brook Store, located on the north side of South Country Road, is an important historical feature located on the tributary. The store was constructed in 1805 and was a gathering place for residents in the area. The store was purchased in the late 1990‟s by the Post-Morrow Foundation in hopes of having it put on the national register of historic places. The store was moved across the street to its present location. In its place, the Brook House was built, which was a restaurant in which one could catch trout and have it prepared immediately for one‟s dinner.

At the junction of South Country Road and Fireplace Neck Road, Zimmer Park is another historical feature within the watershed. The park is located where the Miller Trout Ponds once stood before being filled in with debris from the old Bellport High School building after it burned down in 1963.

2.6 Stormwater Inventory

The inventory of the stormwater infrastructure includes data sets used to comprise the total inventory, as well as the methodology used. Additional data needs are also addressed.

2.6.1 Data Sets

Existing stormwater infrastructure, including culverts, inlets, outfalls and recharge basins within the study area, has been compiled from previous watershed inventories (Charles **Voorhis & Associates, 1996; SWCD, 2002)** and updated in 2008 by Nelson, Pope & Voorhis with the help of Bellport High School‟s Students for Environmental Quality (SEQ). SEQ was trained with GPS technology by Cornell Cooperative Extension to verify the locations of previously mapped stormwater infrastructure, as well as locate any additional visible catch basins, discharge pipes and problematic runoff areas. Town of Brookhaven DPW was then contacted to provide further information regarding the interconnectedness of stormwater infrastructure, and the recent implementation of several stormwater improvement projects. A stormwater infrastructure map for the study area is provided as **Figure 2-14.**

A Bellhaven Community stormwater management plan was prepared by the Suffolk County SWCD for the Town of Brookhaven following the Town stormwater inventory prepared by Charles Voorhis & Associates (CVA) (**1996**) which identified numerous stormwater discharge points into the tributary from this area. The stormwater plan entailed a redesign of the stormwater management system at key discharge points bordering the tributary in this area. The Town of Brookhaven received a New York Clean Water/Clean Air Bond Act grant to apply toward implementation of the stormwater recommendations, which were scheduled to begin spring 2003. Subsequently, several of the stormwater remediation projects recommended in the management plan have since been implemented.

2.6.2 Current Inventory

A current map of all known stormwater infrastructure to date has been compiled and is provided as **Figure 2-14**. This map contains an updated inventory of stormwater conveyance infrastructure within the watershed, including locations and conditions of all stormwater outfalls, catch basins, retention structures, other infrastructure components, as well as sub-watershed areas found to contribute direct stormwater runoff to the tributary. As indicated in **Section 2.6.1**, this information is a compilation of a previous watershed inventory completed for the town by CVA in 1996, SWCD in 2002, and additional field information collected by NP&V and Bellport High School‟s SEQ in 2008. Detailed information on infrastructure type and recommended improvements for each is located within **Section 4.0** in **Table 4-1**. In **Section 5.0, Table 5-1** identifies target projects and priority actions for specified outfalls.

Most of the outfalls are located within the southernmost portion of the watershed, along the man-made channels on the west side of the tributary. In total, eleven of the seventeen outfalls identified by CVA are located within this area. Just north of this, on the agricultural parcel acquired by the Post-Morrow Foundation, is an erosional feature (for which the USDA-NRCS previously aided in stabilizing) which creates an overland flow through the agricultural parcel into the tributary. An outfall located to the northeast, on the east side of the tributary was identified by CVA, and its associated drainage can currently be seen on recent aerial photographs. Two additional outfalls are identified south of Beaver Dam Road. One is located at the marina on the west side of the tributary, and the other is located just south of Beaver Dam Road. The remaining three outfalls identified by CVA are not located within the watershed boundary.

North of Beaver Dam Road, the first outfall encountered is a 12” stormwater pipe located at the terminus of Prairie Lane. Two possible inlets are located to the southwest of this pipe along South Country Road. An additional possible inlet is located at the intersection of South Country Road and Chapel Road.

North of the railroad tracks, two inlets were identified along South Country Road, one of which was confirmed to be a 12" stormwater pipe. No further inlets or outfalls are identified north of this location.

Catch basins are generally concentrated within the southern portion and the northeastern portion of the watershed. In total, 125 catch basins were identified within the watershed. Of these, 34 are in need of cleaning and/or maintenance, and only 19 appear to be piped to an outfall which would drain directly into the tributary. The remaining catch basins seem to directly discharge to the immediate area, or are piped to a recharge basin. Three recharge basins were identified within the watershed, and each are associated with a housing development. Approximately 11 catch basins appear to be piped directly to one of the three recharge basins.

Areas of overland flow were determined by identifying points in which there are no structures which discharge water to the tributary, but direct drainage to the tributary is obvious. Five of these areas were identified within the watershed. The first area is located at the terminus of Bay Road. OF2 is at the end of the erosional feature located on the Post-Morrow acquired property. OF3 is an area which crosses Bay Road and drains to a ponded area on the west side of Bay Road. OF4 consists of runoff associated with the bridge which crosses the tributary on Beaverdam Road. OF5 consists of runoff which drains directly to the tributary from the Memorial Triangle at Zimmer Park.

Several culverts were identified by NP&V and SWCD along the tributary, which allow the river to flow without impedance. These culverts are illustrated in **Figure 2-10**.

A pumpout facility is located at Beaver Dam Boat Marina. Four Brookhaven pumpout boats also service the area, as well as one floating restroom.

SECTION 3.0

3.0 POLLUTANT LOAD ANALYSIS

The following describes the analysis of pollutant loading into Beaver Dam Creek.

3.1 Pollutant Load

3.1.1 Pollution Sources

There are several sources of surface water pollution to marine and fresh waters. These are typically characterized as being point or nonpoint sources, depending on their origin. Nonpoint source pollution comes from various diffuse sources as a result of stormwater which picks up pollutants from the surrounding area. Common pollution sources include herbicides and pesticides, oil and grease, sediment from construction sites, salt from road de-icing operations, and bacterial colonies from animal waste. Point source pollution sources usually consist of chemical or bacterial pollutants that directly discharge to a waterbody through a pipe from a sewage treatment plant (STP) or industrial facility. Although there are no point sources of pollution from STPs or industrial facilities within the watershed, the nonpoint sources of pollution within the watershed are significant. Generally, all of the above mentioned nonpoint sources of pollution occur within the watershed. The largest nonpoint source of pollution to the watershed appears to be the contaminated plume, generated by the Town of Brookhaven landfill, located just beyond the northwest limit of the surface flow watershed boundary. Quantification of pollutants and extent of the plume are the subject of ongoing investigations by the Suffolk County Department of Health Services (SCDHS) in conjunction with the Town of Brookhaven and NYS Department of Environmental Conservation (DEC) (see **Section 2.3.1**). The next largest source of nonpoint source pollution, resulting from stormwater runoff within the watershed, has been quantified and is further described in **Section 3.2**.

3.1.2 Stormwater Runoff

Stormwater runoff results from impervious surfaces within the watershed. Impervious surfaces include developed areas such as parking lots, buildings, roadways, and other such surfaces through which stormwater cannot be absorbed into the underlying soils. Commercial areas tend to have more impervious surfaces than residential areas, and thus generally result in higher stormwater runoff volumes. In general, all developed areas contribute to stormwater runoff, which carries pollutants from the land's surface into adjacent waterbodies.

Pollutant concentrations in stormwater also vary depending on land use. For example, commercial areas may have higher concentrations of hydrocarbons and metals resulting from on-site parking/storage of vehicles and use of various forms of chemicals and detergents, while stormwater runoff from residential areas, parks and golf courses (with larger areas of maintained lawn) may have higher concentrations of nitrogen and phosphorus in stormwater runoff due to the use of fertilizer and the presence of fecal waste from large bird populations and pets. Antiquated or malfunctioning on-site sanitary septic systems and cesspools in waterfront areas with shallow depths to groundwater also are capable of contributing significant amounts of bacteria and nutrients to surface runoff, as well as within groundwater discharges to the adjacent waterways. Nutrients such as phosphorus and nitrogen from stormwater runoff and groundwater discharge can promote the excessive growth of algae, which leads to depleted levels of oxygen in the waterway and can be harmful to other aquatic life. It should further be noted that on-site sanitary systems within high groundwater areas adjacent to the creek may be significant sources of the currently encountered elevated bacteria levels within the lower portion of Beaver Dam Creek. Although not within the scope of this document, further pollutant load analysis specifically from groundwater discharge to the tributary should be conducted.

Sediments and floatable debris transported in stormwater along streets and parking lots, as well as from areas of exposed soil associated with tilled farmland, construction sites, and eroding stream banks are also commonly deposited into local waterways via overland flow directly into surface water or into roadside drainage systems that ultimately discharge to surface waters.

Sediments deposited in receiving waterways result in siltation of wetlands and increased turbidity of surface waters, which reduces flood storage capacity, diminishes sunlight penetration and inhibits photosynthesis process for aquatic vegetation, deplete levels of dissolved oxygen in water and inhibit the natural functions of waterbodies and aquatic habitats.

3.2 Surface Runoff and Pollutant Loading

Section 2.5 provides an overview of the stormwater infrastructure inventory of catch basins, outfalls and areas of overland flow completed for the watershed. These features were overlaid with topographic contour information to distinguish individual subwatershed areas. It was determined that the majority of the 1,394 acre watershed does not directly contribute stormwater runoff into Beaver Dam Creek. Large portions of the watershed are comprised of natural areas (e.g. woodlands and wetlands) which do not generate large amounts of runoff, as the vegetation and topography within these areas are highly effective at absorbing rainfall. The presence of drainage infrastructure and recharge basins in several developed portions of the watershed also effectively directs stormwater runoff to storage areas for recharge to the underlying groundwater table; therefore these areas do not contribute direct surface runoff to Beaver Dam Creek. However, a total of 19 subwatersheds (**Figure 2-14**), varying from less than one to 40 acres in size, were delineated and identified as presently contributing direct stormwater runoff into Beaver Dam Creek or its associated wetlands. Therefore, pollutant loading analyses were focused on these 19 subwatershed areas, which total approximately 105 acres and have the greatest potential for contributing nonpoint source pollution from stormwater runoff to Beaver Dam Creek. They are referenced according to location within the tributary's watershed, which has been divided into three reaches. Reach 1 encompasses the tidal portion of the tributary, south of Beaverdam Road. Reach 2 stretches from Beaverdam Road to the LIRR at Montauk Highway. Reach 3 encompasses the headwaters of the tributary, north of the LIRR.

In order to estimate pollutants entering Beaver Dam Creek, the "Simple Method to Calculate Urban Stormwater Loads" was utilized as described in the *New York State Stormwater Management Design Manual*, *Chapter 4,* dated April 2008. This method utilizes formulas which

include factors for runoff generated by land use type, the contributing area, and the pollutant concentration. These formulas, as described in the *Manual* (**NYSDEC, 2008**), are provided below. Calculations are based upon an assumed water quality storage volume (WQSV) which utilizes a 90% rainfall event. The formula utilized to calculate storage volume is as follows:

$$WQ_v = \frac{(P)\,(R_v)\,(A)}{12}$$

Where: WQ_v = water quality volume (in acre-feet)

P = 90% Rainfall Event Number (1.2 for Long Island)

$R_v = 0.05 + 0.009(I)$, where I is percent impervious cover

A = site area in acres

As this formula estimates that the storm event will carry 90 percent of the pollutant load, the result is used to determine the ranking for each subwatershed.

Similar formulas are utilized to calculate stormwater pollutants as a result of chemical inputs, and to calculate biological pollutants (bacterial contamination). The formula utilized for chemical pollutants is as follows:

$$L = 0.226 * R * C * A$$

Where: L = Annual pollutant load (lbs)

R = Annual runoff (inches)

C = Pollutant concentration (mg/l)

A = Area (acres)

0.226 = Unit conversion factor

The formula utilized for bacterial pollutant loads is slightly different due to the units and conversation factor utilized, and is as follows:

$L = 103 * R * C * A$

Where: L = Annual pollutant load (Billion Colonies)
R = Annual runoff (inches)
C = Pollutant concentration (1,000/ml)
A = Area (acres)
103 = Unit conversion factor

In both cases, annual runoff in inches was calculated based upon the land use within the subwatershed area. The formula utilized for this calculation is as follows:

$R = P * Pj * Rv$

Where: R = Annual runoff (inches)
P = Annual rainfall (inches)
Pj = Fraction of annual rainfall events that produce runoff (0.9)
Rv = Runoff coefficient

In order to determine the runoff coefficient, the following formula was used:

$Rv = 0.05 + 0.9Ia$

Where: Ia = Impervious fraction

Annual rainfall for the Suffolk County area is 45.2 inches, as listed in the *New York State Stormwater Management Design Manual*. Mean impervious coverages by land use type were obtained from Table A.3, Land Use and Impervious Cover Estimates, in the Design Manual. Similarly, median pollutant concentrations were obtained from Table A.1 in the Design Manual. Pollutant loads for total nitrogen (TN), total suspended solids (TSS), total phosphorus (TP) and Fecal Coliform were then calculated based upon the land use and resultant water quality volume

for each of the nineteen subwatersheds. Resultant pollutant loads and ranks are illustrated in **Table 3-1** below.

Overall, the analyses illustrate that subwatersheds 13 and 19 have the highest potential for impacts from nitrogen, total suspended solids, phosphorus and fecal coliform input. Total annual pollutant load from stormwater runoff within the watershed includes 574.83 pounds per year (lbs/yr) for nitrogen, 15,664.10 lbs/yr for total suspended solids, 74.73 lbs/yr for phosphorus and 196,484.85 billion colonies per year for fecal coliform. Based on these results, subwatershed areas were ranked in terms of most severe to least severe impacts based on the overall estimated stormwater pollutant load (N, TSS, P and F. Coliform) from a standard storm event which carries a 90% pollutant load, as calculated by the formula for WQ_v. Subwatershed 19 was estimated to contribute the highest pollutant load, and therefore received the highest rank of 1 for most severe impacts, while subwatershed 4 ranked as the lowest impact rank.

TABLE 3-1

Pollutant Load Analysis Calculations & Loading Estimates

Sub-watershed ID	Stormwater Inlet Feature Code	Land Use Code	Sub-watershed Area (Acres)	Impervious Area (Percent)	Annual Rainfall (inches)	Annual Runoff (inches)	Water Quality Volume (acre-feet)	Total Nitrogen (lbs/yr)	Total Suspended Solids (lbs/yr)	Total Phosphorus (lbs/yr)	Fecal Coliform (Billion Colonies/yr)	Rank
Reach 1 - Mouth of the Creek to Beaverdam Road												
1	OF	R/V/P	9.21	30/0/0	45.2	11.6	0.28	48.14	1,311.73	6.26	16,454	**4**
2	O	R/V/Rd	2.86	30/0/100	45.2	11.8	0.09	15.27	416.19	1.99	5,220	**13**
3	O	R/Rd	3.03	30/100	45.2	14.5	0.12	19.82	540.16	2.58	6,776	**9**
4	O	R/Rd	0.19	30/100	45.2	31.9	0.02	2.68	72.90	0.35	914	**19**
5	O	R/Rd	1.80	30/100	45.2	14.9	0.07	12.12	330.25	1.58	4,143	**15**
6	O	R/Rd	4.64	30/100	45.2	14.1	0.17	29.57	805.73	3.84	10,107	**7**
7	O	R/Rd	1.04	30/100	45.2	13.3	0.04	6.26	170.66	0.81	2,141	**17**
8	O	R/Rd	0.93	30/100	45.2	13.1	0.03	5.50	149.97	0.72	1,881	**18**
9	O	R/Rd	2.66	30/100	45.2	13.9	0.10	16.70	455.05	2.17	5,708	**11**
10	O	R/Rd	2.07	30/100	45.2	14.0	0.08	13.04	355.23	1.69	4,456	**14**
11	O	R/Rd	3.04	30/100	45.2	16.7	0.14	22.98	626.31	2.99	7,856	**8**
12	O	R/V/Rd	8.74	30/0/100	45.2	14.0	0.33	55.18	1,503.60	7.17	18,861	**3**
13	OF	R/A/V	39.82	30/9/0	45.2	3.9	0.41	69.29	1,888.25	9.01	23,686	**2**
14	OF	R/P/Rd	0.95	30/0/100	45.2	28.1	0.07	12.06	328.68	1.57	4,123	**16**
15	O	C	3.41	74	45.2	28.1	0.26	43.38	1,182.01	5.64	14,827	**5**
Reach 2 - Beaverdam Road to the LIRR												
16	OF	Rd	1.02	100	45.2	38.6	0.11	17.90	487.79	2.33	6,119	**10**
17	O	R/V/Rd	9.62	30/0/100	45.2	9.6	0.25	41.71	1,136.68	5.42	14,258	**6**
18	OF	L/Rd	0.98	9/100	45.2	35.2	0.09	15.59	424.95	2.03	5,330	**12**
Reach 3 - LIRR to the Northernmost Extent of the Watershed												
19	O	R/C/I/U/P/Rd	8.87	30/74/38/50/0/100	45.2	31.8	0.75	127.63	3,477.96	16.59	43,626	**1**

Beaver Dam Creek Drainage Area Total Annual Pollutant Load Estimates	**574.83**	**15,664.10**	**74.73**	**196,485**

Stormwater Feature Codes: OF = Overland Flow O = Outfall

Land Use Codes: R = Residential I = Institutional P = Park L = Lawn C = Commercial U = Utility Rd = Road A = Agriculture V = Vacant

TABLE 3-2

Reach Summary of Pollutant Loading Estimates

	Reach Totals			Drainage Area Total
	1	2	3	
Total Nitrogen (lbs/yr)	371.99	75.21	127.63	**574.83**
Total Phosphorus (lbs/yr)	48.36	9.78	16.59	**74.73**
Total Suspended Solids (lbs/yr)	10,136.72	2,049.42	3,477.96	**15,664.10**
Fecal Coliform (Billion Colonies/yr)	127,151	25,707	43,626	**196,485**
% contribution	*65%*	*13%*	*22%*	*100%*

SECTION 4.0

4.0 RECOMMENDATIONS

Appropriate long-term management measures are necessary to maintain and improve the water quality and natural resources of Beaver Dam Creek. The recommendations presented here include proactive measures which can be implemented by community members, local organizations and municipal employees to reduce pollutant loads from land uses within the watershed, as well as to track the extent of pollutants and effectiveness of implemented actions.

These measures have been developed through extensive coordination efforts with the Beaver Dam Creek Watershed Advisory Committee, the NYS Department of State, and the public input process. They address the goals and objectives of the WMP identified in **Section 1.2** and are organized into general watershed-wide recommendations (**Section 4.1**), as well as specific target projects and priority actions within the watershed (**Section 4.2**). Watershed-wide recommendations are broken down into the following four categories:

1. Protection of Natural Resources
2. Education and Outreach
3. Point and Nonpoint Source Management and Control
4. Monitoring Water Quality and Pollutant Reduction

Specific target projects are broken down according to location within each of the three watershed reaches shown in **Figure 2-14**.

The recommendations of this WMP remain consistent with the recommendations of three prior studies which included Beaver Dam Creek: the 1995 *Brookhaven/Southaven Hamlet Study*, the 2001 *SSER Comprehensive Management Plan (CMP)*, and the 2008 *Inventory and Analysis of Barriers to Fish Passage for Six Long Island South Shore Estuary Reserve Tributaries*.

The Brookhaven/Southaven Hamlet Study gave the highest priority to recommendations which were aimed at maintaining "the essentially rural character of the two Hamlets and preserving the area‟s open spaces, wetlands, waterways and natural resources." The Hamlet Study‟s

recommendations further keep with the principles of the Brookhaven Village Association‟s Zoning and Development Policy, as well as the findings of the Long Island Regional Planning Board‟s 1990 study, *Evaluation of Land Use Impacts on Environmental Quality in Urban and Semi-Rural Streams Tributary to Great South Bay*. Many of the Hamlet Study‟s recommendations have already been implemented through extensive efforts by the Town, County and Post-Morrow Foundation, particularly acquisition of key parcels (e.g. Lohmann‟s Farm, Fire Place Nature Preserve, etc.), upzoning of several residential areas to A2, and implementation of waste management programs. Recommendations of the Hamlet Study which have not yet been fully addressed are incorporated into this WMP.

The implementation actions set forth in the *SSER CMP* included construction of stormwater abatement projects in significant nonpoint source contributing areas, continuance of habitat restoration initiatives and acquisition of open space within the Beaver Dam Creek watershed. This WMP also incorporates the recommendations of the recently completed *Inventory and Analysis of Barriers to Fish Passage for Six Long Island South Shore Estuary Reserve Tributaries* (**NP&V, 2008**), which specifically addresses remediation of three temporary barriers to fish passage within the tributary.

4.1 Watershed-Wide Recommendations:

4.1.1 Protection of Natural Resources

The key objectives of these recommendations are to restore existing environmental damages to the natural resources of the watershed and to improve the health of those resources in ways that will enhance the future productivity and health of the watershed‟s ecosystem. Since 2001 and the initial establishment of the Beaver Dam Creek Task Force, various initiatives among several groups and significant amounts of community effort have already been put into place to restore the tidal wetland habitats and water quality of Beaver Dam Creek (**Section 2.4.5**). Post-Morrow, Ducks Unlimited, Town of Brookhaven, Cornell Cooperative Extension, Suffolk County, Bellport High School‟s SEQ, among other groups and organizations continue to be actively involved in public education, planning and implementation of restoration activities associated with the tributary. However, the long-term health of the tributary is contingent upon the continued support and collaboration of these groups to bolster funding, find consensus, coordinate implementation of activities and promote support from individual citizens through public education. The following recommendations and initiatives are proposed to promote protection of natural resources and to aid successful implementation of the watershed management plan:

1. **Monitoring and enhancing habitats.** Seek funding and partnerships to continue and expand upon existing programs to restore, enhance and protect wetlands, in-stream habitats and natural upland areas within the watershed. Specifically, the program components should include the following:
   - Institute a program for monitoring the extent of natural and indigenous vegetation communities along the tributary and natural upland areas within the watershed.
   - Enhance existing habitats by controlling or removing problematic invasive species such as *Phragmites.*
   - Restore damaged or lost wetlands using proactive methods, such as removal of dredge spoil material and reintroduction of wetland plants.
   - Reestablish conducive underwater habitat conditions for shellfish.
   - Improve wetland productivity by eliminating or reducing point and nonpoint sources of pollution (see **Section 4.1.2** and **4.1.3** below).
   - Remove or mitigate barriers to wildlife passage.

