Hempstead Harbor Protection Committee

WATER-MONITORING PROGRAM
HEMPSTEAD HARBOR
Long Island, New York

2006 Water-Monitoring Report

Prepared by

Coalition to Save Hempstead Harbor

and

FUSS & O'NEILL
Disciplines to Deliver

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PROGRAM HISTORY

Twenty years ago, the view of Hempstead Harbor was much different from what it is today. The harbor was suffering from air, water, and land-based problems that resulted from past industrial activities along its shores. These problems were the impetus for the formation of a citizens' activist group in 1986, the Coalition to Save Hempstead Harbor (CSHH). CSHH established Hempstead Harbor's **Citizens Water-Monitoring Program** in 1992 and initially funded the program through membership support, grants from local foundations and businesses, and volunteer services. The program became widely recognized by other monitoring groups and agencies around Hempstead Harbor and Long Island Sound and quickly was able to garner support from local municipalities and government agencies.

As the program continued, positive changes were occurring not only on the landscape around the harbor, but also on the political landscape, as citizens and government learned to work collaboratively to achieve environmental goals. In 2006, the Hempstead Harbor Protection Committee (HHPC) was able to step up to fully fund the harbor's water-monitoring program through a grant from the Fish and Wildlife Foundation. The grant enabled the completion of an EPA-approved **Quality Assurance Project Plan (QAPP)**, which further enhanced the credibility of the monitoring program.

Program Initiation

CSHH's mission, to identify and eliminate environmental threats to Hempstead Harbor and surrounding communities, is longstanding, and its early priorities included preventing increased air pollution from proposed and existing incinerators and ensuring the cleanup of toxic waste sites that were degrading the harbor's water quality. By 1990, chronic sewage spills into the harbor from failing treatment plants and cutbacks in Nassau County Department of Health's water-quality monitoring program shifted CSHH's focus to creating a citizens water-monitoring program for Hempstead Harbor. This program was intended as a springboard for public education and outreach programs that foster an increased awareness of environmental issues and encourage public participation in local conservation efforts.

In the early 1990s, water-quality concerns about Long Island Sound gained increased attention, and while CSHH was already focused on the water-quality issues of Hempstead Harbor, it recognized that the priorities established under the Long Island Sound Study's Comprehensive Conservation and Management Plan (CCMP) were consistent with the needs of Hempstead Harbor. CSHH established its Citizens Water-Monitoring Program to encourage all who live, work, and recreate around Hempstead Harbor to renew their interest in the harbor as well as Long Island Sound and to participate in restoration efforts.

CSHH's water-quality monitoring, public education, and advocacy were achieved with the Long Island Sound Study's priorities in mind. An important component of the program has been to involve citizens in observing changing conditions around the harbor and notifying CSHH as well as appropriate municipal and environmental agencies of any unusual events affecting the harbor. Over the years, the scope of the program has expanded, as has the network of partners that have supported it.

Municipal Watershed-Based Management

As CSHH continued it monitoring efforts, the municipalities that shared jurisdiction over Hempstead Harbor recognized they also shared the harbor's water-quality problems but did not have the resources to tackle large harbor issues. It became increasingly evident that they needed a mechanism to overcome the complexities of municipal boundaries and facilitate a more coordinated government approach to water-quality problems. In 1995, the Hempstead Harbor Protection Committee was created and became Long Island's first watershed-based intermunicipal organization, specifically formed to protect and improve the water quality of Hempstead Harbor. CSHH became the first environmental organization to join the committee as nonvoting member and technical adviser.

HHPC first focused on storm-water runoff abatement as it developed a comprehensive *Hempstead Harbor Water-Quality Improvement Plan* (completed in 1998), for which CSHH implemented the plan's water-quality monitoring component. Also, in recognition of the need to balance the diverse uses of Hempstead Harbor, the HHPC secured grants to fund the preparation of a *Harbor Management Plan for Hempstead Harbor* (2004).

CSHH and HHPC Profiles and Activities

The Coalition to Save Hempstead Harbor and the Hempstead Harbor Protection Committee continue to work closely together on improving Hempstead Harbor's water quality. Each organization has offered separate and valuable contributions to improving conditions around the harbor. At the same time, the two organizations illustrate the great successes that can result from creating valuable partnerships that can pool resources and maximize results to benefit the environment and local communities.

CSHH

When CSHH first formed in 1986, it was in response to reports of continued degradation of Hempstead Harbor on a number of fronts. CSHH joined with other community members and successfully prevented a new incinerator from being built on the harbor's western shore, and shut down a failing incinerator that was operating on its eastern shore. CSHH sponsored the development of a townwide recycling plan in the Town of North Hempstead as an alternative solution to solid-waste management and became a critical watchdog for the harbor as remediation plans were formulated to clean up contaminated sites.

As CSHH developed its Citizens Water-Monitoring Program, it also participated in the meetings and hearings that led to the completion of the **Long Island Sound Study's Comprehensive Conservation and Management Plan** in 1994. These meetings afforded opportunities to network with many members of nonprofit organizations and government agencies that were involved in water monitoring around Long Island Sound.

In 1996, CSHH initiated the creation of the **Water-Monitoring Work Group**, a soundwide network of environmental agencies and nonprofits, to provide a forum for analyzing current testing parameters, methodologies, and equipment used by members and for examining testing results in a broader context. The soundwide network remains an important resource to check the location and extent of various water conditions around the sound. In addition, the **Long Island Sound Mapping Project** was completed in July 1998 through a grant awarded to CSHH by EPA/Long Island Sound Study. The project was undertaken on behalf of the Water-Monitoring Work Group and achieved the group's goals of mapping sites that are being monitored around Long Island

Sound and identifying the agencies and other organizations that are responsible for testing at those sites.

In 1998, CSHH published ***Hempstead Harbor: Its History, Ecology, and Environmental Challenges***. The book supports the goals of the water-monitoring program in encouraging community members to learn about Hempstead Harbor as an important habitat for marine life and other species. It also describes the critical relationship between the ecology of the harbor and sound and the quality of life (as well as economy) of surrounding communities.

In 2000, CSHH became a partner in **EPA's Environmental Monitoring for Public Awareness and Community Tracking (EMPACT)** program. CSHH worked with the Marine Sciences Department of the University of Connecticut to maintain a telemetry link at the EMPACT Web site at www.MYSound.uconn.edu, so that water-quality data from Hempstead Harbor could be viewed on the Web. The Town of Oyster Bay became an important partner in this project, having contributed the stationary probe and use of a boat and staff to assist with probe maintenance. In 2005, logistical problems and lack of funding to purchase and maintain necessary new equipment prevented the continuation of this program.

In 2001, CSHH received the prestigious **Clearwater Award**, announced by The Waterfront Center, a Washington, DC-based educational organization with worldwide membership. CSHH was commended for the scope of its activities in working to improve conditions in and around Hempstead Harbor. Particularly noted were CSHH's book (mentioned above) and the expansion of its water-monitoring program.

In 2002, CSHH was asked by the EPA Long Island Sound Study Office to plan and coordinate a **Storm-Water Workshop** to help prepare Long Island communities to meet the requirements of the EPA Phase II Storm Water Regulations. CSHH received a grant to host the workshop, which was cosponsored by the EPA Long Island Sound Office, Long Island Sound Study, and the New York Sea Grant Program.

CSHH continues to work with other environmental groups and agencies around Hempstead Harbor and Long Island Sound. CSHH also has participated on every advisory committee that has been created around the harbor to develop various revitalization plans, such as the Glen Cove Creek Reclamation Committee, Glenwood Landing Steering Committee, the Roslyn Waterfront Committee, the Glen Cove Waterfront Citizens' Planning Committee, and, most recently, in 2006, was a member of the Glen Cove Master Plan Task Force. CSHH is a long-standing member of the Long Island Sound Study's Citizens Advisory Committee and served for three years as chair of its Communications Subcommittee.

From 1992 through 2005, CSHH coordinated local activities as part of the International Coastal Cleanup. Special fund-raising events, member contributions, and grants that CSHH has been awarded throughout the years–including those from the NY Department of State, EPA's Long Island Sound Office, the Rauch Foundation, the New York Community Trust, Long Island Community Foundation, and local businesses–have supported CSHH's programs and activities.

HHPC

The idea for a Hempstead Harbor Protection Committee was conceived by the then-assemblyman, now New York State Comptroller, Tom DiNapoli, and former Sea Cliff mayor, Ted Blackburn, in the mid-1990s. In 1995 funds were sought and received from the New York State

Department of State to fund a part time director and to hire coastal experts to prepare an in-depth Water Quality Improvement Plan. Each of the nine municipalities signed an intermunicipal agreement to work cooperatively and to contribute financially on a pro-rata basis. Long Island's first watershed-based intermunicipal coalition was thus born.

HHPC's municipal members include County of Nassau, the Towns of Oyster Bay and North Hempstead, the City of Glen Cove and the Villages of Sea Cliff, Roslyn Harbor, Roslyn, Flower Hill, and Sands Point. The committee accomplishes its mission to protect and improve the harbor's water quality through planning studies, capital improvement projects, educational outreach, water-quality monitoring, information and technology sharing, development of model ordinances, coordination of enforcement, and working with other governmental agencies as well as environmental, educational, community, and business groups. This approach saves each municipality expenses and effort by cooperation, provides for a more coordinated approach to solving harbor problems, and provides year-round focus on harbor issues.

The HHPC has recently conducted a **study of the Scudder's Pond subwatershed** in Sea Cliff and has secured nearly a million dollars toward the implementation of its recommendations. This subwatershed has been identified as one of the most significant contributors of bacteria-laden storm-water runoff to the harbor. The HHPC will shortly begin a similar study in the **Powerhouse Drain subwatershed** in Glenwood Landing.

Other activities include the preparation of a federal **No Discharge Zone application,** which is in the process of being submitted to the U.S. EPA for approval. Once designated, boaters will be forbidden to discharge their wastes into the harbor, and avenues for enforcement will be strengthened. The HHPC has also established a Web site as a resource on the harbor. Recent educational efforts have included the production of professional **coastal interpretive signage** and the installation of **pet-waste stations** around the harbor.

The HHPC has also been instrumental in expanding the state's designation of the harbor as a Significant Coastal Fish and Wildlife Habitat Area to the entire harbor; having harbor trails and land acquisition added to the state's Open Space Plan and having the harbor designated by the Long Island Sound Study as an inaugural "Long Island Sound Stewardship Site." The Hempstead Harbor Protection Committee has been an unqualified success and has spawned the creation of at least one other intermunicipal effort, the Manhasset Bay Protection Committee.

Since 1995, the HHPC has received a total of 22 grants, which have covered most of the committee's costs. The balance of the HHPC's budget (including monetary matches for the grants) is made up from annual contributions (dues) received from the nine member municipalities. These annual contributions (for calendar year 2007) total $82,500.

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Environmental restoration and conservation require dedication, passion, patience, broad-based community support, and collaboration, as well as large infusions of technical expertise and funding. We therefore gratefully acknowledge the financial support and participation of all who have partnered with us to protect our local environment.

We also acknowledge the special efforts of individuals who have helped us maintain our water-monitoring program, including CSHH volunteers and members of local fishing clubs, local beach and marina managers, boaters and sailors, and other members of the community who report on harbor conditions, especially Mark Ring and Peter Emmerich; CSHH fish-survey leader, Dr. John Waldman; Town of Oyster Bay's Department of Environmental Resources staff assistance and for use of its Environmental control boat and Department of Parks staff at Tappen Beach Marina; Nassau County Department of Health Bureau of Environmental Sanitation director, John Jacobs; Interstate Environmental Commission engineer, Peter Sattler; and Nassau County Police Department's Underwater Search and Rescue Team.

Our efforts would not be possible without the assistance of the following organizations and agencies that work with the CSHH and HHPC as technical advisers and partners:

- The New York State Department of State
- The New York State Department of Environmental Conservation
- The New York State Legislative Commission on Water Resource Needs of Long Island
- New York Sea Grant / NEMO
- The Glenwood / Glen Head Civic Association
- The North Shore Country Club
- The U.S. Environmental Protection Agency, Long Island Sound Study Office
- Residents for a More Beautiful Port Washington

Osprey nest in the lower harbor (photo by Carol DiPaolo)

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STATE OF THE HARBOR 2006

1. HARBOR OVERVIEW

Hempstead Harbor is a deep, V-shaped harbor that lies along the north shore of Long Island, bordering the western portion of Long Island Sound, between Manhasset Bay to the west and Oyster Bay to the east. The harbor is about 5 miles long from mouth to head, and its shoreline extends 14 miles from Sands Point on the west at its mouth to Mattinecock Point on the east. For the most part, the harbor presents a beautiful water body that is quiet and uncrowded, though it has widely mixed uses.

Industrial or commercial enterprises were historically concentrated in four areas along the harbor's shoreline. They remain currently, to a much lesser degree, in three areas of the harbor. The former industrial sites degraded the harbor's shorelines, wetlands, and water quality with the effects of oil spills, sewage spills, toxic contamination, storm-water runoff, air pollution, and industrial discharges. The worst of these effects were noted in the mid-1980s.

Efforts to restore the harbor resulted in the closure of a landfill, two incinerators, and a sewage treatment plant. The remediation of some hazardous waste sites has been completed, and remediation of others is still underway. One sewage treatment plant (in Glen Cove) remains and in 2003 was upgraded, using a biological process to remove nitrogen from its discharge; in late 2006, an ultraviolet disinfection system was installed. These are important steps in improving the harbor's water quality. Revitalization plans are being implemented for sections of the waterfront that suffered the most abuse, such as along Glen Cove Creek and the shore in Glenwood Landing.

The Hempstead Harbor Club (photo by Carol DiPaolo)

Despite the harbor's impaired condition during the 1980s, in 1987 New York State designated Hempstead Harbor a **Significant Coastal Fish and Wildlife Area,** including the portion of the harbor extending from Mott Point and Prospect Point at the northern section of the harbor south to the Roslyn viaduct. Over the last 15 years, however, the harbor's ecosystem has vastly improved, containing a diversity of marine life and water birds. Wetland grasses have recovered a large portion of the lower harbor south of the Bar Beach sand spit, once again providing a nursery and healthy habitat for marine species and bird populations. Reflecting Hempstead Harbor's dramatic turnaround, its designation as a Significant Coastal Fish and Wildlife Area was updated and extended in October 2005 to include the portion of the harbor south of the Roslyn viaduct.

Today, Hempstead Harbor continues to support many diverse uses and activities. Fuel is transported to a Glenwood Landing oil terminal that is adjacent to a power plant that has operated since the early 1900s. Further north, tugboats tow barges to and from a sand and gravel transfer station on the western shore of the harbor and into Glen Cove Creek along the eastern shore. In contrast to these commercial uses, the recreational uses continue to flourish and expand as the harbor's water quality improves. Marinas, yacht clubs, and fishing clubs, which are concentrated in the northern portion of the harbor, are thriving. Town, village, and small private beaches are also located along the harbor's shore. As the harbor environment has continued to improve, there has been increased pressure to develop properties along the shoreline, which in time could exacerbate the problems that are currently being mitigated.

A challenge that must be met in planning for the future of Hempstead Harbor is to balance these diverse and often competing interests. The Harbor Management Plan for Hempstead Harbor (Hempstead Harbor Protection Committee, 2004) offers a comprehensive strategy so that the municipalities that share Hempstead Harbor can "work cooperatively to address issues related to the wise use and protection of the harbor's surface waters, natural resources, underwater lands, and shorefront."

Specific environmental challenges and priorities that remain for Hempstead Harbor include storm-water-runoff abatement; prevention of inappropriate land use and development, particularly along the shore; continued improvements in water quality; and continued remediation of contamination from former industrial activities.

2. METHODS

It is difficult to draw direct relationships among all the variables that affect water quality, and this is the challenge presented every year in attempting to analyze the past season's water-quality data. The graphs presented in the electronic portion of this report compare parameters (such as rainfall and bacteria levels) that show expected correlations but also noticeable variability. The data collected over the years are a critical resource as we look for trends that point to the health of the harbor.

The story of Hempstead Harbor and Long Island Sound is a complicated one. There are many variables. Some things we can control—such as nitrogen discharges and other pollution from both point and nonpoint sources; other things we can't control—such as rainfall and temperature. However, all of these factors have critical relationships that have an impact on ecological health and survival and human use of the waters, including swimming, fishing, and other recreational pursuits.

The data collected through the water-monitoring program help us learn about the interrelationships that occur in Hempstead Harbor. This information enables us to work with others on a harborwide and soundwide basis to discover causal effects of human activities, so that we can plan and implement best management practices that will assure a healthy environment for the future.

2.1. Quality Assurance Project Plan

In 2006, a Quality Assurance Project Plan (QAPP) was prepared by the consulting engineering firm of Fuss & O'Neill, Inc., for the Hempstead Harbor Water-Monitoring Program, on behalf of the Coalition to Save Hempstead Harbor and the Hempstead Harbor Protection Committee. The QAPP documents the quality assurance and quality control (QA/QC) procedures implemented in the CSHH program.

Although the QAPP incorporated several new items into the water-monitoring program, the majority of the procedures in the QAPP have been implemented by the program for years. The approval of the QAPP by the U.S. Environmental Protection Agency, Region 2, broadens the use of the program's data by additional outside organizations, enables the program to receive federal funding for future monitoring efforts, reiterates the ongoing commitment of CSHH to provide high-quality monitoring data for Hempstead Harbor, and demonstrates the reliability of the data presented in this and previous, water-quality reports.

2.2. Location of Testing Stations

The water-monitoring program includes 12 stations in Hempstead Harbor. At the end of the 2004 monitoring season, we added 4 stations near CSHH #8 (the Glen Cove sewage treatment plant outfall). The new stations–CSHH #9, #10, #11, and #12–were added to track the frequency and source of unusual dry- and wet-weather flows that were noticed at discharge points west of the STP outfall and that, on testing, indicated high levels of bacteria. CSHH stations #9, #10, #11, and #12 became regular testing sites in 2005, and the NCDH continues to perform the analyses for samples collected at these sites.

View of CSHH #8 (STP outfall), #9, #10, #11, and #12 along Glen Cove Creek (photo by Carol DiPaolo)

The principal stations that are sampled weekly during the monitoring season are located in the northern portion of the harbor, between the Bar Beach sand spit and Long Island Sound, as well as stations in Glen Cove Creek. The CSHH monitoring stations include:

- CSHH #1 at Beacon 11 (between Tappen Beach Marina on the east shore and Bar Beach on the west shore);
- CSHH #2 at Bell Buoy 6 (a stationary marker at the harbor mouth, east of Mott Point);

- CSHH #3 at the red channel marker near the mouth of Glen Cove Creek, between the Hempstead Harbor Club (which is adjacent to Garvies Point) and Sea Cliff Beach; and
- CSHH #8, at the Glen Cove Sewage Treatment Plant (STP) outfall pipe.
- CSHH #9, about 10 feet west of CSHH #8;
- CSHH #10, about 20 feet west of CSHH #8, at the end of the seawall;
- CSHH#11, about 50 feet east of CSHH #8, at the end of the floating dock;
- CSHH #12, about 100 feet east of CSHH #8, in the middle of the creek, north of the bend in the south seawall.

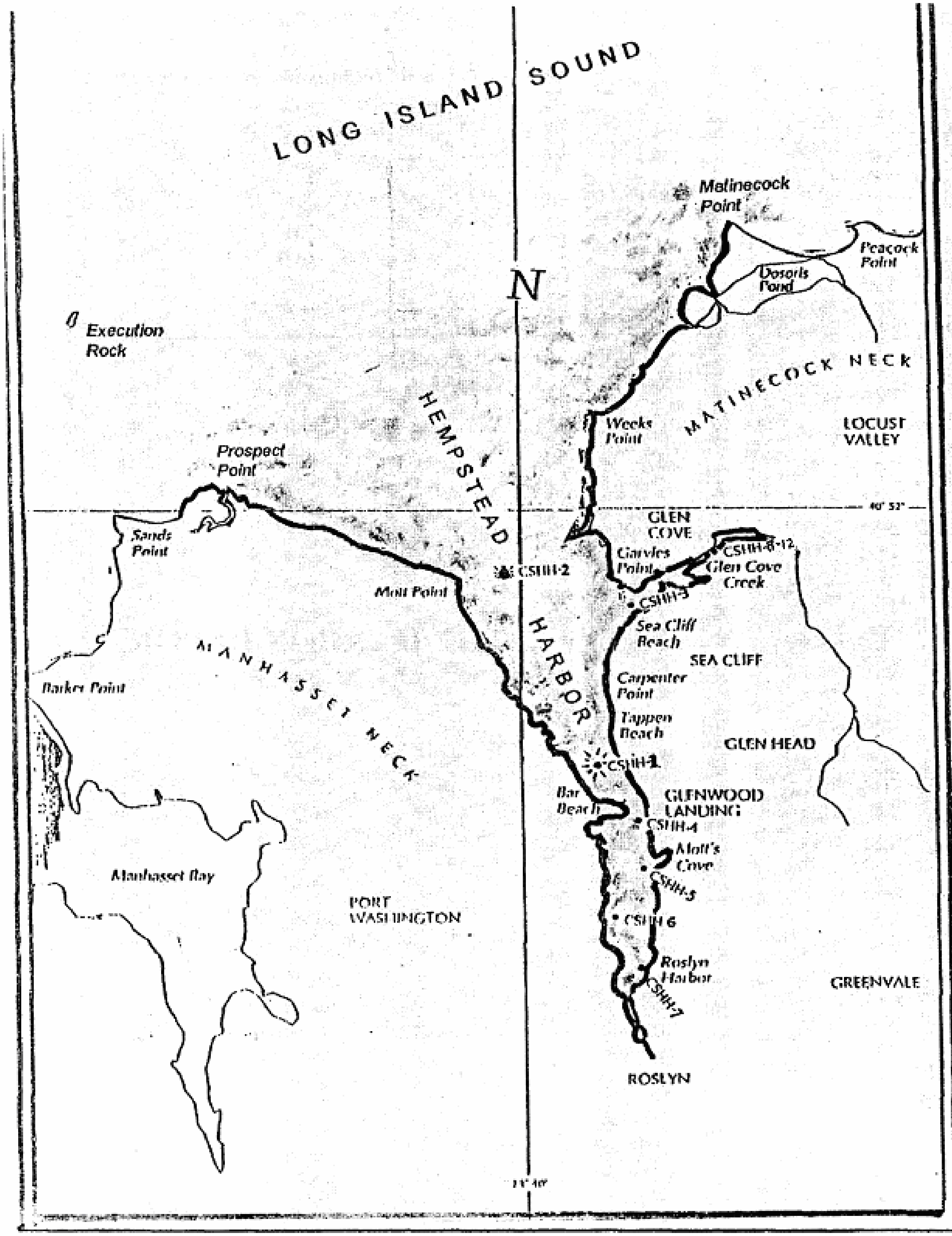
On August 30, 2006, a **boat tour of Glen Cove Creek** took place with representatives from Glen Cove, the city's consultants, and CSHH to view discharge pipes along the creek. The city received a grant from the New York Department of State to map and source the outfalls along both the north and south sides of the creek. A report of the findings was anticipated to be released in 2007. On August 31, 2006, a Nassau County DPW representative met with CSHH during the last portion of scheduled monitoring to take additional samples at CSHH #8-#10 and at other outfalls on the north side of the creek that had flows that were causing discoloration of creek water with suspended solids. Several of those sample results showed high levels of total and fecal coliform as well as enterococci, further supporting the need for an investigation of the source of all outfalls along Glen Cove Creek.

Sampling an unusual discharge from north side of Glen Cove Creek (photo by Carol Di Paolo)

Ducks near Steamboat Landing (photo by Carol DiPaolo)

The four stations located in the lower harbor are often inaccessible during low tides and are monitored less frequently. These stations include:

- CSHH #4 at the Bar Beach sand spit;
- CSHH #5 at Mott's Cove;
- CSHH #6 at a point east of the site of the former Town of North Hempstead incinerator, now the waste-transfer station;
- CSHH #7, the station farthest south in the harbor, on the east shore just before the new walkway for the Sterling Glen and Horizon (totaling 208 senior rental units) and just north of the Roslyn viaduct. (The former marker for this station was a portion of an old oil dock, which was removed during the construction of the new development, formerly referred to as the Forest City Daly and the Bryant Landing project.)



Map of Hempstead Harbor Showing Locations of CSHH Stations 1-8

2.3. Frequency of Testing and Testing Parameters

Testing is conducted weekly, from May to November, at each station, generally on the same day of the week and at the same time (beginning at approximately 8 am and typically continuing for 4 hours). CSHH collects samples and conducts water-quality tests with the assistance of Town of Oyster Bay staff for onboard testing and boat transportation to sampling sites.

Water samples are collected weekly (weather and tidal cycles permitting) from all 12 testing stations for bacterial analysis by the Nassau County Department of Health. In addition, tests for dissolved oxygen (DO), salinity, water temperature, pH, nitrite, nitrate, and ammonia are conducted weekly at CSHH #1, #2, #3, and #8 and monthly at CSHH #4, #5, #6, and #7. Chlorine testing is conducted at CSHH #8, near the outfall of the Glen Cove sewage treatment plant. A summary of the samples collected and analyses performed is presented in **Table 1**.

Physical observations are recorded regarding weather conditions, wind direction and velocity, water surface, air temperature, floatables, and wildlife and human activities. Whenever possible, floatable debris is retrieved and brought back to shore for disposal.

Dissolved oxygen, salinity, water temperature, and pH are recorded with an electronic meter (YSI Model 600 sonde with 650 MDS display unit) at 1-meter depth increments at every station. A DO reading for bottom water is also measured using the Winkler titration method at the first testing station as a quality-assurance check of the electronic meter. A quality assurance test is also performed for pH using a LaMotte test kit– a wide-range indicator that uses a color comparator.

LaMotte test kits are also used to measure ammonia and chlorine levels. Technicians at the Town of Oyster Bay Laboratory use an electronic kit (Hach) for measurement of nitrite and nitrate levels. Periodically, samples are also collected for plankton analysis by the Department of Health. The water samples for the test kits are collected within a half meter of the water surface.