2. **Acquisition of land.** Considerable efforts have been made by Suffolk County, the Town and the Post-Morrow Foundation to acquire lands for open space preservation in the vicinity of the tributary and upland areas important for groundwater protection (see **Section 2.4.5**). However,

opportunities for additional land acquisition should be considered as funds and parcels become available for acquisition or other means of protection, including:

- Waterfront lots with existing expanses of tidal wetlands and adjacent areas supporting rare plants or communities, and endangered and/or threatened species.
- Remaining vacant land along the Beaver Dam Creek corridor near the headwaters of the tributary. The Town and County should cooperate with private interests to consolidate these parcels through exchange of ownership, acquisition through tax defaults, or transfer of development rights.
- Vacant old filed lots in the northwest quadrant of the watershed near the landfill. These parcels provide a buffer between residential areas and the landfill. They should be acquired through either tax defaults or outright acquisition.
- Beaver Dam Boat Basin. Purchase or partnership agreement for operation/ management of this marina could aid the pursuit of best management operation practices and improvements.
- Consider consolidation of public land between Montauk and Sunrise Highways and use Transfer of Development Rights (TDRs) to swap public land with privately held land nearest the headwaters section of the tributary.

3. **Complete the residential upzoning to A2**. Although substantial spot upzoning has occurred within Brookhaven Hamlet since the 1995 Hamlet Study, all remaining residential parcels two acres and larger within the watershed study area boundary should be upzoned to A2.

4. **Continued coordination among stakeholders.** Promote ongoing collaboration of the Beaver Dam Creek Task Force with involved agencies and non-profit groups for implementation of the watershed management plan recommendations. This can be achieved through the establishment of an e-mail list-serve with key members of these organizations, during regular meetings of the Brookhaven Village Association, via continued updates to the existing websites concerning the Beaver Dam creek watershed, such as the Brookhaven Village Association"s website (http://www.brookhavenvillageassociation.org/) and the Brookhaven/South Haven Hamlets website (http://brookhavensouthhaven.org/), as well as the Brookhaven/South Haven Blog (http://brookhavensouthhaven.blogspot.com/) and Post-Morrow newsletters.

5. **Volunteer maintenance and monitoring.** Involve schools, scouting and other groups in the ongoing maintenance, monitoring and improvement of the watershed and its bordering open space areas (i.e. spring and fall maintenance and cleanups, monthly litter pickup runs, etc.). These efforts can be coordinated through local organizations such as the Post-Morrow Foundation, Cornell Cooperative Extension, Beaver Dam Creek Task Force and the Brookhaven Village Association.

6. **Sponsorship of Improvements**. Allow local organizations and business groups/associations to sponsor signage, information plaques and to underwrite the addition (and maintenance) of landscaping or other improvements by permitting recognition of their monetary contribution towards the improvement on signage (e.g. similar to highway mile sponsors).

4.1.2 Education and Outreach

The Town of Brookhaven has implemented numerous stormwater-focused educational programs to increase citizen stewardship within their communities and reduce pollutants that can potentially impact ground and surface water resources. These programs, including detailed actions implemented through the Town‟s Stormwater Management Program, are discussed in **Section 2.4.5**. Additional recommendations are presented here to further make the public aware of issues within the watershed, and to promote the discontinuance of practices which contribute to pollution within the watershed. The following recommendations are provided:

1. **Educational Programs and Opportunities**. Continue to provide educational opportunities through the Town‟s Stormwater Management Program, as well as develop/promote educational opportunities regarding watershed habitat protection and other public involvement opportunities in the form of pamphlets, newsletters, website information, posting of signage with the name of the tributary at tributary/road crossings, and other media tools through Cornell Cooperative Extension, Suffolk County, Town of Brookhaven, Post-Morrow Foundation and the South Shore Estuary Reserve.

2. **Storm drain marking program.** Have Suffolk County and the Town continue the storm drain marking program in coordination with local groups, such as SEQ, for placement of medallions on additional storm drains throughout the watershed.

3. **Fertilizer use.** Encourage homeowners to reduce or eliminate fertilizer use, or remove fertilizer dependent vegetation and establish native planting areas in proximity to Beaver Dam Creek.
   - Educate the public about the value of protecting the indigenous landscape through local outlets, such as schools, libraries, horticultural centers and local landscapers.
   - Practice bayscaping, an environmentally friendly form of landscaping within coastal watersheds (visit www.peconicbaykeeper.org for more information). Include maintaining or creating naturalized meadow, woodland and shrub planting areas to intercept and filter stormwater and reduce fertilizer/nutrient input. Organizations such as the Peconic Baykeeper and Cornell Cooperative Extension already have extensive ecological landscaping information in place and can aid local organizations such as the Post-Morrow Foundation and Brookhaven Village Association in disseminating this information for no or minimal cost within the community via their websites, flyers and community meetings.
   - Plant shade trees along open stretches of tributary banks for soil stability, biological uptake and shading of surface water to maintain lower water temperatures and higher dissolved oxygen levels.

4. **Stormwater runoff.** Encourage homeowners to reduce stormwater runoff from their properties through the following mechanisms:
   - Redirect gutters into dry wells or rain barrel collection systems.
   - Install rain gardens planted with native vegetation and redirect gutters into them.

- Consider pervious alternatives to paved walkways and driveways (e.g. crushed stone or seashells, pavers, pervious pavement).
- Reduce or eliminate lawn watering.

5. **Sanitary system maintenance.** Encourage homeowners to regularly inspect and maintain on-site sanitary systems in high groundwater areas and elsewhere in the watershed. Detailed information to educate homeowners on maintenance can be found on Cornell Cooperative Extension‟s website at http://waterquality.cce.cornell.edu/.

6. **Waterfowl population control.** High concentrations of waterfowl such as Canada geese can result in elevated bacteria levels and excess nutrients within local waterways. These concentrations can be managed by discouraging the feeding of waterfowl, and discouraging lawns that extend down to tributary banks. Instead, native plant buffers such as tall grasses can be established along the shoreline.

7. **Boat maintenance BMPs and 'Clean Boater' packet.** Encourage use of environmentally-friendly boat cleaning and bottom paint products. Establish a program to provide boat owners with a „Clean Boater‟ packet at time of annual boating permit issuance (similar to Connecticut‟s Department of Environmental Protection program). The packet could include a free bilge sock or oil absorbent pad for small spills on the boat, a pumpout facilities directory, and boat maintenance BMP information.

8. **Business stewardship**. Identify and work with local businesses in the watershed to educate them on how their daily activities can significantly contribute to groundwater contamination and/or stormwater pollution, such as auto garages or landscapers. Develop and initiate an education campaign focused on activities which are harmful and simple steps which could be taken to reduce or eliminate those pollution sources.

9. **Dog waste.** Encourage compliance with the Town‟s new "pooper scooper law" through:
   - Friendly reminders on the Brookhaven Village Association website, in Post-Morrow Newsletters and the Town‟s "Green Gazette."
   - Continued maintenance/availability of buckets and bags on Post-Morrow properties which are utilized for dog walking.
   - Placement of additional buckets/bags or other bag dispensers in key areas utilized by the public for convenience.

4.1.3 Point and Nonpoint Source Management and Control

The key objective of these recommendations is to reduce both point and nonpoint sources of pollution within the watershed. Despite the current level of protection for development activities within and adjacent to tidal and freshwater wetlands discussed in **Section 2.4.5**, the varying array of many nonpoint sources of pollution (e.g. lawn fertilization, regular pumping of septic systems, picking up of pet waste, etc.) are often more discrete and difficult to control. Therefore, control of these pollution sources must be largely handled through education of the community and municipal staff to increase awareness and promote voluntary actions by individuals (**Section 4.1.2**). However, additional measures must be implemented at the local and county level. Adoption of this WMP is vital in unifying the responsibilities of municipal government and coordination of local organizations for the implementation of all recommended measures. Gaps within existing local laws are further discussed below and in **Section 5.1**. The following recommendations are provided:

1. **Sanitary Systems.** Consider adoption of a Town of Brookhaven on-site treatment system management program that requires[1]:
    - On-site treatment systems to be inspected and maintained or rehabilitated at a minimum frequency of once every three years; and
    - Provides enforcement.

    Section 5.1 provides additional detail regarding legislative options for sanitary system upgrades which have been successful in other areas of the country.

2. **Land use density**. Ensure appropriate land use density within the watershed area for Beaver Dam Creek, through upzoning of remaining vacant parcels (see **Section 4.1.1**) and coordination with Suffolk County Department of Health Services on the implementation of Article 6 of the Suffolk County Sanitary Code; sanitary credit transfers to the Beaver Dam Creek watershed area should be reviewed and limited based on nitrogen load.

3. **Groundwater quality.** Improve the quality of groundwater flowing toward Beaver Dam Creek by reducing the volume and types of nonpoint sources of pollution impacting the tributary. The following components are necessary for long-term management of nonpoint sources from groundwater; strategies for their implementation are further discussed in **Section 4.2** and **Section 5.0**.

[1] These are May 2008 MS4 municipal separate storm sewer system (MS4) SPDES General Permit Requirements for MS4s discharging to Oyster Bay/Mill Neck Creek and the Peconic Bay Total Maximum Daily Load (TMDL) drainage areas.

- Continued meeting of the Beaver Dam Creek Water Quality Group with Brookhaven Town and county officials to address the leachate plume.
- Mapping of the groundwater contributing area to Beaver Dam Creek (e.g. refinement of the Suffolk County Groundwater Model by CDM in 2003).
- Implement a GIS tracking system for status of residential wells (e.g. abandoned, in use), as well as for monitoring wells being used to track the leachate plume.
- Conduct pollutant load modeling for groundwater-based sources to determine water quality impacts (e.g. nitrogen) resulting from sources such as on-site sanitary systems in high water table areas, existing and proposed sewer districts, and from the Town of Brookhaven landfill leachate plume.
- Remediate nonpoint source pollution from groundwater (e.g. upgrade/relocation of non-functioning sanitary systems, mitigation of leachate plume from the Town landfill).
- Implement a GIS tracking system for septic system location, maintenance and functioning status, particularly within high groundwater areas. An inspection mechanism and schedule for tracking septic system maintenance should be implemented through the coordination of Town and County staff.

4. **Stormwater pollution.** Regular maintenance of existing drainage infrastructure and roadways (street sweeping, leaf collection, etc.) are key actions to ensuring accumulated leaves, sediment and other pollutants are not directed into the adjacent waterways. Reduce the volume and types of nonpoint sources of pollution carried within stormwater to improve the quality of surface waters within the watershed so that the tributary‟s surface waters consistently meet the State of New York‟s *SA water quality standards* for swimming, fishing and shell-fishing. This can be accomplished through the continued implementation of the Town‟s Stormwater Management Program (see **Section 2.4.5)**, as well as through the enforcement of NYS standards for erosion and sediment control and post-construction design for construction projects of one acre or more. A valuable resource is the NYSDEC and NYSDOS *Stormwater Management Guidance Manual for Local Officials* **(2004**). The following additional components are necessary for long-term management of nonpoint sources from stormwater runoff; strategies for their implementation are further discussed in **Section 4.2** and **Section 5.0.**
   - Expansion of stormwater staff at the Town of Brookhaven to be able to implement the actions described within the Town‟s Stormwater Management Program.
   - Modify Town Highway Department drainage structures that direct road runoff directly into waterways. These structures should be replaced with sumps, stormwater detention basins or swales to protect waterways from direct intrusion of salt, oil, and other substances from stormwater.
   - Periodic updating of GIS mapping for storm drain infrastructure and conveyance systems, as necessary (see current comprehensive map in **Figure 2-14** and **2-14A** through **2-14C**).
   - Prioritization of street sweeping and catch basin maintenance within the Beaver Dam Creek watershed, particularly those priority subwatershed areas identified within **Figure 14**.
   - Consider alternatives to road salt that are less harmful to water quality and wildlife, such as Calcium Magnesium Acetate and Potassium Acetate.
   - Regular monitoring of catch basins/drainage structures within the watershed in order to determine necessary maintenance measures and prioritize cleanout schedules.
   - Encourage public involvement by implementing an "adopt-a-drain" program within the community, where citizens monitor existing drains, remove litter and leaf debris and report catch basins in need of cleaning to the Town.
   - Consider new or expanded stormwater retention facilities within key areas of the watershed (see recommended designs and construction timetable within **Section 4.2**).
   - Mitigate the impact of necessary impervious surface areas within the drainage area through the use of infiltration, surface detention basins, dry wells, trench drains and other types of

structures that retain, filter and recharge stormwater. The NYS Stormwater Design Manual can be used as a basis for selecting appropriate BMPs.

- Promote local organic landscape care in conjunction with the Town‟s Leaf and Mulch Program (see **Section 2.4.5**), including use of compost material from the Town of Brookhaven‟s Compost Facility instead of chemical fertilizers.
- Team with private manufacturers to install pilot stormwater and water quality drainage infrastructure improvements and new technologies (e.g. catch basin inserts, impervious pavement) for evaluation within the watershed.
- Require all new commercial and residential construction, including expansions to existing structures to install stormwater retention systems such as dry wells, trench drains, rain gardens and other BMP methods.
- Require "curb cut" permits from the Brookhaven Highway Department for the construction, relocation or paving of impervious driveways in order to ensure proper stormwater retention onsite (and ensure stormwater is not directed onto existing streets or drainage swales leading to the tributary).
- Ensure compliance with the NYS Pollutant Discharge Elimination System (SPDES) permit program and Chapter 86 of the Town Code by requiring the installation of erosion and sediment controls during all new construction and alterations involving site re-grading within the watershed area and regular inspection of these measures to ensure compliance.
- Adopt incentives to encourage property owners to install stormwater BMPs and replace impervious surfaces and driveways with pervious alternatives (gravel, crushed shell or limestone, pavers, etc).
- Consider potential impacts to the Beaver Dam Creek headwaters during preparation of the NYS DOT Sunrise Highway Corridor Sustainable Transportation Study; avoid expansion of impervious surfaces in this area to the maximum extent practicable.
- For areas directly contributing stormwater to the tributary, consider adoption and enforcement of NYS erosion and sediment control and post-construction design standards for projects of less than one acre.

5. **Providing public water.** Complete the installation of public water in areas where wells are threatened by contamination from landfill leachate-contaminated groundwater. Although public water mains are currently provided throughout the study area, there are a few individuals who are still utilizing private wells. As of March 2009, the SCDHS has been contacting all people within the plume‟s path to offer well testing and giving them the chance to switch to Suffolk County Water Authority water for free if they have not yet switched to public water.

6. **No Discharge Zone.** Maintain and improve surface water quality within the tributary through the creation of a State and federally recognized *No-Discharge Zone* encompassing the entire tributary within which boaters may not dispose of waste material through their boat bilges, holding tanks or marine toilets.

7. **Boat pump-outs.** Encourage use of existing and proposed pump-out stations through the following:
   - Provide the service for free or for a low fee.
   - Provide pump-out locations and operation hours with boating licenses or docking/mooring permits.
   - Provide access to either the pump-out boat or the station during winter months, particularly for commercial fishing boats.
   - Increase signage denoting the location of pump-out stations and the hours of operation, particularly near fueling docks and the marinas.

4.1.4 Monitoring Water Quality & Pollutant Reduction

1. **Water quality monitoring**. Existing surface water quality monitoring programs of the SCDHS and NYSDEC should be continued and expanded to determine the effectiveness of implemented management measures after they are constructed or installed. Utilize Bellport High School‟s Students for Environmental Quality (SEQ) to supplement the County‟s water quality monitoring and conduct periodic sampling to track effectiveness of stormwater improvement projects within the watershed.

2. **Landfill leachate.** The Beaver Dam Creek Water Quality Group should continue to meet with Town and county officials to address the landfill leachate plume. It is imperative that the severity and spatial extent of the landfill leachate plume be determined (see **Section 4.1.3**), tracked over the long term, and appropriate mitigation actions put into place until the plume no longer poses a threat to public health or the environment. Modeling the extent of the plume could be done by using a contaminate transport model or by analyzing water samples from ground water wells (already initiated by Town). A contaminate transport model can be an add-on to a calibrated ground water flow model and based upon earlier studies completed for the Town.

3. **Failing sanitary systems.** Identify failing on-site septic systems within the surface and ground water contributing area. This could be done by analyzing water samples from shallow ground water wells and comparing these data to regions with similar land uses, nearby areas and sewered areas. Track these identified systems in GIS and remediate as necessary (see **Section 4.1.3**).

4. **Adaptive management.** The recommendations and implementation of this WMP should be re-evaluated and adjusted as necessary in the future as conditions change and more information is gathered. At minimum, a re-evaluation should occur within 10 years of the adoption of this WMP.

4.2 Target Projects and Priority Actions

Based upon the results of the pollutant load analysis discussed in **Section 3.0**, **Table 4-1** below identifies recommendations for stormwater improvements within the subwatersheds that drain into Beaver Dam Creek. Target projects and priority actions were also determined by considering the highest ranked subwatershed areas within each stream reach and reviewing the existing drainage infrastructure conditions, availability of land area for drainage improvements and other land use and physical conditions. The recommendations for the top ranked priority areas, as well as the land use and physical constraints for each are summarized below:

Reach 1 – Subwatershed 1:

This subwatershed contributes overland flow (OF1) to the tributary (see **Figure 2-14a**) and primarily includes road runoff from Bay Road. This subwatershed is ranked as the fourth greatest estimated pollutant contributor overall. Adequate land area and depth to groundwater are available within this subwatershed for drainage installations/improvements. Suggested improvements include:

- Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Bay Road to intercept stormwater prior to the overland flow discharge point.
- Reduce existing pavement at the terminus of Bay Road in close proximity to the water (i.e., replace unused concrete area with native plantings and four foot wide access path or evaluate feasibility of bioretention area installation to provide stormwater storage and treatment prior to overflows into the Bay.
- Consider additional options for stormwater recharge and/or diversion on individual properties (e.g. installation of rain gardens or rain barrel rainwater collection systems).

Reach 1 - Subwatersheds 2 through 12:

Outfalls 1 through 11 within the Bellhaven community (see **Figure 2-14a**) collectively exceeded pollutant loads for all other subwatersheds within the study area. The Bellhaven community is densely developed and resultant runoff is captured in catch basins, which then directly pipe stormwater runoff into Beaver Dam Creek via outfalls. This area is significantly constrained with respect to both available land area and depth to groundwater for potential drainage improvements. Given these constraints, efforts in this area will need to be focused on retrofitting techniques for existing catch basins and methods to reduce runoff volumes reaching these drainage structures which directly discharge to the tributary. Suggested improvements include:

- Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables on a regular basis.
- Installation of linear, low profile drainage systems along Buscher, Shields and Lindner Courts to redirect stormwater from direct outfalls and allow for some recharge of stormwater.
- Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Highview Blvd. to intercept stormwater and reduce stormwater volumes contributing to the direct outfall pipes.
- Explore retrofit options for existing catch basins discharging directly to the tributary. While regular maintenance is required, the use of catch basin inserts to capture oils, sediment, bacteria and other pollutants would assist in improving water quality of directly discharged stormwater into the tributary.
- Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies, such as catch basin

retrofitting and replacement of existing paved areas (such as cul-de-sacs) with porous pavement or grass pave (load bearing cellular confinement system which is planted and resembles lawn area).

- Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems on individual properties).

Reach 1 – Subwatershed 13:

The subwatershed contributes overland flow to the tributary (OF2; see **Figure 2-14a**) and primarily includes farmland to which Suffolk County maintains the development rights. Due to its size and land use, this subwatershed is the greatest estimated pollutant contributor in Reach 1 and ranked number 2 overall. Most of the concern regarding this subwatershed is related to periods of exposed soils which occur during typical farm practices and from the lack of on-site stormwater storage/recharge, as currently the majority of stormwater runoff is directed along the topographic profile of the area, towards the tributary. Adequate land area and depth to groundwater are available within this subwatershed for drainage installations/improvements. Suggested improvements include:

- Investigate the possibility of creating vegetated drainage swales or berms and adding drainage retention (with large storm overflows) on the seaward (eastern) side of the existing farm areas to reduce direct runoff to the tributary and associated wetland areas.
- Installation of roadside leaching drainage structures along South Country Road to recharge stormwater runoff in areas with greater depth to groundwater and reduce stormwater runoff volumes from running overland towards the tributary.
- Partner with the NYS Department of Agriculture and Markets to further promote the Agricultural Environmental Management Program in order to encourage the implementation of the identified conservation practices, and/or explore options for conservation easements or other means to support agricultural BMPs.

Reach 1 – Subwatershed 15:

This subwatershed contains the Beaver Dam Marina, which contributes stormwater to the tributary via Outfall 12 (O12; see **Figure 2-14a**). This subwatershed is ranked as the fifth greatest estimated pollutant contributor overall. Suggested improvements include:

- Require installation of stormwater drainage improvements and consider conversion of existing impervious parking area to pervious pavement or gravel parking/storage areas during any future site plan or building department application for Beaver Dam Marina to reduce runoff and improve stormwater recharge.

Reach 2 – Subwatershed 17

This outfall (O13) was ranked sixth overall and is a direct discharge pipe associated with a residential development in which all stormwater is directed from roadside catch basins to this outfall (see **Figure 2-14b**). As the roadside catch basins connected to this outfall have little or no stormwater storage or recharge capacity, pollutants are discharged directly into the tributary. Therefore, the following improvement projects are suggested for consideration:

- Installation of roadside leaching drainage structures along Prairie Lane to recharge stormwater runoff and reduce direct flow of runoff into the tributary.
- Pursue the purchase of existing vacant land within the subwatershed for the creation of a recharge basin to serve this area or obtain drainage easements to redirect stormwater to recharge facilities and away from the tributary.
- Reduce impervious surface area which contributes stormwater runoff to the tributary by educating and working with homeowners to consider pervious alternatives to paved areas and on-site stormwater recharge options (e.g. rain gardens, rainwater collection systems for reuse as irrigation, dry wells, etc.).
- Require the installation of stormwater retention for any newly proposed impervious surfaces.

Reach 3 – Subwatershed 19

Outfall 14 (O14), which is a directly discharging outfall pipe into the tributary, was ranked as the number 1 priority for the overall watershed. This subwatershed is mainly comprised of impervious area associated with South Country Road as it merges into Montauk Highway north of the LIRR tracks and several commercial uses with high amounts of impervious cover, and therefore high stormwater runoff volumes. While depth to groundwater is limited in areas closest to the tributary, vacant lands, owned by the Town of Brookhaven (north side of the LIRR and east of Old Country Road) and the Post Morrow Foundation (large parcel on the west side of Montauk Highway), are present within or adjacent to this subwatershed, which may present opportunities for the installation of stormwater retention and water quality treatment practices. It is also within this portion of the watershed/tributary in which NP&V staff observed vaporizing chemicals from culverts and friable oil and flocculent within the tributary itself, which is most likely the result of direct chemical discharges or dumping and evidence of the plume from the Brookhaven Landfill reaching this area. As this is the northernmost subwatershed associated with an outfall, water treatment within the area should be considered. Priority actions for this outfall include:

- Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Montauk Highway and South Country Road within the subwatershed contributing area in order to redirect stormwater from the existing catch basins (labeled CB97 – CB 99, see **Figure 2-14c**) that directly discharge to the tributary.
- Exploration of the use of either the Town or Post Morrow-owned vacant lands adjacent or within the subwatershed for the installation of pilot stormwater water quality treatment practices such as:
    - Hydrodynamic separators and/or other BMPs with low maintenance requirements to remove sediments and hydrocarbons. (Hydrodynamic separators have been successfully installed by the Town in Setauket and Sound Beach).
    - If adequate land area is available, the creation of bioretention areas, wet or dry swales or constructed stormwater ponds/wetlands in accordance with the *New York State Stormwater Management Design Manual* could be explored.
- Initiate inspections and enforcement of surrounding businesses to monitor potential discharge violations and to prevent further chemical discharges to the tributary.
- Coordination between the Town, SCDHS and NYSDEC to further monitor the plume to track the full extent of its reaches and establish options and secure funding for plume remediation to prevent further spread of the plume into the tributary and groundwater.

Additionally, the remediation of the three temporary barriers to fish passage identified within the 2008 inventory for SSER **(NPV, 2008)** is recommended as a priority action. Implementation requires the coordination of Town staff with the LIRR for remediation of Crossings 50 and 51, while Crossing 46 can be easily implemented by Town staff alone:

- Reach 3, Outfall 14:
    - Fish Barrier Crossing 50 – Replace the collapsed culvert below the LIRR to allow for unimpeded passage of fish and wildlife.
    - Fish Barrier Crossing 51 – Remove the short section of chain link fence which currently crosses through Beaver Dam Creek on the north side of the LIRR.

- Reach 2:
    - Fish Barrier Crossing 46 – Remove log jam which is currently impeding fish passage near the vicinity of Beaverbrook Drive.

Table 4-1 provides a summary of recommendations for the remaining subwatershed outfalls.

TABLE 4-1

SPECIFIC RECOMMENDED STORMWATER MANAGEMENT IMPROVEMENTS WITHIN THE BEAVER DAM CREEK WATERSHED MANAGEMENT AREA

Sub-watershed #	Infrastructure Type & No.	Priority Ranking	Estimated Water Quality Volume*	Recommended Improvements
Reach 1				
1	Overland Flow (OF1)	4	±12,350 CF	▪ Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Bay Road to intercept stormwater prior to the overland flow discharge point. ▪ Reduce existing pavement at the terminus of Bay Road in close proximity to the water (i.e., replace unused concrete area with native plantings and four foot wide access path or evaluate feasibility of bioretention area installation to provide stormwater storage and treatment prior to overflows into the Bay. ▪ Consider additional options for stormwater recharge and/or diversion on individual properties (e.g. installation of rain gardens or rain barrel rainwater collection systems).
2 - 12	Outfalls (O1 – O11)	Ranging from 3-19.	±51,103 CF	▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables on a regular basis. ▪ Installation of linear, low profile drainage systems along Bellhaven Rd. and Buscher, Shields and Lindner Courts to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Highview Blvd. to intercept stormwater and reduce stormwater volumes contributing to the direct outfall pipes. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary. While regular maintenance is required, the use of catch basin inserts to capture oils, sediment, bacteria and other pollutants would assist in improving water quality of directly discharged stormwater in to the tributary. ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas (such as cul-de-sacs) with porous pavement or grass pave.

Sub-watershed #	Infrastructure Type & No.	Priority Ranking	Estimated Water Quality Volume*	Recommended Improvements
				▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems on individual properties).
13	Overland flow (OF2)	2	±17,800 CF	▪ Investigate the possibility of creating vegetated drainage swales or berms and adding drainage retention (with large storm overflows) on the seaward (eastern) side of the existing farm areas to reduce direct runoff to the tributary and associated wetland areas. ▪ Installation of roadside leaching drainage structures along South Country Road to recharge stormwater runoff in areas with greater depth to groundwater and reduce stormwater runoff volumes from running overland towards the tributary.
14	Overland Flow (OF3)	16	±3,100 CF	▪ Consider installation of roadside stormwater leaching drainage structures or (if depth to groundwater is minimal) low profile infiltrator systems at Bay Rd. and 2nd Street to reduce stormwater to the overflow on the southern portion of the subwatershed.
15	Outfall (O12)	5	±11,100 CF	▪ Require installation of stormwater drainage improvements and consider conversion of existing impervious parking area to pervious pavement or gravel parking/storage areas during any future site plan or building department application for Beaver Dam Marina to reduce runoff and improve stormwater recharge.
Reach 2				
16	Overland Flow (OF4)	10	±4,600 CF	▪ Consider installation of catch basins with inserts along this stretch of Beaverdam Road to capture oils, sediment, bacteria and other pollutants.
17	Outfall (O13)	6	±10,700 CF	▪ Installation of roadside leaching drainage structures along Prairie Lane to recharge stormwater runoff and reduce direct runoff into the tributary. ▪ Pursue the purchase of existing vacant land within the subwatershed for the creation of a recharge basin to serve this area or obtain drainage easements to redirect stormwater to recharge facilities and away from the tributary. ▪ Reduce impervious surface area which contributes stormwater runoff to the tributary by educating and working with homeowners to consider pervious alternatives to paved areas and on-site stormwater recharge options (e.g. rain gardens, rainwater collection systems for reuse as irrigation, dry wells, etc.).

Sub-watershed #	Infrastructure Type & No.	Priority Ranking	Estimated Water Quality Volume*	Recommended Improvements
				▪ Require the installation of stormwater retention for any newly proposed impervious surfaces.
18	Overland Flow (OF5)	12	±4,000 CF	▪ Installation of roadside leaching drainage structures along South Country Road (near junction with Fireplace Neck Rd.) to capture oils, sediment, bacteria and other pollutants prior to direct overflow to the tributary.
Reach 3				
19	Outfall (O14)	1	±32,750 CF	▪ Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Montauk Highway and South Country Road within the subwatershed contributing area in order to redirect stormwater from the existing catch basins that directly discharge to the tributary. ▪ Exploration of the use of either the Town or Post Morrow owned vacant lands adjacent or within the subwatershed for the installation of pilot stormwater water quality treatment practices such as: o Hydrodynamic separators in areas with adequate depth to groundwater (which remove sediments and hydrocarbons with little maintenance requirements and have been successfully installed by the Town in Setauket and Sound Beach) o If adequate land area is available, explore the creation of bioretention areas, wet or dry swales or constructed stormwater ponds/wetlands in accordance with the *New York State Stormwater Management Design Manual*. ▪ Initiate inspections and enforcement of surrounding businesses to monitor potential discharge violations and to prevent further chemical discharges to the tributary. ▪ Continued coordination between the Beaver Dam Creek Water Quality Group and Town and County officials to further monitor the plume, track its extent, devise a strategy for mitigation, and secure funding for plume remediation to prevent further spread of the plume into the tributary and groundwater. (This is currently ongoing and the Town has commenced expanded monitoring of groundwater wells). ▪ Regular monitoring by the Suffolk County Health Department of the surface waters of Beaver Dam Creek, for contaminants associated with groundwater pollution, particularly ammonia.

*Estimated Water Quality Volume is the estimated stormwater volume which the storm event will carry 90 percent of the pollutant load and therefore the treatment volume goal for proposed stormwater management practices. Value provided in cubic feet (CF).

Before structural measures are implemented, a qualified and experienced professional should delineate and flag wetland areas near the proposed stormwater remediation projects noted in **Table 4-1**. The inspection of each proposed Best Management Practice or new retention facility should include the following components: locate the tidal wetlands boundary, measure water depths at various locations, if necessary conduct reviews of existing site conditions, catalog vegetative species, collect photographic documentation as well as land-use and geographical details for completion of environmental forms. In addition, coordination with survey crew will be required for field location of property lines, wetland boundaries and existing drainage infrastructure that would tie into such systems.

SECTION 5.0

5.0 IMPLEMENTATION STRATEGY

The following implementation strategy is designed to advance the goals and objectives of the Beaver Dam Creek Watershed Management Plan. This strategy essentially consists of a schedule of specific activities, capital projects and policy or legislative actions that need to be enacted and implemented in order to ensure adequate management of the watershed in accordance with this plan. The strategy is based on the recommendations set forth in **Section 4.0**.

Beaver Dam Creek lies within multiple governmental jurisdictions, and each agency is responsible for a different type of activity that affects the watershed or directly affects the tributary. This WMP is designed to facilitate inter-governmental coordination and cooperation among these agencies so as to ensure that all actions work to the benefit of the watershed. The purpose of this section is to identify the sphere of jurisdiction exercised by each relevant agency, as well as to identify the specific actions that each agency can take to help implement the recommendations set forth in **Section 4.0**.

This Section is divided into three sub-sections; **Section 5.1** identifies recommended revisions to local land and water use controls which would help to preserve water quality and ecological resources; **Section 5.2** identifies the governmental jurisdictions that will have a role in implementing the Beaver Dam Creek WMP and categorizes the actions they must take; and **Section 5.3** lists costs and potential funding sources which the County, Town and local non-profit organizations should review when seeking financial assistance to implement the recommended actions.

5.1 Revisions to Local Land and Water Use Controls

In order to achieve many of the recommendations discussed in **Section 4.1**, revisions to local land and water use controls will be necessary. The following specific actions have been identified as necessary to implement these recommendations:

- Consider completing the residential upzoning to A2 recommended within the Brookhaven Hamlet Study. All remaining residential parcels two acres and larger within the watershed study area boundary should be upzoned.

- Ensure appropriate land use density within the watershed area for Beaver Dam Creek, through coordination with SCDHS on the implementation of Article 6 of the Suffolk County Sanitary Code. Transfer of Development Rights (TDRs) to the Beaver Dam Creek watershed area should be reviewed and limited based on nitrogen load.

- The contribution of nitrogen to surface waters is largely the result of malfunctioning and antiquated on-site sanitary systems. The development of enforceable regulations providing requirements to improve antiquated and failing sanitary systems and ensure proper maintenance of sanitary systems would greatly reduce the contribution of nitrogen from sanitary wastes via groundwater into Beaver Dam Creek and other surface waters. Review and consideration of local regulations to require mandatory pump outs, as well as upgrades of cesspools and malfunctioning septic systems within groundwater contributing areas is recommended by SCDHS and the Town of Brookhaven. The May 2008 MS4 municipal separate storm sewer system (MS4) SPDES General Permit Requirements for MS4s discharging to Oyster Bay/Mill Neck Creek and the Peconic Bay Total Maximum Daily Load (TMDL) drainage areas presently require:
    - On-site treatment systems to be inspected and maintained or rehabilitated at a minimum frequency of once every three years; and
    - Provides enforcement.

  Similar requirements should be adopted by the Town of Brookhaven through the development of an on-site treatment system management program.

The Town of South Kingstown, Rhode Island could also serve as a valuable model for a community which has implemented a septic system ordinance that focuses on upgrading old and non-functioning systems to protect the water quality of sensitive coastal waters. Key features of the South Kingstown code include the following:

- Legislation is drafted in accordance with and under the authority of the state law.
- Records maintained for system inspection, maintenance and upgrades.
- Establishment of a public education program to inform people about the findings, benefits and goals of on-site wastewater management.
- Inspection results used to complete a town-wide system inventory and to track inspections, maintenance and upgrades.
- System owners assume responsibility for hiring a septage hauler or maintenance contractor to complete the maintenance/inspection requirements contained in the inspection report.
- All cesspools are considered substandard and an inadequate means of on-site wastewater treatment. Therefore, they are considered to be malfunctioning systems that are to be replaced with an on-site wastewater system conforming to state and local standards within 12 months after the sale of a property or within five years of the date of the first maintenance (baseline) inspection.
- Grant and loan program with 2% fixed rate for replacement of malfunctioning systems.

Further information can be found at: www.southkingstownri.com/code/pw_onsitewaste.cfm.

- Maintain and improve surface water quality within the tributary through the creation of a State and federally recognized *No-Discharge Zone (NDZ)* encompassing the entire tributary within which boaters may not dispose of waste material through their boat bilges, holding tanks or marine toilets. (The Peconic Baykeeper has already enlisted the support of local towns, established a campaign, and seeks to carry forward a petition to the NY Department of State for designating the South Shore Estuary a NDZ).

- Promote low impact development and require stormwater quality best management practices for on-site drainage design on any site plans and subdivisions in the watershed area.

- Establish and set aside funding for creation of incentive programs to encourage property owners to use BMPs for stormwater management and reduction of existing impervious area for existing development within the watershed.

- Require "curb cut" permits from the Brookhaven Highway Department for the construction, relocation or paving of pervious driveways in order to ensure proper stormwater retention on-site (and not directed onto existing streets or drainage swales leading to the tributary).

- In addition to enforcing the NYS standards for erosion and sediment control and post-construction design for construction projects of one acre or more, consider adoption and enforcement of these standards for construction projects of less than one acre for projects involving site re-grading within areas directly contributing stormwater to the tributary.

5.2 Implementation Actions According to Governmental Jurisdiction

Table 5-1 identifies each of the applicable governmental jurisdictions beginning with the local on up through the federal level. Although the WMP will guide federal, state and local actions in accordance with the New York State Coastal Zone Management Act, it will not be binding on the County of Suffolk. However, there is a long history of constructive cooperation between the County and the Town of Brookhaven on environmental issues. For that reason, the County has been included in **Table 5-1.**

TABLE 5-1

IMPLEMENTATION STRATEGY FOR BEAVER DAM CREEK

JURISDICTIONS & ACTIONS

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
Watershed-Wide Recommendations							
Protection of Natural Resource Recommendations							
1.	**Monitoring and enhancing habitats.** Seek funding and participation partnerships to continue and expand upon existing programs to restore, enhance and protect wetlands, in-stream habitats and natural upland areas within the watershed. - Institute a program for monitoring the extent of natural and indigenous vegetation communities along the tributary and natural upland areas within the watershed. - Enhance existing habitats by controlling or removing problematic invasive species such as *Phragmites* and restore damaged or lost wetlands through the use of proactive methods such as removal of dredge spoil material and reintroduction of wetland plants. - Improve wetland productivity by eliminating or reducing point and nonpoint sources of pollution, reestablishing conducive underwater habitat for shellfish, and removing or mitigating barriers to wildlife passage.	Municipal & Private Implementation	Town; SSER; Brookhaven Village Association (BVA), Post Morrow Foundation (PMF) or Other Land Preservation Interest Groups	Long Term/ Immediate & Ongoing	3, 4, 5, 9, 12 & 13	County, Town, Post Morrow Foundation & Other Private Funding Sources, Consultant	>$10,000 per Project (costs dependent on scale of restoration projects) Shoreline Restoration Projects
1a.	Reach 3, Outfall 19: ▪ Fish Barrier Crossing 50 - Replace the collapsed culvert below the LIRR to allow for unimpeded passage of fish and wildlife. ▪ Fish Barrier Crossing 51 - Remove the short section of chain link fence which currently crosses through Beaver Dam Creek on the north side of the LIRR.	Government Action	LIRR; Town	Short Term	13	LIRR; Town; Private Drainage Vendors/ Contractor	Dependent Upon Scope of replacement needs
1b.	Reach 2: ▪ Fish Barrier Crossing 46 – Remove log jam which is currently impeding fish passage near the vicinity of Beaverbrook Drive.	Government Action	Town	Immediate	N/A	Town	Negligible number of staff hours
2.	**Acquisition of land.** Acquire additional lands (waterfront lots with existing expanses of tidal wetlands and adjacent areas supporting rare plants or communities, remaining vacant land near headwaters of tributary, vacant old filed lots in the northwest quadrant of the watershed; and Beaver Dam Boat Marina) as funds and parcels become available for sale. Consider consolidation of public land between Montauk & Sunrise Highways and TDRs to swap public land with private land nearest the headwaters of tributary.	Municipal & Private Implementation	County; Town; PMF or Other Land Preservation Interest Groups	Long Term/ Immediate & Ongoing	10	N/A	Market Value of Land
3.	**Complete the residential upzoning to A2**. Although substantial spot upzoning has occurred within Brookhaven Hamlet since the 1995 Hamlet Study, all remaining residential parcels two acres and larger within the watershed study area boundary should be upzoned to A2.	Legislative	SCDHS & Town Board, Town Planning Board; ZBA	Short Term/ 1-3 years	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town Boards and Consultants	Improved Coordination & Policy
4.	**Continued coordination among stakeholders.** Promote on-going collaboration of the Beaver Dam Creek Task Force with involved agencies and non-profit groups for implementation of the watershed management plan recommendations via establishment of an e-mail list-serve, through Brookhaven Village Association (BVA) meetings, continued updates to existing local websites and blogs.	Direct Government Action; Education	Town; SSER; PMF; BVA; Private Community Involvement	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town; SSER; Local Schools; Private Organizations/ Businesses	Town/County Staff Hours for Coordination of Outreach Programs

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
5.	**Volunteer maintenance and monitoring.** Involve schools, scouting and other groups of young people in the ongoing maintenance and improvement of the watershed and its bordering open space areas (i.e. spring and fall maintenance and clean-ups, monthly litter pick-up runs, etc.).	Direct Government Action; Education	Town; SSER; Local Schools; Private Community Involvement	Short, Intermediate & Long Term	2, 3, 4, 8, 9, 12 & 13	Town; SSER; Local Schools; Private Organizations/ Businesses	Town/County Staff Hours for Coordination of Outreach Programs
6.	**Sponsorship of Improvements.** Allow local organizations and business groups/associations to sponsor the information plaques and to underwrite the addition (and maintenance of) landscaping or other improvements by permitting recognition of their monetary contribution towards the improvements on signage (e.g. similar to highway mile sponsors).	Direct Government Action; Education	Town; Private Community Involvement	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town; Private Organizations/ Businesses	Town/County Staff Hours for Coordination
Education and Outreach Recommendations							
1.	**Educational programs and opportunities**. Continue to provide educational opportunities through the Town"s Stormwater Management Program, as well as develop/promote educational opportunities regarding watershed habitat protection and other public involvement opportunities in the form of pamphlets, newsletters, website information, posting of signage with name of tributary at tributary/road crossings, and other media tools through CCE, County, Town, PM and SSER.	Education; Individual Implementation	Town; SSER; County, PMF, Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Private Organizations/ Businesses Consultant; Printer	$15,000 per yr*/ Literature, Signs, Web
2.	**Storm drain marking program.** Continue Suffolk County and the Town storm drain marking program in coordination with local groups, such as SEQ, for placement of medallions on additional storm drains throughout the watershed.	Direct Government Action; Education	Town; SSER; Local Schools; Private Community Involvement	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town; SSER; Local Schools; Private Organizations/ Businesses	Town/County Staff Hours for Coordination of Outreach Programs
3.	**Fertilizer use.** Encourage homeowners to reduce or eliminate fertilizer use, or remove fertilizer dependent vegetation and establish native planting areas.	Education; Private Implementation	Town; SSER; CCE, PMF Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
3a.	- Educate the public about the value of protecting the indigenous landscape through local outlets, such as schools, libraries, horticultural centers and local landscapers.	Education;	Town; SSER, CCE, PMF, Local Schools, Private Businesses	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Landscape Contractors	Literature-Web
3b.	- Practice bayscaping and maintain or create naturalized meadow, woodland and shrub planting areas intercept and filter stormwater and reduce fertilizer/nutrient input.	Education; Permit; Private Implementation	Town; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Landscape Contractors	Private Funds/ Buffer Plantings
3c.	- Plant shade trees along open stretches of tributary banks for soil stability, biological uptake and shading of surface water to maintain lower water temperatures allowing higher dissolved oxygen levels.	Education; Private Implementation	Town; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Landscape Contractors	Private Funds/ Buffer Plantings
4.	**Stormwater runoff**. Encourage homeowners to reduce stormwater runoff from their properties through BMPs (redirect gutters into dry wells, rain barrel collection systems, or rain gardens planted with native vegetation and installation of pervious alternatives to paved walkways and driveways).	Education; Individual Implementation	Town; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
5.	**Sanitary system maintenance.** Encourage homeowners to regularly inspect and maintain on-site sanitary systems in high groundwater areas and elsewhere in the watershed (information available at CCE"s website).	Education	Town; SSER	Short Term/ Immediate & Ongoing	Non-Profit Donations 2, 3, 4, 6, 7, 8 & 9	Town; Consultant; Printer	Private Funds/ Improved Sanitary System Function