Table 1. CSHH Monitoring-Program Parameters

Parameter	Location	Analyzer or Method	Location of Analysis
Dissolved Oxygen	Vertical profiles at 1-meter intervals at all locations	YSI 600	Field
Dissolved Oxygen	One location for electronic meter validation	LaMotte 7414	Field
Water Temperature	Vertical profiles at 1-meter intervals at all locations	YSI 600	Field
Water Temperature	One location for electronic meter validation	Calibrated Thermometer	Field
Air Temperature	One measurement at each location during monitoring	Calibrated Thermometer	Field
Salinity	Vertical profiles at 1-meter intervals at all locations	YSI 600	Field
pH	Vertical profile at 1-meter intervals at all locations	YSI 600	Field

Parameter	Location	Analyzer or Method	Location of Analysis
pH	One location for electronic meter validation	LaMotte 2218 reagent	Field
Ammonia	Grab sample at half-meter depth at all locations	LaMotte 4795	Field
Ammonia	More refined method used when the test above detects ammonia	LaMotte 3304	Field
Nitrate	Grab sample at half-meter depth at all locations	Hach 8192	Oyster Bay Town Lab
Nitrite	Grab sample at half-meter depth at all locations	Hach 8507	Oyster Bay Town Lab
Chlorine	Surface grab sample at CSHH #8	LaMotte 3308	Field
Clarity	All locations	LaMotte Secchi Disk	Field
Fecal Coliform Bacteria	Grab sample half-meter depth at all locations	Most Probable Number	Nassau County Department of Health
Enterococci	Grab sample at half meter depth at all locations	Membrane Filter	Nassau County Department of Health
Precipitation	Village of Sea Cliff	Visually read rain gauge	Field

3. MONITORING RESULTS

This section summarizes results of the CSHH sampling program. Where possible, historical data are used for comparison, including data from 1995 through 2006. **Appendices A** and **B** include graphs constructed with the data collected during this period.

3.1. Dissolved Oxygen

Dissolved oxygen, the form of oxygen that marine life needs to survive, is an important indicator of the health of our Long Island Sound estuary. Hypoxia (low oxygen) and anoxia (no oxygen) are common water-quality problems that occur during the summer in Hempstead Harbor and in other areas in and around Long Island Sound, particularly in the western sound. DO is indirectly affected by nutrient enrichment, particularly nitrogen, which can enter Hempstead Harbor through storm-water runoff, discharges from sewage treatment plants, or leaching from failing septic systems. Nitrogen accelerates the growth of phytoplankton or algae and increases the density of organisms that grow. The increased number and growth rate causes frequent or prolonged "blooms." When the cells in the plankton blooms die off, the decomposition process depletes dissolved oxygen that fish, shellfish, and other aquatic organisms need to survive. The larvae of these organisms are often especially sensitive to low DO concentrations.

Although many algal species produce oxygen during their growth stage through photosynthesis, algal mortality and subsequent decay generally influence DO levels more strongly, especially later in the summer when more organic matter is decaying and rates of photosynthesis are declining. Therefore, productive aquatic ecosystems with larger nutrient loads are more prone to low DO levels. The impact of temperature and salinity on DO levels in these ecosystems is generally of secondary importance. Generally, as temperature and salinity increase, the dissolved oxygen concentration decreases. Since the majority of organic-matter decay occurs at the estuary bottom, DO levels tend to be higher at the surface and lower at the bottom of the water column. Density-dependent stratification, such as elevated salinity levels at the harbor bottom, inhibits mixing and exaggerates this affect.

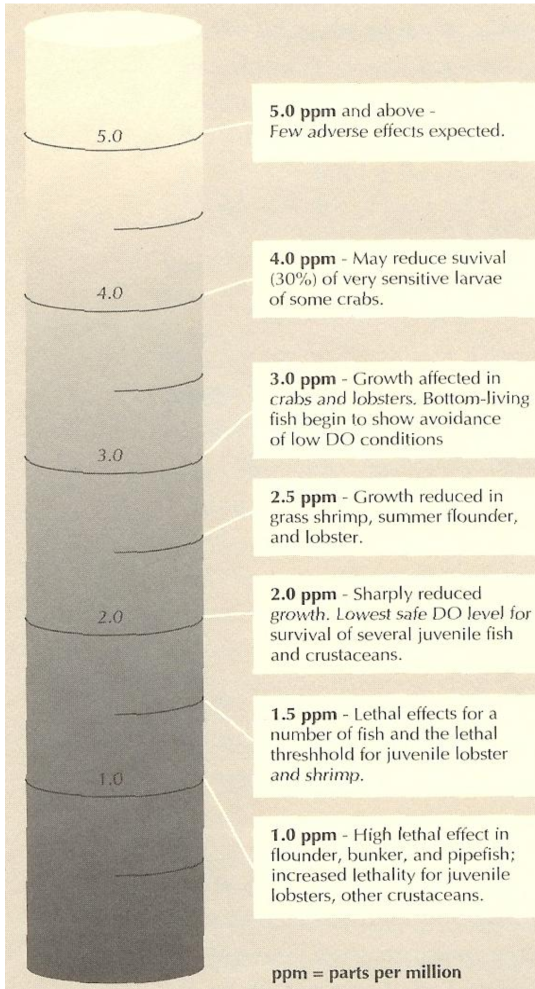


Figure 1. Effect of depleted DO on marine life
(Source: Hempstead Harbor, Its History, Ecology, and Environmental Challenges, 1998)

Generally, DO levels above 5.0 ppm are considered healthy; DO levels below 5.0 ppm begin to cause various adverse impacts (related to growth, reproduction, and survival of organisms). **Figure 1** presents some of the effects of decreasing dissolved oxygen levels on common aquatic organisms. The severity of impacts, and threshold DO levels where impacts occur, are strongly species dependent. The New York State Department of Environmental Conservation has established a water-quality standard of 5.0 ppm for class B estuarine waters, such as Hempstead Harbor (the class designation depends on typical uses of the water).

However, states often interpret effects of environmental conditions on marine life differently; for example, Connecticut has established a standard of 5.0 ppm, and defined maximum periods for which exposure to low DO is allowed. Critical levels of DO, below 3.0 ppm, can be lethal for certain marine species.

Percent saturation of dissolved oxygen is also monitored in Hempstead Harbor. Percent saturation is a measure of the amount of oxygen currently dissolved in water compared with the amount that can be dissolved in the water, and is influenced by variability in water temperature and salinity. In a marine system with abundant nutrients and organisms, such as Hempstead Harbor, dissolved oxygen levels near the surface can be oversaturated during the day (greater than 100%) due to photosynthesis by algae, and undersaturated at night (50% or lower) due to decay of dead organic matter (respiration).

This report evaluates DO measurements collected at the bottom of Hempstead Harbor, which are considered critical because bottom-dwelling marine life have more difficulty than other marine species in trying to escape low DO conditions. Hypoxic conditions (low DO, interpreted to be less than 3.0 ppm in this report) and anoxic conditions (no DO, less than 1.0 ppm in this report) have been implicated in fish kills in Hempstead Harbor, particularly of Atlantic menhaden (commonly known as bunker) but also of juvenile flounder and other species.

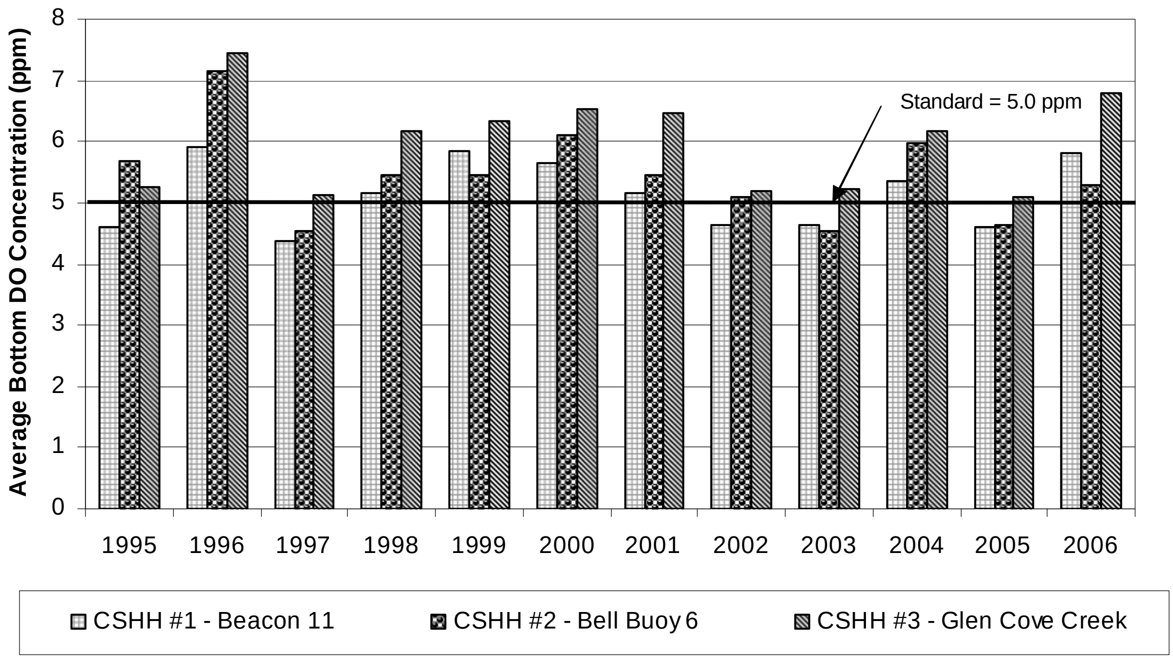


Figure 2. Measured average DO in Hempstead Harbor for 12 monitoring seasons

Fortunately, there were no fish kills during 2001 through 2004 despite extended periods of hypoxia. A clam kill did occur in 2005 south of Bar Beach, near CSHH #5, but this kill reportedly resulted from lunar/tidal effects and not hypoxia. A small, localized fish kill occurred in 2006 from an unusual condition off of Morgan Beach (see **Section 4.7** of this report).

Figure 2 presents average annual dissolved oxygen levels at CSHH #1, CSHH #2, and CSHH #3 for the period of record. The data are also summarized in **Table 2**, along with results for CSHH #8.

Table 2. Average Monitoring Season Dissolved Oxygen Levels in Hempstead Harbor

Average Bottom DO (ppm)	2006	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	1995
CSHH #1	5.76	4.59	5.36	4.63	4.64	5.16	5.64	5.85	5.17	4.39	5.90	4.60
CSHH #2	5.27	4.63	5.96	4.55	5.11	5.46	6.10	5.44	5.45	4.54	7.11	5.67
CSHH #3	6.80	5.09	6.17	5.21	5.20	6.47	6.54	6.32	6.48	5.15	7.45	5.26
CSHH #8	7.05	5.76	6.58	5.28	6.11	6.82	7.35	7.14	N/A	N/A	N/A	N/A

Average DO levels at CSHH #1, CSHH #3, and CSHH #8 for the 2006 monitoring season were higher than in many previous years. Average levels at CSHH #3 (6.8 ppm) were the highest observed since 1996 and the second highest on record there. Similarly, levels at CSHH #1 (5.76 ppm) were the highest since 1999 and the third highest on record for that location. Levels at CSHH #8 (7.05 ppm) were also the second highest on record, and levels at CSHH #2 (5.27 ppm) were within the range of values from previous years (average levels at that location range from 4.54 to 7.11 ppm).

These generally high DO average values follow several years in which average DO levels were generally lower than typical. The 2001 through 2003 Water Quality Report stated that bottom DO averages for 2002-2003 were lower than in preceding years. Higher average DO levels were observed during 2004, ranging from 5.4 to 6.6 ppm between the sampling locations, while 2005 levels were similar to those recorded in 2003 and 2002 (average levels at the sampling locations ranged from 4.6 to 5.8 during that monitoring season). DO concentrations appear to be consistently lower at CSHH #1 in most years, although not in 2006. Levels increase through CSHH #2 and #3, and are consistently highest at CSHH #8. This pattern may be due to one or more factors, such as higher DO in the outfall from the STP, mixing of harbor and sound waters characterized by different DO, or time of sample collection.

The number of hypoxic measurements in 2006 was low; at CSHH #1, hypoxia was measured three times, on July 27, August 10, and August 31. DO levels were 2.30, 2.48, and 2.97 ppm on these dates, respectively. At CSHH #2, hypoxic measurements were recorded for approximately one month, starting on July 27, and included two anoxic measurements on July 27 and August 2, when levels were 0.98 and 0.14 ppm, respectively. At CSHH #3, two hypoxic measurements were recorded (levels were 2.93 and 2.37 ppm on July 20 and August 31, respectively). At CSHH #8, no hypoxic events were recorded.

These results differ from previous seasons, where hypoxic DO levels were typically measured for one to two months, starting in late July, and anoxic levels were measured at each of the locations presented above, except CSHH #8, which may benefit from DO levels in the discharge from the sewage treatment plant.

The cause of low DO is difficult to discern. Anthropogenic factors that may be reducing DO levels at the bottom of Hempstead Harbor and Long Island Sound include nutrient enrichment from wastewater treatment plant discharges; overuse of fertilizers in agriculture, home gardening, and golf-course maintenance; and residual oxygen demand in bottom sediments from past industrial activities.

Likewise, the cause of DO levels in 2006 that appear to be improved could be the result of human and natural factors, such as mixing of the water column by wind, reduced nitrogen discharges from the sewage treatment plant, improved storm-water quality resulting from watershed initiatives, and others that are not known. Changes in the physical nature and chemistry of the water can also influence DO levels, although typical effects are relatively minor. (See **Sections 3.2** and **3.3.**) It is also possible that differences in wind patterns could affect vertical mixing within the water column, resulting in a well-mixed water column during some years, and a more stratified water column in others.

Table 3. DO Readings 1996-2006—Number and Percentage of Testing Dates at Which DO Tested at Specific Levels

	>6 ppm		**5 to 6 ppm**		**3 to 5 ppm**		**<3 ppm**	
			Beacon 11					
1996	11	58%	—	—%	3	16%	5	26%
1997	4	27	3	20	4	27	4	27
1998	8	40	4	20	6	30	2	10
1999	11	50	3	14	5	23	3	14
2000	8	44	2	11	8	44	0	0
2001	7	37	3	16	6	31	3	16
2002	5	26	5	26	3	16	6	32
2003	5	25	5	25	5	25	5	25
2004	7	35	1	5	9	45	3	15
2005	8	35	2	9	4	17	9	39
2006	11	50	1	5	7	32	3	14
			Bell Buoy 6					
1996	10	63%	2	13%	3	19%	1	6%
1997	2	13	2	13	5	33	6	40
1998	9	50	2	15	5	28	2	11
1999	8	42	1	5	6	32	4	21
2000	11	61	3	17	3	17	1	6
2001	8	42	5	26	2	10	4	21
2002	9	50	0	0	4	22	5	28
2003	6	32	4	21	4	21	5	26
2004	8	44	3	17	4	22	3	17
2005	5	22	2	9	8	35	8	35
2006	8	36	2	9	4	18	8	36
			Glen Cove Creek					
1996	12	63%	2	11%	4	21%	1	5%
1997	6	38	2	13	4	25	4	25
1998	12	63	2	11	3	16	2	11
1999	13	59	3	14	3	14	3	14
2000	13	68	2	11	4	21	0	0
2001	11	58	2	10	4	21	2	10
2002	10	53	0	0	4	21	5	26
2003	8	42	3	16	5	26	3	16
2004	8	40	3	15	8	40	1	5
2005	7	30	3	13	7	30	6	26
2006	14	64	3	14	3	14	2	9
			Glen Cove STP Outfall					
2001	12	63%	5	26%	1	5%	1	5%
2002	7	37	8	42	3	16	1	5

	>6 ppm		5 to 6 ppm		3 to 5 ppm		<3 ppm	
			Beacon 11					
2003	7	35	6	30	5	25	2	10
2004	11	65	2	10	5	25	2	10
2005	10	43	1	4	7	30	5	22
2006	16	73	2	9	4	18	0	0

3.2. Temperature

Water temperature is monitored to record seasonal and annual changes of temperature within the harbor, and to determine whether temperature could be affecting marine life, especially organisms that are in the southernmost limit of their habitat in the harbor. Water temperature is also used to determine the percent saturation of DO within the harbor, as described earlier in this report. Percent saturation is a measure of the amount of oxygen currently dissolved in water compared with the amount that can be dissolved in the water. Percent saturation is strongly influenced by temperature. For example, at 32ºF (0 ºC), the saturation concentration of DO in water (meaning that the water is 100% saturated) is 14.6 ppm, whereas at 86ºF (30 ºC), the DO saturation concentration is 7.6 ppm.

Additionally, temperature monitoring determines whether the water column is stratified or well mixed. Stratification is the process through which water at the surface of the harbor can warm while water at the bottom stays cold. Since the colder water is denser, it stays at the bottom and cannot mix easily with the warmer water. This colder water becomes isolated from the surface where the majority of oxygen transfer occurs, which prevents replacement of DO lost through consumption by organisms. Hempstead Harbor does not generally exhibit pronounced stratification; since the harbor is relatively shallow and strongly influenced by tides, vertical mixing continues through much of the season.

Air temperature affects aquatic temperature, which affects both dissolved oxygen concentrations and biological activity within an aquatic system. However, since CSHH records temperature data only during monitoring events, temperature more strongly indicates the time of day that CSHH monitored a certain location. As a whole, however, monitoring events began at similar times each season and have similar durations. As such, changes in temperature averaged between sites during a season could be indicative of annual variability in weather conditions.

Figure 3 presents average monitoring-season air temperature recorded at CSHH #1 through CSHH #3 for each year since 1995. Average air temperatures recorded during the monitoring events vary by approximately 4 degrees during the period of record. On average, 2004 was the coolest monitoring season on record, with an average temperature of 19.5 ºC recorded at the three stations, whereas average air temperatures for 1995 through 2003 and 2005 were 2 ºC warmer. Average air temperatures in 2005 and 2006 were more consistent with average air temperature recorded from 1995-2003.

Somewhat similar characteristics are apparent in the water temperature data collected by CSHH during the monitoring season. **Figure 4** presents average annual water temperature for each monitoring location for the period of record. As with air temperature, many factors affect water temperature, but water temperature is more representative of conditions that occurred over several days and is not as heavily influenced by daily variation in air temperature. .

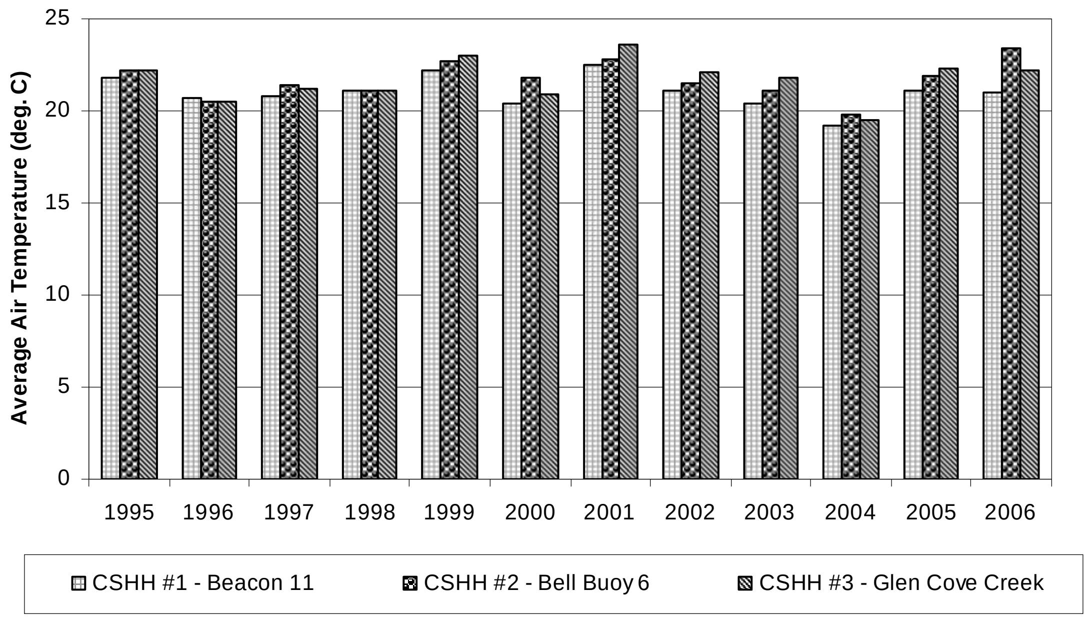


Figure 3. Average air temperature recorded during seasonal monitoring events

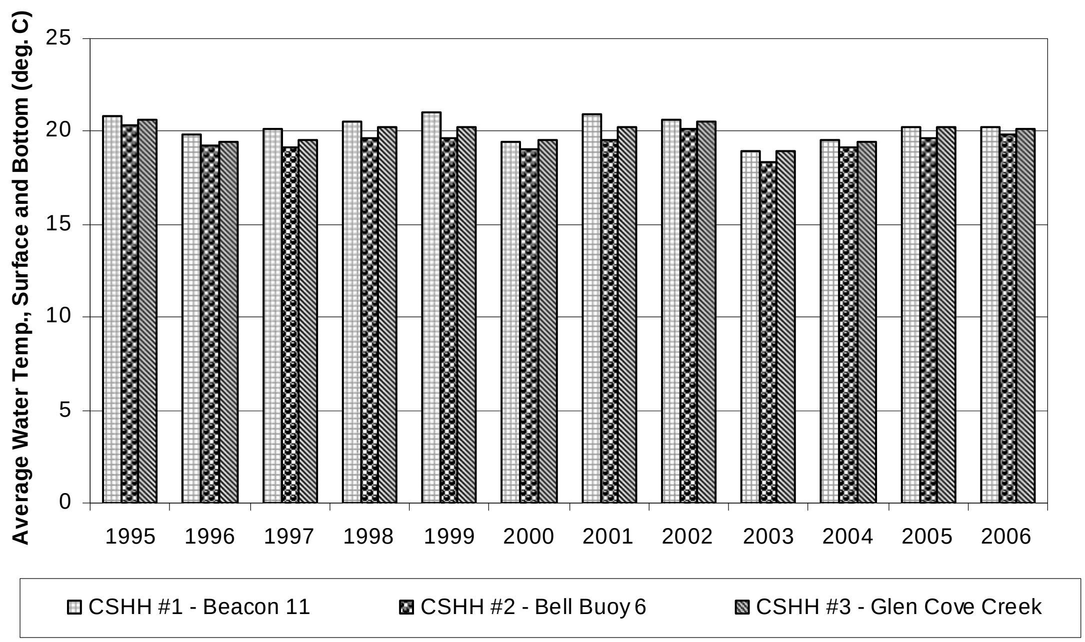


Figure 4. Average water temperature recorded during seasonal monitoring events

Measured water temperatures at CSHH #2 were slightly lower than at the other monitoring locations during each year, although the temperature difference is generally less than 1 ºC. CSHH #2 is located at the mouth of the harbor and is more significantly influenced by the Long Island Sound's deeper, and thus cooler, water. In 2004, water temperature was slightly cooler than typical, as the second-coolest year on record (although approximately 0.5 ºC warmer than in 2003). Water temperature recorded during the 2005 and 2006 monitoring seasons were approximately equal to the average of the previous ten years, at approximately 20 ºC. See **Appendix A** for additional air and water temperature monitoring data.

3.3. Salinity

Monitoring salinity assists in determining whether the harbor is being influenced by tidal water or by freshwater from the watershed (i.e., whether any water-quality problems result from storm water, wastewater, other discharges, or from tidal influences). Like temperature, salinity is an indicator of the water's oxygen-holding capacity and whether the water column is stratified.

Salinity can also affect dissolved oxygen levels; the saturation level of dissolved oxygen at 25 ppt salinity is equal to approximately 85% of the saturation level of dissolved oxygen for freshwater. In Long Island Sound, salinity generally ranges between 21 ppt and 28 ppt (as compared with 32 ppt, which is typical in the open ocean). Salinity levels within an estuary are generally affected by proximity to freshwater inflows, such as rivers or sewage treatment plant discharges, and through direct precipitation and runoff.

Figure 5 presents average annual salinity levels at CSHH #1, #2, and #3 for the period of record. Salinity levels in Hempstead Harbor generally vary less than in the sound. During the testing season, salinity readings in Hempstead Harbor usually range from 23 ppt to 28 ppt, with lower readings generally observed in the spring, and gradually increasing through the fall.

Additionally, salinity levels measured at the bottom of the harbor are generally higher than those near the surface, because high-salinity water is denser and tends to sink. Surface salinity levels are often approximately 1 ppt lower than those at the bottom, suggesting that slight stratification is occurring in the harbor.