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
6.	**Waterfowl population control.** Discourage lawns that extend down to tributary banks and feeding of waterfowl populations).	Education; Individual Implementation	Town; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
7.	**Boat maintenance BMPs.** Encourage use of environmentally-friendly boat cleaning and bottom paint products. Establish a program to provide boat owners with a „Clean Boater" packet at time of annual boating permit issuance (similar to CT DEP). The packet could include a free bilge sock or oil absorbent pad for small spills on the boat, a pumpout facilities directory, and boat maintenance BMP information.	Education; Individual Implementation	Town; Boaters	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$20,000 per yr*/ Literature-Web
8.	**Business stewardship.** Identify and work with local businesses in the watershed to educate them on how their daily activities can significantly contribute to groundwater contamination and/or stormwater pollution, such as auto garages or landscapers. Develop and initiate an education campaign focused on activities which are harmful and simple steps which could be taken to reduce or eliminate those pollution sources.	Education; Individual Implementation	Town; Target Businesses; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
9.	**Dog waste.** Encourage compliance with Town"s new "pooper scooper law" through:	Education & Government Action	Town; SSER	Short Term/ 1-3 years	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer	Dependent Upon Specific Project
9a.	- Friendly reminders on the Brookhaven Village Associations website, in PM Newsletters and the Town"s "Green Gazette."	Education & Government Action	Town, BVA, PM Foundation	Short Term/ 1-3 years	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
9b.	Continued maintenance/availability of buckets/bags on PM properties which are utilized for dog walking.	Education & Government Action	PM Foundation	Ongoing	No cost	None	None.
9c.	- Place additional buckets/bags or install dispensers in Town and County parks and key areas for convenience, particularly in high runoff areas.	Education & Government Action	Town, County	Short Term/ Immediate & Ongoing	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Poopaway.com; ProPet.org; Curbappealsigns.com	$5,000 per yr/ Dispensers ($400-700/station and bag supply)
Point and Nonpoint Source Management and Control							
1.	**Sanitary systems.** Consider adoption of a Town of Brookhaven on-site treatment system management program that requires on-site treatment systems to be inspected and maintained or rehabilitated at a minimum frequency of once every three years and provides enforcement.	Legislative; Government Action; Enforcement	Town; SCDHS	Short Term/ Immediate & Ongoing	3, 4, 6, 7, 8 & 9	Town; Consultant; Private Organizations/ Businesses	Town Staff Hours
2.	**Land use density**. Ensure appropriate land use density within the watershed area through upzoning of remaining vacant parcels (see Sec. 4.1.1) and coordination with SCDHS on the implementation of Article 6 of the SCSC; TDRs to the Beaver Dam Creek watershed area should be reviewed and limited based on nitrogen load.	Legislative	SCDHS & Town Board, Town Planning Board; ZBA	Short Term/ 1-3 years	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town Boards and Consultants	Improved Coordination & Policy

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
3.	**Groundwater quality.** Improve the quality of groundwater flowing toward Beaver Dam Creek by reducing the volume and types of nonpoint sources of pollution impacting the tributary.	Direct Government Action; Government-sponsored research, Education	Town; County; NYSDEC; Community Involvement	Short, Intermediate & Long Term	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town; County, NYSDEC, USGS, Private Organizations/ Businesses	Town/County Staff Hours for Coordination; Dependent Upon Specific Project
3a.	- Continued meeting of the Beaver Dam Creek Water Quality Group with Town and County officials to address the leachate plume.	Direct Government Action; Community Involvement	Town; Community Involvement	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	None.	Town/County Staff Hours for Coordination
3b.	- Mapping of the groundwater contributing area to Beaver Dam Creek.	Direct Government Action	Town; County	Short Term/ 1-3 years	2, 3, 4, 8 & 9	USGS, Private Organizations/ Businesses	Dependent upon specific project
3c.	- Implement a GIS tracking system for status of residential wells (e.g. abandoned or in use), as well as for monitoring wells being used to track the leachate plume.	Direct Government Action; Community Involvement	Town; County; Community Involvement	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town, County	Town/County Staff Hours for Implementation/ Coordination
3d.	- Conduct pollutant load modeling for groundwater-based sources to determine water quality impacts (e.g. nitrogen) resulting from sources such as on-site sanitary systems in high water table areas, existing and proposed sewer districts, and from the Town of Brookhaven landfill leachate plume.	Direct Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town, County, Private Organizations/ Businesses	Dependent upon specific project
3e.	- Remediate nonpoint source pollution from groundwater (e.g. upgrade/relocation of non-functioning sanitary systems, mitigation of leachate plume from the Town landfill).	Direct Government Action; Community Involvement	Town; County; Private Individuals	Intermediate & Long Term	2, 3, 4, 8 & 9	Town, County, Private Organizations/ Businesses	Dependent upon specific project
3f.	- Implement a GIS tracking system for septic system location, maintenance and functioning status, particularly within high groundwater areas. An inspection mechanism and schedule for tracking septic system maintenance should be implemented through the coordination of Town and county staff.	Direct Government Action; Community Involvement	Town; County; Community Involvement	Short Term/ 1-3 years, Intermediate & Long Term	2, 3, 4, 8 & 9	Town, County, Private Organizations/ Businesses	Dependent upon specific project
4.	**Stormwater pollution**. Reduce the volume and types of nonpoint sources of pollution so that all (or most) of the watershed consistently meets the State of New York"s *SA water quality standards* for swimming, fishing and shell-fishing. This can be accomplished through the continued implementation of the Town"s Stormwater Management Program and the following additional components necessary for long-term strategic management of nonpoint sources from stormwater runoff.	Direct Government Action	SCDHS & Town; Planning Board; ZBA	Short Term/ 1-3 years	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town Boards and Consultants	$2,000 per yr/ Improved Coordination & Policy
4a.	- Expansion of stormwater staff at Town of Brookhaven to be able to implement the actions described within the Town"s Stormwater Management Program.	Direct Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 6, 7, 8 & 9	Town	$150,000 per yr for new staff
4b.	- Modify Town Highway Department drainage structures that direct road runoff directly into waterways. These structures should be replaced with sumps, stormwater detention basins or swales to protect waterways from direct intrusion of salt, oil, and other substances from stormwater.	Direct Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 6, 7, 8 & 9	Town Stormwater and Highway Staff, Drainage Contractors	Dependent upon specific project
4c. 4d.	- Periodic updating of GIS mapping for storm drain infrastructure and conveyance systems, as necessary (see current comprehensive map in **Figure 2-14** and **2-14A** through **2-14C**). - Prioritization of street sweeping and catch basin maintenance within the watershed, particularly those priority subwatershed areas identified within **Figure 14**.	Direct Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town	Town/County Staff Hours for Implementation/ Coordination

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
4e.	- Consider alternatives to road salt that are less harmful to water quality and wildlife, such as Calcium Magnesium Acetate and Potassium Acetate.	Direct Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town	Town/County Staff Hours for Implementation/ Coordination
4f. 4g.	- Regular monitoring of catch basins/drainage structures within immediate areas of the watershed in order to determine necessary maintenance measures and prioritize clean out schedules. - Encourage public involvement by implementing an "adopt-a-drain" program within the community, where citizens monitor existing drains, remove litter and leaf debris and report catch basins in need of cleaning to the Town.	Direct Government Action; Education; Private Implementation	Town; SSER; PM, BVA, Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; PM, BVA, Consultant; Printer	Town staff hours for coordination; $10,000 per yr*/ Literature-Web
4h.	- Consider new or expanded stormwater retention facilities within key areas of the watershed to intercept and recharge stormwater runoff, mitigating the impact of necessary impervious surface areas within the drainage area (see recommended designs and construction timetable within **Section 4.2**). Infiltration techniques such as surface detention basins, dry wells, trench drains and other types of structures that retain, filter and recharge stormwater should be considered and implemented.	Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 6, 7, 8 & 9	Drainage Contractors	Dependent Upon Specific Project
4i.	- Promote local organic landscape care, including use of compost material from the Town of Brookhaven"s Compost Facility.	Education; Private Implementation	Town; SSER; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
4j.	- Team with private manufacturers to install pilot stormwater and water quality drainage infrastructure and new technologies (e.g. catch basin inserts, impervious pavement) for evaluation within the watershed.	Direct Government Action	Town	Short, Intermediate & Long Term	2, 3, 4, 8 & 9	Town; Private Drainage Venders	Dependent Upon Specific Project
4k.	- Require all new commercial and residential construction within the watershed area to retain all stormwater on-site through the use of dry wells, trench drains, rain gardens and other BMP methods.	Legislative Review	Town Planning Board & ZBA	Short Term; Immediate & Ongoing	2, 3, 4, 6, 7, 8 & 9	Town Personnel	Private Expenditure/ Drainage Retention
4l.	- Require "curb cut" permits from the Brookhaven Highway Department for the construction, relocation or paving of impervious driveways in order to ensure proper stormwater retention onsite (and not directed onto existing streets or drainage swales leading to the tributary).	Legislative Review	Town Planning Board & ZBA	Short Term; Immediate & Ongoing	2, 3, 4, 6, 7, 8 & 9	Town Personnel	Private Expenditure/ Drainage Retention
4m.	- Ensure compliance with SPDES GP 0-08-001 and Chapter 86 of the Town Code by requiring the installation of erosion and sediment controls during all new construction and alterations involving site re-grading within the watershed area and regular inspection of these measures.	Legislative Review; Government Action	Town Planning Board & Town Building Dept.	Short Term; Immediate & Ongoing	2, 3, 4, 6, 7, 8 & 9	Town Personnel	Private Expenditure/ Drainage Retention
4n.	- Adopt incentives to encourage property owners to install stormwater BMPs and replace impervious surfaces and driveways with pervious alternates (gravel, crushed shell or limestone, pavers, etc.).	Education; Private Implementation	Town; SSER; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web
4o.	- Consider potential impacts to the Beaver Dam Creek headwaters during preparation of the NYS DOT Sunrise Highway Corridor Sustainable Transportation Study; avoid expansion of impervious surfaces in this area to the maximum extent practicable.	Government Action	State	Short Term/ Immediate & Ongoing	2	State	State staff

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
4p.	- For areas directly contributing stormwater to the tributary, consider adoption and enforcement of NYS erosion and sediment control and post-construction design standards for projects of less than one acre.	Legislative; Government Action; Enforcement	Town; SCDHS	Short Term/ Immediate & Ongoing	2, 3, 4, 6, 7, 8 & 9	Town Personnel	Town Staff Hours
5.	**Providing public water.** Complete the installation of public water in areas where wells are threatened by contamination from landfill leachate-contaminated groundwater. Switch remaining individuals still using private wells within the plume"s path to public water for free.	Government Action	Town; County	Short Term/ Immediate & Ongoing	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town	Town staff
6.	**No Discharge Zone**. Maintain and improve surface water quality within the tributary through the creation of a State and federally recognized *No-Discharge Zone* encompassing the entire tributary within which boaters may not dispose of waste material through their boat bilges, holding tanks or marine toilets.	Legislative	SCDHS & Town; Planning Board; ZBA	Short Term/ 1-3 years	Annual Budget 2, 3, 4, 6, 7, 8 & 9	Town Boards and Consultants	$2,000 per yr/ Improved Coordination & Policy
7.	**Boat pump-outs**. Encourage use of existing and proposed pump-out stations. - Providing the service for free or for a low fee; - provide pump-out location and operation hours with boating licenses or docking/mooring permits; - providing access to either the pump-out boat or the station during winter months, particularly for commercial fishing boats; and - increase signage denoting the location of pump-out stations and the hours of operation, particularly near fueling docks and the marinas.	Direct Government Action; Education; Private Implementation	Town; SSER; Residents	Short Term/ Immediate & Ongoing	1, 3, 4, 5, 6, 8 & 9	Town; SSER; Consultant; Printer	$10,000 per yr*/ Literature-Web + Budget for Pump Out Services
Monitoring Water Quality & Pollutant Reduction							
1a.	**Water quality monitoring.** Continue and expand existing water quality monitoring programs of the SCDHS and NYSDEC to determine the effectiveness of implemented management recommendations and to track trends in water quality.	Government Sponsored Research	SCDHS; NYSDEC; Town	Short Term/ Immediate & Ongoing	SUNY SoMAS; 3, 4 & 8	County; NYSDEC; SUNY SoMAS	$17,500 per yr/ Monitoring Data & Reports
1b.	**Water quality monitoring.** Utilize Bellport High School"s SEQ to supplement the County"s water quality monitoring and conduct periodic sampling to track effectiveness of stormwater improvement projects within the watershed.	Education	SEQ; SCDHS	Short Term/ Immediate & Ongoing	3, 4 & 8	SEQ	$2,000 per yr/ Water Quality Data Log
2.	**Landfill leachate.** Beaver Dam Creek Water Quality Group should continue to meet with Town and county officials to address the landfill leachate plume. It is imperative that the severity and spatial extent of the landfill leachate plume be determined (see **Section 4.1.3**), tracked over the long term, and appropriate mitigation actions put into place until the plume no longer poses a threat to public health or the environment.	Direct Government Action; Government Sponsored Research	Town; SCDHS; NYSDEC	Short Term/ Immediate & Ongoing	3, 4 & 8	Town; County; NYSDEC	Dependent upon specific project
3.	**Failing sanitary systems.** Identify failing on-site septic systems within the surface and ground water contributing area. This could be done by analyzing water samples from shallow ground water wells and comparing these data to regions with similar land uses, nearby areas and sewered areas. Track these identified systems in GIS and coordinate remediation as necessary (see **Section 4.1.3**).	Direct Government Action; Community Involvement	Town; County; Community Involvement	Short Term/ 1-3 years, Intermediate & Long Term	2, 3, 4, 8 & 9, 12, 13	Town, County, Private Organizations/ Businesses	Dependent upon specific project
4.	**Adaptive management.** The recommendations and implementation of this WMP should be re-evaluated and adjusted as necessary in the future as conditions change and more information is gathered. At minimum, a re-evaluation should occur within 10 years of the adoption of this WMP.	Direct Government Action; Community Involvement	Town; SSER; PMF; BVA; Community Involvement	Long Term	2, 3, 4, 8 & 9	Town; SSER; Private Organizations/ Businesses	Town Staff Hours for Coordination

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
Target Projects and Priority Actions							
1.	Reach 3, Subwatershed 19 (Outfall 14): ▪ Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Montauk Highway and South Country Road within the subwatershed contributing area in order to redirect stormwater from the existing catch basins that directly discharge to the tributary. ▪ Exploration of the use of either the Town or Post Morrow owned vacant lands adjacent or within the subwatershed for the installation of pilot stormwater water quality treatment practices such as: o Hydrodynamic separators and/or other appropriate BMPs in areas with adequate depth to groundwater (which remove sediments and hydrocarbons with little maintenance requirements and have been successfully installed by the Town in Setauket and Sound Beach). o If adequate land area is available, the creation of bioretention areas, wet or dry swales or constructed stormwater ponds/wetlands in accordance with the *New York State Stormwater Management Design Manual* could be explored.	Government Action	Town; Post Morrow Foundation	Intermediate Term; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; Private Drainage Vendors/ Contractor	Dependent Upon Specific Project
1a.	Reach 3, Subwatershed 19 (Outfall 14): ▪ Initiate inspections and enforcement of surrounding businesses to monitor potential discharge violations and to prevent further chemical discharges to the tributary.	Government Action	Town; SCDHS; NYSDEC	Short Term/ Intermediate & Ongoing;	3, 4, 6, 7, 8 & 9	Town & SCDHS Staff	±$75,000 Town/County Staff Hours
1b.	Reach 3, Subwatershed 19 (Outfall 14): ▪ Coordination between the Town, SCDHS and NYSDEC to further monitor the plume to track the full extent of its reaches and establish options and secure funding for plume remediation to prevent further spread of the plume into the tributary and groundwater.	Government Action	Town	Short Term	3, 4, 6, 7, 8 & 9	Town & SCDHS Staff	Scope of Monitoring & Remedial Efforts to be Determined by SCDHS
2.	Reach 1, Subwatershed 13 (Overland Flow 2): ▪ Investigate the possibility of creating vegetated drainage swales or berming and adding drainage retention (with large storm overflows) on the seaward (eastern) side of the existing farm areas to reduce direct runoff to the tributary and associated wetland areas. ▪ Installation of roadside leaching drainage structures along South Country Road to recharge stormwater runoff in areas with greater depth to groundwater and reduce stormwater runoff volumes from running overland towards the tributary.	Government Action	Town	Short Term; Grant Pending	2, 3, 4, 6, 7, 8 & 9, 11	Town; Drainage Contractor	Dependent Upon Specific Project

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
3.	Reach 1, Subwatershed 12 (Outfall 11 – Highview Blvd., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Buscher, Shields and Lindner Courts to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Highview Blvd. to intercept stormwater and reduce stormwater volumes contributing to the direct outfall pipes. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary. While regular maintenance is required, the use of catch basin inserts to capture oils, sediment, bacteria and other pollutants would assist in improving water quality of directly discharged stormwater into the tributary. ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas (such as cul-de-sacs) with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure
4.	Reach 1, Subwatershed 1 (Overland Flow 1 – Bay Rd.): ▪ Installation of stormwater retention structures (catch basins and leaching pools) within the existing road right of way along Bay Road to intercept stormwater prior to the overland flow discharge point. ▪ Reduce existing pavement at the terminus of Bay Road in close proximity to the water (i.e., replace unused concrete area with native plantings and four foot wide access path or evaluate feasibility of bioretention area installation to provide stormwater storage and treatment prior to overflows into the Bay. ▪ Consider additional options for stormwater recharge and/or diversion on individual properties (e.g. installation of rain gardens or rain barrel rainwater collection systems).	Government Action	Town; Private Residents	Short Term; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; Drainage Contractor; Residents	Dependent Upon Specific Project; Private Expenditure
5.	Reach 1, Subwatershed 15 (Outfall 12 – Beaver Dam Boat Marina): ▪ Require installation of stormwater drainage improvements and consider conversion of existing impervious parking area to pervious pavement or gravel parking/storage areas during any future site plan or building department application for Beaver Dam Boat Marina to reduce runoff and improve stormwater recharge.	Government Action	Town	Long Term	Private Expenditure	Private Expenditure	Private Expenditure
6.	Reach 2, Subwatershed 17 (Outfall 13 – Prairie Ln.): ▪ Installation of roadside leaching drainage structures along Prairie Lane to recharge stormwater runoff and reduce direct runoff into the tributary. ▪ Pursue the purchase of existing vacant land within the subwatershed for the creation of a recharge basin to serve this area or obtain drainage easements to redirect stormwater to recharge facilities and away from the tributary. ▪ Reduce impervious surface area which contributes stormwater runoff to the tributary by educating and working with homeowners to consider pervious alternatives to paved areas and on-site stormwater recharge options (e.g. rain gardens, rainwater collection	Government Action; Education	Town; Private Residents	Short Term; Long Term/ Grant Pending	2, 3, 4, 6, 7, 8 , 9 & 10	Town; Drainage Contractor; Private Residents	Dependent Upon Specific Project

	systems for reuse as irrigation, dry wells, etc.). ▪ Require the installation of stormwater retention for any newly proposed impervious surfaces.						
No.	**Recommendation**	**Type of Action**	**Responsible Entity**	**Short-Long Term/ Tentative Schedule**	**Funding Sources**	**Possible Vendors**	**Public Budget/ Product**
7.	Reach 1, Subwatershed 6 (Outfall 4 – Shields Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Shields Ct. to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure
8.	Reach 1, Subwatershed 11 (Outfall 6 – Bellhaven Rd., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Bellhaven Rd. to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure
9.	Reach 1, Subwatershed 3 (Outfall 3 – Lindner Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Lindner Court to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure

	generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).						
No.	**Recommendation**	**Type of Action**	**Responsible Entity**	**Short-Long Term/ Tentative Schedule**	**Funding Sources**	**Possible Vendors**	**Public Budget/ Product**
10.	Reach 2, Subwatershed 16 (Overland Flow 4 – Beaver Dam Rd.): ▪ Consider installation of catch basins with inserts along this stretch of Beaver Dam Road to capture oils, sediment, bacteria and other pollutants.	Government Action	Town	Short Term; Grant Pending	2,3,4,6,7,8 &9	Town; Drainage Contractor	Dependent Upon Specific Project
11.	Reach 1, Subwatershed 9 (Outfall 10 – Buscher Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Buscher Court to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure
12.	Reach 2, Subwatershed 18 (Overland Flow 5): ▪ Installation of roadside leaching drainage structures along South Country Road (near junction with Fireplace Neck Rd.) to capture oils, sediment, bacteria and other pollutants prior to direct overflow to the tributary.	Government Action	Town	Short Term; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; Drainage Contractor	Dependent Upon Specific Project
13.	Reach 1, Subwatershed 2 (Outfall 1 – Lindner Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Lindner Court to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure

No.	Recommendation	Type of Action	Responsible Entity	Short-Long Term/ Tentative Schedule	Funding Sources	Possible Vendors	Public Budget/ Product
14.	Reach 1, Subwatershed 10 (Outfall 9 – Buscher Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Buscher Ct. to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure
15.	Reach 1, Subwatershed 5 (Outfall 5 – Shields Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Shields Ct. to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure
16.	Reach 1, Subwatershed 14 (Overland Flow 3): Consider installation of roadside stormwater leaching drainage structures or (if depth to groundwater is minimal) low profile infiltrator systems at Bay Rd. and 2nd Street to reduce stormwater to the overflow on the southern portion of the subwatershed.	Government Action	Town	Short Term; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; Drainage Contractor	Dependent Upon Specific Project
17. & 18.	Reach 1, Subwatershed 7 (Outfall 7 – Buscher Ct., Bellhaven) and Reach 1, Subwatershed 8 (Outfall 8) – Buscher Ct., Bellhaven): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Buscher Ct. to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure

	pave. ▪ Pursue resident involvement and incentive programs to reduce stormwater runoff generated from the individual properties (i.e., conversion of impervious surfaces to pervious paths and driveways, installation of rain gardens or rain tanks to collect roof runoff or the use of low profile infiltrator systems).						
19.	Reach 1, Subwatershed 4 (Outfall 2 – Bellhaven Rd. at terminus of Shields Ct.): ▪ Routinely monitor and clean out existing catch basins to remove leaf debris, sediments and floatables. ▪ Installation of linear, low profile drainage systems along Bellhaven Rd. to redirect stormwater from direct outfalls and allow for some recharge of stormwater. ▪ Explore retrofit options for existing catch basins discharging directly to the tributary (e.g. catch basin inserts). ▪ Explore opportunities to team with private manufactures to establish pilot improvement and stormwater monitoring projects involving newer technologies such as catch basin retrofitting and replacement of existing paved areas with porous pavement or grass pave.	Education; Government Action; Maintenance	Town; SSER; Residents	Short Term/ Intermediate & Ongoing; Grant Pending	2, 3, 4, 6, 7, 8 & 9	Town; SSER; Consultant; Printer; Drainage Vendor/Contractor; Private Residents	Dependent Upon Specific Project; Expenditure

Notes:

* $5,000 per yr is combined educational budget for educational materials using consultant assistance for pamphlet design, printing and distribution, part of newsletters and website maintenance.
All budget estimates are in current 2008 dollars, and do not account for inflation or increased costs which may occur over time.