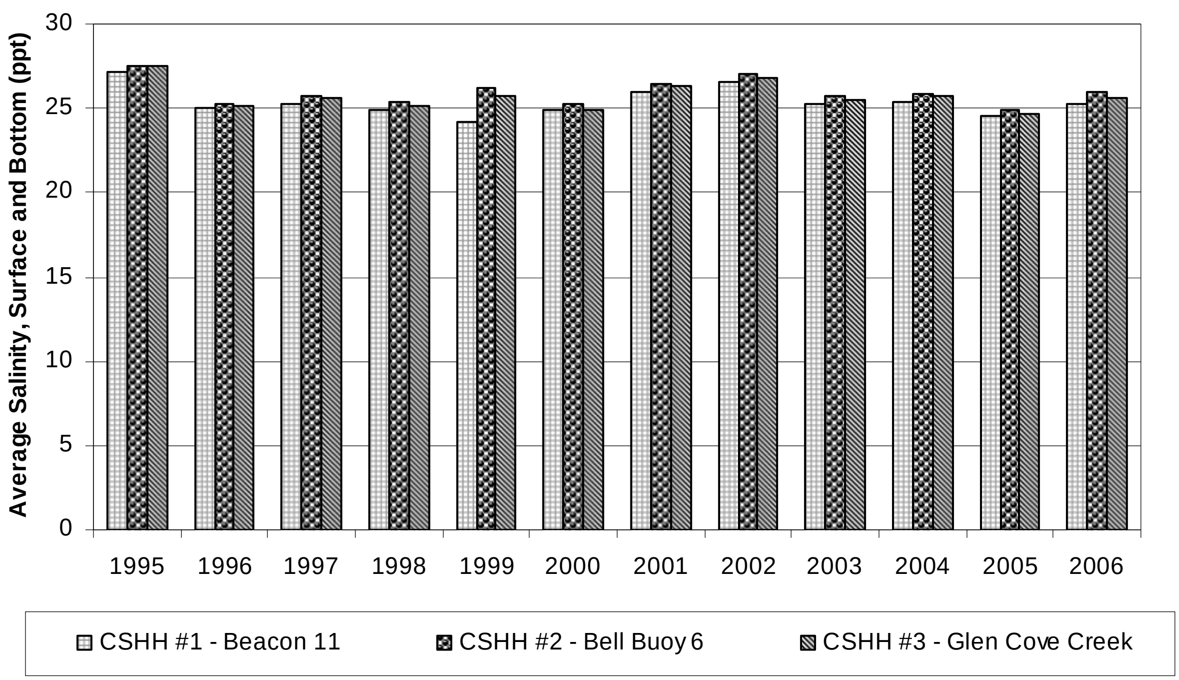


Figure 5. Measured average salinity in Hempstead Harbor during the monitoring season

In most years (1996 through 2000, and 2003 through 2006), average salinity levels within the harbor during the monitoring season were approximately 25 ppt (± 1 ppt), and the remaining years were characterized by slightly elevated levels, such as 1995 when average salinity during the monitoring season was above 27 ppt at each station. Average salinity levels in 2006 (25.6 ppt) were approximately equal to average levels from 1995 through 2004. Levels in 2005 were the lowest measured during the period of record. See **Appendix A** for additional salinity data results.

In 2006, salinity levels were relatively constant, with little variation from week to week and throughout the season.

3.4. pH

pH is monitored to follow trends in aquatic life and water chemistry. Carbon dioxide (CO_2) release by bacteria respiration and uptake via plant photosynthesis affect aquatic pH over short periods (hours to days), whereas the increase in atmospheric CO_2 may affect aquatic pH over decades.

3.5. Nitrogen

3.5.1 The Nitrogen Cycle

Ammonia, nitrate, and nitrite are three nitrogen-based compounds that are commonly present in marine waters. CSHH collects data for each of these compounds. Others include organic nitrogen and nitrogen gas. **Figure 6** presents a diagram of the nitrogen cycle in the water environment.

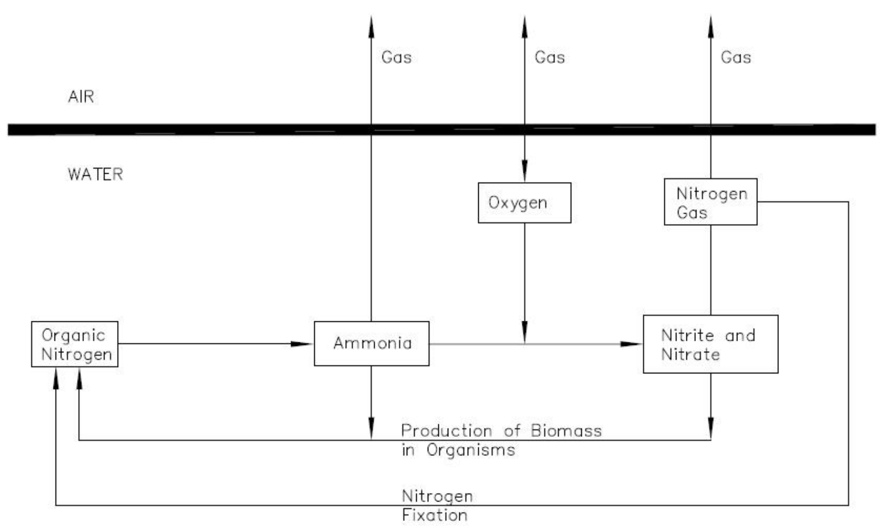


Figure 6. Nitrogen in marine environments
(Source: *Surface Water Quality Modeling*, Steven Chapra, McGraw-Hill, 1997)

Nitrogen is generally made available to a marine ecosystem from the atmosphere (called fixation) and from the watershed. Nitrogen fixation is usually a smaller source than watershed inputs, since few organisms can perform this process. The majority of watershed inputs are either ammonia or nitrite and nitrate. Ammonia generally originates from fertilizer, failing septic systems, storm-water runoff, and old or failing wastewater treatment plants (generally, treatment plants that are less than 40 years old include processes that convert ammonia to nitrate). Nitrate also originates from fertilizer and storm-water runoff, but is a common product of many newer wastewater treatment plants, even when functioning properly.

Ammonia and nitrate are important for organisms, which require nitrogen for growth and reproduction. Nitrogen forms amino acids, proteins, urea, and other compounds that are needed for life. These forms of nitrogen are referred to as organic nitrogen.

Many forms of organic nitrogen are quickly converted to ammonia in water. One form of ammonia can form a gas and be released into the atmosphere. Some forms are toxic to marine life in high concentrations. Ammonia can also be converted to nitrite in the presence of oxygen as part of the nitrification process. Nitrite is highly unstable and quickly transforms to nitrate through the addition of additional oxygen.

The ammonia and nitrate that have been created as part of these processes can then be used by other organisms for growth and reproduction. However, when anoxic conditions form, certain bacteria convert nitrate into nitrogen gas, which is released to the atmosphere.

Sewage treatment plants can be upgraded to provide biological nutrient removal. The Glen Cove treatment plant was upgraded to do so. Older wastewater treatment plants blow oxygen into the wastewater to promote the growth of microorganisms, which decay carbon-based waste rapidly and produce carbon dioxide. Ammonia is converted into nitrate as a byproduct. Plants with nitrogen removal upgrades have an anoxic zone in the wastewater treatment tanks, and circulate wastewater that has been treated with oxygen already. Highly specialized bacteria remove the oxygen from the nitrate, releasing nitrogen gas and removing the nitrogen from the wastewater stream.

3.5.2 Nitrogen Monitoring by CSHH

CSHH takes samples weekly at upper harbor stations (CSHH #1, #2, #3, and #8) and approximately monthly at lower harbor stations to test for ammonia, nitrite, and nitrate. Nitrite and nitrate samples are currently analyzed at the Town of Oyster Bay lab using an electronic Hach kit. Ammonia is measured on board at the different stations using a LaMotte testing kit.

The presence of ***ammonia (NH_3)*** in the harbor can indicate nutrient enrichment. Ammonia is usually only detected when wastewater treatment systems, including septic tanks, cesspools, and publicly owned treatment works (POTWs), are malfunctioning and discharging to the harbor. However, elevated ammonia levels can also be present in the harbor from storm-water discharges or may even indicate a large presence of fish. If ammonia is detectable at CSHH #1, a midpoint in the harbor, ammonia levels are then measured at the other locations using a salicylate method for fine-tuning the results. If ammonia is not detectable at CSHH #1, it is unlikely that ammonia will be detectable at other locations except CSHH #8 (due to the discharge from the Glen Cove STP).

Nitrate (NO_3) and ***nitrite (NO_2)*** occur in later stages of the nitrogen cycle and are normally present in the estuary. However, high concentrations indicate enrichment problems and can also be used to anticipate algal blooms and hypoxia.

Following years of studies and modeling around Long Island Sound, nitrogen discharge limitations were imposed on sewage treatment plants all around the Sound to reduce nitrogen inputs, thereby reducing algal blooms and the frequency and duration of low oxygen levels throughout the Sound. However, reducing storm-water inputs is more complicated because the sources of nitrogen and other pollutants are so diffuse.

3.5.3 Nitrogen Monitoring Results

CSHH has analyzed samples on the boat for nitrogen since the 1990s. In 2004, 2005, and 2006, CSHH began to send samples to the Town of Oyster Bay laboratory for nitrate, nitrite, and ammonia analysis while continuing to test samples for ammonia on the boat. The majority of samples were collected at CSHH #1, #2, #3, and #8, although samples each were collected at CSHH #2, #3, #4, and #5 as well.

Typically, ammonia is not detected by the field testing kits during many monitoring events except at the CSHH#3, near the STP outfall. Usually, when ammonia is detected at other locations in the harbor, large schools of fish are present as well, or a rainstorm occurred within a few days before sampling.

Unfortunately, nitrogen from the Town lab for 2004 through 2006 are questionable, since the results included high ammonia levels compared with other parameters. Usually, nitrate levels are higher than ammonia levels in water. Techniques for analyzing ammonia are particularly susceptible to interferences from these parameters. CSHH has been working to reduce the likelihood of interference by saltwater, turbidity, and color in results recorded on the boat and in the lab. These efforts will continue through future seasons to increase the data reliability

3.6. Chlorine

CSHH's program includes monitoring of total and free ***chlorine*** adjacent to the STP outfall to monitor the amount of chlorine discharged into Glen Cove Creek. Through the 2006 sampling season, the Glen Cove STP was chlorinating its effluent to kill off potential pathogens. The STP then removed the ***chlorine*** before discharging the treated water to Glen Cove Creek. Because chlorine by-products can have an adverse impact on marine life, regulations require that residual chlorine contained in the water discharged from the STP to the creek be limited to **1-2 ppm,** similar to the residual concentration of chlorine typically present in drinking water.

At the end of the 2006 monitoring season, a new disinfection system was installed at the plant that uses ultraviolet (UV) light for disinfecting the wastewater prior to discharge. UV disinfection leaves no chemical residual and will not affect the environment when it is discharged.

3.7. Water Clarity

Water clarity is monitored through the use of a Secchi disk–a white plastic disk that is lowered into the water to determine the lowest depth at which ambient light can penetrate the water column. In most nutrient-rich waters, such as Hempstead Harbor and Long Island Sound, Secchi-disk depth is limited by the amount of plankton or algae in the water, and so Secchi readings are typically 1 to 2 meters for Hempstead Harbor during the summer months. The large amount of plankton in the water also gives the harbor its usual green to brown color.

3.8. Bacteria

The Nassau County Department of Health and the New York State Department of Environmental Conservation (DEC) use ***bacteria levels*** to open or close swimming beaches and shellfish beds. **Coliform** and **enterococci** bacteria are typically found in human and warm-blooded animals and are indicators of fecal contamination and the potential for the existence of other organisms that may have an adverse impact on human health.

Total coliform bacteria is widely present in the environment, while **fecal coliform** is most commonly found in the intestines of warm blooded animals and birds, and enterococci is most prevalent in the human digestive system. NCDH measures and records the most probable number (MPN) of bacterial cells present in a sample and then calculates the logarithmic average of the results, which reduces the influence of large spikes on the average values. The resulting values are used to determine the likelihood that fecal contamination is present.

During the 1980s, there were chronic raw sewage spills into Hempstead Harbor, which caused elevated levels of pathogen contamination, affecting shellfish beds and recreational use of the harbor. Between 1986 and 1990, beaches around Hempstead Harbor were closed an average of eight days each beach season due to high coliform counts. Beach closures dropped off significantly during the early years of CSHH's monitoring program, and, for beach seasons 1994-1999, there were no beach closures due to high bacteria levels.

However, even though water quality has improved remarkably, in 2000 NCDH initiated a preemptive beach-closure program; that is, in addition to beach closings based on bacteria sample results, NCDH instituted **preemptive or administrative beach closings** following rain events that exceed a threshold level and duration of precipitation. That threshold is established at the beginning of each season based on previous sample results (often ½ inch of rain or more). In 2006, beaches around Hempstead Harbor were closed preemptively for 8 days, related to 4 rain events. The beach closings occurred on 7/6, 7/13, 7/23, 8/26, 8/27, 8/28, 8/29, 8/30, based on a threshold of ½-inch of precipitation over a 24-hour period.

CSHH collects bacteria data weekly (weather and tide permitting) at the 12 CSHH monitoring stations in Hempstead Harbor. Four of these sites (CSHH #9-12) were used as temporary sites in 2004 but became part of the regular sampling program; they are located near the Glen Cove STP and were added to test for the presence of bacteria from discharge pipes in the vicinity of the STP. Samples for bacteria testing are also collected twice a week by the Nassau County Department of Health at five beaches around the harbor. In 2006, these bacteria samples were analyzed at the NCDH laboratory for fecal coliform and enterococci, in conformance with beach closure standards that were implemented in 2004 (see **Section 3.8.1**).

Variability in bacteria concentrations from samples collected at an individual beach on a particular day are presented in the data contained in **Appendix B**. Although rainfall can increase bacteria in a water body, it is difficult to see clear and consistent influences from rainfall when rainfall dates are plotted against coliform counts, as presented in **Appendix B** as well. It is also important to note that changes in government regulations, testing protocols, and methodologies for sample analysis make it difficult to compare water-quality conditions relating to bacteria levels over time. For example, the method used for enterococci analysis by the NCDH laboratory changed from the 2004 to 2005 monitoring seasons, making comparisons between data from the two years difficult.

Several notable characteristics of the bacteria data are presented in **Table 5.** In general, fecal coliform and enterococci data vary consistently between months, and changes in fecal coliform levels generally correspond to proportional changes in enterococci levels. For example, the 2004 Tappen Beach monitoring data show fecal and total coliform levels decreasing from 35 and 150 MPN/ mL, respectively, in July to 11 and 94 MPN/100 mL respectively in August. In several instances, the data do not follow this trend, such as in May, when the average enterococci and fecal coliform levels were 333 and 20 MPN/100 mL, respectively. In that instance, the enterococci value resulted from an unusually high measurement of 1,920 MPN/100 mL recorded on May 16.

Table 5. Monthly Average Beach Enterococci and Fecal Coliform Data for 2006

	Units in MPN/100 mL	**Tappen Beach**	**Sea Cliff Beach**	**Bar Beach**	**Hempstead Harbor Beach**	**Sands Point Golf Club**
April	Enterococci	2	0.1	0..1	0.1	0.1
	Fecal	**5**	**0.6**	**1**	**0.6**	**7**
May	Enterococci	333	73	35	16	7
	Fecal	**20**	**14**	**100**	**9**	**16**
June	Enterococci	33	12	30	27	6
	Fecal	**73**	**68**	**107**	**98**	**9**
July	Enterococci	35	47	40	46	68
	Fecal	**150**	**277**	**154**	**567**	**259**
August	Enterococci	11	65	76	46	120
	Fecal	**94**	**51**	**100**	**97**	**106**
Season Average	*Enterococci*	*83*	*39*	*36*	*27*	*40*
	Fecal	***69***	***82***	***92***	***151***	***79***

In addition to the monthly average beach data, time series plots of bacteria monitoring results and precipitation are presented in **Appendix B**. As bacteria data are collected on a weekly basis, these plots show a "snapshot" of conditions at the time of sampling. Given the inherent variability in microbial water quality, these data are most useful to determine whether certain monitoring locations have consistently higher or lower bacteria concentrations or whether a monitoring location is particularly influenced by rainfall, wind, and currents.

The time series plots in **Appendix B** indicate that elevated bacteria concentrations at CSHH #9, #10, #11, and #12 typically occur following precipitation events, whereas elevated levels at the other monitoring locations do not appear to correlate as well to precipitation. Based on field observations, however, bacteria levels were generally higher when this area was monitored during low tide and a dry weather discharge was occurring from nearby pipes. These trends will be examined during next monitoring season.

CSHH #2 appears to have generally lower bacteria concentrations than other monitoring locations, possibly as a result of dilution associated with its location near the mouth of the harbor, as well as its distance from storm-water discharges and areas of bird activity.

3.8.1 Beach Closure Standards

In October 2000, Congress enacted the Beaches Environmental Assessment and Coastal Act of 2000 (BEACH Act), which gave EPA the authority to set and impose water-quality standards for coastal beaches throughout the United States and compelled all states to adopt new criteria for determining beach closures by April 2004. Anticipating that the new standards would require using a different indicator organism in analyzing water samples, the NCDH began doing parallel testing in 2002, using the state's current indicator—coliform (both total and fecal)—along with the proposed indicator—enterococcus. Both coliform and enterococcus are naturally present in the human intestine and, therefore, could indicate the presence of other potentially harmful organisms. (Both coliform and enterococci are present also in the intestines of warm-blooded animals and birds.) EPA considers the enterococcal standard to be more closely correlated with gastrointestinal illnesses and, therefore, more protective of human health. However, there have been only limited studies as to the effectiveness of using the enterococcal standard. A primary advantage in switching to the new standard is that it takes only 24 hours to obtain results, whereas it takes 48 hours to obtain results using the coliform standard.

New York State instituted new beach closure standards on June 23, 2004, presented in NYCRR Title 10, Section 6-2.15. The new standards for marine water include:

(1) Based on a single sample, the upper value for the density of bacteria shall be:

- 1,000 fecal coliform bacteria per 100 ml; or
- 104 enterococci per 100 ml.

(2) Based on the mean of the logarithms of the results of the total number of samples collected in a 30-day period, the upper value for the density of bacteria shall be:

- 2,400 total coliform bacteria per 100 ml; or
- 200 fecal coliform bacteria per 100 ml; or
- 35 enterococci per 100 ml.

3.9. Precipitation

Precipitation affects Hempstead Harbor water quality through direct precipitation (precipitation that falls directly on the harbor surface) and through storm-water runoff. Although both of these inputs can reduce the harbor's salinity, direct precipitation will tend to dilute the quantity of pollutants (although direct precipitation can carry airbourne pollutants) in the harbor, whereas storm-water runoff will tend to increase pollutant loads by washing bacteria, chemicals, and nutrients that have accumulated on the ground surface in the watershed into the harbor.

CSHH collects precipitation data using a rain gauge located in Sea Cliff (note that 25.4 mm is equivalent to approximately 1 inch). **Table 6** presents monthly total precipitation for June through October, 1997 through 2006.

Table 6. Monthly Rainfall Totals for the 1997-2006 Monitoring Seasons, in mm

	June	July	August	September	October	Total
2006	262	148	89	105	166.5	770.5
2005	45	81	41	28.5	460.5	656
2004	95	214	91	310.5	40	750.5

	June	July	August	September	October	Total
2003	291.5	87	88	194.5	134	795
2002	180.5	22.5	175.5	116.5 (9/15-30)	180	675+
2001	167	70.5	165	94	19.5	516
2000	146	159	158	125	6	594
1999	31	21	135	323	92	602
1998	191	59	145	90	97	582
1997	47	232	141	84	27 (10/1-15)	531+

A relatively large quantity of precipitation fell in 2006 compared with other years; it was the second wettest year; only in 2003 did more precipitation fall. The distribution of precipitation from month to month was also relatively constant. In many other years, some months are much drier than others. For example, in 2004, another wet year, monthly precipitation ranged from 40 mm in October to 310.5 mm in September, whereas in 2006 precipitation ranged only from 89 mm in August to 262 mm in June.

4. OBSERVATIONS

4.1. Reconnaissance Trip

The 2006 water-monitoring season began with a reconnaissance trip on April 21, starting at 6:45 AM at CSHH #1 (Beacon 11) and ending at about 10 AM. The purpose of pre-sampling season trips is to check all stations in the upper and lower harbor and in Glen Cove Creek to see what changes, if any, have occurred from the previous season.

We noted that barges anchored near the KeySpan property in 2005 were still there, including the barge that was closest to the now-vacant parcel adjacent to the Tappen Beach Marina and the barge near the former HinFin site that has part of the old Glen Cove ferry terminal on it. Pieces of old barges and docks were seen near the Shore Realty Superfund site south of the HinFin property. The mast of the sunken sailboat south of the Hempstead Harbor Club and at the opening of Glen Cove Creek was still visible (as it was in 2005).

Work at Sterling Glen in Roslyn, October 2006
(photo by Carol DiPaolo)

Work at Bryant Landing/Sterling Glen was continuing, and the start of work on the Roslyn Viaduct was evident with a large new culvert that was constructed just north of the viaduct on the west shore. A dry-weather flow from the pipe was visible; later, an environmental specialist for the Department of Transportation identified the outfall as the replacement outfall from the DOT's retention basin/vortex storm-water treatment facility, which will eliminate the direct, untreated storm water that presently discharges into the harbor.

With regard to wildlife observations during this trip, ospreys were seen building nests at (1) Beacon 11, (2) on the blue sailboat near Mott's Cove, (3) on the old pilings north of the Port Washington transfer station, (4) on the west shore platform that is north of the pilings, (5) on the pilings of a resident's dock on the east shore, and (6) on the old pilings near the power line on the west shore, south of Bar Beach. About 30 swans, a dozen egrets, and dozens of geese were also observed.

Weekly monitoring began on June 1 and continued through October 26.

4.2. Fish-Survey Reports

Two fish-survey reports have been very useful in filling out the data regarding the diversity and quantity of marine life in Hempstead Harbor.

4.2.1 Glenwood Power Station Entrainment and Impingement Monitoring Report

The power station report (by ASA Analysis & Communication, Inc., September 2005) was referenced in the 2004-2005 Hempstead Harbor Water-Monitoring Report. It summarized the monitoring program conducted from January 14, 2004, to January 5, 2005, for KeySpan Generation LLC. KeySpan was required by its State Pollution Discharge Elimination System Permit (SPDES) to conduct a one-year study to estimate the numbers of fish and invertebrates that are drawn into the plant's water intake from Hempstead Harbor (harbor water is used in a "once-through cooling-water system" to cool steam electric-generating units) and become either trapped in the system or impinged on the intake screen.

Because of the frequency of the monitoring samples taken as part of this study (weekly from March through September and every other week during the rest of the monitoring period), we have a much more accurate picture of fish and other species that are found in Hempstead Harbor. Thirty-four types of fish and several other marine animals were found in samples, and each species found was categorized by life stage, from egg to yearling and older. Direct losses were calculated for these species during the power plant's actual operation, and estimates of losses were calculated had the power plant been running full time. In addition, potential annual losses were estimated for seven species (Atlantic menhaden, Atlantic silverside, bay anchovy, Gobiidae, mummichog, striped killifish, and winter flounder). The federal Environmental Protection Agency requires power plants to address the problem of fish entrainment and impingement, and the KeySpan power plant is required by NYS Department of Environmental Conservation to provide a technology review by May 2007 to decrease the numbers of fish and other species destroyed through the plant's water intake.

4.2.2 A Study of the Striped Bass in the Marine District of New York State

This report, prepared by DEC marine biologist Julia Socrates (November 2006), includes the most recent information on the NYS DEC's Western Long Island Beach Seine Survey and the Hudson River Young-of-the-Year Striped Bass Survey. The seine surveys have been conducted in western Long Island bays since 1984 and in the Hudson River since 1979. It has been reported that Hudson River striped bass generally spend their first year of life in the lower Hudson River. In the following spring, these yearling fish can be found in the Hudson River as well as in bays around western Long Island. Although the purpose of the study is to examine the striped bass that have migrated out of the Hudson River as one- and two-year-old fish, the report provides information on other species as well.

Western Long Island sampling occurred primarily in Jamaica Bay on the south shore of Long Island and Little Neck and Manhasset Bays on the north shore. Hempstead Harbor, Oyster Bay, and Port Jefferson Harbor were also sampled on the north shore, but not as frequently. The report covers 174 seine hauls on 35 dates between May 5, 2005, and October 21, 2005.

Striped bass were caught from May through August 2005, with the highest number caught in August. The report compares catches by age and length between north shore and south shore for the 2005 period as well as in comparison with previous years' catches. Some of the findings of the report are listed below (see "A study of the Striped Bass in the Marine District of New York State," NYS DEC, November 2006, pp. 1-16):

- In 2005, north shore bays had more young-of-the-year catches than south shore bays.
- North shore bays continue to have a greater range of sizes, dominated by two ranges– 150-200 mm and 300-350 mm total length.
- The total young-of-the-year striped bass catch for 2005 was the fifth highest of the previous 22 years.
- Older striped bass have ranked in the top 10 species caught in 19 out of the 22 years of study.
- In 2005, the five most abundant species caught in Little Neck Bay included silversides, Atlantic menhaden, scup, killifish, and bluefish, and the five most abundant species caught in Manhasset Bay were silversides, menhaden, killifish, striped bass, and winter flounder.
- For 2005, the catch per unit effort (CPUE) for bluefish, winter flounder, blackfish, weakfish, blueback herring, Atlantic tomcod, and most crab species (including blue crabs) was up from 2004.
- The CPUEs for summer flounder and horseshoe crabs were down from 2004.
- CPUE for American eel, alewife, and American shad remained low.
- Almost all bait fish CPUEs were down from 2004 efforts.

It is interesting to compare the above findings with the recreational fishing reports for this period from the 2005 Hempstead Harbor Water-Monitoring Report. In 2005, "great fishing" reports started in June, describing large numbers of bunker, striped bass, and bluefish, along with weakfish and porgies in Hempstead Harbor. In early August, large numbers of fluke were reported caught in Hempstead Harbor. Bluefish and bait fish continued to be observed in large numbers through early September, and large numbers of peanut bunker were observed on October 17. During November 4-6, 2005, two observers reported an unusually large quantity of bass. One fisherman reported catching 50 to 60 bass on November 6, off the western shore of the harbor. Many of the bass reported were undersized. It is possible that the bass were drawn to the harbor by the peanut bunker and other bait fish that were observed in significant quantities in previous weeks. The same source reported that he caught more blackfish in 2005 than in previous years.

4.3. Recreational Fishing Reports

Members of the Hempstead Harbor Anglers have reported their catches over the years, particularly through Peter Emmerich, a former president of the fishing club. On August 3, 2006, Pete reported the following about fishing in July:

> *Fishing has been stupendous. I have no other words for how great it has been. The bass season was great except that we had one big blow that scattered the bunker, so it took a while for it to get back together. We have caught huge fish, and the best part about this season is the bass are still around in big numbers. Usually you can't find a good bass bite after the end of June, but people are still catching 40- pound fish under the bunker schools in the sound during the last week of July….*

In July, Pete caught a 36-pound striped bass midway between Prospect and Matinecock Points. He said, "That bass was the first one I pulled up on a night when I also pulled up 15 more. Can you imagine throwing fish back like that?"