Definition of Terms/Schedule: Short Term – 1-3 years Intermediate Term – 3-5 years Long Term – 5-10 years

Definition of Abbreviations: N/A - Not Applicable yr – Year SSER – South Shore Estuary Reserve BVA – Brookhaven Village Association CCE – Cornell Cooperative Extension
SCDHS – Suffolk County Dept. of Health Services PMF – Post Morrow Foundation SCSC – Suffolk County Sanitary Code ZBA- Zoning Board of Appeals
SEQ – Students for Environmental Quality SUNY SoMAS: SUNY Stony Brook School of Marine and Atmospheric Sciences

List of potential funding sources to offset cost of implementing Beaver Dam Creek WMP and associated number abbreviation: Note that funding availability varies according to annual budget cycles and legislative action.

(1) NYS Office of Parks, Recreation and Historic Preservation Parks Development Grants under the EPA and LWCF (Land & Water Conservation Fund)- http://www.nysparks.com/grants/
(2) NYS Dept. of Transportation- Transportation Enhancements Program (TEP)- https://www.nysdot.gov/portal/page/portal/programs/tep
(3) NYS Dept. of State- Local Waterfront Revitalization Program (LWRP)- http://www.nyswaterfronts.com/request.html
(4) NYS Department of Environmental Conservation- Water Quality Improvement Program- http://www.dec.ny.gov/pubs/4774.html
(5) NYS Department of Environmental Conservation- Terrestrial Invasive Species Eradication Grant Program- http://www.dec.ny.gov/animals/33358.html
(6) NYS Environmental Facilities Corporation, *et al*.-NYS Water & Sewer Infrastructure Co-funding Initiative- http://www.nycofunding.org/DotNetNuke/
Note: NYS EFC provides financing and technical assistance. Funding sources vary and historically major sources have been the US Environmental Protection Agency"s Drinking Water State Revolving Fund (DWSRF) and Clean Water State Revolving Fund (CWSRF)
(7) NYS Energy Research and Development Authority (NYSERDA)- Municipal Water and Wastewater Treatment Plan Programs (various)- http://www.nyserda.org/Programs/Environment/muniwaterwwt.asp
(8) NYS Department of State- Shared Municipal Services Incentive Program- For programs that achieve cost savings through shared services involving two or more municipalities- http://www.dos.state.ny.us/lgss/smsi/stateassistance.html
(9) Suffolk County- Suffolk County Water Quality Protection and Restoration Program
(10) Suffolk County Open Space Program and future Town of Brookhaven Open Space Bond Acts (if passed)
(11) NYS Agricultural Nonpoint Source Abatement and Control Grant Program- http://www.nys-soilandwater.org/aem/nonpoint.html
(12) USDA Natural Resources Conservation Service – Wetlands Reserve Program (WRP) - http://www.nrcs.usda.gov/programs/
(13) USDA Natural Resources Conservation Service – Wildlife Habitat Incentives Program (WHIP) - http://www.nrcs.usda.gov/programs/whip/

5.3 Cost and Potential Funding Sources

Costs associated with each proposed implementation measure are identified in **Table 5-1** above. In addition to those noted in the table, both federal and state funding may be available through grant applications, several of which are summarized below. Generally, applications for these programs are accepted on a yearly basis.

1. Environmental Protection Fund (EPF), Local Waterfront Revitalization Program Grants through the NYS Department of State

http://nyswaterfronts.com/request.html

On an annual basis, the Department of State solicits grant applications from local governments for 50/50 matching grants from the New York State Environmental Protection Fund's Local Waterfront Revitalization Program. Funding to advance preparation, refinement or implementation of Local Waterfront Revitalization Programs (LWRP) is available to local governments under Title 11 of the New York State Environmental Protection Fund Local Waterfront Revitalization Program. The LWRP encourages municipalities to plan for the future of their waterfronts and undertake improvement projects to implement their plans.

2. Federal Commons Grants Management Portal

www.grants.gov

66.439 Targeted Watersheds Grants

To support innovative, community-based watershed approaches aimed at preventing, reducing, or eliminating water pollution. The Targeted Watersheds Grant Program provides resources in the form of grants or cooperative agreements to support watershed organizations in their efforts to expand and improve existing water protection measures. In separate competitive announcements, funds are awarded to assist watershed partnerships comprised of State, Tribal, local, and interstate agencies, and public or nonprofit organizations in developing, implementing, and demonstrating: 1) on-the-ground projects to improve or maintain water quality; and 2) organizational and technical capacity building projects to prime organizations to be in a position to implement on-the-ground watershed projects. The cornerstone of the implementation portion

of the program is diverse partnerships that are ready to implement projects to improve water quality and produce tangible, measurable, environmental results in a short time frame.

66.461 Regional Wetland Program Development Grants

Wetland Program Development Grants (WPDGs) provide eligible applicants an opportunity to conduct projects that promote the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects, extent, prevention, reduction, and elimination of water pollution. While WPDGs can continue to be used by recipients to build and refine any element of a comprehensive wetland program, proposals that address one or more of the three national priorities (Wetland Program Planning Based on the Four Core Elements, Regulation-Enhancing Wetland Protection and/or Monitoring and Assessment) may increase their chances of being selected. States, tribes, local government agencies, interstate agencies, and intertribal consortia are eligible to apply under this announcement. Universities that are agencies of state government are eligible. Non-profit organizations are not eligible to compete under this RFP.

66.480 Assessment and Watershed Protection Program Grants

To support the coordination and acceleration of research, investigations, experiments, training, demonstrations, surveys, and studies relating to the causes, effects (including health and welfare effects), extent, prevention, reduction, and elimination of water pollution. The two main goals of the Assessment and Watershed Protection Program Grants (AWPPGs) include supporting a watershed approach to better address water quality problems in the U.S. and building the capacity of all levels of government to develop and implement effective, comprehensive programs for watershed protection, restoration, and management. Funding under this program area includes: Watershed/Total Maximum Daily Load (TMDL) Program - (1) Assessment and TMDL Workshops; (2) Impaired Waters Recovery and Results Analysis; (3) Tools and Products Training for the Watershed Approach; and (4) Tools, Incentives and Trainings that Foster Financing of Water Quality, Habitat Restoration/Protection on a Watershed Scale. Nonpoint Source Program - (1) National Conference and Outreach Program to Promote Clean Lakes.

10.904 Watershed Protection and Flood Prevention

To provide technical and financial assistance in carrying out works of improvement to protect, develop, and utilize the land and water resources in watersheds. Technical assistance is provided in designing, and installing watershed works of improvement. Financial assistance is provided for sharing costs of measures for watershed protection, flood prevention, agricultural water management, sedimentation control, public water based fish, wildlife, and recreation; and in extending long term credit to help local interests with their share of the costs. Watershed area must not exceed 250,000 acres. Capacity of a single structure is limited to 25,000 acre-feet of total capacity and 12,500 acre-feet of floodwater detention capacity.

3. EPA Watershed Academy

www.epa.gov/owow/watershed/wacademy/fund.html

Funding is available under a variety of programs, including the Aquatic Ecosystem Restoration (CAP Section 206) Program, Clean Water State Revolving Fund, the U.S. Fish and Wildlife Service Coastal Program, the USDA Natural Resources Conservation Service"s Environmental Quality Incentives Program (EQIP), Five-Star Restoration Program, the U.S. Fish and Wildlife Service's National Coastal Wetlands Conservation Grant Program, the National Integrated Water Quality Program (NIWQP), Nonpoint Source Implementation Grants (319 Program), North American Wetlands Conservation Act Grants Program, Water and Waste Disposal Systems for Rural Communities, Wetlands Program Development Grants, Wetlands Reserve Program and the Wildlife Habitat Incentives Program (WHIP).

4. NYS Conference of Mayors and Municipal Officials – Grant Link

www.nycom.org/

Supports projects that lead to measurable pollution prevention and economic development results. Applications are accepted on an ongoing basis. Sponsored by the NYS Department of Environmental Conservation.

5. New York State Conservation Partnership Program

http://www.landtrustalliance.org/community/Regions/northeast/nyscpp

New York State Conservation Partnership Program (NYSCPP) is funded through the Environmental Protection Fund and administered by the Land Trust Alliance in coordination with the New York State Department of Environmental Conservation. Since 2002, the program has invested in more than 200 projects with 64 land trusts working in urban, suburban, and rural communities across the state, from Harlem to the Adirondacks. Conservation Partnership Program grants are intended to help New York‟s land trust community build professional capacity, strengthen community partnerships, accelerate the pace of land conservation, and implement best business practices. Grants are available in four categories: conservation catalyst, conservation transaction, professional development, and capacity and excellence.

6. New York Clean Water State Revolving Funds

http://www.nysefc.org

The Clean Water State Revolving Fund (CWSRF) was established to help finance facilities that protect, maintain or improve water quality. The CWSRF provides interest-free short-term and low interest rate long-term financing to recipients to finance planning, design, and construction of eligible water quality projects. Since 1991, the Clean Water SRF has provided approximately $12.68 billion in financing and $1.19 billion in subsidies for more than 1,300 water quality related environmental projects in New York State. It is administered by Environmental Facilities Corporation (EFC) in partnership with the New York State Department of Environmental Conservation. The Drinking Water SRF is jointly administered by EFC and the State Department of Health (DOH). Since 1997, the program has provided more than $2 billion in low-cost financing and grants, and $135.3 million in subsidies for 541 drinking water improvement projects throughout the State.

SECTION 6.0

6.0 REFERENCES

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APPENDIX A

Priority Waterbodies List (PWL) Report Excerpt

...South Shore Long Island Watershed

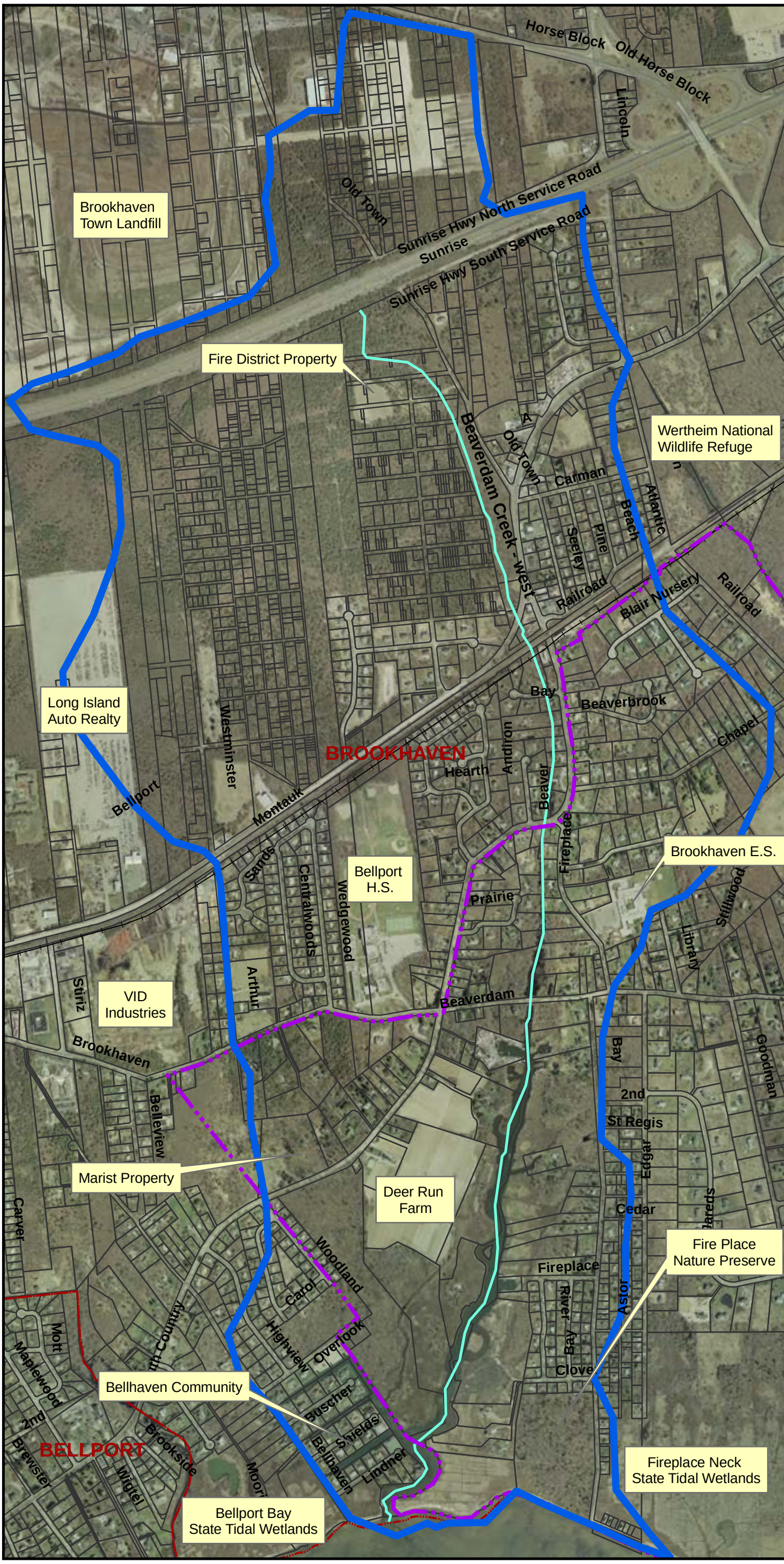
Water Index Number	Waterbody Segment	Category
Shinnecock Bay to Moriches Bay		
(MW7.1c) AO-QB	Quantuck Bay (1701-0042)	Impacted Seg
(MW7.1c) AO-SB-QB-157 thru 160	Tidal Tribs to Quantuck Bay/Canal (1701-0303)	Impacted Seg
(MW7.1c) AO-SB-QB-158-P835a	Old Ice Pond (1701-0304)	UnAssessed
(MW7.1c) AO-SB-QB-OIC	Quantuck Canal/Moneybogue Bay (1701-0371)	Impacted Seg
(MW7.2a) AO-MB (portion 1)	Moriches Bay, East (1701-0305)	Impacted Seg
(MW7.2a) AO-MB (portion 2)	Moriches Bay, West (1701-0038)	Impacted Seg
(MW7.2a) AO-MB (portion 3)	Tuthill, Hurts, Seatuck Coves (1701-0309)	Impacted Seg
(MW7.2a) AO-MB (portion 4)	Forge River, Lower and Cove (1701-0316)	Impacted Seg
(MW7.2a) AO-MB-160a thru 168	Tidal Tribs to East Moriches Bay (1701-0306)	Impacted Seg
(MW7.2a) AO-MB-162-P837	Beaverdam Pond (1701-0307)	UnAssessed
(MW7.2a) AO-MB-167-P840b	Unnamed (Eastport) Pond (1701-0311)	UnAssessed
(MW7.2a) AO-MB-168a thru 175	Tidal tribs to West Moriches Bay (1701-0312)	Impacted Seg
(MW7.2a) AO-MB-170	Terrell River, Lower, and tidal tribs (1701-0313)	Impacted Seg
(MW7.2a) AO-MB-170	Terrell River, Upper, and tribs (1701-0103)	
(MW7.2a) AO-MB-170-P847	Mill Pond (1701-0314)	UnAssessed
(MW7.2a) AO-MB-174-P850/P851	West and East Mill Ponds (1701-0026)	
(MW7.2b) AO-MB-NB	Narrow Bay (1701-0318)	Impacted Seg
(MW7.2b) AO-MB-NB-175a--176d	Tidal Tribs to Narrow Bay (1701-0319)	Impacted Seg
Great South Bay		
(MW7.3) AO-GSB (portion 1)	Great South Bay, East (1701-0039)	Impacted Seg
(MW7.3) AO-GSB (portion 2)	Great South Bay, Middle (1701-0040)	Impacted Seg
(MW7.3) AO-GSB (portion 3)	Great South Bay, West (1701-0173)	Impacted Seg
(MW7.3) AO-GSB (portion 4)	Bellport Bay (1701-0320)	Impacted Seg
(MW7.3) AO-GSB (portion 5)	Patchogue Bay (1701-0326)	Impacted Seg
(MW7.4) AO-GSB-177	Carmans River, Lower, and tribs (1701-0321)	Impacted Seg
(MW7.4) AO-GSB-177	Carmans River, Upper, and tribs (1701-0102)	NoKnownImpact
(MW7.4) AO-GSB-177-P855	Lower Lake (1701-0322)	UnAssessed
(MW7.4) AO-GSB-177-P856	Upper Lake (1701-0323)	UnAssessed
(MW7.4) AO-GSB-BB-177-P863	Artist Lake (1701-0135)	NoKnownImpact
(MW7.5) AO-GSB-178	Beaverdam Creek (1701-0104)	UnAssessed
(MW7.5) AO-GSB-178,179	Beaverdam/Motts Creeks, Lower, and tribs (1701-0324)	Impacted Seg
(MW7.5) AO-GSB-179	Motts Creek, Upper (1701-0325)	UnAssessed
(MW7.5) AO-GSB-180 thru 188	Tidal Tribs to Patchogue Bay (1701-0327)	Impacted Seg
(MW7.5) AO-GSB-181 thru 187	Minor Tribs to Patchogue Bay (1701-0329)	UnAssessed
(MW7.5) AO-GSB-181-P881	Dunton Lake (1701-0330)	UnAssessed
(MW7.5) AO-GSB-183	Mud Creek, Upper, and tribs (1701-0101)	NoKnownImpact
(MW7.5) AO-GSB-183-P883	Robinson Pond (1701-0331)	UnAssessed
(MW7.5) AO-GSB-184	Swan River, Upper, and tribs (1701-0100)	Impacted Seg
(MW7.5) AO-GSB-184-P884	Swan Lake (1701-0332)	UnAssessed
(MW7.5) AO-GSB-185	Patchogue River, Upper, and tribs (1701-0099)	Impacted Seg
(MW7.5) AO-GSB-185-P885	Patchogue Lake (1701-0095)	Impacted Seg
(MW7.5) AO-GSB-185-P889	Carman Lake (1701-0018)	Impacted Seg
(MW7.5) AO-GSB-186	Tuthills Creek, Upper, and tribs (1701-0098)	Impacted Seg
(MW7.5) AO-GSB-186-P890	West Lake (1701-0334)	UnAssessed

PWL Waterbodies

Water Index Number	Waterbody/Segment Name (ID) Use Impairment(s)	County Cause/Source Information	Seg Size	Type	Class	W.B.Category
ATLANTIC OCEAN LONG ISLAND SOUND						
[illegible] AO-GSB (portion 5)	Pecconic Bay ([illegible]) Shellfishing KNOWN to be IMPAIRED Public Bathing KNOWN to be STRESSED Fish Consumption KNOWN to be STRESSED Recreation KNOWN to be STRESSED	Suffolk Causes: Pathogens Sources: Other Source, Urban Runoff, Storm Sewers	3200.0 Acre	Estuary	SA	Impaired Seg
[illegible] AO-GSB-[illegible]	Carmans River, Lower and tributaries ([illegible]) Recreation KNOWN to be STRESSED	Suffolk Causes: Pathogens Sources: Other Source, Urban Runoff	350.0 Acre	Estuary	SC	Minor Impacts
[illegible] AO-GSB-[illegible]	Bellmore Motts Creek, Upper and tributaries ([illegible]) Recreation KNOWN to be STRESSED	Suffolk Causes: Pathogens Sources: Other Source, Urban Runoff, Storm Sewers	[illegible] Acre	Estuary	SC	Minor Impacts
[illegible] AO-GSB-[illegible]	Tidal Tributaries Peconic Bay ([illegible]) Aquatic Life KNOWN to be STRESSED Recreation KNOWN to be STRESSED	Suffolk Causes: D.O./Oxygen Demand, Pathogens Sources: Other Source, Urban Runoff, Storm Sewers	[illegible] Acre	Estuary	SC	Minor Impacts
[illegible] AO-GSB-[illegible]	Sears Bites, Upper and tributaries ([illegible]) Aquatic Life KNOWN to be IMPAIRED	Suffolk Causes: Nutrients Sources: Storm Sewers, Urban Runoff	4.0 Mile	River	C(TS)	Impaired Seg
[illegible] AO-GSB-[illegible]	Peconic River, Upper and tributaries ([illegible]) Aquatic Life KNOWN to be STRESSED	Suffolk Causes: Nutrients, Silt/Sediment Sources: Urban Runoff, Storm Sewers	4.0 Mile	River	C(TS)	Minor Impacts

FIGURES

FIGURE 1-1
AERIAL VIEW OF STUDY AREA



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Brookhaven Hamlet Historic Area
- Railroad
- Beaver Dam Creek
- Towns and Villages
- Tax Parcels

Source: NYSGIS Orthoimagery Program,
Date: 2004
1 inch = 1,000 feet

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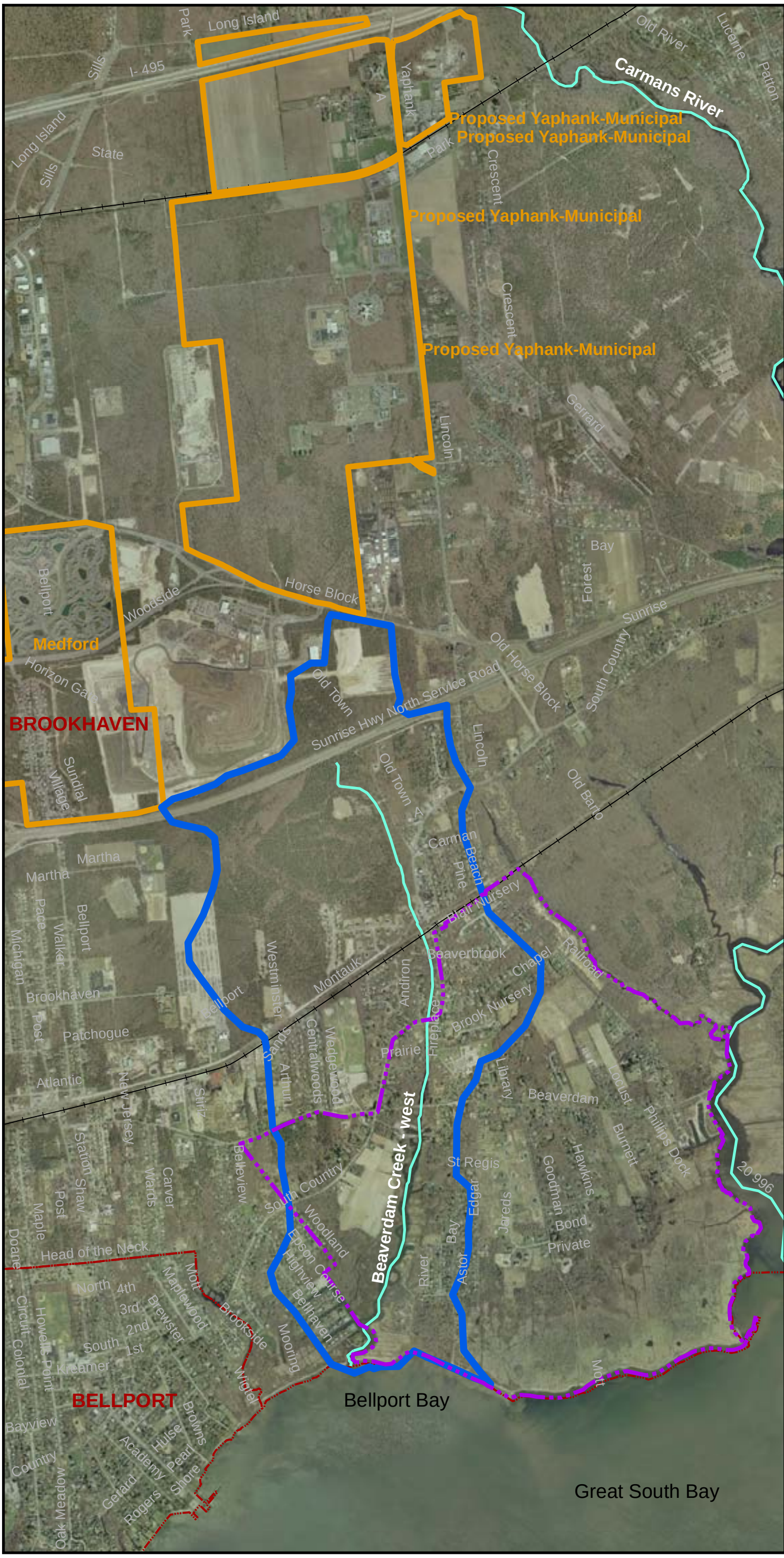
FIGURE 1-2
REGIONAL AERIAL VIEW



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Brookhaven Hamlet Historic Area
- Sewer District
- Railroad
- Target Tributaries
- Towns and Villages

Source: NYSGIS Orthoimagery Program,
Date: 2004
1 inch = 2,000 feet

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FIGURE 2-1
TOPOGRAPHY

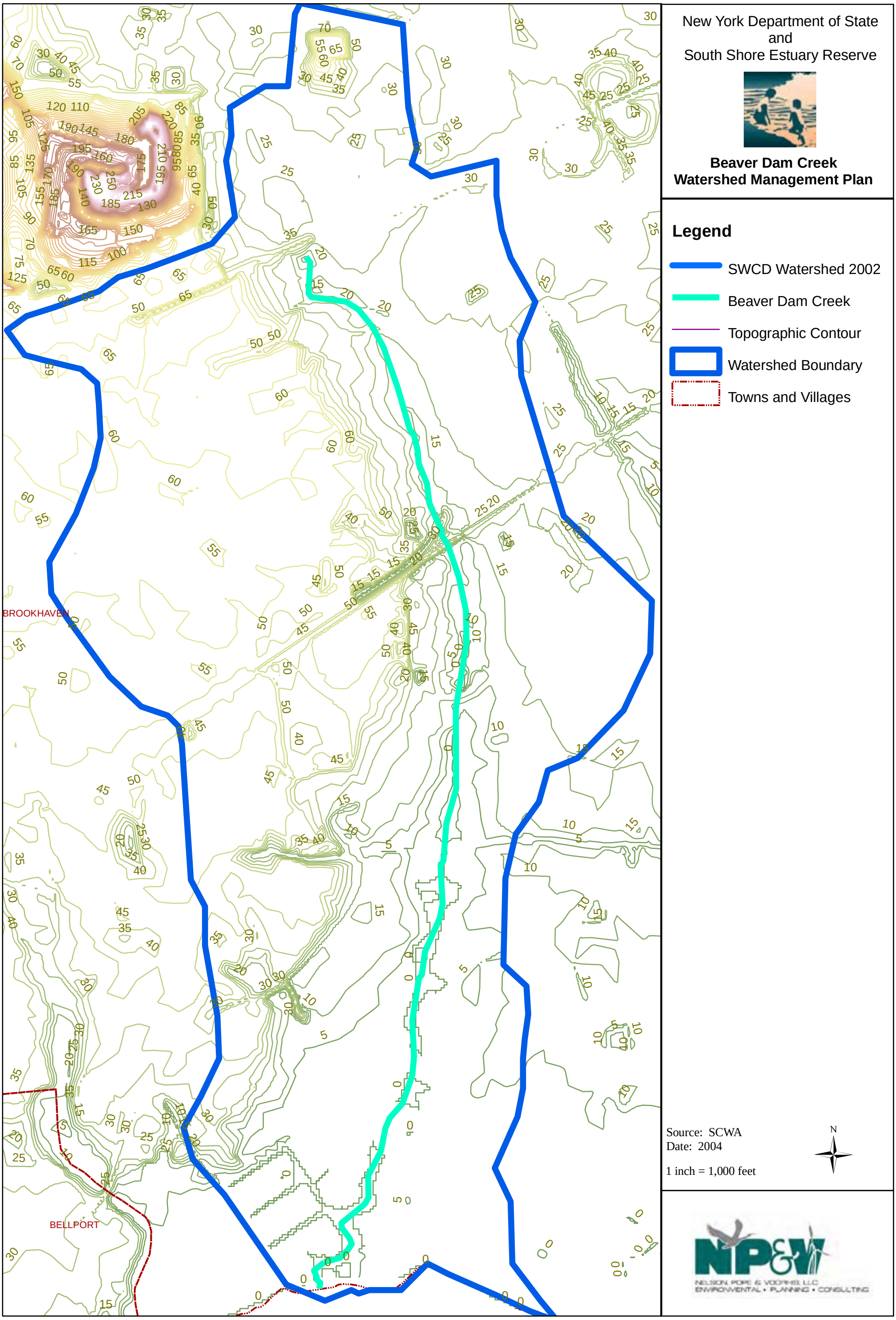
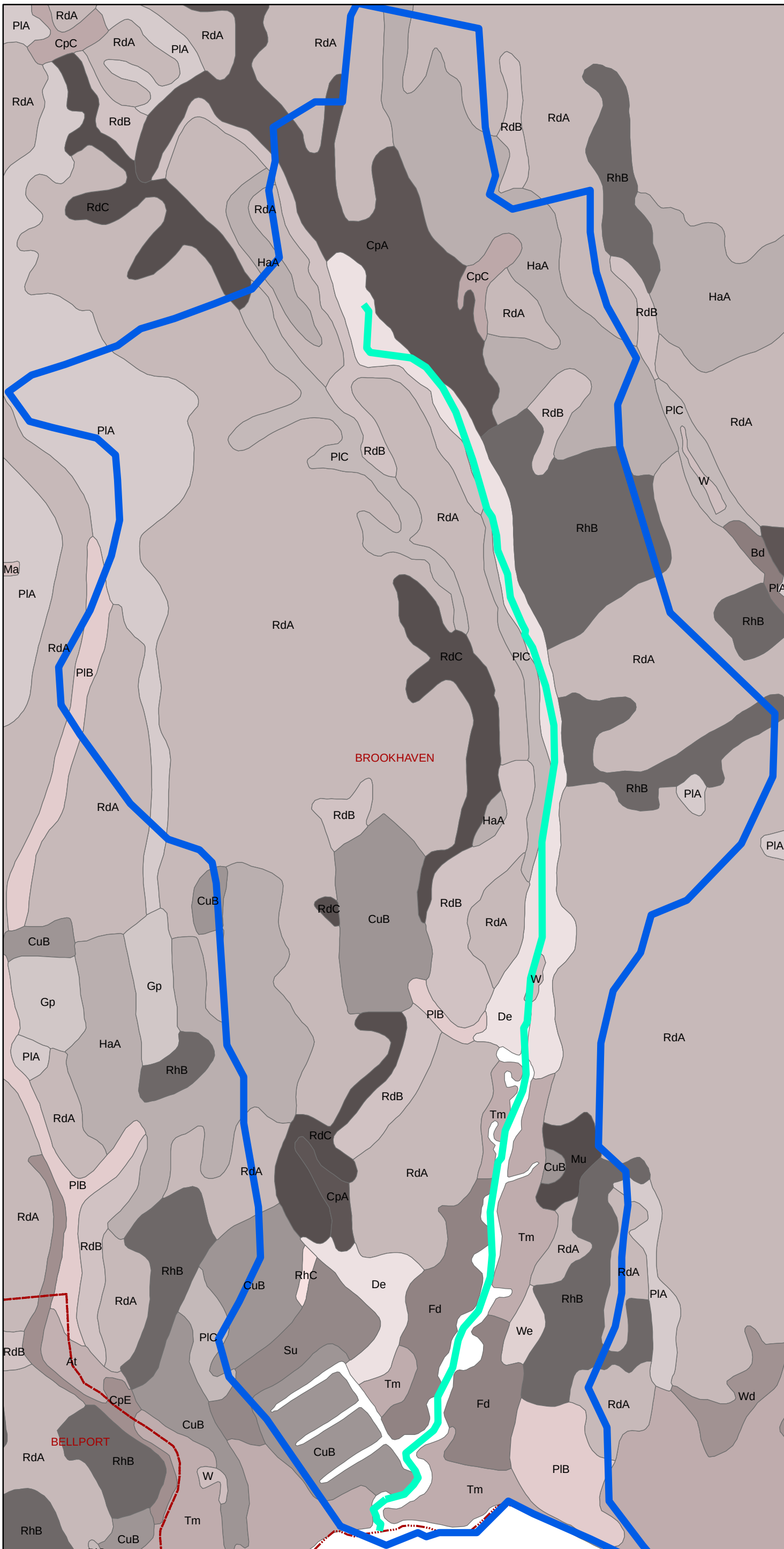


FIGURE 2-2
SOILS MAP



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Beaver Dam Creek
- Watershed Boundary
- Towns and Villages

Soil Types

- At - Atison Sand
- Bd - Berryland Mucky Sand
- CpA - Carver and Plymouth Sands, 0-3% slopes
- CpC - Carver and Plymouth Sands, 3-15% slopes
- CpE - Carver and Plymouth Sands, 15-35% slopes
- CuB - Cut and Fill Land, gently sloping
- CuC - Cut and Fill Land, sloping
- CuE - Cut and Fill Land, steep
- De - Deerfield Sand
- Fd - Fill Land, Dredged Material
- Gp - Gravel Pits
- HaA - Haven Loam, 0-2% slopes
- HaB - Haven Loam, 2-6% slopes
- HaC - Haven Loam, 6-12% slopes
- Ma - Made Land
- Mu - Muck
- PlA - Plymouth Loamy Sand, 0-3% slopes
- PlB - Plymouth Loamy Sand, 3-8% slopes
- PlC - Plymouth Loamy Sand, 8-15% slopes
- RdA - Riverhead Sandy Loam, 0-3% slopes
- RdB - Riverhead Sandy Loam, 3-8% slopes
- RdC - Riverhead Sandy Loam, 8-15% slopes
- ReB - Riverhead Very Stony Sandy Loam, 3-8% slopes
- ReC - Riverhead Very Stony sandy Loam, 8-15% slopes
- RhB - Riverhead and Haven Soils, graded, 0-8% slopes
- RhC - Riverhead and Haven Soils, graded,
- Su - Sudbury Sandy Loam
- Tm - Tidal Marsh
- W - Water
- Wd - Walpole Sandy Loam
- We - Wareham Loamy Sand

Source: NRCS SSURGO database,
Suffolk County
Date: 12/11/2006

1 inch = 1,000 feet

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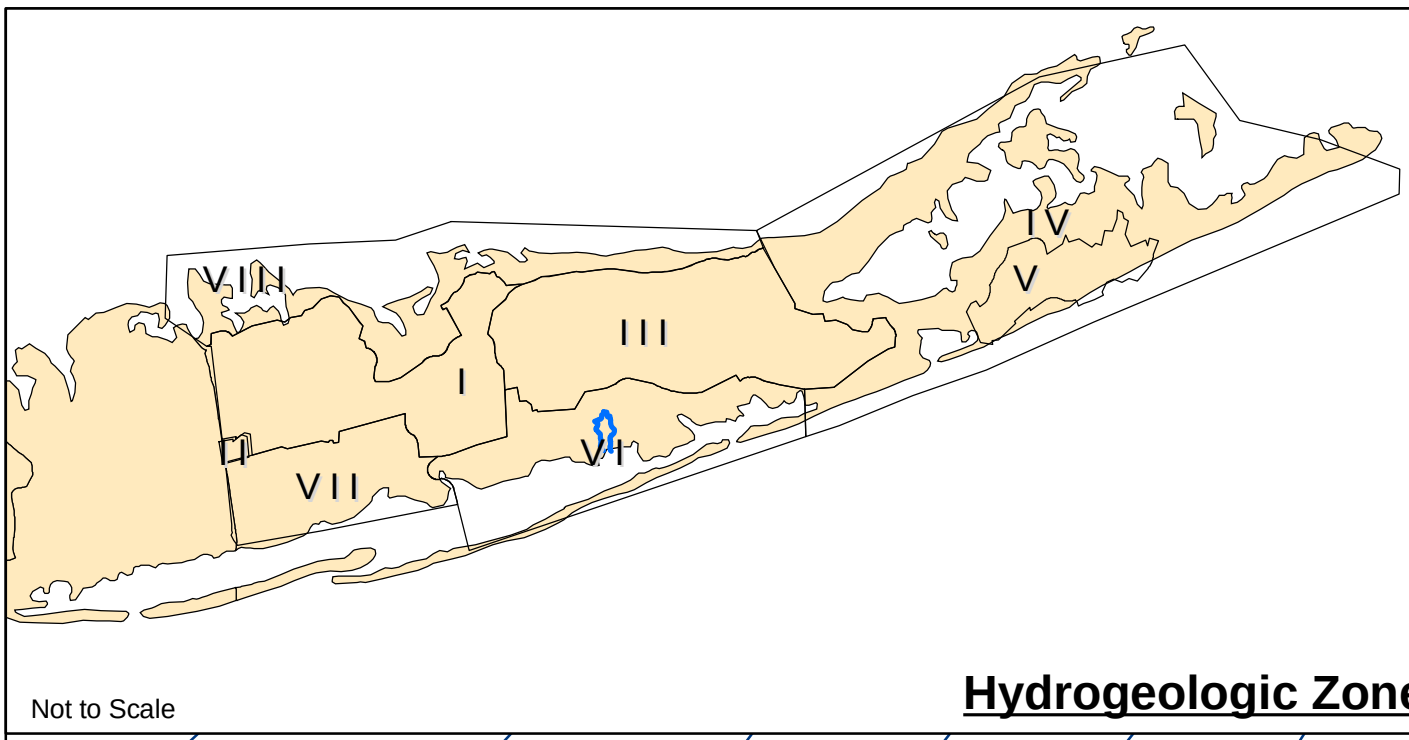
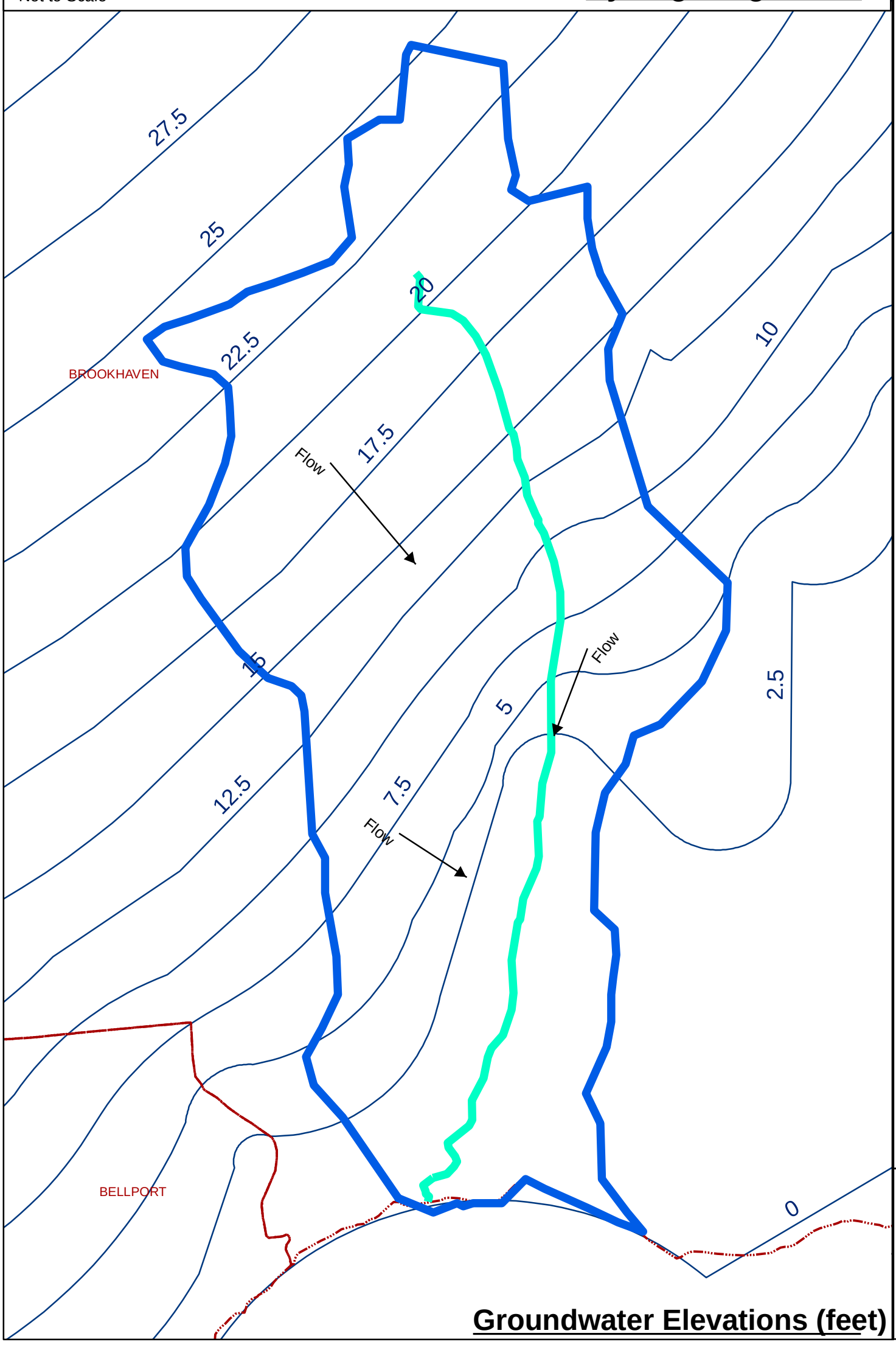
FIGURE 2-3
GROUNDWATER RESOURCES





New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Beaver Dam Creek
- Watershed Boundary
- Towns and Villages
- Groundwater Contours

Source: USGS and Town of Brookhaven Report 86-4207;
Suffolk County Department of Health;
SCWA
Date: 1988; October 1993;

1 inch = 1,500 feet

N

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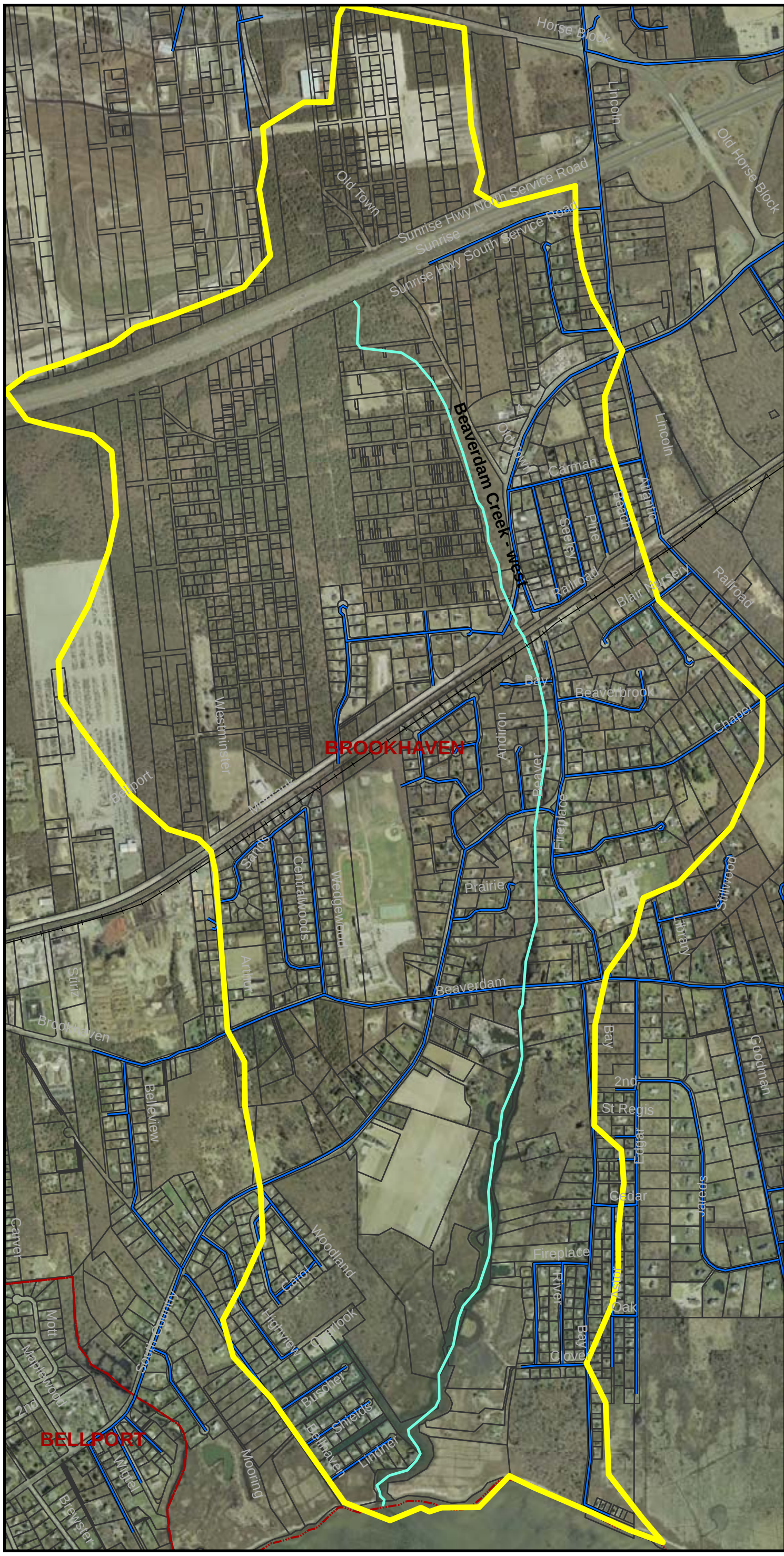
FIGURE 2-4
PUBLIC WATER SUPPLY