> *So, plenty of bunker and plenty of bait, and the bluefish were here early, are here in big numbers, and are large again. We are catching 14- and 15-pound blues where we could not get a 10-pounder for several years. Many small blues around as well, and you can see the snappers starting to show and moving out to deeper water.*

Fish tales? The camera angle makes a big fish look even bigger! Pete Emmerich caught this 35-pound bass at the mouth of Hempstead Harbor in June, near where he caught a 36-pounder in August.

When I told Pete about all the bird activity I had seen in the Hempstead Harbor on August 3, this was his reply:

Now, why are you seeing all the birds and activity? The fluke are here, the fluke are here! The sound is full of the best fluking fisherman have seen in a decade. It started in Orient, passed through Port Jeff and Huntington, and now they are filling the western sound. Everything is chasing the bait blowing in from the east. I caught 25 fluke by myself last Saturday and never went farther north than Webb. My buddy caught a 5-pound-10-ounce fluke at Morgan Park on Sunday.

I have hammered fluke at Mott's Point for 2 weeks now. Tons of calico crabs on the bottom, and I extracted calicos out of the fluke's stomach after cleaning.

On August 10, a fisherman near Bell 6 (CSHH #2) said he had caught 14 fluke and 4 of them were "keepers." On August 17, a fisherman at Tappen Marina said that during the preceding night the harbor was "thick with bluefish" and that any bunker brought up on lines were missing chunks from bluefish attacks; he said that fishing for fluke and bass was great but slacking off.

On August 29, it was reported that fishermen were still catching fluke during the preceding week in Hempstead Harbor. On the evening of August 24, the report was that "the blues are ferocious and about 5 pounds"; during the day, fishing was described as "all-out war-like conditions on the bunker schools with blues." A "sandworm hatch" was reported to have occurred on August 23.

Pete Emmerich reported that on August 30 he caught a 21-inch fluke in the harbor; he said he knew there were more fluke around, but the bottom was loaded with calico crabs, which were stealing his bait. He also noted that there were lots of bait fish in the harbor and strong bluefishing.

Hempstead Harbor anglers reported a "fantastic porgy bite" and "schoolie bass" in the harbor in early September. The Hempstead Harbor Anglers Club held its annual snapper derby on September 9 and recorded a total catch of 275 snappers, 4 shad, and a "good size Atlantic needle fish" off the beach at Tappen Beach Park.

On October 25, Pete Emmerich reported that he had been out fishing in Long Island Sound with a friend the previous two weekends for black fish and had only "limited success." Pete also reported the following:

Over the past few weeks, I had been jigging schoolie stripers under the barges. There are fish there but not in the big numbers we would expect. Seems like there is a lack of bait. I have seen only one school of adult bunker in the harbor last Friday and I do not see any birds working bait with fish on them yet this year. It is almost like we are still in a summer rather than a fall pattern.

We have been black fishing in the sound in water depths from 25 to 50 feet using standard methods and using green crabs for bait. These friends who have been fishing shallow water off the Rye area using Asian crabs have done much better….

We are not seeing any of the bluefish blitzes we should be seeing, again, where is the bait? I do not know of anyone who has gone or has had success fishing for larger stripers with bait, as again, where is the bait?

On October 27, Pete reported that a friend of his caught 10 bass (one was 27 inches long) and a few bluefish.

In contrast to the recreational fishing reports, on October 26, DEC staff were seen in Hempstead Harbor doing the last monthly seining of north shore bays as part of the striped bass survey (May-October) for the study referenced above in **Section 4.2.2**; they reported that they caught mostly silversides and killifish in Hempstead Harbor and nearby bays.

4.4. Jellies

Comb jellies were observed in significant quantities from late June to mid-October 2006. The comb jellies observed in Hempstead Harbor include two varieties: the larger egg-shaped sea walnuts and the tiny, rounder sea gooseberries. The sea walnuts have lobes that are rimmed with short comb-like appendages that are phosphorescent. They can be seen at night glowing as the water is moved around them, as in the wake of a boat. Sea gooseberries have a tail-like appendage that can be seen when they are up close to the surface. Comb jellies do not sting.

4.5. Birds

During 2006, egrets, blue herons, swans, gulls, terns, mallards, black ducks, Canada geese, cormorants, and ospreys were observed throughout the season, and a belted kingfisher was observed on September 21. Various gulls, swallows, crows, pigeons, and other common land-based birds are observed near beaches, but their numbers are not recorded.

Several osprey nests were present, built on old pilings, a private dock, platforms, a navigational light, and on a sailboat in the lower harbor. On June 8, a pair of ospreys continued to bring nesting material and food back to the nest on top of the Beacon, and the nest in the sailboat in the lower harbor had three eggs in it and one had just hatched. On August 2, two young ospreys were seen in the nest in the sailboat; we saw only one in the nest on August 10.

On August 24, a full harbor survey was scheduled for August 24 but was interrupted by our **efforts to rescue a fledgling osprey** from the sailboat nest in the lower harbor. As we left Mott's Cove, we saw three ospreys on the sailboat where the nest is located–one perched at the top of the mast; two others on the boat with one on the nest on the bow. We headed toward the sailboat to take a photo, but two of the ospreys flew away; the young fledge stayed in the nest, even as we approached closer to the boat. When we pulled up right next to the boat, we saw that the osprey's left leg was entangled in a mess of fishing line, with its foot bent back and up–seemingly disconnected from the leg. We thought the line was attached to the nest, and, when we attempted to cut it free, the osprey went over the side of the sailboat. We were able to get the osprey from the water into the water-monitoring boat and called Theodore Roosevelt Bird Sanctuary for information on organizations that would rescue wild birds. We were able to contact Bobby Horvath, who, with his wife, founded and manages Winorr (a nonprofit animal rehabilitation agency). (In September 2004, Bobby was called to rescue the young bald eagle that flew onto Tappen Beach.)

Bobby Horvath met us at Tappen Marina gas dock, where most of the fishing line was cut away from the osprey's leg. The bird's skin had grown over the fishing line, and the bottom of the leg looked like a black stump. The fishing line was also embedded around the osprey's neck. Unfortunately, this rescue does not have a happy ending. Bobby took the young male osprey to the vet he works with, who donates his services for animal rehabilitation. The osprey was treated for several days, but it was badly infected, couldn't stand or perch, and would not eat. It was not a candidate for release or for remaining in captivity, so, sadly, the osprey had to be euthanized.

Above: Osprey fledgling on water-monitoring boat, with fishing line wrapped around its left leg. The right leg is turned out. Some of the osprey's left wing feathers were missing on the inside.

Right: Osprey with infected leg after fishing line was cut away from it. More fishing line was embedded around its neck.

4.6. Diamondback Terrapins

Diamondback terrapins are the only turtle found in estuarine waters. They are up to 9 inches long and have been seen in Hempstead Harbor. In spring of 2005, Professor Matthew Draud (a recognized expert on the diamondback terrapin) of Long Island University observed several dozen diamondbacks off the eastern shoreline just north of the Roslyn viaduct. Professor Draud considered the area under the viaduct to be a critical habitat for the diamondbacks in the harbor, because diamondbacks typically converge by the hundreds in one area in the spring and mate for several weeks. This information was used to support efforts to extend Hempstead Harbor's designation as a "significant coastal fish and wildlife habitat" to include the area south of the Roslyn viaduct.

In 2006, the area under the viaduct changed dramatically with the building of the Sterling Glen and Horizon senior community at Bryant Landing and the start of construction for the new viaduct. It is not known whether this activity has had an impact on the terrapins. Two turtles were reported seen in Glen Cove Creek in July near Brewer's Marina.

4.7. Algal Blooms

Color and turbidity of water within the harbor in 2006 was, for the most part, typical of conditions observed during the monitoring period. During most monitoring seasons, Hempstead Harbor Secchi-disk depths (an indicator of light penetration into the water column) consistently range from 0.25 to 3 m, as was the case in 2006. Low Secchi-disk depths are a strong indicator of the presence of algal blooms because algae absorbs more light and is present in greater quantities than other particulate material. The water is typically characterized by a brown to green color.

In 2006, noticeable plankton blooms occurred in July with a green bloom observed on July 7 and a brown bloom on July 27. Also, on September 14, the harbor water was an abnormal brown in areas, particularly at the Tappen Marina. The evening before, Hempstead Harbor angler Michael Marchese reported that the water at Brewer's Marina was abnormally brown–he described it as a "chocolate brown" and that "some of the brown color looked suspended in the water." No odor was noted. Turbidity during the day of sampling was noted as high, and Secchi depth ranged from 0.5 m to 1.3 m.

4.8. Fish Kill

An unusual event occurred on Sunday, August 6, 2006, and was reported by Pete Emmerich at about 9:30 AM, involving abnormal water color and odor and a localized fish kill between Morgan Beach and Crescent Beach. Other fishermen in the area had seen it, and someone at the beach reported the odor to Glen Cove Parks Department. The event seems to be connected to decomposing plankton. The water in a patch offshore and north of Glen Cove Creek, turned bright blue–it was described as Caribbean blue or the blue of a coral reef–and had a distinctive, bad odor. This occurred a few hundred yards off shore and stretched from Morgan Park to about Matinecock Point. In the area were dozens of small dead fish– bergalls (or cunner). Small sea robins were floating to the top (alive but hardly moving) along with some large fluke and were drifting on the outgoing tide. No fish were caught in the area during the time the water was blue–even though lots of fish were caught the night before. Later on, Pete received a call that the fishing was great at Mott's Point, so it seemed this phenomenon was limited to the area off Glen Cove.

John Jacobs from the Nassau County Health Department offered the following explanation for what probably took place: In a low DO situation, the organisms that try to decompose the plankton will (in the absence of oxygen) take another path to do their work and form sulfur bacteria. The sulfur bacteria then give off hydrogen sulfide, which causes the water to look blue like a coral reef and produces a strong odor–almost like rotten eggs. Marine life will be affected by both the low DO and the hydrogen sulfide, which in itself is toxic to fish and other species. (Bottom DO levels on August 2 varied widely throughout the harbor during sampling, but were as low as 0.14 ppm at CSHH #2, the station closest to the sound; low bottom DO levels were noted in most upper-harbor stations through August 10, and DO was 2.2 ppm at CSHH #2.)

There were no reports that this had occurred anywhere else in the harbor, and by the following day, things were back to normal.

BLANK DATA REPORTING SHEETS

Water-Monitoring Data Sheet

Collection Date : ______________________ **Time :** ______________________
Monitor Name : ______________________
Site Name : CSHH #1, Beacon 11 **Location :** Hempstead Harbor

Weather : ❑ fog/haze ❑ drizzle ❑ intermittent rain ❑ rain ❑ snow ❑ clear ❑ partly cloudy

% Cloud Cover : ❑ 0% ❑ 25% ❑ 50% ❑ 75% ❑ 100% other ________

Wind Direction : ❑ N ❑ NE ❑ NW ❑ S ❑ SE ❑ SW ❑ E ❑ W **Velocity :** _______ kt (mph)

		Date	Amount
Rainfall : Previous 24 hrs accumulation	_____._ mm	________	________
Previous 48 hrs accumulation	_____._ mm	________	________
Previous week's accumulation	_____._ mm	________	________

Tidal Stage : ❑ incoming ❑ outgoing hours to high tide : ________

Water Surface : ❑ calm ❑ ripple ❑ waves ❑ whitecaps

Water Color : ❑ normal : ❑ brown ❑ green other ________
❑ abnormal : ❑ brown ❑ green other ________

Water Observations : ❑ jelly fish ❑ dead fish ❑ dead crabs ❑ algal bloom
❑ odors ❑ sea weed ❑ bubbles ❑ foam
❑ oil slick ❑ floatables ❑ ice
❑ submerged aquatic vegetation (SAV) ❑ turbidity (suspended particles)

Comments ______________________

Plankton count ________ type ________ sample taken : ❑ surface ❑ below surface

Wildlife Observations (type, approximate number ...)

CSHH #1 ______________________
CSHH #2 ______________________
CSHH #3-8 ______________________

Floatables Observations (type, approximate number ...)

____

Human Activities

____

Cal. constants: ____________

Water Monitoring Data Sheet

Date: ____________

Air Temperature : ________ **°C**

Station :

Time : ____________

Depth (meters)	Temp °C	Salinity (ppt)	DO (ppm)	pH	Secchi (meters)	Nitrogen (ppm) NO_2	NO_3	NH_3
Surface								
0.5								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

DO Cal check ____% sat.

Air Temp: ________

Station :

Time : ____________

Depth (meters)	Temp °C	Salinity (ppt)	DO (ppm)	pH	Secchi (meters)	Nitrogen (ppm) NO_2	NO_3	NH_3
Surface								
0.5								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

DO Cal. check ____% sat.

Air Temp: ________

Station :

Time : ____________

Depth (meters)	Temp °C	Salinity (ppt)	DO (ppm)	pH	Secchi (meters)	Nitrogen (ppm) NO_2	NO_3	NH_3
Surface								
0.5								
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

DO Cal. check ____% sat.

BEACH MONITORING - DAILY SAMPLING LOG

COALITION TO SAVE HEMPSTEAD HARBOR

ELAP ID #10339

NASSAU COUNTY DEPARTMENT OF HEALTH
DIVISION OF PUBLIC HEALTH LABORATORIES
209 MAIN STREET, HEMPSTEAD N.Y. 11550
PEDRO J. FRANCO M.D., DIRECTOR TELEPHONE (516) 572-1200 FAX (516) 572-1206

COLLECTOR'S NAME: DATE:

ALL SAMPLES SUBMITTED IN STERILE POLYSTYRENE VESSELS CONTAINING SODIUM THIOSULFATE (UNLESS OTHERWISE SPECIFIED)

FIELD NO.	AREA NO.	POINT NO.	SAMPLE TYPE	LOCATION	TIME	TEMPERATURE AIR	TEMPERATURE WATER	WIND	WEATHER	WAVE HEIGHT	LABORATORY USE ONLY: LAB NUMBER	FECAL COLIFORMS	ENTEROCOCCI	COMMENTS
CSHH-1	10		5	BEACON ELEVEN										
CSHH-2	10		5	BELL BUOY 6										
CSHH-3	10		5	RED MARKER GLEN COVE CREEK										
CSHH-4	10		5	BAR BEACH SPIT										
CSHH-5	10		5	MOTT'S COVE										
CSHH-6	10		5	EAST OF INCINERATOR										
CSHH-7	10		5	BRYANT LANDING										
CSHH-8	10		5	GLEN COVE STP										
CSHH-9				FIRST PIPE WEST OF STP OUTFALL										
CSHH-10				PIPE AT CORNER OF SEAWALL WEST OF STP OUTFALL										
CSHH-11				50 YARDS EAST OF STP OUTFALL										
CSHH-12				EAST OF STP OUTFALL BY BEND IN SEAWALL										
TRIP BLANK														

COMMENTS / REMARKS

Data Entry __________ Proofed __________

TEST	METHOD	CODE
Fecal Coliform / 100 ml.	Membrane Filtration	SM-18-20 9222D
Enterococci / 100 ml.	Membrane Filtration	EPA Method 1600

TEMP CONTROL: DATE RECEIVED: TIME RECEIVED:

SAMPLE ACCEPTABLE: Yes_____ No_____ ANALYSIS SUCCESSFUL: Yes_____ No_____

LABORATORY ACCREDITATION NOTICE:
The results provided on this report have been produced in compliance with "NELAC" (National Environmental Laboratory Accreditation Conference) standards and relate only to the identified sample. Any deviations from the accepted "NELAC" collection requirements for non-potable samples are appropriately noted. This report shall not be reproduced except in full without the written approval of the laboratory. Current New York State laboratory certification status is maintained under ELAP ID #10339.

VERIFICATION REVIEW

NAME: TITLE: DATE:

COMMENTS:

FORM #BCH-MF6 06/07/2005

CODES FOR DAILY SAMPLING LOG

TIME - use military time; 9:00 a.m.= 0900, 2:30 p.m.= 1430

TEMP - use two spaces and report in degrees centigrade to nearest whole number (if 9 degrees, report as 09, if 23 degrees, report as 23)

WIND - use one or two places for direction and two places for speed: south at 15 mph should be reported as S-15; northwest at 2 mph should be entered as as NW-02. No wind or "calm" should be be entered as N-00.

WEATHER - 1 = fair, 2 = partly cloudy, 3 = cloudy, 4 = rain, 5 = snow, 6 = fog

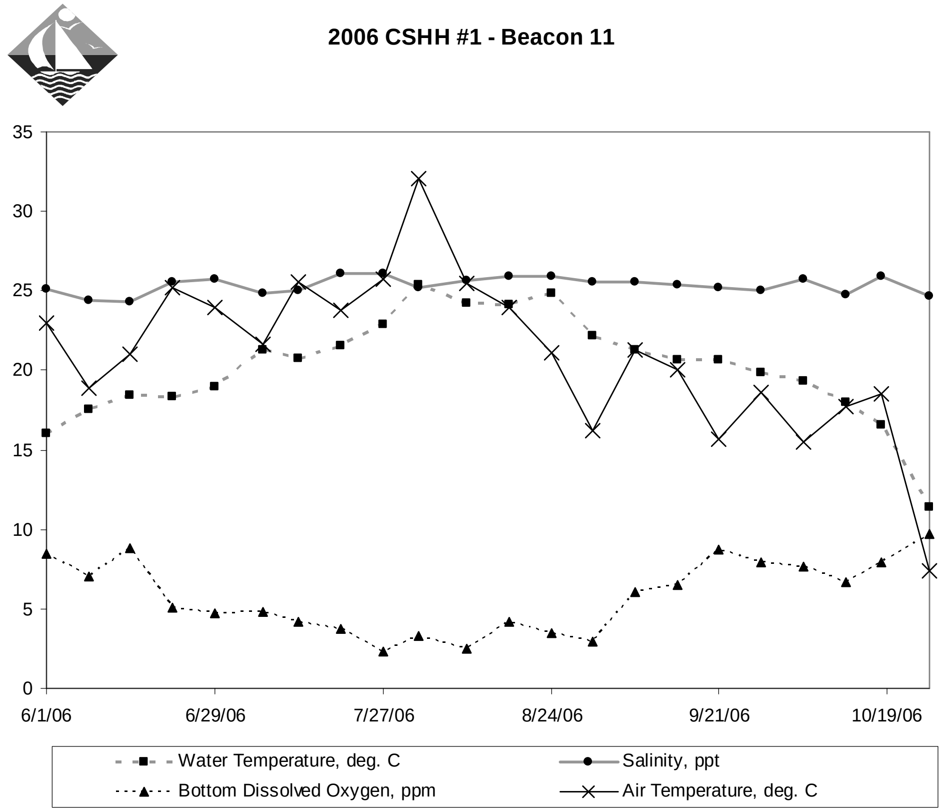
WAVE HEIGHT - should be entered to nearest half foot, using two digits: CALM = 0.0; 2 1/2 FOOT WAVES = 2.5

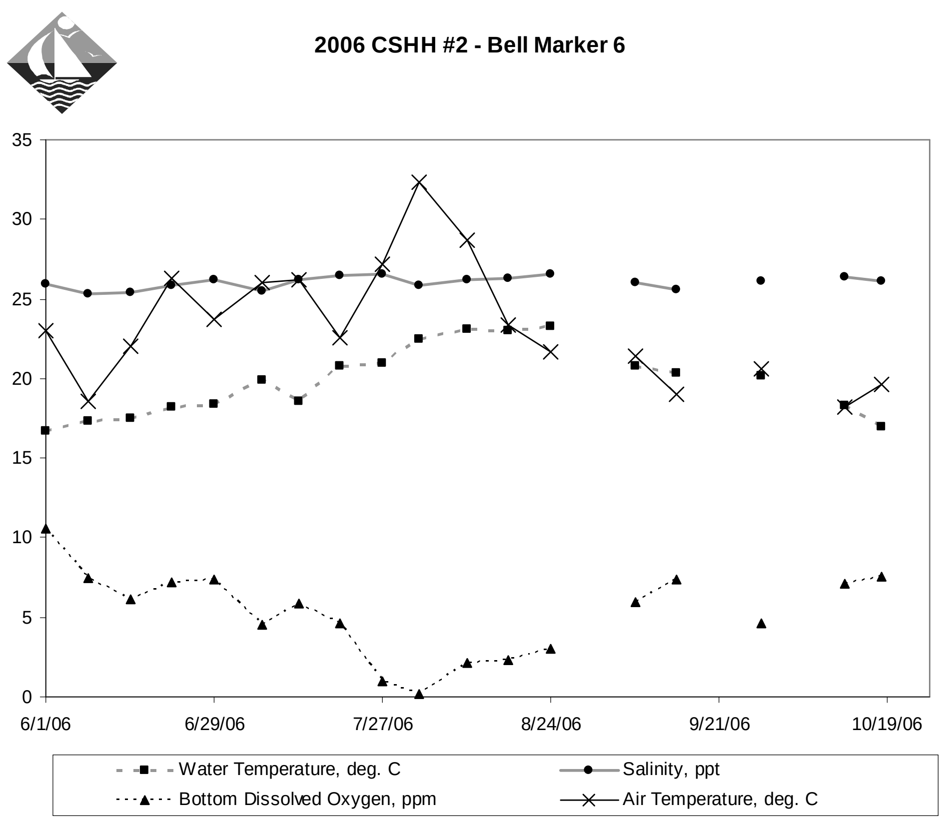
SAMPLE TYPE - 3 = fresh water pond/stream/drain, 4 = sewage, 5 = beach, 6 = other

COMMENTS, REMARKS - use this area to record any unusal conditions or observations.

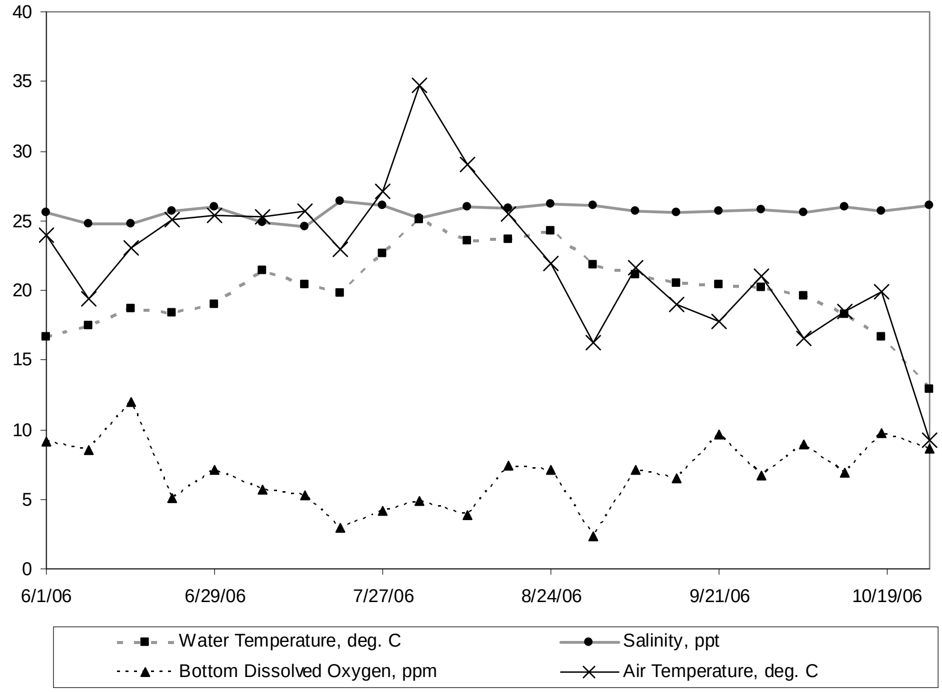
APPENDIX A

2006 Field Monitoring Results

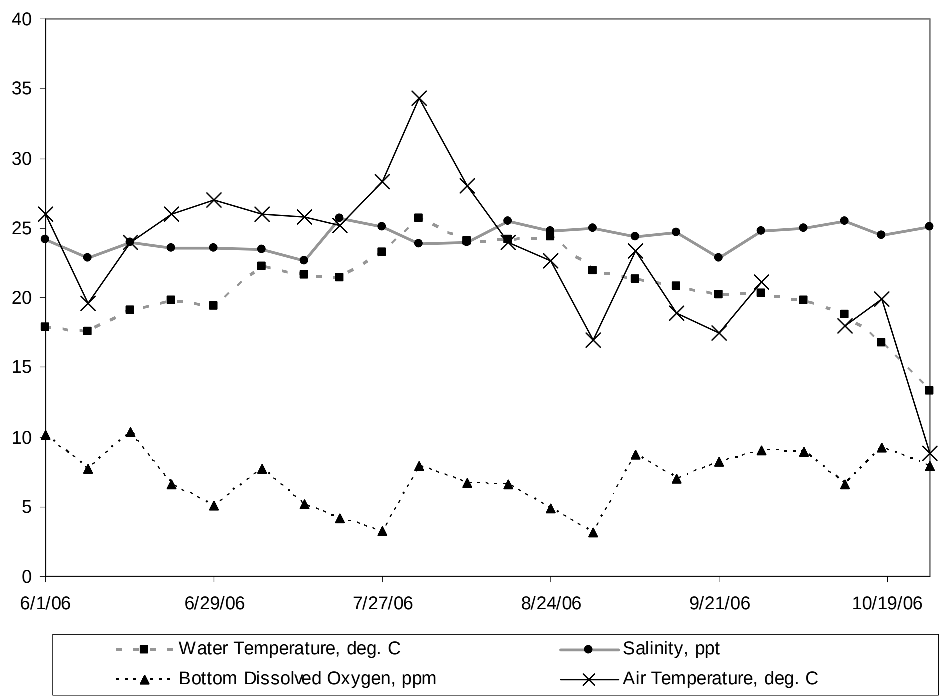

2006 CSHH #1 - Beacon 11
35
30
25
20
15
10
5
0
6/1/06
6/29/06
7/27/06
8/24/06
9/21/06
10/19/06
Water Temperature, deg. C
Salinity, ppt
Bottom Dissolved Oxygen, ppm
Air Temperature, deg. C