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Railroad
- Beaver Dam Creek
- Water Mains
- Towns and Villages
- Tax Parcels

Source: NYSGIS Orthoimagery Program,
Date: 2004

N

1 inch = 1,000 feet

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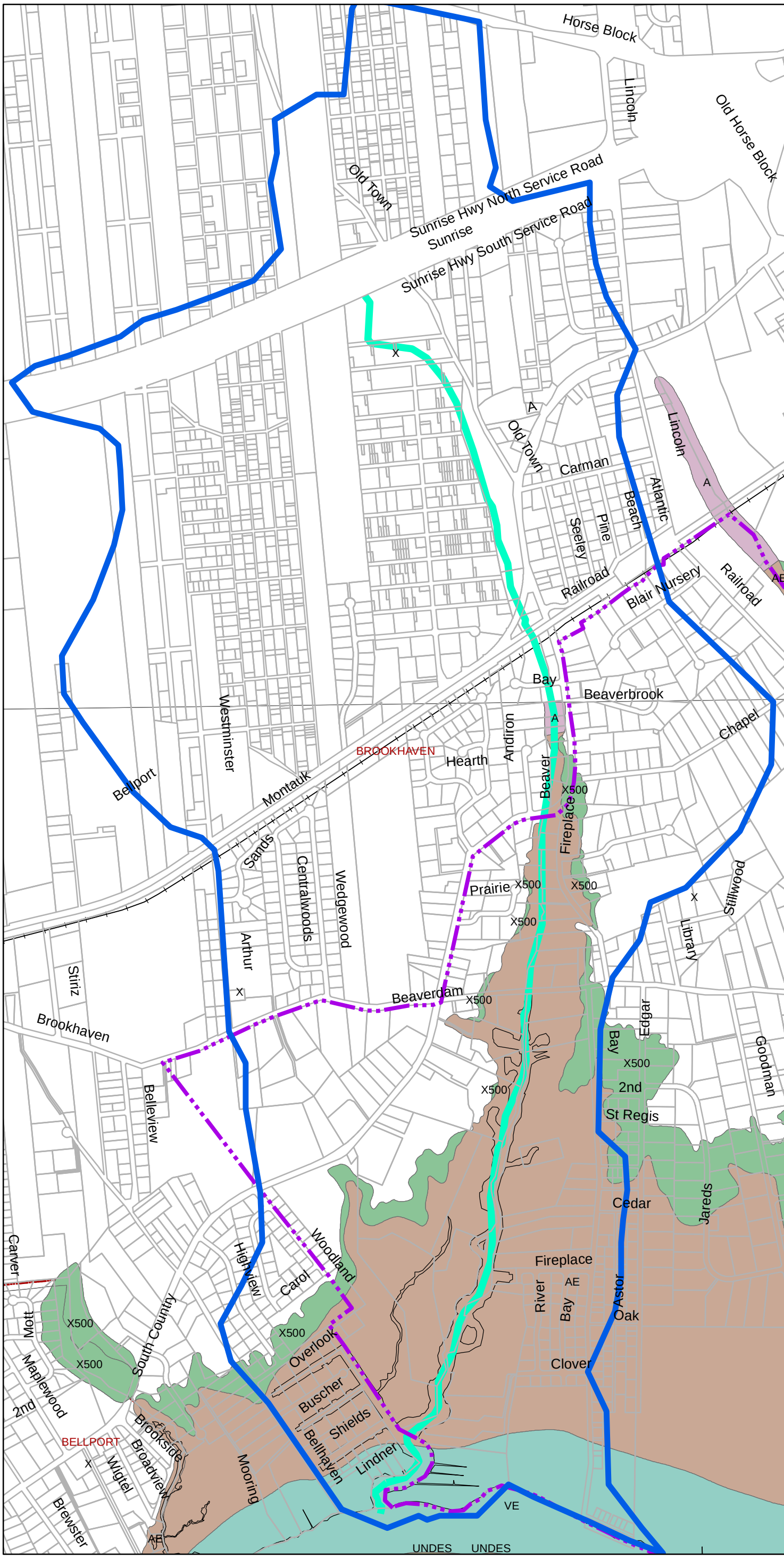
FIGURE 2-5
FEMA FLOOD ZONE MAP



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Brookhaven Hamlet Historic Area
- Towns and Villages
- Tax Parcels
- Beaver Dam Creek

ZONE

- A - 100 Yr Floodplain, No Base Flood El.
- AE - 100 Yr Floodplain, Base Flood El.
- UNDES - No Defined Flood Hazard
- VE - 100 Yr Floodplain, Base Flood El., Velocity Hazard
- X - Outside 100 and 500 Yr Floodplain
- X500 - 500 Year Floodplain

Source: FEMA Flood Data
Date: 1996
1 inch = 1,000 feet

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FIGURE 2-6
SEA, LAKE AND OVERLAND SURGES FROM HURRICANES (SLOSH) DATA MAP

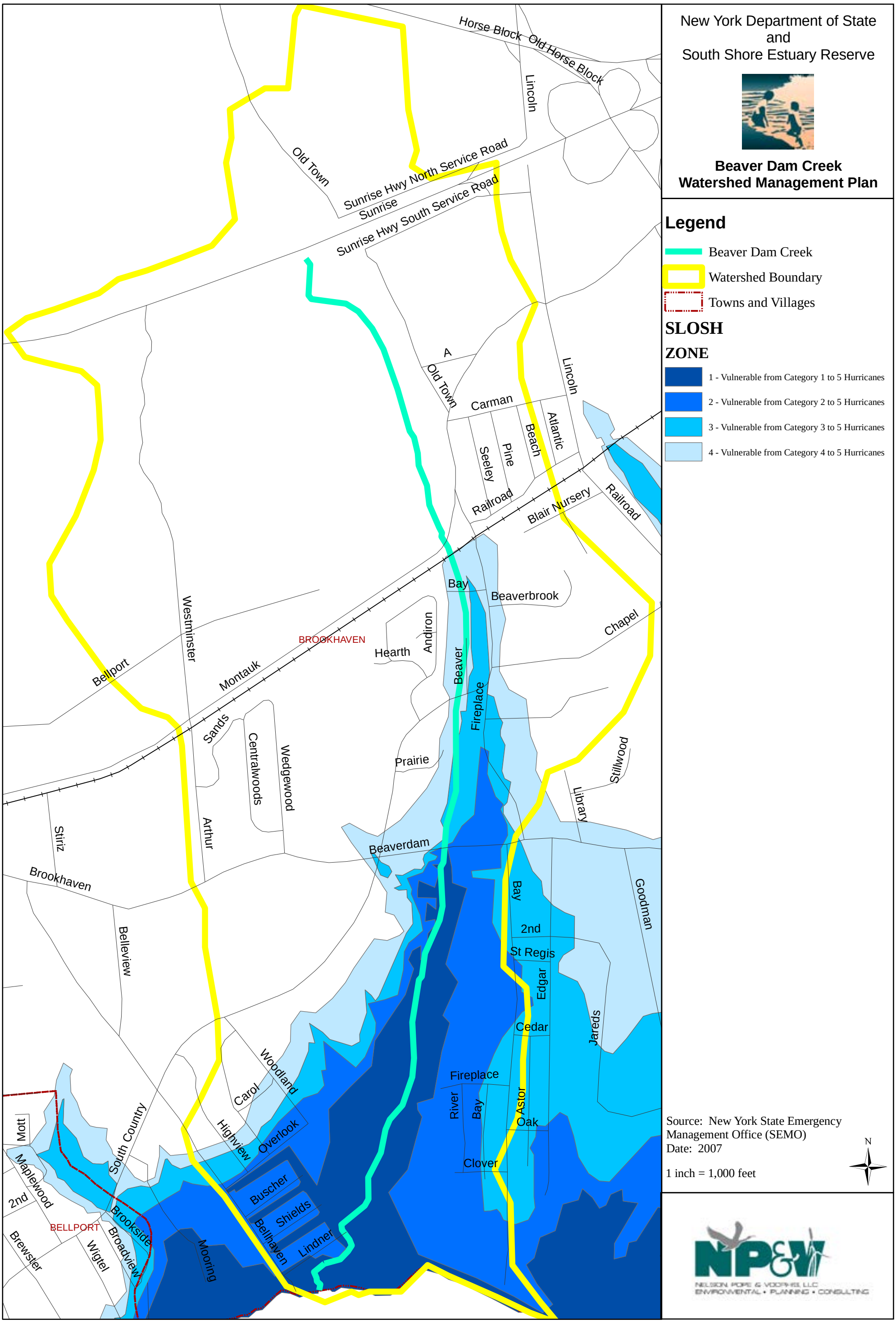
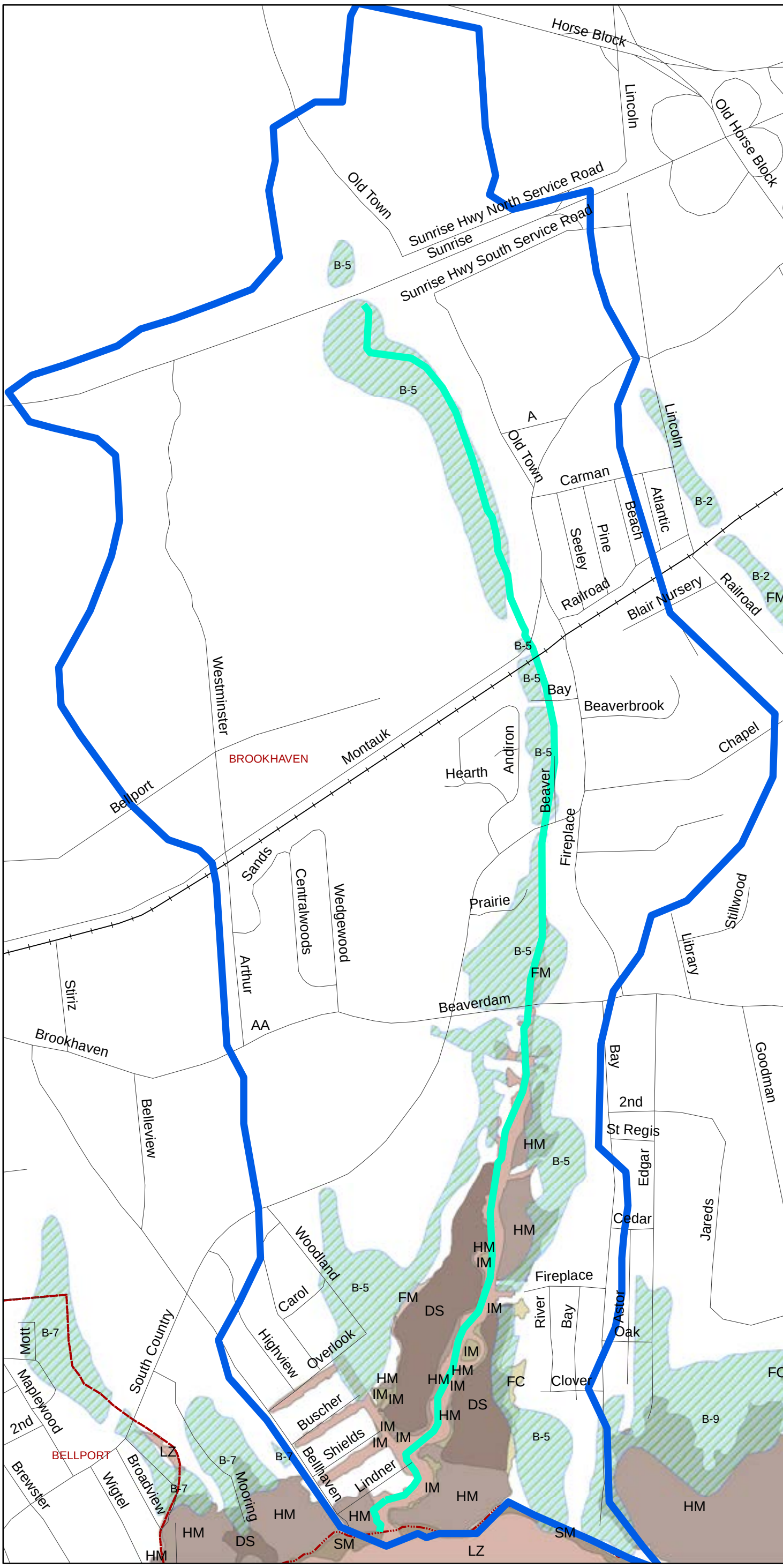


FIGURE 2-7
NYSDEC WETLANDS



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Beaver Dam Creek
- Towns and Villages

Freshwater Wetlands

- NY State DEC Regulated Wetlands

Tidal Wetlands

- DS - Dredged Spoil
- FC - Formerly Connected
- FM - Fresh Marsh
- HM - High Marsh
- IM - Intertidal Marsh
- LZ - Littoral Zone
- SM - Coastal Shoals, Bars, Mudflats

Note:
Wetland #B-5 is a Class 1 wetland (Provides most critical wetland benefits; highly regulated).
Wetland #B-9 is a Class 2 wetland (Provides important wetland benefits; less highly regulated).

Source: NYSDEC
Date: 1974
1 inch = 1,000 feet

N

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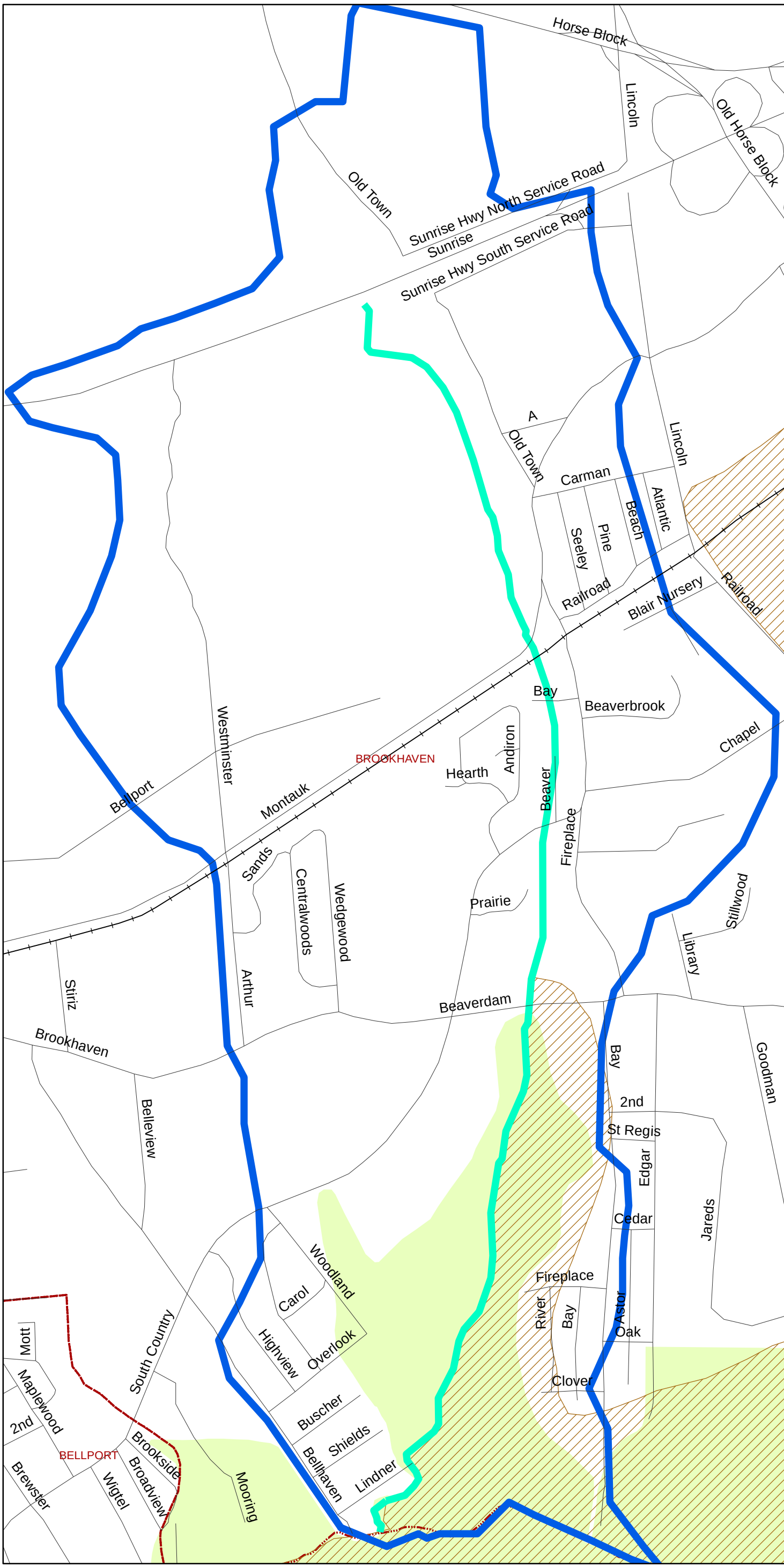
FIGURE 2-8
FISH AND WILDLIFE
SIGNIFICANT HABITAT AREAS



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Beaver Dam Creek
- Watershed Boundary
- Waterfowl Focus Areas
- Towns and Villages
- Significant F&W Habitats

Source: NYSDOS
Date: 2006

1 inch = 1,000 feet

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FIGURE 2-9
NYSDEC SHELLFISH CLOSURE AREAS

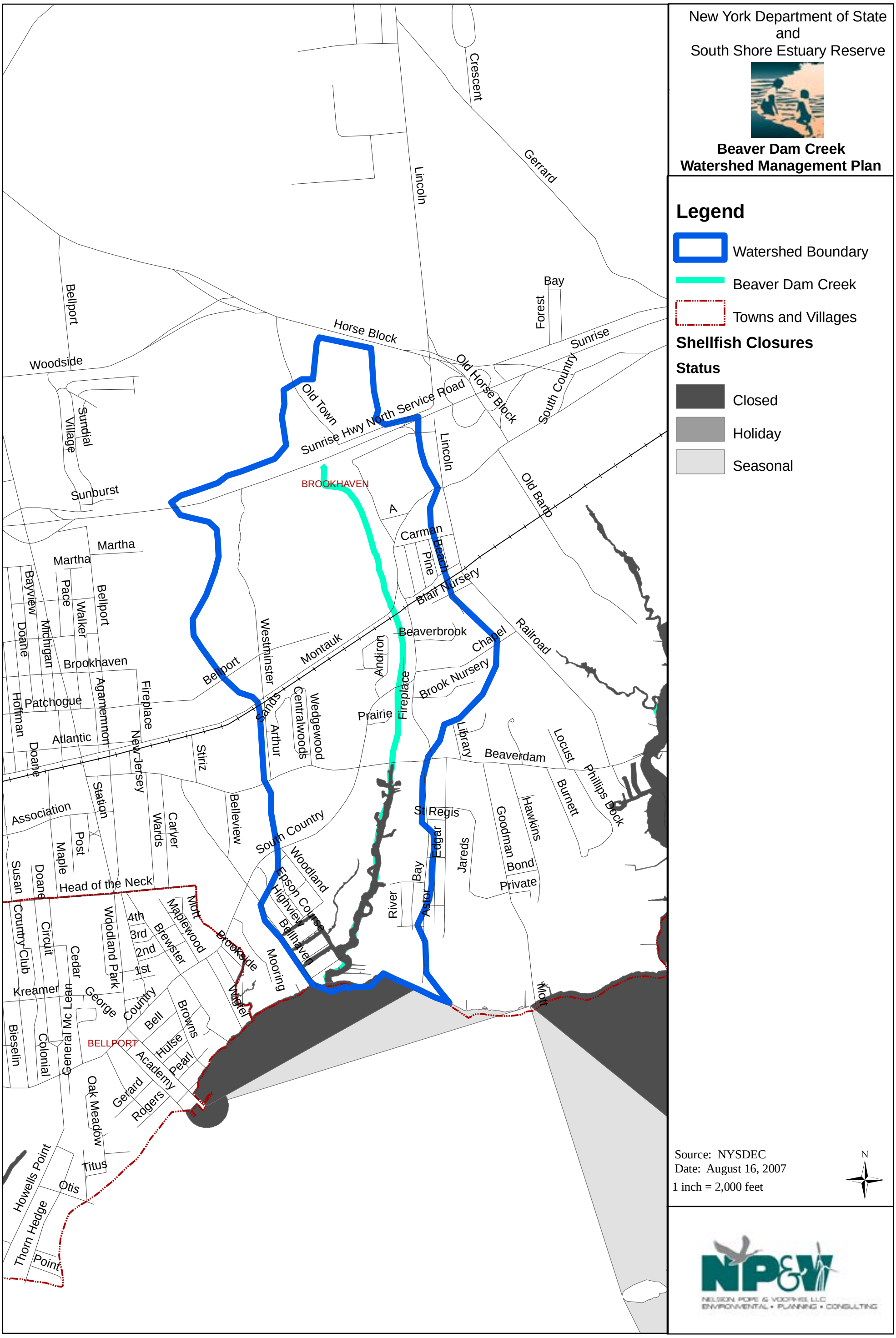

FIGURE 2-10
2007 FISH BARRIER INVENTORY

New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

SSER CROSSINGS

BARRIER

- None
- Permanent
- Temporary
- Watershed Boundary
- Railroad
- Beaver Dam Creek
- Towns and Villages

Source: NYSGIS Orthoimagery Program,
NPV Barriers Inventory
Date: 2004; 2007

1 inch = 1,000 feet

N

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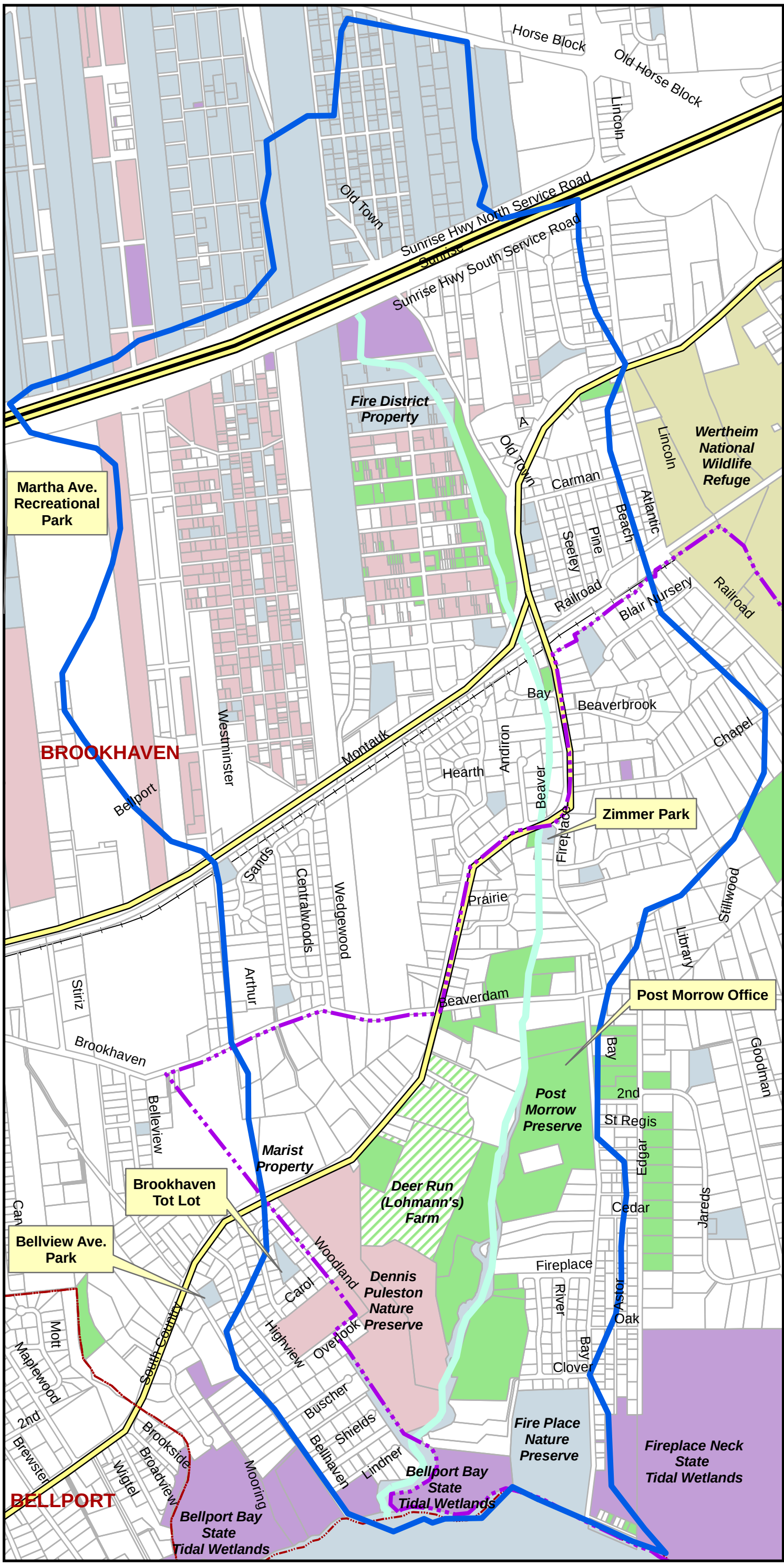
FIGURE 2-11
PUBLICLY OWNED LANDS



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Brookhaven Hamlet Historic Area
- Towns and Villages
- Main Roads
- Sunrise Highway
- Beaver Dam Creek
- Federally Owned Land
- State Owned Land
- Suffolk County Owned Land
- Suffolk County Development Rights
- Town of Brookhaven Owned Land
- Post Morrow Owned Land
- Railroad

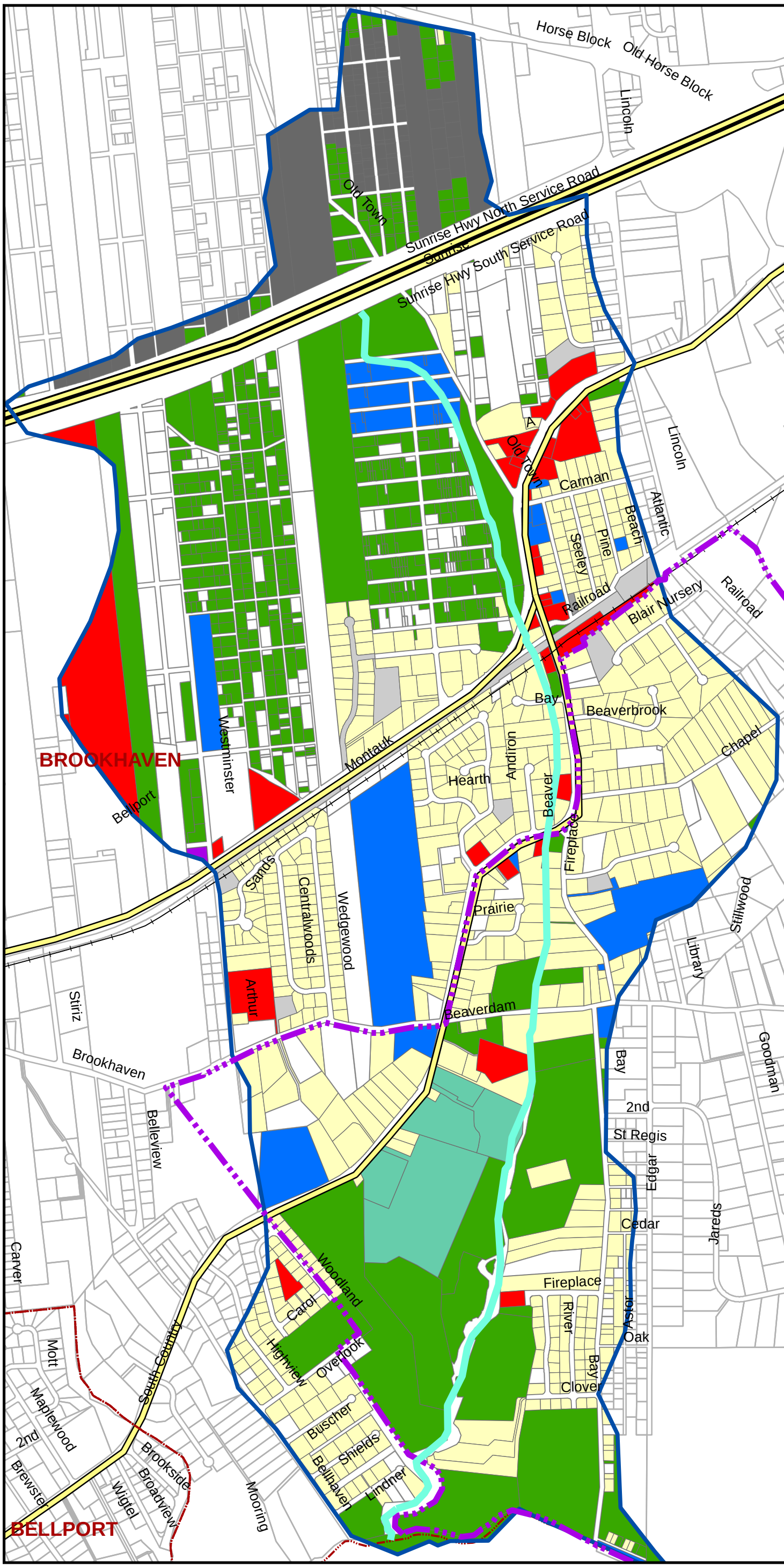
Source: Town of Brookhaven
Date: Updated by NPV on 3/5/09

1 inch = 1,000 feet

N

NPV
NELSON, POPE & VOORHIS, LLC
ENVIRONMENTAL • PLANNING • CONSULTING

FIGURE 2-12
LAND USE MAP



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Beaver Dam Creek
- Watershed Boundary
- Brookhaven Hamlet Historic Area
- Towns and Villages
- Railroad
- Main Roads
- Sunrise Highway

Land Use

- Agricultural
- Residential
- Vacant
- Commercial
- Institutional
- Industrial
- Transportation
- Utilities
- Waste Handling & Management
- Parks, Open Space, Conservation Areas

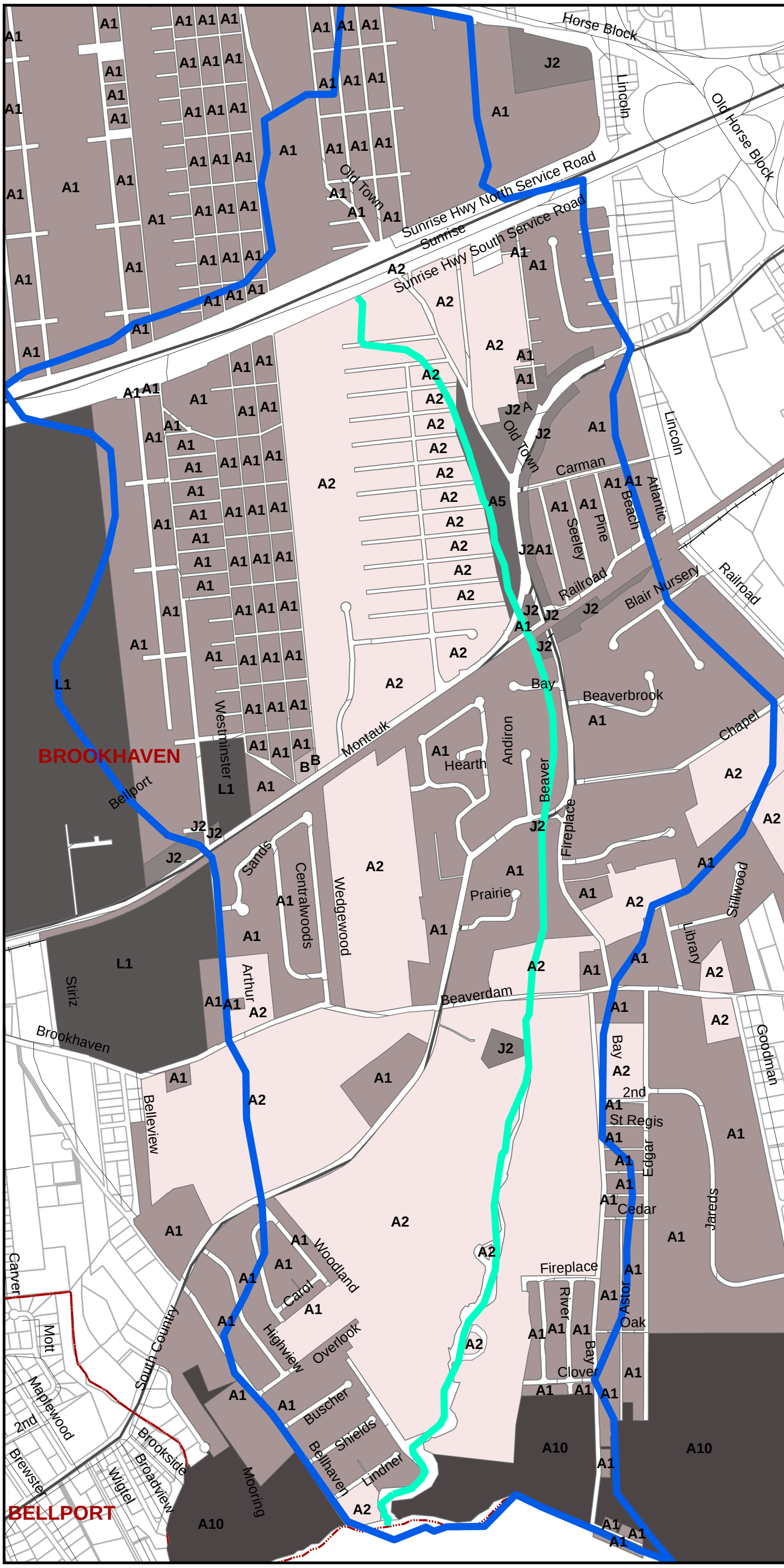
Source: Town of Brookhaven;
Suffolk County Water Authority
Date: Updated by NPV on 2/29/08

N

1 inch = 1,000 feet

NELSON POPE & VOORHIS LLC
ENVIRONMENTAL • PLANNING • CONSULTING

FIGURE 2-13
ZONING MAP



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Watershed Boundary
- Towns and Villages
- Beaver Dam Creek
- Railroad
- Roads
- Main Roads

Zoning

- A1
- A10
- A2
- A5
- B
- J2
- J5
- L1
- L2
- ROW

Source: Town of Brookhaven
Date: 05/12/2008

1 inch = 1,000 feet

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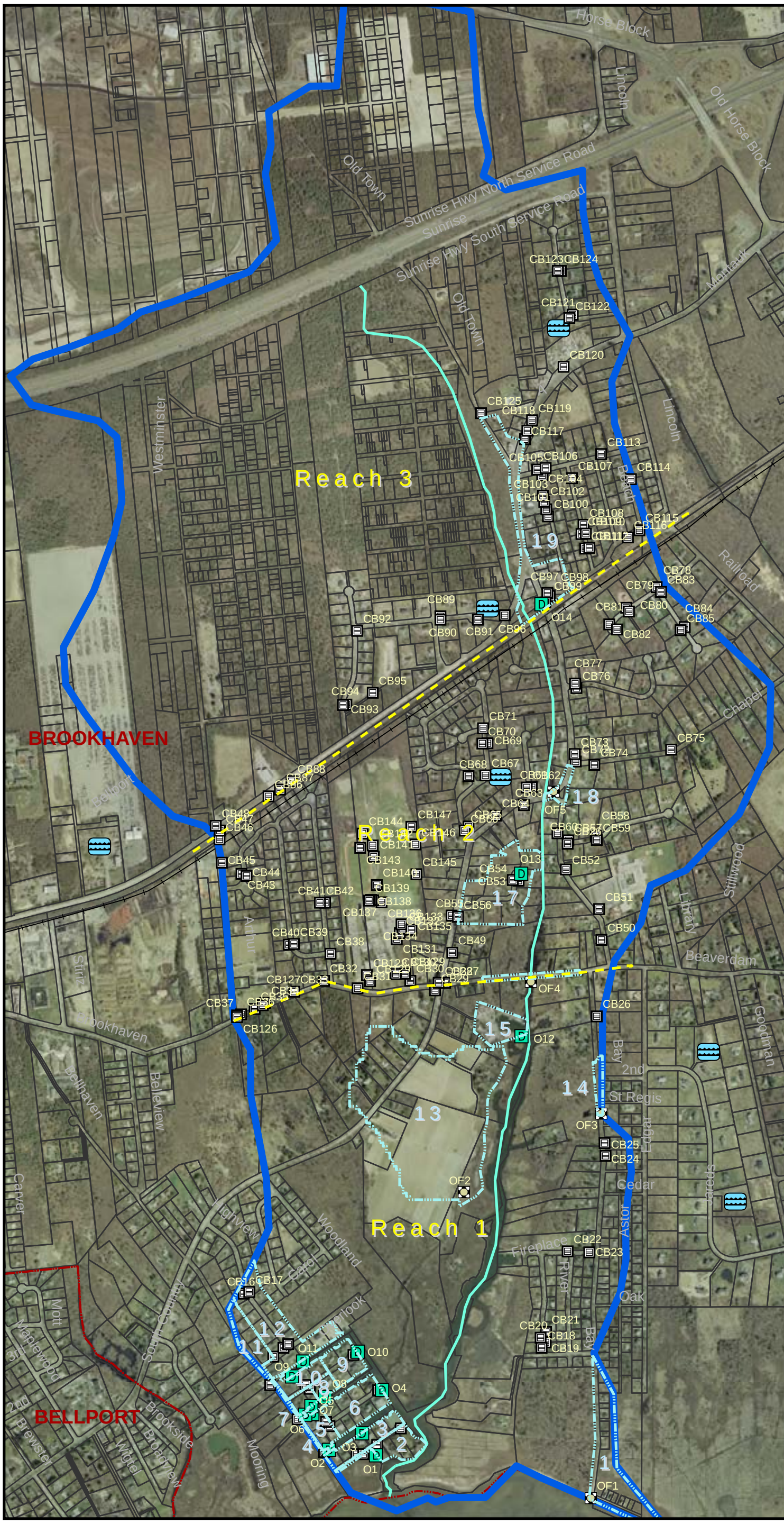
NELSON POPE & VOORHIS LLC
ENVIRONMENTAL • PLANNING • CONSULTING

FIGURE 2-14
STORMWATER INVENTORY



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Subwatershed Areas

Stormwater Inventory

Stormwater Infrastructure Component

- Catch Basins
- Overland Flow
- Outfalls
- Recharge Basins
- Watershed Boundary
- Beaver Dam Creek
- Railroad
- Towns and Villages

1 inch = 1,000 feet

N

Source: NYSGIS Orthoimagery Program,
NPV Barriers Inventory
Date: 2004; 2007

NPEW
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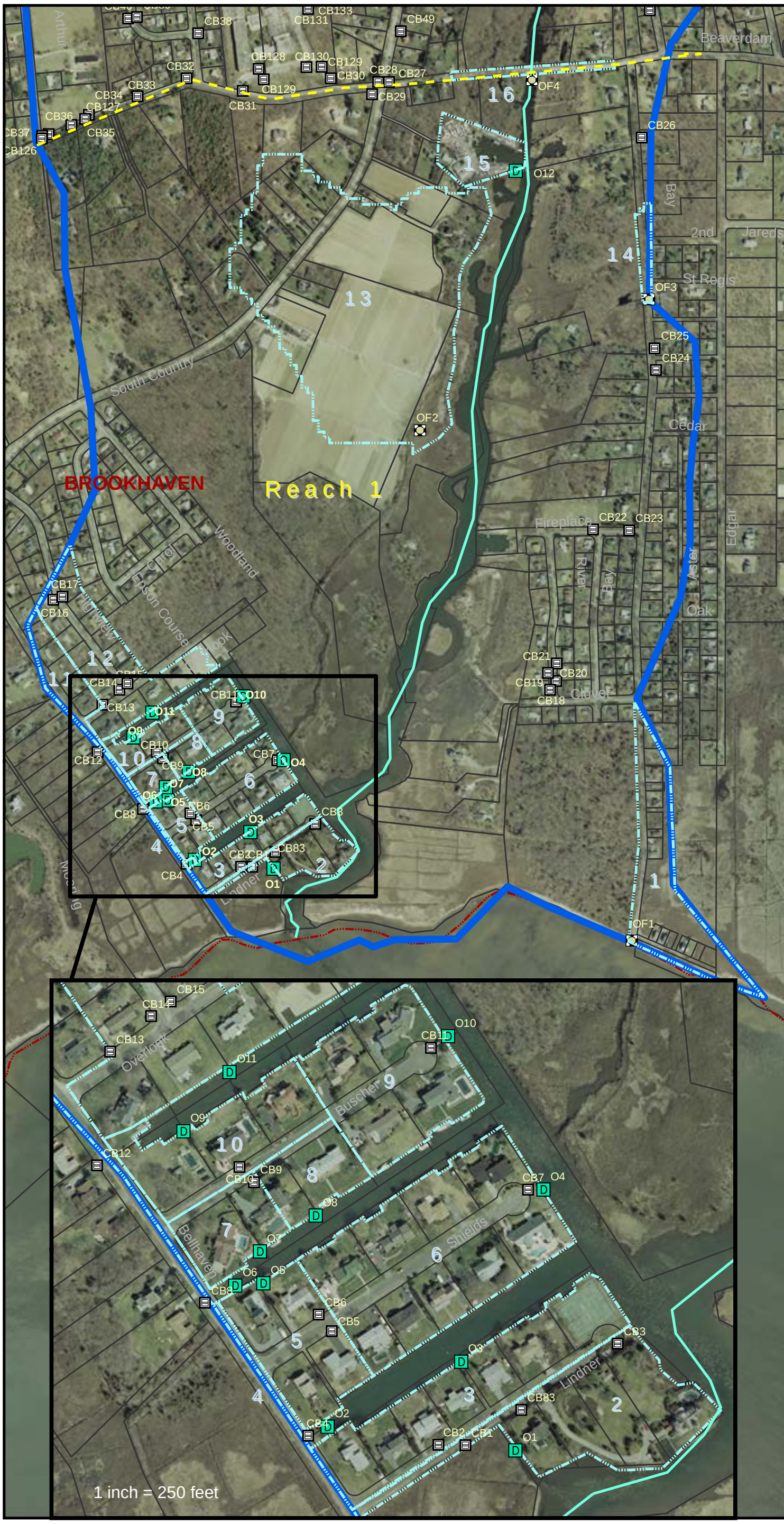
FIGURE 2-14a
STORMWATER INVENTORY



New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

Subwatershed Areas

Stormwater Inventory

Stormwater Infrastructure Component

Catch Basins

Overland Flow

Outfalls

Recharge Basins

Watershed Boundary

Railroad

Beaver Dam Creek

Towns and Villages

N

Source: NYSGIS Orthoimagery Program,
NPV Barriers Inventory
Date: 2004; 2007

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FIGURE 2-14b
STORMWATER INVENTORY

New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Subwatershed Areas

Stormwater Inventory

Stormwater Infrastructure Component

- Catch Basins
- Overland Flow
- Outfalls
- Recharge Basins
- Watershed Boundary
- Railroad
- Beaver Dam Creek
- Towns and Villages

1 inch = 800 feet

N

Source: NYSGIS Orthoimagery Program,
NPV Barriers Inventory
Date: 2004; 2007

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FIGURE 2-14c
STORMWATER INVENTORY

New York Department of State
and
South Shore Estuary Reserve

Beaver Dam Creek
Watershed Management Plan

Legend

- Subwatershed Areas
- **Stormwater Inventory**
- **Stormwater Infrastructure Component**
  - Catch Basins
  - Overland Flow
  - Outfalls
  - Recharge Basins
- Watershed Boundary
- Railroad
- Beaver Dam Creek
- Towns and Villages

N

1 inch = 800 feet

Source: NYSGIS Orthoimagery Program, NPV Barriers Inventory
Date: 2004; 2007

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