2006 CSHH #2 - Bell Marker 6
35
30
25
20
15
10
5
0
6/1/06
6/29/06
7/27/06
8/24/06
9/21/06
10/19/06
Water Temperature, deg. C
Salinity, ppt
Bottom Dissolved Oxygen, ppm
Air Temperature, deg. C

2006 CSHH #3 - Glen Cove Creek



2006 CSHH #8 - Glen Cove STP Outfall



Hempstead Harbor Water-Monitoring Program 2006

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH	Air Temp (°C)	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom			(bottom)	
CSHH #1 - Beacon 11												
6/1/06	16.63	15.36	15.995	25.02	25.17	25.095	8.17	8.48	7.01	23	2.2	9:11
6/8/06	17.52	17.5	17.51	24.00	24.74	24.37	8.00	7.00	7.35	18.9	4.3	9:05
6/15/06	18.48	18.38	18.43	24.22	24.39	24.305	9.36	8.78	7.70	21.0	2.2	9:35
6/22/06	20.1	16.67	18.385	25.22	25.97	25.595	7.69	5.09	8.22	25.2	4.6	9:15
6/29/06	19.16	18.84	19	25.72	25.84	25.78	5.03	4.71	7.90	24.0	2.3	8:35
7/7/06	22.04	20.56	21.3	24.39	25.27	24.83	10.03	4.79	8.00	21.6	4.7	9:06
7/13/06	21.10	20.35	20.725	24.99	25.11	25.05	4.40	4.22	8.00	25.6	1.1	8:40
7/20/06	23.26	19.84	21.55	25.58	26.52	26.05	7.48	3.77	7.80	23.8	4.8	8:50
7/27/06	23.40	22.36	22.88	25.94	26.25	26.095	4.27	2.30	N/A	25.7	1.7	8:40
8/2/06	26.14	24.62	25.38	25.03	25.33	25.18	6.28	3.32	8.00	32.1	3.3	8:45
8/10/06	24.89	23.54	24.215	25.47	25.86	25.665	4.28	2.48	7.00	25.5	2.9	8:50
8/17/06	24.95	23.35	24.15	25.62	26.19	25.905	5.23	4.21	7.38	24.0	4.1	9:10
8/24/06	25.06	24.58	24.82	25.71	26.10	25.905	5.22	3.47	7.40	21.1	2.9	8:30
8/31/06	22.16	22.12	22.14	25.53	25.56	25.545	3.56	2.97	7.50	16.2	3.6	8:44
9/7/06	21.46	21.12	21.29	25.26	25.78	25.52	7.89	6.05	7.60	21.3	4.1	8:48
9/14/06	20.68	20.66	20.67	25.25	25.43	25.34	6.60	6.46	7.60	20.0	2.3	9:20
9/21/06	20.66	20.62	20.64	25.19	25.28	25.235	8.82	8.70	8.00	15.7	3.8	8:50
9/28/06	19.83	19.91	19.87	24.91	25.12	25.015	8.18	7.92	7.90	18.6	2.7	8:45
10/5/06	19.25	19.33	19.29	25.52	25.89	25.705	7.99	7.64	7.90	15.5	5.2	8:55
10/12/06	17.87	18.13	18	24.18	25.29	24.735	7.41	6.70	8.00	17.7	3.0	8:37
10/18/06	16.50	16.60	16.55	25.58	26.20	25.89	9.00	7.89	7.90	18.5	4.9	9:15
10/26/06	11.22	11.58	11.4	24.43	24.87	24.65	10.23	9.68	7.90	7.4	2.9	8:30
Average			*20.19*			*25.34*		*5.76*		*21.02*		

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH	Air Temp (°C)	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom			(bottom)	
CSHH #2 - Bell Marker 6												
6/1/06	17.09	16.27	16.68	25.89	25.95	25.92	10.99	10.53	7.47	23.0	6.5	9:45
6/8/06	17.53	17.17	17.35	25.26	25.45	25.355	8.54	7.43	7.46	18.6	6.2	10:45
6/15/06	18.47	16.48	17.475	25.01	25.73	25.37	11.02	6.12	7.86	22	6.2	10:05
6/22/06	19.85	16.63	18.24	25.59	26.07	25.83	9.97	7.23	7.93	26.3	8.6	10:20
6/29/06	18.74	18.10	18.42	26.14	26.25	26.195	8.50	7.37	7.89	23.7	6.4	9:20
7/7/06	22.25	17.57	19.91	24.82	26.12	25.47	10.06	4.50	8.00	26.0	7.9	11:26
7/13/06	19.58	17.49	18.535	25.89	26.52	26.205	6.61	5.87	7.50	26.2	6.9	9:10
7/20/06	21.54	20.03	20.785	26.34	26.56	26.45	7.90	4.62	7.80	22.6	7.4	10:05
7/27/06	22.32	19.59	20.955	26.30	26.83	26.565	7.00	0.98	7.80	27.2	7.4	9:10
8/2/06	25.20	19.71	22.455	25.49	26.20	25.845	8.74	0.14	7.90	32.3	7.5	9:40
8/10/06	23.24	22.98	23.11	26.13	26.32	26.225	6.96	2.15	7.50	28.7	8.7	10:25
8/17/06	23.80	22.30	23.05	26.10	26.48	26.29	8.75	2.27	7.95	23.4	7.5	9:50
8/24/06	23.97	22.63	23.3	26.39	26.67	26.53	6.61	3.06	7.59	21.7	6.0	9:03
8/31/06	No water sampling at this site because of high wind and waves (2-3 foot waves).											
9/7/06	20.90	20.76	20.83	25.86	26.11	25.985	8.38	5.91	7.90	21.4	8.1	9:20
9/14/06	20.35	20.27	20.31	25.04	26.13	25.585	7.99	7.39	7.80	19.0	6.7	9:55
9/21/06	No water sampling at this site because of high wind and waves.											
9/28/06	20.05	20.21	20.13	25.76	26.48	26.12	8.63	4.63	7.90	20.6	6.0	9:15
10/5/06	No water sampling at this site because of high wind and waves.											
10/12/06	18.26	18.33	18.295	26.22	26.52	26.37	8.55	7.07	7.80	18.2	6.6	9:08
10/18/06	17.01	16.98	16.995	26.07	26.12	26.095	7.95	7.52	7.70	19.6	8.7	9:40
10/26/06	No water sampling at this site because of high wind and waves.											
Average			*19.82*			*26.02*		*5.27*		*23.36*		

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH	Air Temp (°C)	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom			(bottom)	
CSHH #3 - Glen Cove Creek, Red Marker												
6/1/06	18.07	15.16	16.615	25.20	25.96	25.58	10.66	9.10	7.60	24.0	3.2	10:15
6/8/06	17.67	17.17	17.42	24.25	25.22	24.735	8.23	8.5	7.46	19.4	4.79	11:10
6/15/06	18.69	18.65	18.67	24.74	24.74	24.74	9.95	11.94	7.89	23.0	2.6	10:30
6/22/06	19.81	17.00	18.405	25.43	25.97	25.7	9.23	5.11	7.92	25.1	4.9	10:45
6/29/06	19.18	18.85	19.015	25.95	26.09	26.02	7.62	7.10	7.88	25.4	2.9	9:55
7/7/06	22.46	20.46	21.46	24.34	25.39	24.865	10.31	5.72	8.00	25.3	4.2	11:44
7/14/06	21.01	19.87	20.44	23.72	25.49	24.605	7.48	5.24	7.50	25.7	2.9	9:35
7/20/06	20.56	19.00	19.78	26.01	26.69	26.35	7.39	2.93	7.80	22.9	5.0	10:30
7/27/06	23.40	21.94	22.67	25.90	26.35	26.125	7.65	4.14	7.80	27.1	3.4	9:35
8/2/06	26.89	23.31	25.1	24.89	25.48	25.185	8.64	4.85	7.70	34.7	3.3	10:06
8/10/06	24.23	22.91	23.57	25.79	26.21	26	6.64	3.90	7.00	29.0	4.9	11:45
8/17/06	23.95	23.39	23.67	25.50	26.27	25.885	7.74	7.44	7.76	25.5	1.8	10:16
8/24/06	24.13	24.38	24.255	26.02	26.31	26.165	7.53	7.08	7.70	21.9	3.9	9:23
8/31/06	21.71	21.95	21.83	25.75	26.38	26.065	3.69	2.37	7.50	16.2	3.8	9:30
9/7/06	21.23	21.03	21.13	25.46	25.98	25.72	9.32	7.08	7.90	21.6	5.1	9:50
9/14/06	20.45	20.61	20.53	24.98	26.18	25.58	8.40	6.50	7.70	19.0	3.4	10:15
9/21/06	20.42	20.48	20.45	25.67	25.67	25.67	9.19	9.68	8.20	17.8	4.5	9:40
9/28/06	20.30	20.20	20.25	25.41	26.15	25.78	9.30	6.75	8.00	21.0	3.4	9:45
10/5/06	19.57	19.57	19.57	25.04	26.14	25.59	9.81	8.97	8.10	16.5	5.3	10:50
10/12/06	18.10	18.49	18.295	25.66	26.37	26.015	7.85	6.94	7.80	18.5	3.3	9:30
10/18/06	16.65	16.65	16.65	25.36	26.02	25.69	9.78	9.72	8.10	19.9	5.4	10:08
10/26/06	12.92	12.94	12.93	26.13	26.14	26.135	8.65	8.58	8.00	9.2	3.0	9:30
Average			*20.12*			*25.65*		*6.80*		*22.21*		

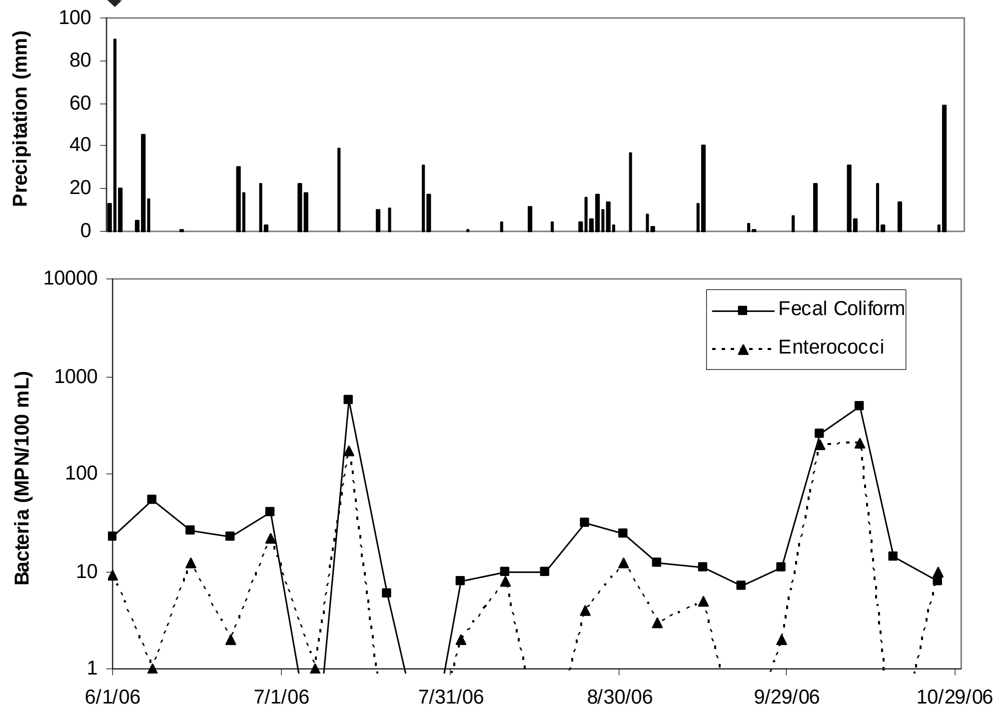
Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH	Air Temp (°C)	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom			(bottom)	
CSHH #8 -	**Glen Cove Sewage Treatment Plant**											
6/1/06	18.52	17.30	17.91	22.89	25.41	24.15	9.44	10.16	7.51	26.0	1.4	10:35
6/8/06	17.79	17.43	17.61	20.91	24.73	22.82	8.22	7.67	7.44	19.6	3.2	11:30
6/15/06	19.83	18.30	19.065	22.98	24.94	23.96	11.09	10.36	7.96	24.0	1.4	10:50
6/22/06	20.68	18.90	19.79	21.49	25.62	23.555	8.07	6.62	7.90	26.0	3.2	11:05
6/29/06	19.61	19.12	19.365	21.42	25.64	23.53	6.19	5.08	7.83	27.0	1.0	10:30
7/7/06	22.76	21.79	22.275	22.09	24.79	23.44	8.45	7.75	8.00	26.0	2.5	12:06
7/14/06	22.37	20.90	21.635	20.58	24.60	22.59	7.25	5.17	7.50	25.8	1.4	9:50
7/20/06	22.36	20.41	21.385	24.91	26.45	25.68	6.64	4.18	8.00	25.2	2.9	10:55
7/27/06	23.83	22.62	23.225	23.90	26.21	25.055	6.84	3.22	N/A	28.3	2.2	10:00
8/2/06	25.88	25.49	25.685	22.39	25.23	23.81	10.34	7.90	7.60	34.3	1.6	10:40
8/10/06	23.92	24.15	24.035	22.40	25.43	23.915	7.08	6.66	7.50	28.0	3.7	11:20
8/17/06	24.26	24.10	24.18	24.95	25.96	25.455	7.23	6.60	7.65	24.0	2.2	10:45
8/24/06	24.52	24.12	24.32	23.23	26.25	24.74	7.03	4.92	7.61	22.6	2.7	9:55
8/31/06	21.73	22.15	21.94	24.25	25.69	24.97	3.81	3.17	7.50	17.0	1.9	10:00
9/7/06	21.37	21.31	21.34	23.59	25.07	24.33	8.71	8.76	7.70	23.3	3.9	10:25
9/14/06	20.86	20.84	20.85	23.64	25.71	24.675	7.52	6.98	7.40	18.9	1.6	10:40
9/21/06	20.33	20.14	20.235	20.40	25.29	22.845	8.14	8.19	7.90	17.5	3.2	10:08
9/28/06	20.39	20.32	20.355	24.18	25.36	24.77	9.18	9.08	7.50	21.1	2.2	10:20
10/5/06	19.92	19.75	19.835	24.32	25.66	24.99	9.16	8.95	7.90		3.6	11:25
10/12/06	18.64	18.95	18.795	24.66	26.38	25.52	7.14	6.59	7.80	18.0	1.6	10:04
10/18/06	16.91	16.55	16.73	23.23	25.78	24.505	10.02	9.24	7.40	19.9	3.7	10:36
10/26/06	13.38	13.22	13.3	24.14	26.06	25.1	8.07	7.94	7.50	8.8	1.7	10:00
Average			*20.63*			*24.29*		*7.05*		*22.92*		

Date	Water Temp (°C)			Salinity (ppt)			DO (ppm)		pH	Air Temp (°C)	Depth (m)	Time
	Surface	Bottom	Average	Surface	Bottom	Average	Surface	Bottom			(bottom)	
CSHH #4 - Bar Beach Spit												
6/8/06	17.75	17.49	17.62	23.83	24.59	24.21	8.14	7.17	7.36	18.8	3.6	10:30
7/7/06	23.29	18.79	21.04	24.67	25.67	25.17	7.58	2.90	8.00	24.3	6.6	11:02
8/24/06	24.48	24.28	24.38	26.14	26.22	26.18	4.93	3.96	7.49	24.9	2.9	10:38
9/21/06	20.60	20.61	20.605	25.33	25.32	25.325	8.61	8.62	8.00	17.9	5.4	10:50
Average			*20.9*			*25.2*		*5.7*		*21.5*		
CSHH #5 - Mott's Cove												
6/8/06	17.60	17.50	17.55	23.69	24.00	23.845	7.87	7.43	7.39	20.0	1.7	9:40
7/7/06	22.55	22.52	22.535	24.12	24.32	24.22	7.12	7.11	8.00	23.6	1.5	9:43
8/24/06	25.27	25.05	25.16	25.60	25.90	25.75	4.48	4.10	7.36	24.8	1.6	10:52
9/21/06	20.36	20.61	20.485	24.57	25.14	24.855	9.20	9.02	8.00	18.3	1.8	11:15
Average			*21.4*			*24.7*		*6.9*		*21.7*		
CSHH #6 - East of Former Incinerator Site												
6/8/06	17.71	17.46	17.585	23.02	23.75	23.385	7.42	7.17	7.37	19.5	2.0	9:55
7/7/06	22.65	22.67	22.66	23.80	24.09	23.945	7.88	7.41	8.00	24.4	1.7	10:05
8/24/06	no sampling because of osprey rescue											
9/21/06	20.67	20.71	20.69	24.97	24.98	24.975	9.30	9.72	8.00	17.8	2.2	11:35
Average			*20.3*			*24.1*		*8.1*		*20.6*		
CSHH #7 - West of Bryant Landing (formerly site of oil dock)												
6/8/06	16.69	17.42	17.055	16.75	22.99	19.87	6.85	6.59	7.23	19.0	1.9	10:10
7/7/06	22.70	22.63	22.665	23.10	23.93	23.515	9.55	5.92	8.00	25.1	1.6	10:30
8/24/06	no sampling because of osprey rescue											
9/21/06	19.69	19.77	19.73	23.74	23.89	23.815	9.37	9.60	7.90	17.5	1.8	11:50
Average			*19.8*			*22.4*		*7.4*		*20.5*		

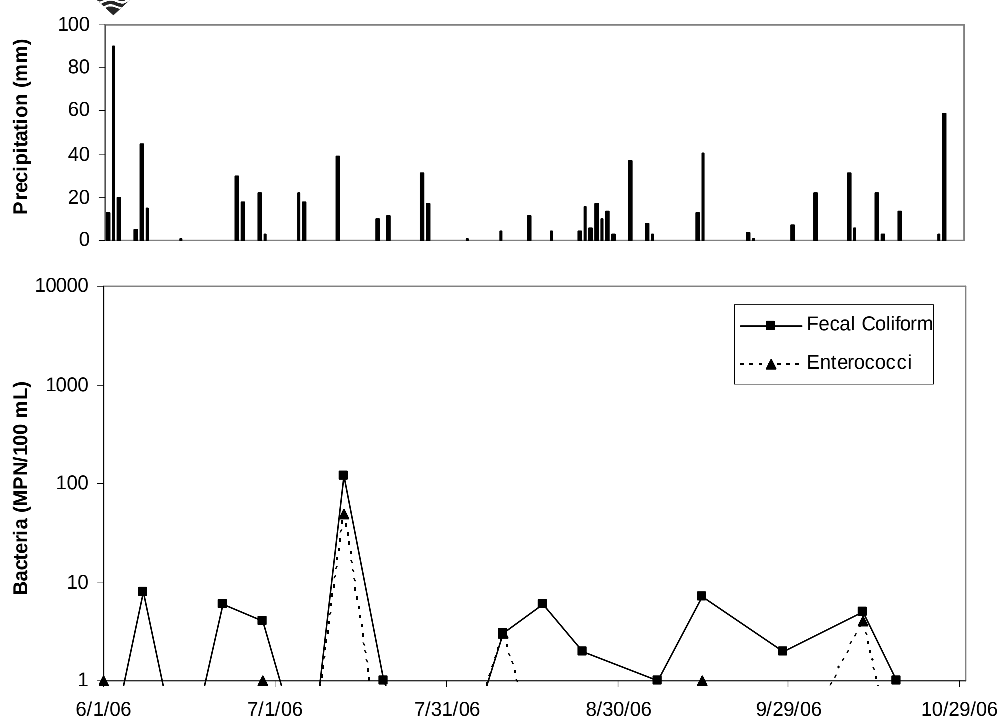
APPENDIX B

2006 Bacteria and Precipitation Data

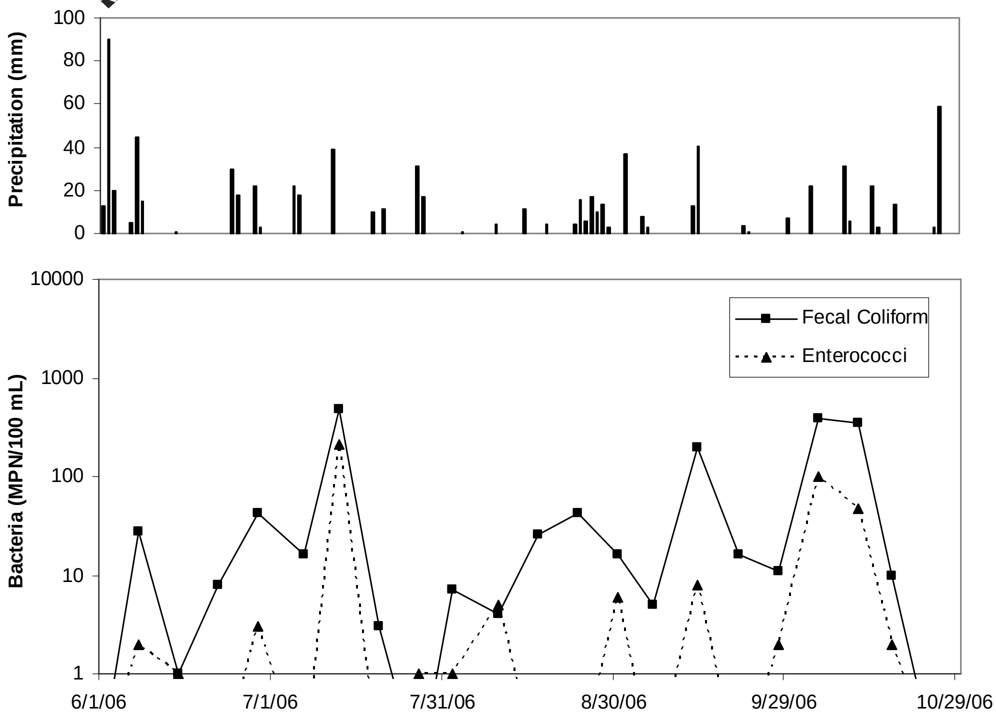
2006 CSHH#1 - Beacon 11



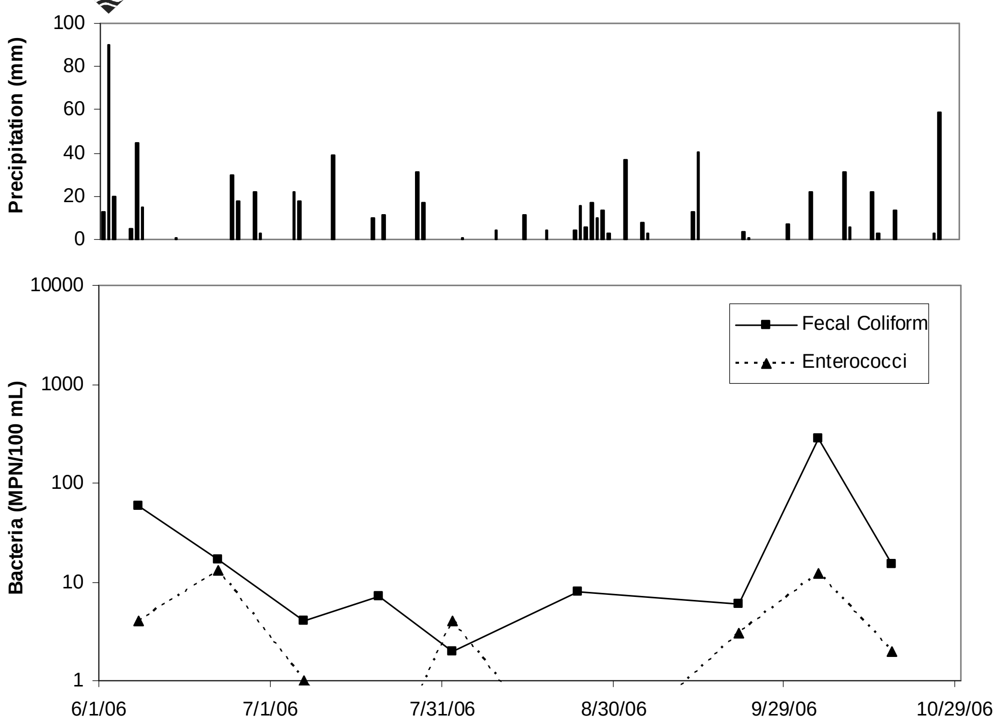
2006 CSHH#2 - Bell Marker 6



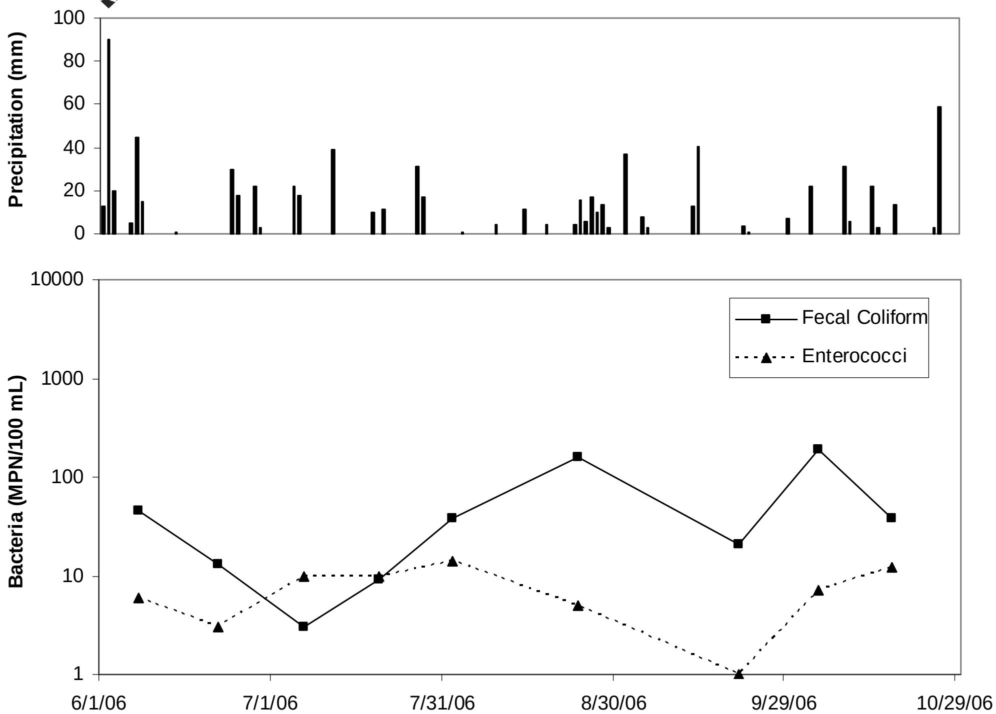
2006 CSHH#3 - Glen Cove Creek



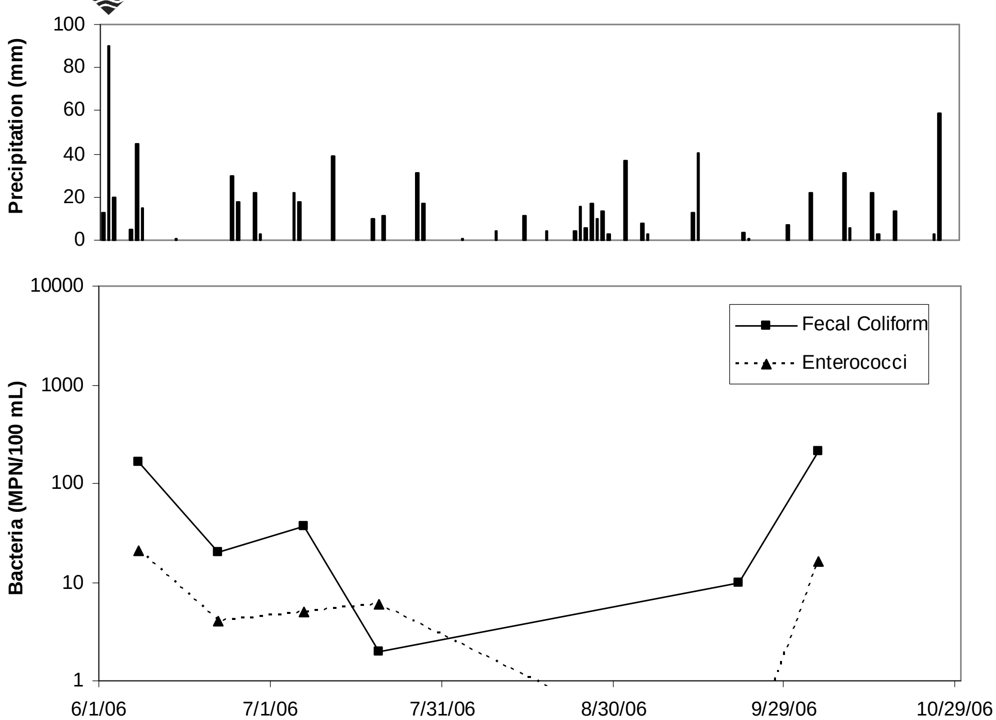
2006 CSHH#4 - Bar Beach Sand Split



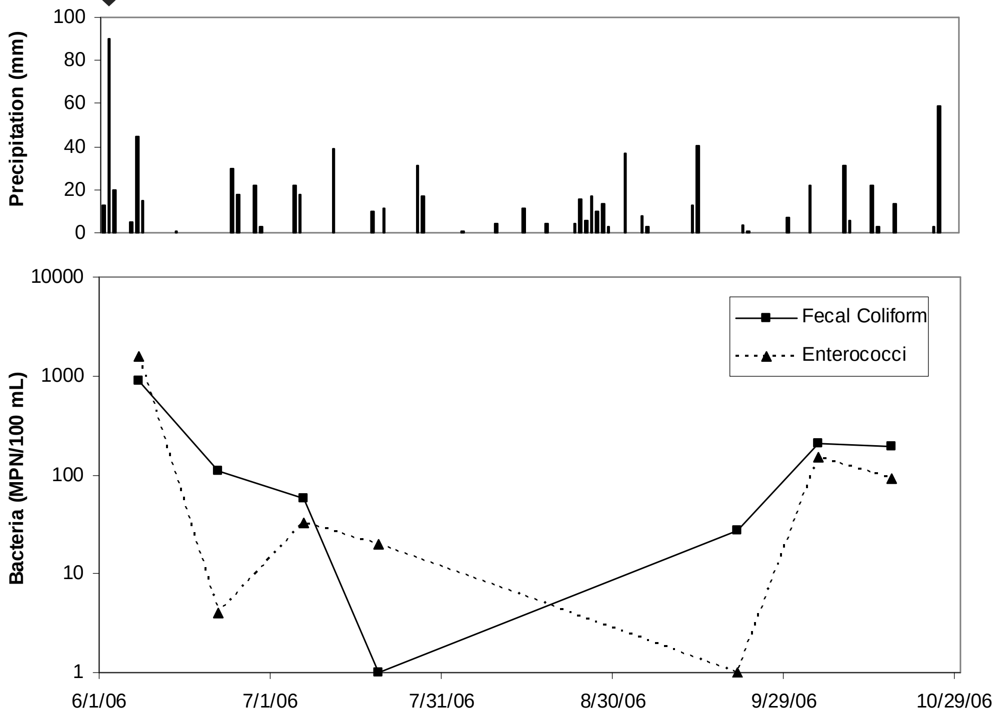
2006 CSHH#5 - Mott's Cove



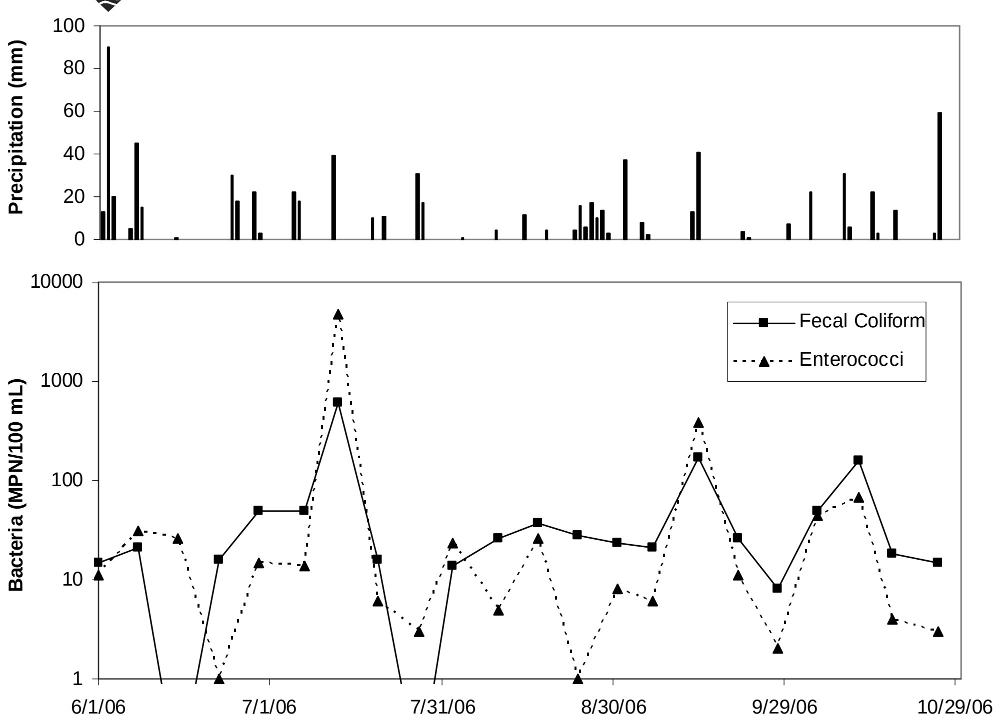
2006 CSHH#6 - East of the Former Incinerator Site



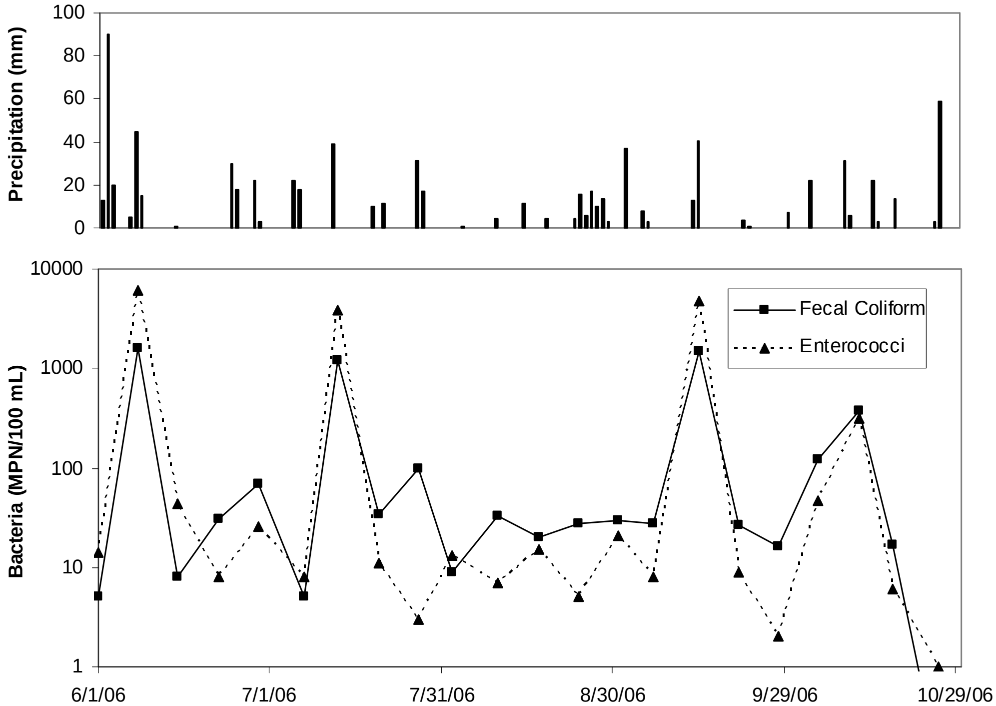
2006 CSHH#7 - West of the Old Oil Dock



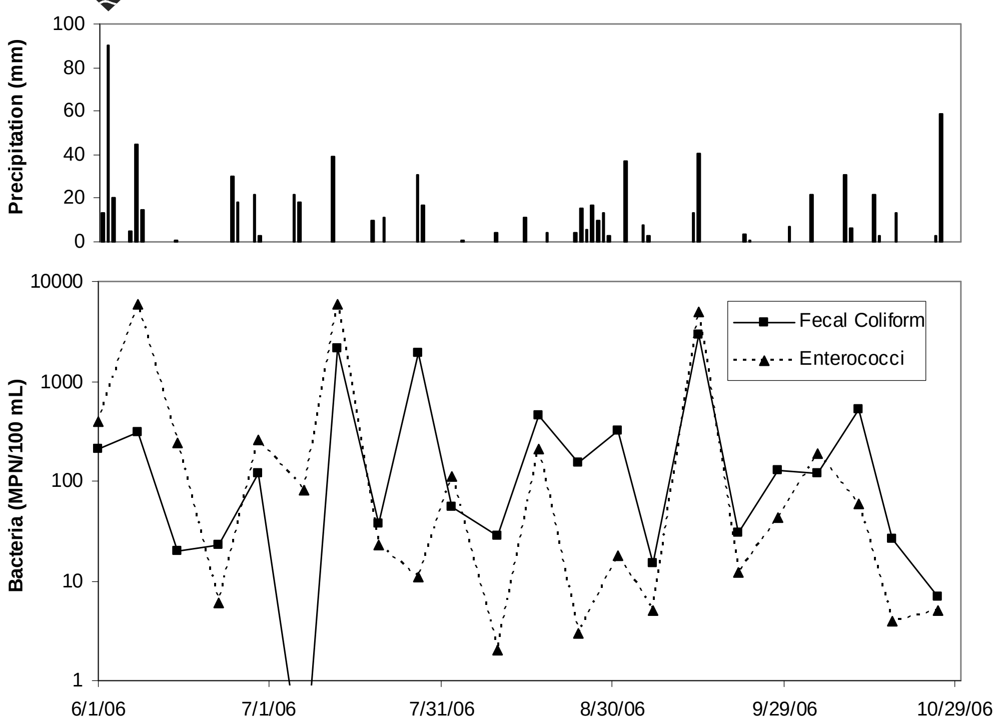
2006 CSHH#8 - Glen Cove Sewage Treatment Plant Outfall

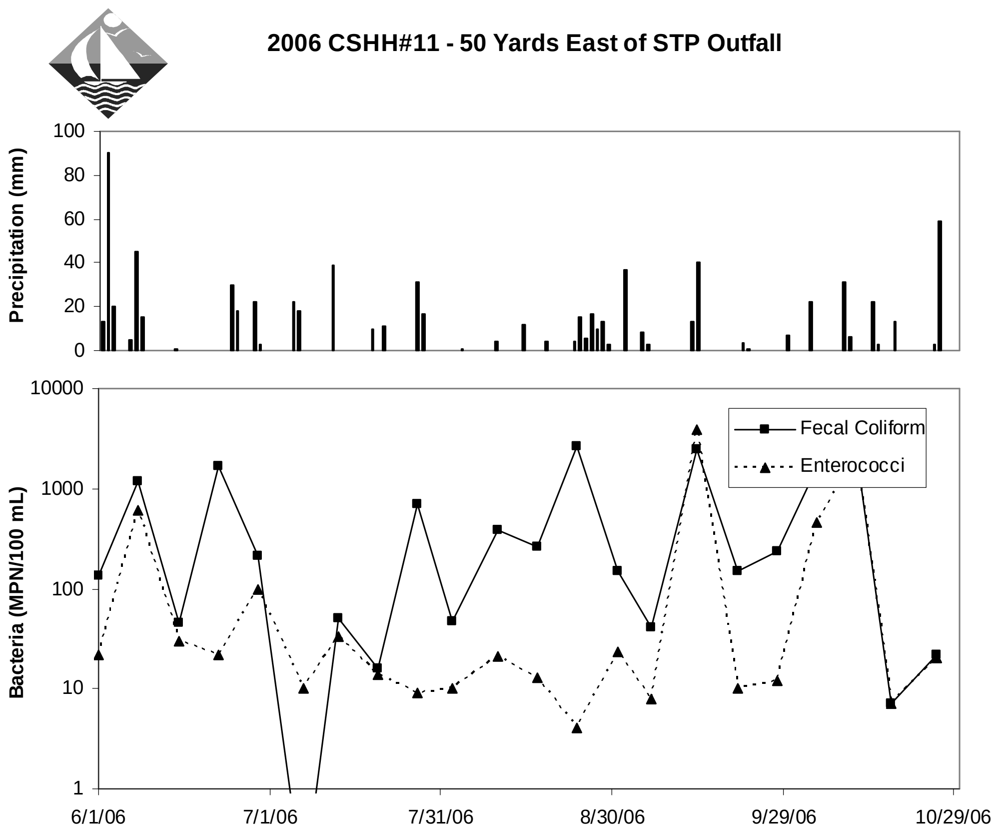


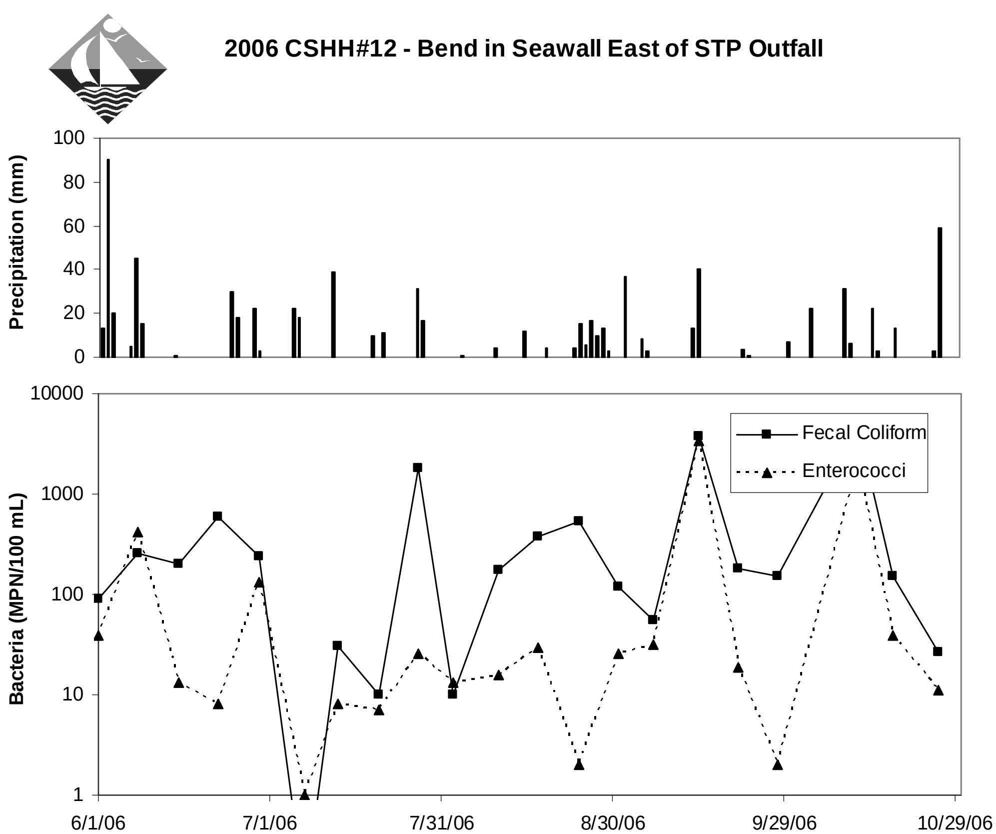
2006 CSHH#9 - First Pipe West of STP Outfall



2006 CSHH#10 - Pipe at Seawall Corner West of STP Outfall




2006 CSHH#11 - 50 Yards East of STP Outfall
Precipitation (mm)
100
80
60
40
20
0
Bacteria (MPN/100 mL)
10000
1000
100
10
1
Fecal Coliform
Enterococci
6/1/06
7/1/06
7/31/06
8/30/06
9/29/06
10/29/06


2006 CSHH#12 - Bend in Seawall East of STP Outfall
Precipitation (mm)
100
80
60
40
20
0
Bacteria (MPN/100 mL)
10000
1000
100
10
1
Fecal Coliform
Enterococci
6/1/06
7/1/06
7/31/06
8/30/06
9/29/06
10/29/06

CSHH #1 - Beacon 11

Date	*Fecal Coliform* CFU/100ml	Log Avg FC	*Enterococci* CFU/100ml	Log Avg Ent
06/01/06	23.00		9.00	
06/08/06	54.00		1.00	
06/15/06	26.00	**31.8442957**	12.00	**4.76**
06/22/06	23.00	**29.3565959**	2.00	**3.83**
06/29/06	40.00	31.2303286	22.00	**5.44**
07/07/06	0.10	10.5252153	1.00	**3.50**
07/13/06	560.00	16.8031166	170.00	**9.79**
07/20/06	6.00	12.5321453	0.10	**3.76**
07/27/06	0.10	4.22357153	0.10	**2.06**
08/02/06	8.00	3.06115875	2.00	**1.28**
08/10/06	10.00	7.68928314	8.00	**1.94**
08/17/06	10.00	3.43754386	0.10	**0.44**
08/24/06	31.00	4.77408708	4.00	**0.91**
08/31/06	24.00	14.2867217	12.00	**2.38**
09/06/06	12.00	15.4935464	3.00	**2.58**
09/14/06	11.00	15.7917178	5.00	**2.35**
09/21/06	7.00	14.7044566	0.10	**2.35**
09/28/06	11.00	11.9524017	2.00	**2.05**
10/05/06	***255.00***	**19.17**	200.00	**3.59**
10/12/06	500.00	**40.43**	210.00	**8.41**
10/18/06	14.00	**42.43**	0.10	**3.84**
10/26/06	8.00	**43.57**	10.00	**9.66**

CSHH #2 - Bell Marker 6

Date	*Fecal Coliform* CFU/100ml	Log Avg FC	*Enterococci* CFU/100ml	Log Avg Ent
06/01/06	0.10		1.00	
06/08/06	8.00		0.10	
06/15/06	0.10	**0.43**	0.10	**0.22**
06/22/06	6.00	**0.83**	0.10	**0.18**
06/29/06	4.00	**1.14**	1.00	**0.25**
07/07/06	0.10	**1.14**	0.10	**0.16**
07/13/06	120.00	**1.96**	49.00	**0.55**
07/20/06	1.00	**3.10**	0.10	**0.55**
07/27/06	0.10	**1.37**	0.10	**0.55**
08/02/06	0.10	**0.65**	0.10	**0.35**
08/10/06	3.00	**1.29**	3.00	**0.68**
08/17/06	6.00	**0.71**	0.10	**0.20**
08/24/06	2.00	**0.82**	0.10	**0.20**
09/06/06	1.00	**2.45**	0.10	**0.23**
09/14/06	7.00	**3.03**	1.00	**0.18**
09/28/06	2.00	**2.41**	0.10	**0.22**
10/12/06	5.00	**4.12**	4.00	**0.74**
10/18/06	1.00	**2.15**	0.10	**0.34**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal coliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

CSHH #3 - Glen Cove Creek

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/01/06	0.10		0.10	
06/08/06	28.00		2.00	
06/15/06	1.00	**1.41**	1.00	**0.58**
06/22/06	8.00	**2.18**	0.10	**0.38**
06/29/06	43.00	3.95	3.00	0.57
07/07/06	16.00	10.90	0.10	0.57
07/13/06	480.00	19.25	210.00	1.45
07/20/06	3.00	23.98	0.10	0.91
07/27/06	0.10	9.98	1.00	1.45
08/02/06	7.00	**6.94**	1.00	**1.16**
08/10/06	4.00	**5.26**	5.00	**2.54**
08/17/06	26.00	**2.94**	0.10	**0.55**
08/24/06	43.00	**5.00**	0.10	**0.55**
08/31/06	16.00	**13.80**	6.00	**0.79**
09/06/06	5.00	**12.90**	0.10	**0.50**
09/14/06	200.00	**28.22**	8.00	**0.54**
09/21/06	16.00	**25.61**	0.10	**0.54**
09/28/06	11.00	**19.50**	2.00	**0.99**
10/05/06	390.00	**36.92**	100.00	**1.74**
10/12/06	350.00	**86.36**	47.00	**5.96**
10/18/06	10.00	**47.44**	2.00	**4.52**
10/26/06	0.10	**17.19**	0.10	**4.52**

CSHH #4 - Bar Beach Sand Split

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/08/06	58.00		4.00	
06/22/06	17.00		13.00	
07/07/06	4.00	**15.80**	1.00	**3.73**
07/20/06	7.00	**7.81**	0.10	**1.09**
08/02/06	2.00	**3.83**	4.00	**0.74**
08/24/06	8.00	**4.00**	0.10	**0.63**
09/21/06	6.00	**6.93**	3.00	**0.55**
10/05/06	280.00	**40.99**	12.00	**6.00**
10/18/06	15.00	**29.32**	2.00	**4.16**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal coliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

CSHH #5 - Mott's Cove

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/08/06	46.00		6.00	
06/22/06	13.00		3.00	
07/07/06	3.00	**12.15**	10.00	**5.65**
07/20/06	9.00	**7.05**	10.00	**6.69**
08/02/06	38.00	**10.09**	14.00	**11.19**
08/24/06	160.00	**77.97**	5.00	**8.37**
09/21/06	21.00	**57.97**	1.00	**2.24**
10/05/06	190.00	**63.17**	7.00	**2.65**
10/18/06	38.00	**53.32**	12.00	**4.38**

CSHH #6 - East of the Former Incinerator Site

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/08/06	164.00		21.00	
06/22/06	20.00		4.00	
07/07/06	37.00	**49.51**	5.00	**7.49**
07/20/06	2.00	**11.40**	6.00	**4.93**
09/21/06	10.00	**0.00**	0.10	**0.00**
10/05/06	210.00	**45.83**	16.00	**1.26**

CSHH #7 - West of Old Oil Dock

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/08/06	900.00		***1600.00***	
06/22/06	110.00		4.00	
07/07/06	58.00	**179.07**	33.00	***59.55***
07/20/06	1.00	**18.55**	20.00	**13.82**
09/21/06	27.00	**0.00**	1.00	**0.00**
10/05/06	210.00	**75.30**	150.00	**12.25**
10/18/06	190.00	**102.51**	90.00	**23.81**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal coliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

CSHH #8 - Glen Cove STP Outfall

	Fecal Coliform		*Enterococci*	
Date	CFU/100ml	Log Avg FC	CFU/100ml	Log Avg Ent
06/01/06	15.00		11.00	
06/08/06	21.00		31.00	
06/15/06	0.10	**3.16**	26.00	**20.70**
06/22/06	16.00	**4.74**	1.00	**9.70**
06/29/06	49.00	**7.56**	15.00	**10.59**
07/07/06	50.00	**9.62**	14.00	**11.11**
07/13/06	600.00	**18.81**	***4700.00***	**30.33**
07/20/06	16.00	**51.89**	6.00	**22.62**
07/27/06	0.10	**18.81**	3.00	**28.18**
08/02/06	14.00	**14.64**	23.00	**30.69**
08/10/06	26.00	**12.84**	5.00	**24.98**
08/17/06	37.00	**7.36**	26.00	**8.83**
08/24/06	28.00	**8.23**	1.00	**6.17**
08/31/06	23.00	**24.41**	8.00	**7.51**
09/06/06	21.00	**26.48**	6.00	**5.74**
09/14/06	170.00	**38.54**	380.00	**13.65**
09/21/06	26.00	**35.92**	11.00	**11.49**
09/28/06	8.00	**27.96**	2.00	**13.20**
10/05/06	50.00	**32.65**	44.00	**18.57**
10/12/06	160.00	**49.01**	68.00	**30.17**
10/18/06	18.00	**31.28**	4.00	**12.14**
10/26/06	15.00	**28.02**	3.00	**9.36**

CSHH#9 - First Pipe West of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	CFU/100ml	Log Avg FC	CFU/100ml	Log Avg Ent
06/01/06	5.00		14.00	
06/08/06	1600.00		***6001.00***	
06/15/06	8.00	**40.00**	43.00	***153.44***
06/22/06	31.00	**37.53**	8.00	***73.32***
06/29/06	70.00	**42.51**	26.00	***59.59***
07/07/06	5.00	**42.51**	8.00	***53.28***
07/13/06	1200.00	**40.14**	***3900.00***	***48.88***
07/20/06	34.00	**53.61**	11.00	***37.22***
07/27/06	100.00	**67.76**	3.00	**30.59**
08/02/06	9.00	**44.95**	13.00	**26.63**
08/10/06	33.00	**65.57**	7.00	**25.93**
08/17/06	20.00	**28.91**	15.00	**8.53**
08/24/06	28.00	**27.81**	5.00	**7.28**
08/31/06	30.00	**21.86**	21.00	**10.75**
09/06/06	28.00	**27.43**	8.00	**9.75**
09/14/06	1500.00	**58.85**	***4800.00***	***36.00***
09/21/06	27.00	**62.49**	9.00	**32.51**
09/28/06	16.00	**55.87**	2.00	**27.06**
10/05/06	120.00	**73.72**	47.00	**31.79**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal coliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

10/12/06	380.00	**124.20**	320.00	***66.49***
10/18/06	17.00	**50.70**	6.00	**17.46**
10/26/06	0.10	**16.55**	1.00	**11.25**

CSHH#10 - Pipe at Corner of Seawall West of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/01/06	209.00		390.00	
06/08/06	309.00		***6001.00***	
06/15/06	20.00	**108.90**	240.00	***825.09***
06/22/06	23.00	**73.83**	6.00	***240.94***
06/29/06	120.00	**81.36**	260.00	***244.64***
07/07/06	0.10	**17.64**	80.00	***178.21***
07/13/06	2100.00	**25.87**	***6001.00***	***178.21***
07/20/06	37.00	**29.26**	23.00	***111.49***
07/27/06	1900.00	**70.74**	11.00	***125.86***
08/02/06	55.00	**60.52**	110.00	***105.97***
08/10/06	28.00	**186.78**	2.00	***50.67***
08/17/06	455.00	**137.56**	210.00	**25.92**
08/24/06	150.00	**182.00**	3.00	**17.24**
08/31/06	320.00	**127.45**	18.00	**19.03**
09/06/06	15.00	**98.29**	5.00	**10.25**
09/14/06	2900.00	***248.63***	***4900.00***	**48.84**
09/21/06	30.00	**144.33**	12.00	**27.55**
09/28/06	130.00	**140.26**	43.00	***46.93***
10/05/06	120.00	**115.28**	190.00	***75.18***
10/12/06	518.00	***234.10***	60.00	***123.58***
10/18/06	26.00	**91.18**	4.00	**29.81**
10/26/06	7.00	**68.16**	5.00	**25.02**

CSHH #11 - 50 Yards East of STP Outfall

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/01/06	136.00		22.00	
06/08/06	1200.00		600.00	
06/15/06	46.00	**195.81**	30.00	***73.43***
06/22/06	1700.00	***336.11***	22.00	***54.33***
06/29/06	210.00	***305.94***	100.00	***61.38***
07/07/06	0.10	**72.26**	10.00	***52.43***
07/13/06	50.00	**38.27**	33.00	**29.35**
07/20/06	16.00	**30.99**	14.00	**25.20**
07/27/06	700.00	**25.95**	9.00	**21.08**
08/02/06	47.00	**19.23**	10.00	**13.30**
08/10/06	390.00	**100.52**	21.00	**15.42**
08/17/06	260.00	**139.79**	13.00	**12.80**
08/24/06	2600.00	***386.94***	4.00	**9.97**
08/31/06	150.00	***284.34***	23.00	**12.02**
09/06/06	41.00	***276.68***	8.00	**11.50**
09/14/06	2500.00	***401.19***	***3900.00***	**32.69**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal coliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

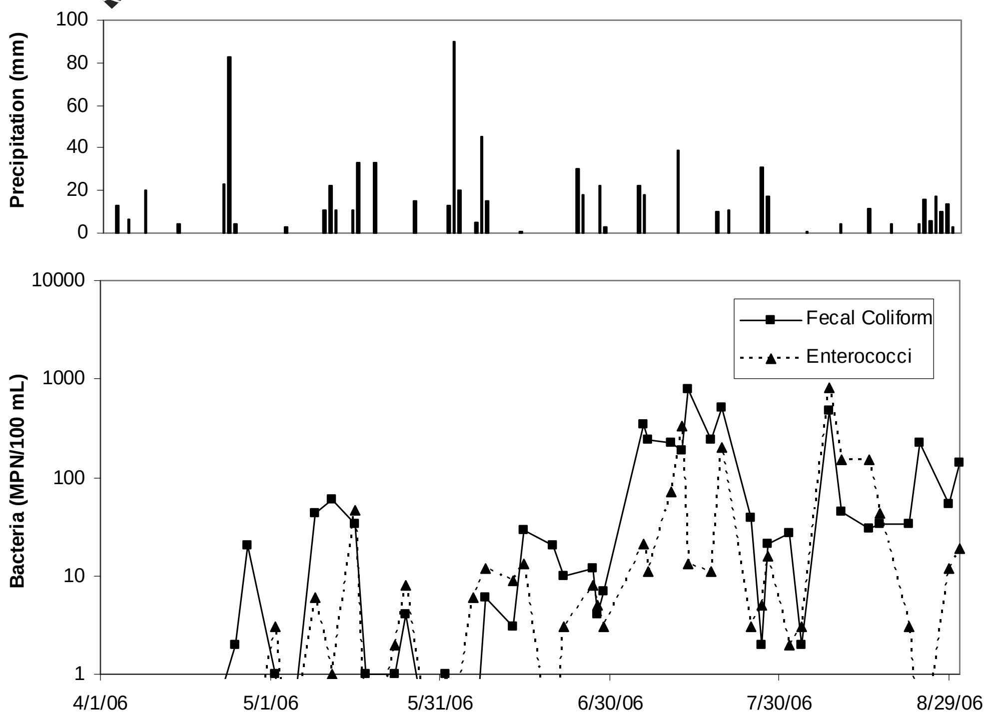
09/21/06	150.00	***359.40***	10.00	**31.02**
09/28/06	240.00	***223.16***	12.00	***38.64***
10/05/06	***1600.00***	***358.29***	460.00	***70.34***
10/12/06	***2400.00***	***808.56***	2300.00	***218.25***
10/18/06	7.00	***249.54***	7.00	***61.62***
10/26/06	22.00	**169.99**	20.00	***70.79***

CSHH #12 - Bend in Seawall East of STP Outfall

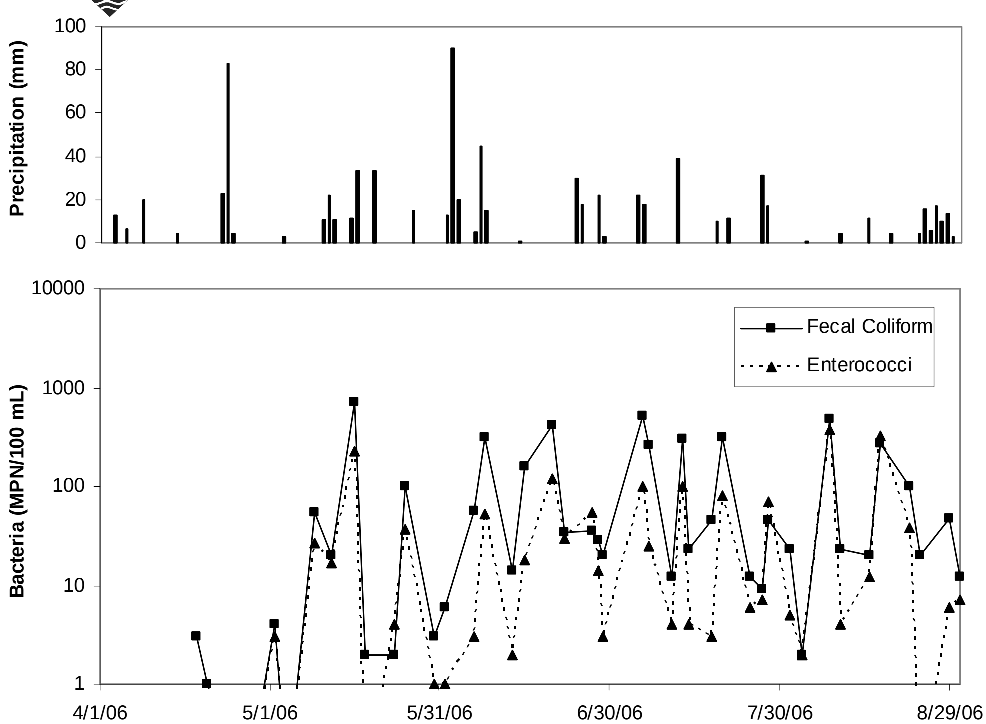
	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
06/01/06	91.00		39.00	
06/08/06	255.00		420.00	
06/15/06	200.00	**166.80**	13.00	***59.72***
06/22/06	600.00	***229.72***	8.00	***36.13***
06/29/06	240.00	***231.74***	130.00	***46.67***
07/07/06	0.10	**59.32**	1.00	**22.43**
07/13/06	31.00	**38.92**	8.00	**10.16**
07/20/06	10.00	**21.38**	7.00	**8.98**
07/27/06	1800.00	**26.63**	26.00	**11.36**
08/02/06	10.00	**14.10**	13.00	**7.17**
08/10/06	173.00	**62.65**	16.00	**12.48**
08/17/06	380.00	**103.42**	29.00	**16.15**
08/24/06	536.00	***229.33***	2.00	**12.57**
08/31/06	120.00	**133.42**	26.00	**12.57**
09/06/06	55.00	**187.63**	32.00	**15.05**
09/14/06	3700.00	***346.21***	***3400.00***	***43.95***
09/21/06	180.00	***298.15***	19.00	***40.39***
09/28/06	150.00	***231.11***	2.00	***40.39***
10/12/06	***4700.00***	***827.78***	2000.00	***126.79***
10/18/06	150.00	***371.44***	39.00	***41.49***
10/26/06	27.00	***231.16***	11.00	***36.19***

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal coliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

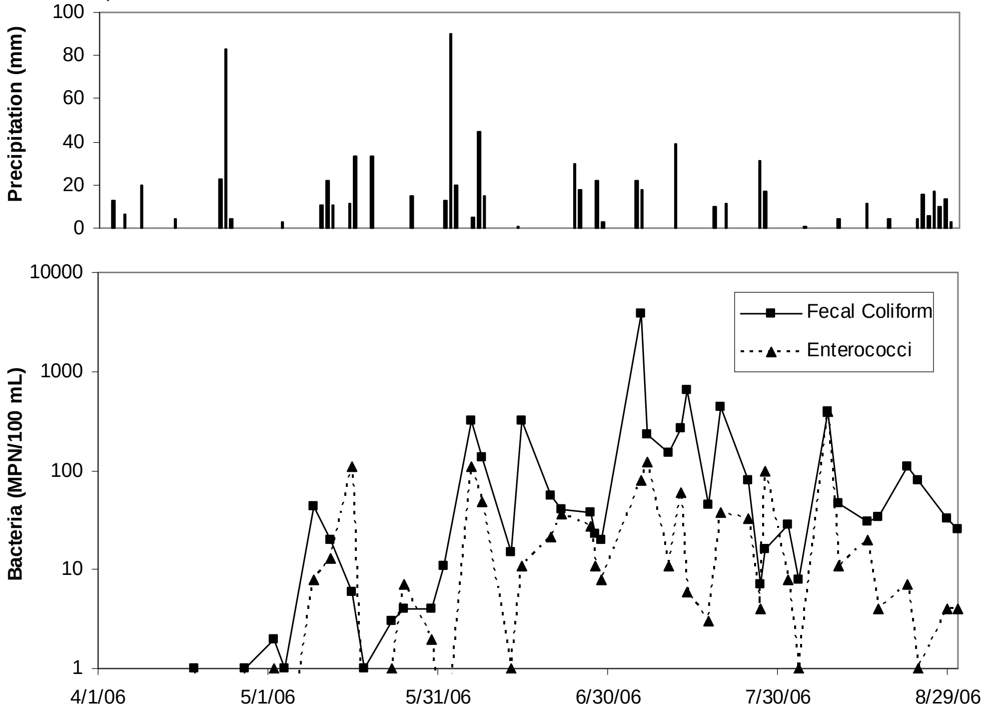
2006 Sands Point Golf Club (IBM) Beach



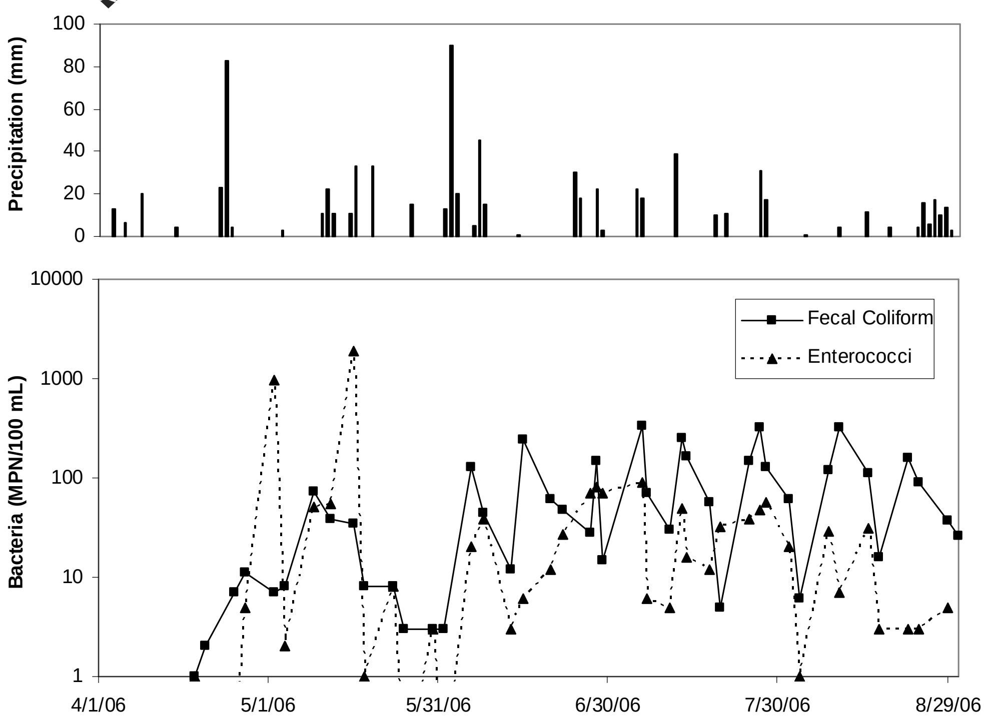
2006 Bar Beach

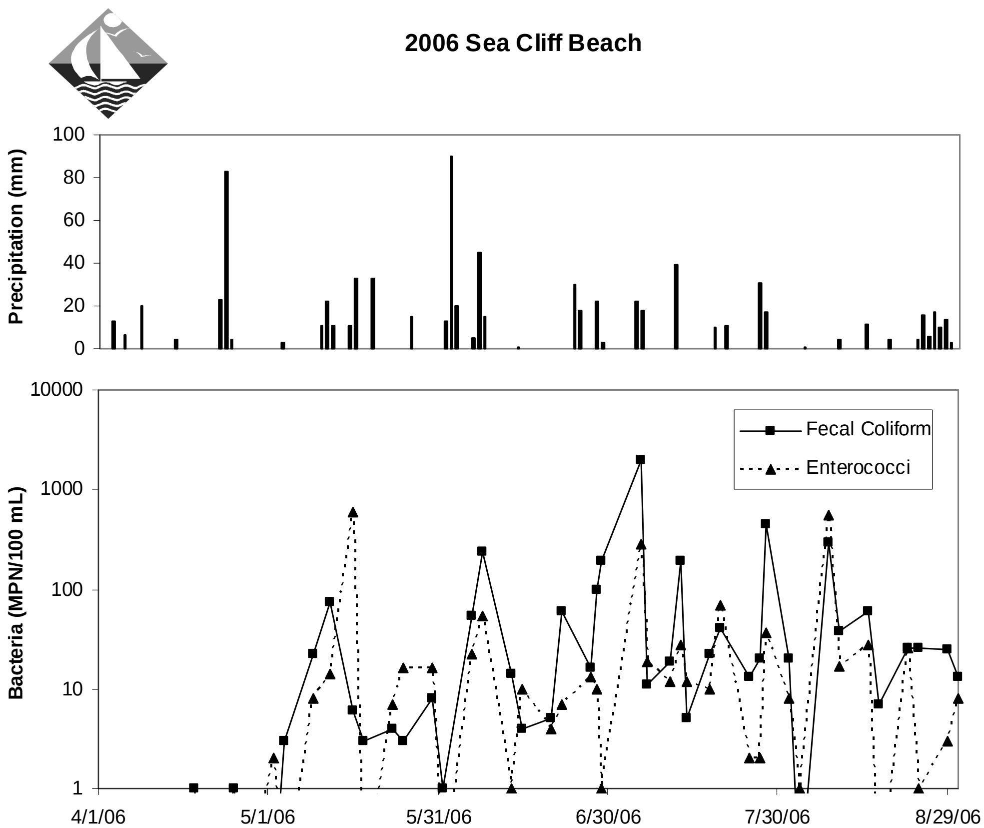


2006 Hempstead Harbor Beach



2006 Tappen Beach




2006 Sea Cliff Beach
Precipitation (mm)
100
80
60
40
20
0
Bacteria (MPN/100 mL)
10000
1000
100
10
1
Fecal Coliform
Enterococci
4/1/06
5/1/06
5/31/06
6/30/06
7/30/06
8/29/06

Sands Point Beach (Formerly IBM Beach)

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
04/18/06	0.10		0.10	
04/25/06	2.00		0.10	
04/27/06	20.00	**1.59**	0.10	**0.10**
05/02/06	1.00	**1.41**	3.00	**0.23**
05/04/06	0.10	**0.83**	0.10	**0.20**
05/09/06	43.00	**1.61**	6.00	**0.35**
05/12/06	59.00	**2.69**	1.00	**0.41**
05/16/06	33.00	**3.68**	47.00	**0.73**
05/18/06	1.00	**3.18**	0.10	**0.59**
05/23/06	1.00	**4.11**	2.00	**0.82**
05/25/06	4.00	**4.10**	8.00	**1.03**
05/30/06	0.10	**2.46**	0.10	**1.34**
06/01/06	1.00	**2.25**	0.10	**1.03**
06/06/06	0.10	**2.46**	6.00	**1.44**
06/08/06	6.00	**2.69**	12.00	**1.78**
06/13/06	3.00	**1.42**	9.00	**1.99**
06/15/06	29.00	**1.92**	13.00	**2.40**
06/20/06	20.00	**1.96**	0.10	**1.72**
06/22/06	10.00	**2.30**	3.00	**1.82**
06/27/06	12.00	**2.85**	8.00	**1.80**
06/28/06	4.00	**2.95**	5.00	**2.00**
06/29/06	7.00	**3.19**	3.00	**2.07**
07/06/06	350.00	**8.11**	21.00	**4.79**
07/07/06	240.00	**17.66**	11.00	**5.09**
07/11/06	220.00	**25.31**	70.00	**6.07**
07/13/06	190.00	**30.40**	330.00	**8.73**
07/14/06	782.00	**50.42**	13.00	**9.03**
07/18/06	240.00	**61.10**	11.00	**8.89**
07/20/06	510.00	**72.92**	200.00	**11.53**
07/25/06	38.00	**92.60**	3.00	**17.75**
07/27/06	2.00	**67.27**	5.00	**15.97**
07/28/06	21.00	**70.48**	16.00	**16.92**
08/01/06	27.00	**103.42**	2.00	**18.22**
08/03/06	2.00	**74.44**	3.00	**15.67**
08/08/06	470.00	**68.75**	820.00	**22.59**
08/10/06	45.00	**66.36**	150.00	**26.45**
08/15/06	30.00	**38.24**	150.00	**23.81**
08/17/06	34.00	**37.84**	43.00	**25.12**
08/22/06	33.00	**23.92**	3.00	**17.93**
08/24/06	220.00	**29.27**	0.10	**11.18**
08/29/06	54.00	**42.54**	12.00	**13.71**
08/31/06	140.00	**47.93**	19.00	**14.17**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal doliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

Bar Beach

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
04/18/06	3.00		0.10	
04/20/06	1.00		0.10	
04/25/06	0.10	**0.67**	0.10	**0.10**
04/27/06	0.10	**0.42**	0.10	**0.10**
05/02/06	4.00	**0.65**	3.00	**0.20**
05/04/06	0.10	**0.48**	0.10	**0.18**
05/09/06	55.00	**0.94**	27.00	**0.36**
05/12/06	20.00	**1.38**	17.00	**0.59**
05/16/06	710.00	**2.76**	230.00	**1.14**
05/18/06	2.00	**2.67**	0.10	**0.89**
05/23/06	2.00	**2.85**	4.00	**1.71**
05/25/06	100.00	**4.07**	37.00	**2.33**
05/30/06	3.00	**8.97**	1.00	**4.27**
06/01/06	6.00	**8.61**	1.00	**3.69**
06/06/06	56.00	**18.95**	3.00	**5.51**
06/08/06	309.00	**25.05**	52.00	**6.90**
06/13/06	14.00	**22.06**	2.00	**4.67**
06/15/06	160.00	**26.90**	18.00	**5.35**
06/20/06	410.00	**33.78**	120.00	**7.74**
06/22/06	34.00	**33.80**	30.00	**8.86**
06/27/06	35.00	**41.18**	54.00	**10.10**
06/28/06	29.00	**39.76**	14.00	**10.43**
06/29/06	20.00	**37.35**	3.00	**9.32**
07/06/06	520.00	**75.10**	100.00	**18.46**
07/07/06	260.00	**87.56**	25.00	**22.81**
07/11/06	12.00	**63.27**	4.00	**17.65**
07/13/06	300.00	**72.89**	100.00	**20.67**
07/14/06	23.00	**76.25**	4.00	**22.01**
07/18/06	45.00	**67.95**	3.00	**18.70**
07/20/06	310.00	**77.11**	80.00	**21.11**
07/25/06	12.00	**60.26**	6.00	**15.57**
07/27/06	9.00	**51.43**	7.00	**14.57**
07/28/06	46.00	**52.61**	69.00	**14.87**
08/01/06	23.00	**56.25**	5.00	**15.66**
08/03/06	2.00	**42.60**	2.00	**13.19**
08/08/06	480.00	**35.88**	370.00	**14.02**
08/10/06	23.00	**34.57**	4.00	**12.63**
08/15/06	20.00	**30.53**	12.00	**12.86**
08/17/06	270.00	**37.22**	320.00	**17.22**
08/22/06	100.00	**32.62**	38.00	**19.04**
08/24/06	20.00	**31.20**	0.10	**11.81**
08/29/06	47.00	**39.93**	6.00	**10.29**
08/31/06	12.00	**35.40**	7.00	**9.90**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal doliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

Hempstead Harbor Beach

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
04/18/06	1.00		0.10	
04/20/06	0.10		0.10	
04/25/06	0.10	**0.22**	0.10	**0.10**
04/27/06	1.00	**0.32**	0.10	**0.10**
05/02/06	2.00	**0.46**	1.00	**0.16**
05/04/06	1.00	**0.52**	0.10	**0.15**
05/09/06	44.00	**0.98**	8.00	**0.26**
05/12/06	20.00	**1.43**	13.00	**0.42**
05/16/06	6.00	**1.68**	110.00	**0.79**
05/18/06	1.00	**1.59**	0.10	**0.64**
05/23/06	3.00	**2.45**	1.00	**1.02**
05/25/06	4.00	**2.57**	7.00	**1.23**
05/30/06	4.00	**4.30**	2.00	**2.27**
06/01/06	11.00	**4.73**	0.10	**1.66**
06/06/06	320.00	**9.87**	110.00	**3.83**
06/08/06	136.00	**12.83**	48.00	**4.93**
06/13/06	15.00	**10.84**	1.00	**3.51**
06/15/06	320.00	**15.21**	11.00	**3.94**
06/20/06	55.00	**26.32**	21.00	**4.93**
06/22/06	40.00	**27.45**	36.00	**6.01**
06/27/06	38.00	**45.08**	27.00	**8.52**
06/28/06	23.00	**42.14**	11.00	**8.74**
06/29/06	20.00	**39.38**	8.00	**8.67**
07/06/06	***3800.00***	**88.81**	80.00	**19.60**
07/07/06	230.00	**85.93**	120.00	**19.77**
07/11/06	150.00	**86.77**	11.00	**17.06**
07/13/06	270.00	**96.20**	60.00	**19.12**
07/14/06	636.00	**135.25**	6.00	**22.51**
07/18/06	45.00	**113.16**	3.00	**20.00**
07/20/06	440.00	**126.72**	38.00	**21.10**
07/25/06	80.00	**145.60**	33.00	**20.94**
07/27/06	7.00	**113.06**	4.00	**18.24**
07/28/06	16.00	**105.20**	100.00	**20.35**
08/01/06	28.00	**124.54**	8.00	**21.52**
08/03/06	8.00	**99.08**	1.00	**16.66**
08/08/06	400.00	**74.79**	400.00	**16.12**
08/10/06	46.00	**71.82**	11.00	**15.61**
08/15/06	30.00	**43.06**	20.00	**15.94**
08/17/06	34.00	**42.15**	4.00	**14.06**
08/22/06	110.00	**36.45**	7.00	**13.85**
08/24/06	80.00	**39.15**	1.00	**10.91**
08/29/06	33.00	**47.46**	4.00	**7.54**
08/31/06	25.00	**44.51**	4.00	**7.08**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal doliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

Tappen Beach

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
04/18/06	1.00		1.00	
04/20/06	2.00		0.10	
04/25/06	7.00	**2.41**	0.10	**0.22**
04/27/06	11.00	**3.52**	5.00	**0.47**
05/02/06	7.00	**4.04**	960.00	**2.17**
05/04/06	8.00	**4.53**	2.00	**2.14**
05/09/06	73.00	**6.74**	51.00	**3.37**
05/12/06	38.00	**8.36**	55.00	**4.77**
05/16/06	35.00	**9.80**	***1920.00***	**9.29**
05/18/06	8.00	**9.61**	1.00	**7.44**
05/23/06	8.00	**14.41**	8.00	**15.12**
05/25/06	3.00	**12.32**	0.10	**9.16**
05/30/06	3.00	**11.35**	3.00	**14.29**
06/01/06	3.00	**9.94**	0.10	**8.70**
06/06/06	130.00	**14.08**	20.00	**6.66**
06/08/06	45.00	**15.82**	39.00	**7.95**
06/13/06	12.00	**11.74**	3.00	**4.68**
06/15/06	240.00	**15.88**	6.00	**4.80**
06/20/06	60.00	**18.19**	12.00	**3.25**
06/22/06	48.00	**20.05**	27.00	**4.02**
06/27/06	28.00	**28.45**	70.00	**7.70**
06/28/06	150.00	**33.60**	80.00	**9.73**
06/29/06	15.00	**31.22**	70.00	**11.65**
07/06/06	330.00	**63.15**	90.00	**26.34**
07/07/06	70.00	**59.36**	6.00	**23.35**
07/11/06	30.00	**57.00**	5.00	**19.01**
07/13/06	250.00	**65.20**	49.00	**20.72**
07/14/06	164.00	**82.70**	16.00	**24.13**
07/18/06	56.00	**72.45**	12.00	**25.70**
07/20/06	5.00	**57.98**	32.00	**26.17**
07/25/06	150.00	**64.11**	38.00	**28.98**
07/27/06	320.00	**73.30**	48.00	**30.22**
07/28/06	130.00	**83.30**	56.00	**29.67**
08/01/06	60.00	**89.57**	20.00	**24.19**
08/03/06	6.00	**71.51**	1.00	**18.55**
08/08/06	120.00	**65.35**	29.00	**18.54**
08/10/06	320.00	**74.60**	7.00	**17.10**
08/15/06	110.00	**69.57**	31.00	**18.59**
08/17/06	16.00	**60.87**	3.00	**15.75**
08/22/06	160.00	**86.81**	3.00	**12.77**
08/24/06	90.00	**87.09**	3.00	**11.20**
08/29/06	37.00	**61.70**	5.00	**6.36**
08/31/06	26.00			

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal doliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

Sea Cliff Village Beach

	Fecal Coliform		*Enterococci*	
Date	**CFU/100ml**	**Log Avg FC**	**CFU/100ml**	**Log Avg Ent**
04/18/06	1.00		0.10	
04/20/06	0.10		0.10	
04/25/06	1.00	**0.46**	0.10	**0.10**
04/27/06	0.10	**0.32**	0.10	**0.10**
05/02/06	0.10	**0.25**	2.00	**0.18**
05/04/06	3.00	**0.38**	0.10	**0.16**
05/09/06	22.00	**0.68**	8.00	**0.29**
05/12/06	74.00	**1.22**	14.00	**0.47**
05/16/06	6.00	**1.46**	590.00	**1.03**
05/18/06	3.00	**1.56**	0.10	**0.82**
05/23/06	4.00	**2.48**	7.00	**1.65**
05/25/06	3.00	**2.53**	16.00	**2.08**
05/30/06	8.00	**4.55**	16.00	**5.11**
06/01/06	1.00	**3.91**	0.10	**3.45**
06/06/06	54.00	**8.11**	22.00	**6.67**
06/08/06	236.00	**11.36**	53.00	**8.20**
06/13/06	14.00	**8.77**	1.00	**6.14**
06/15/06	4.00	**8.11**	10.00	**6.44**
06/20/06	5.00	**8.88**	4.00	**5.88**
06/22/06	60.00	**10.75**	7.00	**5.98**
06/27/06	16.00	**14.45**	13.00	**5.74**
06/28/06	100.00	**17.53**	10.00	**6.07**
06/29/06	190.00	**21.77**	1.00	**5.15**
07/06/06	***2000.00***	**51.46**	280.00	**10.17**
07/07/06	11.00	**43.89**	19.00	**10.03**
07/11/06	19.00	**34.11**	12.00	**8.64**
07/13/06	190.00	**39.88**	28.00	**9.62**
07/14/06	5.00	**36.32**	12.00	**12.05**
07/18/06	22.00	**42.40**	10.00	**12.05**
07/20/06	41.00	**42.28**	70.00	**13.96**
07/25/06	13.00	**44.68**	2.00	**13.95**
07/27/06	20.00	**41.78**	2.00	**11.87**
07/28/06	450.00	**55.18**	37.00	**12.95**
08/01/06	20.00	**42.60**	8.00	**16.02**
08/03/06	0.10	**25.72**	1.00	**12.71**
08/08/06	290.00	**23.31**	560.00	**13.05**
08/10/06	38.00	**24.28**	17.00	**13.34**
08/15/06	60.00	**25.97**	28.00	**13.63**
08/17/06	7.00	**23.05**	0.10	**8.72**
08/22/06	26.00	**22.13**	26.00	**7.79**
08/24/06	26.00	**22.46**	1.00	**6.46**
08/29/06	25.00	**17.53**	3.00	**6.34**
08/31/06	13.00	**17.01**	8.00	**6.49**

MPN refers to most probable number of bacterial cells in the sample. Ent refers to enterococci, and FC refers to fecal doliform. Log AvgFC or Ent refers to the running seasonal average of bacteria results at that location. Bold, italicized values are outside the normal range.

APR	AMT(MM)
1	trace
3	13
5	6.5
8	20
14	4
22	23
23	83
24	4
Total	**153.5**

JUNE	AMT(MM)
1	13
2	90
3	20
6	5
7	45
8	15
14	1
24	30
25	18
28	22
29	3
Total	**262**

AUG	AMT(MM)
4	1
10	4
15	11.5
19	4
24	4
25	15.5
26	5.5
27	17
28	10
29	13.5
30	3
Total	**89**

OCT	AMT(MM)
1	7
4	trace
5	22
6	trace
11	31
12	6
16	22
17	3
19	trace
20	13.5
27	3
28	59
Total	**166.5**

MAY	
3	3
10,11,12	43
15	11
16	33
19	33
26	15
Total	**138**

JULY	
3	trace
5	22
6	18
12,19,21	60*
27	31
28	17
Total	**148**

SEPT	
1	trace
2	37
3	trace
5	8
6	2.5
14	13
15	40.5
20	trace
23	3.5
24	0.5
27	trace
Total	**105**

**This is an estimate: on July 12 SC had 39 mm of rain by 11 pm and a torrential downpour from 11pm to around midnight(not recorded). No data was recorded for 7/19 and 7/21. However, Newsday reported 139 mm of rain from Islip for the month of July; the NY Times (7/30) reported 160 mm for last 30 days at Central Park. On 8/6 NY Times reported 129.3 mm of rain for previous 30 days, as compared with the above estimate of 127 mm.*

***Beaches closed preemptively on 7/6, 7/13, 7/23, 8/26, 8/27, 8/28, 8/29, 8/30 (1/2 inch threshold in 24-hour period).*

APPENDIX C

Summary Tables for 2006 and Previous Seasons

2001

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	Bar Beach	Hempstead Harbor Beach	Sands Point Golf Club
April	Total	194	86	68	239	26
	Fecal	**103**	**43**	**36**	**85**	**9**
May	Total	944	1689	364	486	559
	Fecal	**555**	**274**	**106**	**83**	**21**
June	Total	1045	494	1091	974	2373
	Fecal	**365**	**60**	**451**	**488**	**157**
July	Total	1308	1501	11526	6025	242
	Fecal	**566**	**399**	**11297**	**3458**	**44**
August	Total	12230	24148	2594	3360	2183
	Fecal	**10285**	**1623**	**1872**	**1000**	**124**
September	Total	1500	1100	570	348	468
	Fecal	**1308**	**300**	**116**	**110**	**53**
Season Average	***Total***	***4513***	***9080***	***4187***	***2848***	***1143***
	Fecal	***3559***	***717***	***3754***	***1325***	***75***

2002

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	Bar Beach	Hempstead Harbor Beach	Sands Point Golf Club
April	Total	728	163	157	326	160
	Fecal	**658**	**53**	**11**	**39**	**44**
May	Total	282	194	127	145	130
	Fecal	**169**	**46**	**78**	**124**	**76**
June	Total	1604	750	431	674	560
	Fecal	**1016**	**154**	**168**	**559**	**123**
July	Total	2770	4779	964	1921	613
	Fecal	**1367**	**210**	**831**	**810**	**246**
August	Total	1625	1832	6202	3277	4773
	Fecal	**1278**	**839**	**2130**	**2971**	**2593**
Season Average	*Total*	*1463*	*1626*	*3096*	*1969*	*1226*
	Fecal	***1008***	***451***	***1133***	***1637***	***605***

2003

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	Bar Beach	Hempstead Harbor Beach	Sands Pont Golf Club
April	Total	155	19	159	140	13
	Fecal	**19**	**5**	**152**	**44**	**8**
May	Total	154	1277	130	122	161
	Fecal	**88**	**143**	**47**	**35**	**62**
June	Total	724	915	478	1747	197
	Fecal	**255**	**111**	**64**	**136**	**80**
July	Total	517	1810	1237	781	239
	Fecal	**203**	**304**	**874**	**539**	**65**
August	Total	2117	22364	804	678	347
	Fecal	**1904**	**3114**	**334**	**344**	**81**
Septemb er	Total	*910*	*1820*	*1033*	*3500*	*6567*
	Fecal	***274***	***110***	***177***	***1090***	***977***
Season Average	*Total*	*1097*	*8735*	*816*	*949*	*632*
	Fecal	***809***	***1222***	***421***	***370***	***126***

2004

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	Bar Beach	Hempstead Harbor Beach	Sands Point Golf Club
April	Total	265	161	36	76	57
	Fecal	**66**	**25**	**29**	**71**	**4**
May	Total	851	22029	1910	1137	140
	Fecal	**210**	**3859**	**822**	**141**	**46**
June	Total	701	864	560	1179	168
	Fecal	**557**	**298**	**167**	**615**	**44**
July	Total	790	624	571	2353	146
	Fecal	**301**	**222**	**341**	**460**	**43**
August	Total	414	727	445	993	634
	Fecal	**313**	**442**	**383**	**905**	**375**
Septemb er	Total	*80*	*230*	*17*	*22*	*700*
	Fecal	***80***	***130***	***11***	***17***	***500***
Season Average	*Total*	*682*	*3574*	*701*	*1582*	*268*
	Fecal	***337***	***761***	***359***	***505***	***126***

2005

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	Bar Beach	Hempstead Harbor Beach	Sands Point Golf Club
April	Enterococci	12	1	33	5	1
	Fecal	**19**	**43**	**289**	**60**	**12**
May	Enterococci	19	13	33	29	8
	Fecal	**21**	**18**	**120.23**	**89**	**15**
June	Enterococci	5	3	9	20	9
	Fecal	**87**	**86**	**118**	**330**	**77**
July	Enterococci	15	39	6	26	17
	Fecal	**472**	**596**	**159**	**561**	**176**
August	Enterococci	20	18	79	50	186
	Fecal	**346**	**239**	**256**	**166**	**265**
Season Average	Enterococci	*14.2*	*14.8*	*32*	*26*	*44.2*
	Fecal	***189***	***196***	***188***	***241***	***109***

2006

	Units in MPN/100 mL	Tappen Beach	Sea Cliff Beach	Bar Beach	Hempstead Harbor Beach	Sands Point Golf Club
April	Enterococci	2	0.1	0..1	0.1	0.1
	Fecal	**5**	**0.6**	**1**	**0.6**	**7**
May	Enterococci	333	73	35	16	7
	Fecal	**20**	**14**	**100**	**9**	**16**
June	Enterococci	33	12	30	27	6
	Fecal	**73**	**68**	**107**	**98**	**9**
July	Enterococci	35	47	40	46	68
	Fecal	**150**	**277**	**154**	**567**	**259**
August	Enterococci	11	65	76	46	120
	Fecal	**94**	**51**	**100**	**97**	**106**
Season Average	Enterococci	*83*	*39*	*36*	*27*	*40*
	Fecal	***69***	***82***	***92***	***151***	***79***

CSHH #1 - Beacon 11

	2006				2005			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.35	6.81	25.22	22.42	17.19	4.5	22.94	20.22
July	20.78	3.77	25.79	24.18	23.19	4.22	24.52	24.3
August	23.64	3.29	25.64	23.78	23.73	1.85	25.36	24.4
September	20.58	7.28	25.4	18.9	22.54	4.85	26.49	23.6
October	16.41	7.98	25.56	14.78	16.3	7.36	25.09	13.3
Averages	19.75	5.83	25.52	20.81	20.59	4.56	24.88	21.16

	2004				2003			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	18.3	5.38	25	23.6	17	5.82	23.67	24.6
July	20.87	4.28	25.9	24	18.74	3.6	24.97	21.9
August	22.33	3.86	26.31	24	21.75	2.1	25.79	23.6
September	22.14	3.67	26.15	20.4	21.6	4.32	26.4	22.2
October	16.53	7.66	25.21	12.9	16.49	6.73	25.23	12.8
Averages	20.10	4.94	25.73	20.80	18.94	4.63	25.25	20.40

	2002				2001			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	18.85	4.82	26.42	24.1	20.31	6.62	24.78	24.1
July	21.28	2.31	26.55	25	19.4	3.8	25.68	25.2
August	24.02	2.91	26.89	25	23.25	2.96	26.19	25.4
September	21.98	5.7	26.5	20.3	22.56	5.45	26.7	20.5
October	17.12	7.13	26.38	13.5	17.05	7.86	26.79	15.8
Averages	20.67	4.64	26.56	21.10	20.90	5.16	26.02	22.50

CSHH #1 - Beacon 11

	2000				1999			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.1	5.63	24.43	22.2	19.66	7.07	24.89	23
July	21.8	5.27	25.03	22.2	21.72	3.42	25.78	30
August	22.53	6.41	24.7	24.2	24.35	4.6	25.99	25
September	20.99	4.9	25.07	20.9	21.9	5.57	25.72	22
October	16.78	6.02	25.24	13.2	17.76	8.29	24.7	12
Averages	19.49	5.64	24.87	20.40	21.01	5.85	24.15	22.22

	1998				1997			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.24	6.24	24.18	21.33	18.1	7.01	23.71	24.33
July	21.23	4.89	24.66	24.6	20.83	4.34	24.78	23.5
August	23.95	3.66	24.84	24.5	21.85	1.96	25.96	21.5
September	22.02	4.57	25.48	20.5	22.13	3.26	25.81	19.5
October	17.19	6.84	25.27	13.75	17.45	5.83	26.06	13.67
Averages	20.52	5.17	24.88	21.10	20.10	4.39	25.20	20.81

	1996				1995			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	19	8.35	N/A	23.25	17.78	5.3	26.27	19.67
July	20.04	3.74	24.66	22.75	20.77	2.66	26.53	25.25
August	21.75	2.88	25.13	22.25	23.78	4.56	27.56	24.7
September	21.7	5.14	25.48	19.83	21.72	4.34	28.05	20.5
October	17.34	9.21	24.97	15.25	17.71	6.9	27.34	16.5
Averages	19.87	5.90	25.03	20.71	20.80	4.60	27.21	21.84

CSHH #2 - Bell Marker 6

	2006				2005			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	16.93	7.74	25.89	22.72	16.8	5.22	23.21	21.9
July	18.67	3.99	26.51	25.5	21.78	4.59	23.03	24.4
August	21.91	1.91	26.42	26.53	23.13	2.07	25.58	26.6
September	20.41	5.98	26.24	20.33	22.8	2.98	27.01	24.2
October	17.66	7.3	26.32	18.89	17.01	6.84	25.91	13.9
Averages	19.12	5.38	26.28	22.79	20.30	4.34	25.35	22.22

	2004				2003			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	16.38	5.92	25.41	22.5	15.58	6.35	24.26	22.4
July	19.82	5.11	26.24	24.8	17.16	2.93	25.35	22.9
August	21.47	3.04	26.62	24.1	21.01	1.74	26.14	23.6
September	21.96	6.17	26.33	20.7	21.2	5.38	26.55	22
October	17.37	8.16	25.63	14.3	17.19	6.47	26.03	15
Averages	19.49	5.57	26.06	21.50	18.37	4.55	25.70	21.10

	2002				2001			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	18.06	6.13	26.55	23.4	16.67	4.97	25.36	23.2
July	19.91	1.81	26.87	27.4	18.45	5.32	26	26.2
August	22.85	3.08	27.23	25.4	22.33	3.83	26.46	26
September	21.97	5.84	26.89	21.4	21.88	5.8	27.07	21.1
October	17.74	7.68	27.25	13.9	16.94	8.55	27.24	15.9
Averages	20.13	5.11	26.99	21.50	19.58	5.46	26.41	22.80

CSHH #2 - Bell Marker 6

	2000				1999			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	16.45	6.29	24.77	22.4	17.13	6.41	25.42	23
July	20.19	4.8	25.38	22.7	19.62	2.87	26.23	27
August	22.08	6.46	24.95	24.7	22.88	4.29	26.8	25
September	20.89	6.08	25.54	22.3	22.15	5.75	26.84	26
October	16.86	7.18	26.07	16.3	17.18	8.46	26.3	13
Averages	19.03	6.10	25.28	21.80	19.67	5.44	26.21	22.73

	1998				1997			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	16.39	6.9	24.45	21.33	16.7	9.12	24.14	24.5
July	19.88	4.78	25.13	24.6	18.32	3.12	25.33	23.25
August	22.88	3.3	25.27	24.5	21.12	2.86	26.41	21.37
September	21.62	6.03	25.82	20.5	21.33	3.18	26.79	19.75
October	17.18	6.9	26.27	13.75	18.02	5.22	26.59	14.5
Averages	19.66	5.45	25.40	21.10	19.12	4.54	25.69	21.37

	1996				1995			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.5	7.8	N/A	22	17.61	7.78	26.5	21.25
July	19.15	5.17	24.92	24.5	20.09	4.19	26.93	24.87
August	21.1	4.29	24.99	23.17	22.9	4.87	27.77	25.12
September	22.05	8	25.73	20.17	21.73	5.27	28.44	21.5
October	16.95	9.11	25.34	15.75	17.48	7.72	27.8	15.83
Averages	19.20	7.14	25.28	20.53	20.30	5.67	27.53	22.16

CSHH #3 - Glen Cove Creek

	2006				2005			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.37	8.35	25.6	23.38	17.46	5.46	23.08	22.32
July	20.32	4.51	25.98	25.25	22.32	4.29	24.82	24.8
August	23.19	5.13	26.13	25.46	23.53	2.16	25.67	25.3
September	20.58	7.5	26	19.85	22.76	5.23	26.8	24.8
October	16.91	8.55	26.17	16.03	16.66	8.14	25.58	14.3
Averages	19.67	6.81	25.98	21.99	20.54	5.05	25.19	22.29

	2004				2003			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.67	7.36	25.23	23.4	16.47	7.02	23.97	23.9
July	20.39	4.96	26.15	25.1	18.41	4.25	25.08	22.8
August	22	4.3	26.48	22.8	21.26	3.74	25.92	23.6
September	22.02	4.66	26.34	21.3	21.48	4.81	26.49	22.4
October	16.86	7.62	25.97	13.1	16.97	6.58	25.61	15.6
Averages	19.87	5.76	26.04	20.90	18.90	5.21	25.45	21.80

	2002				2001			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	19.05	6.36	26.48	23.7	18.45	7.63	25.23	24.4
July	20.71	2.61	26.69	25.4	18.55	4.53	25.92	26
August	23.36	2.49	27.1	26.9	23.09	4.83	26.34	27.7
September	21.78	6.49	26.71	22	22.1	6.92	26.88	21.3
October	17.7	7.98	27.05	14.7	17.02	9.01	27.12	16.3
Averages	20.53	5.20	26.83	22.10	20.23	6.47	26.27	23.60

CSHH #3 - Glen Cove Creek

	2000				1999			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.69	6.6	24.35	21.6	18.43	6.32	25.09	23
July	21.16	5.87	25.26	23	21.57	5.02	25.89	30
August	22.66	6.44	24.68	23.5	23.82	4.87	26.44	26
September	21.45	6.13	24.99	20.5	21.8	6.16	26.25	23
October	16.69	7.5	25.52	16.7	16.74	8.7	25.81	14
Averages	19.59	6.54	24.94	20.90	20.20	6.32	25.74	23.04

	1998				1997			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	17.23	7.25	24.27	21.33	17.36	8.32	24.11	26.5
July	21.03	6.34	24.76	24.6	20.2	6.21	25.07	23.37
August	23.39	3.87	25.14	24.5	21.34	2.29	26.29	21.5
September	21.88	5.76	25.75	20.5	21.61	3.12	26.67	20
October	16.9	7.79	25.88	13.75	17.12	5.69	26.69	13.67
Averages	20.28	6.16	25.16	21.10	19.55	5.14	25.66	21.25

	1996				1995			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	18.25	9.35	N/A	22.12	17.82	5.4	26.58	21.5
July	20.32	7.1	24.46	23.67	20.74	4.5	26.87	25
August	21.45	3.2	25.29	22.87	23.24	4.79	27.94	24.7
September	22.09	6.85	25.69	20.83	21.61	4.78	28.22	21
October	16.61	9.88	25.12	15.4	17.4	7.54	27.57	16.5
Averages	19.43	7.44	25.15	20.55	20.59	5.26	27.55	22.18

CSHH #8- Glen Cove Creek STP Outfall

	2005				2005			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	18.21	7.98	25.27	24.52	18.9	7.1	22.25	23.72
July	21.43	5.08	25.51	26.33	23.07	5.48	24.5	25.5
August	24	8.85	25.71	25.18	24.32	3.45	25.32	27.2
September	20.65	8.25	25.36	20.2	23.24	5.07	26.42	25.2
October	17.12	8.18	25.97	15.57	16.98	7.31	25.28	14
Averages	20.28	7.67	25.56	22.36	21.30	5.68	24.75	23.10

	2004				2003			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	19.38	8.14	24.8	26.3	17.01	5.92	23.7	25.7
July	21.26	4.52	25.39	27	18.94	4.03	24.94	24.4
August	22.78	5.98	25.89	24.4	22.51	5.23	25.51	26.1
September	22.22	4.66	25.62	22.1	21.58	4.87	25.99	23.5
October	16.6	7.79	25.72	13.4	16.49	6.49	25.1	14.6
Averages	20.49	6.22	25.50	22.20	19.10	5.28	25.09	22.10

	2002				2001			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	19.89	7.65	26.12	25.5	20.11	7.61	24.57	26.6
July	22.13	4.33	26.27	26.8	20.18	5.56	25.31	27.1
August	24.64	4.85	26.67	27.7	23.82	6.16	25.86	29.2
September	21.91	6.01	26.41	23	22.45	5.74	26.58	22.1
October	17.67	7.69	26.77	16.4	16.67	9.56	26.54	16.7
Averages	21.29	6.11	26.47	23.40	21.05	6.82	25.76	24.80

	2000				1999			
	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)	Avg. Water Temp. (°C) (Bottom)	Avg. DO (ppm) (Bottom)	Avg. Salinity (ppt) (Bottom)	Avg. Air Temp. (°C)
June	18.66	7.13	23.59	23.8	19.99	9.11	24.71	23
July	21.99	6.51	24.93	24.1	22.7	6.03	25.53	30
August	23.58	7.75	24.18	24.5	24.28	5.32	26.19	26
September	21.17	8.63	24.81	23.6	21.78	6.14	25.84	24
October	17.25	7.17	24.87	15.3	16.63	8.63	25.53	15
Averages	20.40	7.35	24.40	21.90	21.02	7.14	25.49	23.70

Salinity Averages

	Beacon 11 CSHH #1	**Bell 6 CSHH #2**	**Red Channel Marker, Near Glen Cove Creek CSHH #3**	**Glen Cove STP Outfall CSHH #8**
2006	25.3 ppt	26.0 ppt	25.6 ppt	24.3 ppt
2005	24.60	24.95	24.71	23.66
2004	25.73	26.06	26.04	25.50
2003	25.25	25.70	25.45	25.09
2002	26.56	26.99	26.83	26.47
2001	26.02	26.41	26.27	25.76
2000	24.87	25.28	24.94	24.40
1999	24.15	26.21	25.49	25.49
1998	24.88	25.40	25.16	N/A
1997	25.20	25.69	25.66	N/A

Precipitation Averages

	June	**July**	**August**	**September**	**October**
2006	262 mm	148 mm	89 mm	105 mm	166.5 mm
2005	45	81	41	28.5	460.5
2004	95	214	91	310.5	40
2003	291.5	87	88	194.5	134
2002	180.5	22.5	175.5	116.5 (9/15-9/30)	180
2001	167	70.5	165	94	19.5
2000	146	159	158	125	6
1999	31	21	135	323	92
1998	191	59	145	90	97
1997	47	232	141	84	27 (10/1-15)

Bottom Dissolved Oxygen Averages

Averages for Bottom DO	***2006***	***2005***	***2004***	***2003***	***2002***	***2001***
Beacon 11, CSHH #1	5.8 ppm	4.59 ppm	4.94 ppm	4.63 ppm	4.64 ppm	5.16 ppm
Bell Buoy 6, CSHH #2	5.3	4.63	5.57	4.55	5.11	5.46
Glen Cove Creek, Red Channel Marker, CSHH #3	6.8	5.09	5.76	5.21	5.20	6.47
Glen Cove STP Outfall, CSHH #8	7.0	5.76	6.22	5.28	6.11	6.82

Averages for Bottom DO	***2000***	***1999***	***1998***	***1997***	***1996***
Beacon 11, CSHH #1	5.64 ppm	5.85 ppm	5.17 ppm	4.39 ppm	5.90 ppm
Bell Buoy 6, CSHH #2	6.10	5.44	5.45	4.54	7.11
Glen Cove Creek, Red Channel Marker, CSHH #3	6.54	6.32	6.48	5.15	7.45
Glen Cove STP Outfall, CSHH #8	7.35	7.14	N/A	N/A	N/A